Warren Reeve Duchac

MANAGERIAL ACCOUNTING

10e

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University of Georgia, Athens

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The Author Team

Carl S. Warren

Dr. Carl S. Warren is Professor Emeritus of Accounting at the University of Georgia, Athens. Dr. Warren has taught classes at the University of Georgia, University of Iowa, Michigan State University, and University of Chicago. Professor Warren focused his teaching efforts on principles of accounting and auditing. He received his Ph.D. from Michigan State University and his B.B.A. and M.A. from the University of Iowa. During his career, Dr. Warren published numerous articles in professional journals, including *The Accounting Review, Journal of Accounting Research, Journal of Accountancy, The CPA Journal,* and *Auditing: A Journal of Practice & Theory.* Dr. Warren has served on numerous committees of the American Accounting Association, the American Institute of Certified Public Accountants, and the Institute of Internal Auditors. He has also consulted with numerous companies and public accounting firms. Warren's outside interests include playing handball, golfing, skiing, backpacking, and fly-fishing.

James M. Reeve

Dr. James M. Reeve is Professor Emeritus of Accounting and Information Management at the University of Tennessee. Professor Reeve taught on the accounting faculty for 25 years, after graduating with his Ph.D. from Oklahoma State University. His teaching effort focused on undergraduate accounting principles and graduate education in the Master of Accountancy and Senior Executive MBA programs. Beyond this, Professor Reeve is also very active in the Supply Chain Certification program, which is a major executive education and research effort of the College. His research interests are varied and include work in managerial accounting, supply chain management, lean manufacturing, and information management. He has published over 40 articles in academic and professional journals, including the *Journal of Cost Management, Journal of Management Accounting Research, Accounting Review, Management Accounting Quarterly, Supply Chain Management Review,* and *Accounting Horizons.* He has consulted or provided training around the world for a wide variety of organizations, including Boeing, Procter and Gamble, Norfolk Southern, Hershey Foods, Coca-Cola, and Sony. When not writing books, Professor Reeve plays golf and is involved in faith-based activities.

Jonathan Duchac

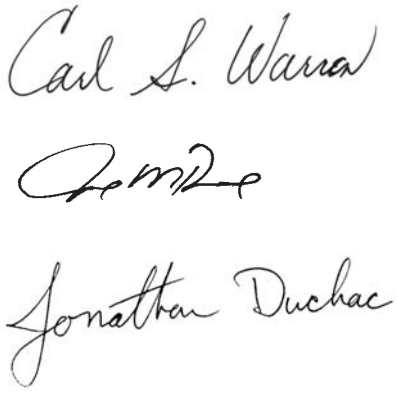
Dr. Jonathan Duchac is the Merrill Lynch and Co. Professor of Accounting and Director of the Program in Enterprise Risk Management at Wake Forest University. He earned his Ph.D. in accounting from the University of Georgia and currently teaches introductory and advanced courses in financial accounting. Dr. Duchac has received a number of awards during his career, including the Wake Forest University Outstanding Graduate Professor Award, the T.B. Rose award for Instructional Innovation, and the University of Georgia Outstanding Teaching Assistant Award. In addition to his teaching responsibilities, Dr. Duchac has served as Accounting Advisor to Merrill Lynch Equity Research, where he worked with research analysts in reviewing and evaluating the financial reporting practices of public companies. He has testified before the U.S. House of Representatives, the Financial Accounting Standards Board, and the Securities and Exchange Commission; and has worked with a number of major public companies on financial reporting and accounting policy issues. In addition to his professional interests, Dr. Duchac is the Treasurer of The Special Children's School of Winston-Salem; a private, nonprofit developmental day school serving children with special needs. Dr. Duchac is an avid long-distance runner, mountain biker, and snow skier. His recent events include the Grandfather Mountain Marathon, the Black Mountain Marathon, the Shut-In Ridge Trail run, and NO MAAM (Nocturnal Overnight Mountain Bike Assault on Mount Mitchell).

Leading by Example

For nearly 80 years, *Accounting* has been used effectively to teach generations of businessmen and women. The text has been used by millions of business students. For many, this book provides the only exposure to accounting principles that they will ever receive. As the most successful business textbook of all time, it continues to introduce students to accounting through a variety of time-tested ways.

The previous edition, 9e, started a new journey into learning more about the changing needs of accounting students through a variety of new and innovative research and development methods. Our Blue Sky Workshops brought accounting faculty from all over the country into our book development process in a very direct and creative way. Many of the features and themes present in this text are a result of the collaboration and countless conversations we've had with accounting instructors over the last several years. 10e continues to build on this philosophy and strives to be reflective of the suggestions and feedback we receive from instructors and students on an ongoing basis. We're very happy with the results, and think you'll be pleased with the improvements we've made to the text.

The original author of *Accounting*, James McKinsey, could not have imagined the success and influence this text has enjoyed or that his original vision would continue to lead the market into the twenty-first century. As the current authors, we appreciate the responsibility of protecting and enhancing this vision, while continuing to refine it to meet the changing needs of students and instructors. Always in touch with a tradition of excellence but never satisfied with yesterday's success, this edition enthusiastically embraces a changing environment and continues to proudly lead the way. We sincerely thank our many colleagues who have helped to make it happen.



"The teaching of accounting is no longer designed to train professional accountants only. With the growing complexity of business and the constantly increasing difficulty of the problems of management, it has become essential that everyone who aspires to a position of responsibility should have a knowledge of the fundamental principles of accounting."

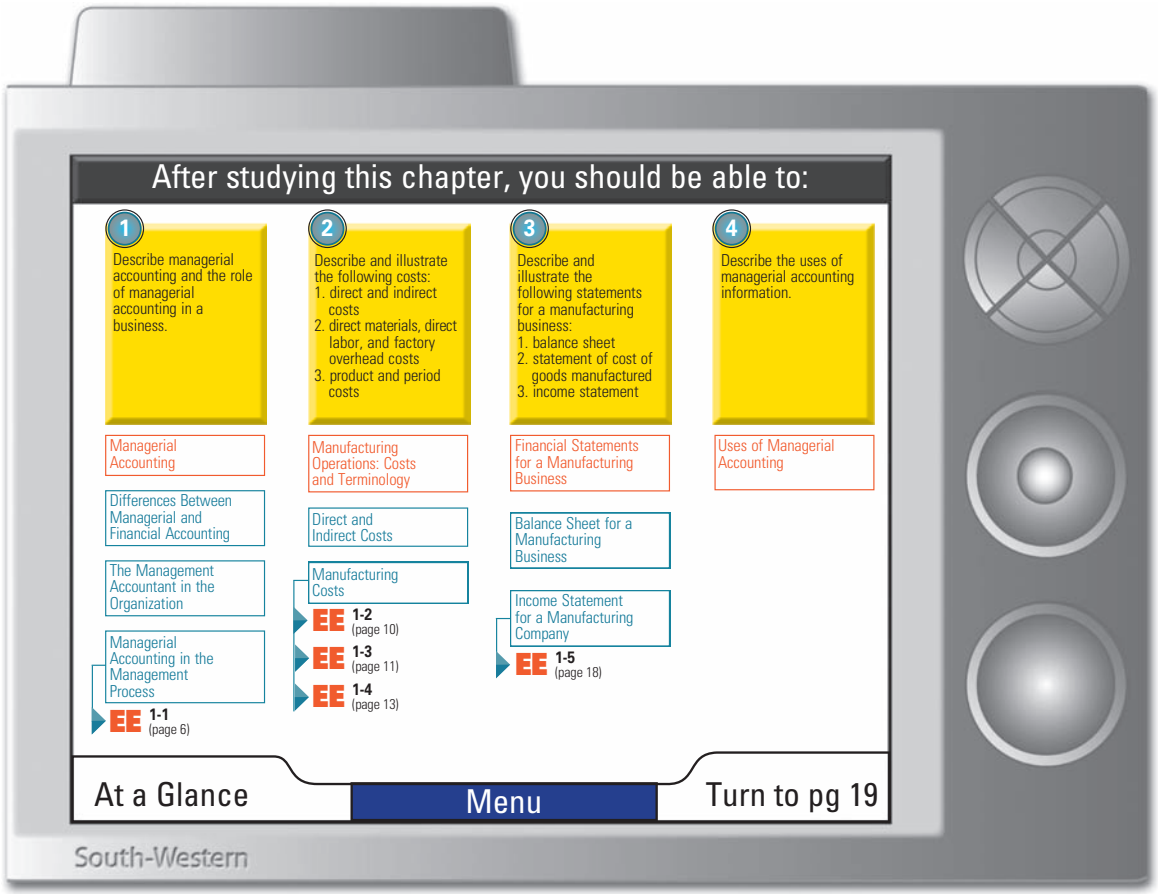
— James O. McKinsey, Author, first edition, 1929

Leading by Example

Textbooks continue to play an invaluable role in the teaching and learning environment. Continuing our focus from previous editions, we reached out to accounting teachers in an effort to improve the textbook presentation. New for this edition, we have extended our discussions to reach out to students directly in order to learn what they value in a textbook. Here's a preview of some of the improvements we've made to this edition based on student input:

NEW! Guiding Principles System

Students can easily locate the information they need to master course concepts with the new "Guiding Principles System (GPS)." At the beginning of every chapter, this innovative system plots a course through the chapter content by displaying the chapter objectives, major topics, and related Example Exercises. The GPS reference to the chapter "At a Glance" summary completes this proven system.



NEW! Written for Today's Students

Designed for today's students, the 10th edition has been extensively revised using an innovative, high-impact writing style that emphasizes topics in a concise and clearly written manner. Direct sentences, concise paragraphs, numbered lists, and step-by-step calculations provide students with an easy-to-follow structure for learning accounting. This is achieved without sacrificing content or rigor.

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NEW! Revised Coverage of Investments

A new chapter on investments and fair value accounting has been written to consolidate coverage of both dept and equity investments. The chapter also contains a conceptual discussion of fair value accounting and its increasing role in defining today's modern accounting methods.

NEW! IFRS

IFRS IFRS

No topic is on the minds of many accounting practitioners more than the possible convergence of IFRS and GAAP. How accounting educators handle this emerging reality is perhaps even more of a question going forward. In the financial chapters found within this text, IFRS icons now exist in the margin to help highlight certain areas where differences exist between these standards.

NEW! Modern User-Friendly Design

Based on students' testimonials of what they find most useful, this streamlined presentation includes a wealth of helpful resources without the clutter. To update the look of the material, some exhibits use computerized spreadsheets to better reflect the changing environment of business. Visual learners will appreciate the generous number of exhibits and illustrations used to convey concepts and procedures.

Exhibit 4

Retained Earnings Statement for Merchandising Business

NetSolutions
Retained Earnings Statement
For the Year Ended December 31, 2011

Retained earnings, January 1, 2011		$128,800
Net income for the year	$75,400	
Less dividends	18,000	
Increase in retained earnings		57,400
Retained earnings, December 31, 2011		$186,200

Journal Page 25

Date		Description	Post. Ref.	Debit	Credit
2011 Jan.	3	Cash		1,800	
		Sales			1,800
		To record cash sales.			

Chapter Updates and Enhancements

The following includes some of the specific content changes that can be found in *Managerial Accounting, 10e*.

Chapter 1: Managerial Accounting Concepts and Principles

- Added a new section at the beginning of the chapter on the uses of managerial accounting, which references subsequent chapters where the uses are described and illustrated.
- Added an illustration of comparing merchandising and manufacturing income statements.
- Added format for the cost of goods manufactured statement.
- Added stepwise preparation of the cost of goods manufactured.

Chapter 2: Job Order Costing

- Added format for the entries used to dispose of overapplied or underapplied factory overhead.
- Changed order of entries so that entries for sales and cost of goods sold are shown separately from the finished goods entry for completed units.

Chapter 3: Process Cost Systems

- Revised Exhibit 2 and accompanying narrative so that Exhibit 2 ties into Exhibit 8, which illustrates entries for Frozen Delights.
- Revised illustration of cost of production report so that units are classified into groups consisting of beginning work in process units (Group 1), started and completed units (Group 2), and ending work in process units (Group 3). This aids students in computing unit costs and assigning costs to groups using first-in, first-out inventory cost flow. Accompanying exhibits and art also classify units by these groups.
- Revised and expanded the section on using the cost of production report for decision making to include an example from Frozen Delights.

Chapter 4: Cost Behavior and Cost-Volume-Profit Analysis

- Supplemented the mixed cost discussion by adding an equation for determining fixed costs.
- Added contribution margin equation to cost-volume-profit discussion.
- Added unit contribution margin equation to cost-volume-profit discussion.
- Added "change in income from operations" equation based on unit contribution margin to cost-volume-profit discussion.
- Incorporated a discussion of computing break-even in sales dollars using contribution margin ratio.
- Added a stepwise approach to discussion of preparing cost-volume-profit and profit-volume charts.
- Added equation for computing the percent change in income from operations using "operating leverage."
- Expanded discussion of margin of safety so that margin of safety may be expressed in sales dollars, units, or percent of current sales.
- Revised appendix on variable costing to include format for variable costing income statement.

Leading by Example

Chapter 5: Variable Costing for Management Analysis

- Chapter objectives revised slightly.
- Generic absorption and variable costing income reporting formats illustrated in Objective 1, followed by numerical examples.
- Graphic on page 184 revised to include units manufactured = units sold.
- Formulas (equations) added for contribution margin analysis section, Objective 5.
- Exhibits 11, 12, and 16 revised for clarity.

Chapter 6: Budgeting

- Made minor changes to chapter objectives.
- Added stepwise approach to preparing a flexible budget.
- Modified the definition of the master budget.
- Added new classifications of budget components of the master budget as operating, investing, and financing budget components.
- Added format for determining "total units to be produced."
- Added format for determining "direct materials to be purchased."

Chapter 7: Performance Evaluation Using Variances from Standard Costs

- Added a 2nd level heading for Objective 1, "Criticisms of Standard Costs."
- Added several new headings for Objective 2, "Budget Performance Report" and "Manufacturing Cost Variances."
- Revised discussion of "Manufacturing Cost Variances" to better tie into subsequent discussion of standard cost variances.
- Utilized a new equation format for computing standard cost variances. Using these equations, a positive amount indicates an unfavorable variance while a negative amount indicates a favorable variance. Later in the chapter, positive variance amounts are recorded as debits and negative variance amounts are recorded as credits.
- Revised the factory overhead variance discussion to include equations for computing total, variable, and fixed factory overhead rates. These rates are then used to explain and illustrate the computation of the controllable factory overhead variance and the volume factory overhead variance.
- Revised the factory overhead variance discussion to use equations for computing the controllable and volume variances.
- Revised the discussion of how the total factory overhead cost variance is related to overapplied or underapplied overhead balance. Further explanation is provided to show how the overapplied or underapplied overhead balance can be separated into the controllable and volume variances.
- Added new key terms for budgeted variable factory overhead, favorable cost variance, unfavorable cost variance, and standards.

Chapter 8: Performance Evaluation for Decentralized Operations

- Modified the chapter objectives slightly.
- Added equations for computing service department charge rates.
- Presented equations for allocating service department charges to decentralized operations (divisions).

- Added example format for determining residual income.
- Added equations for computing increases and decreases in divisional income using different negotiated transfer prices.

Chapter 9: Differential Analysis and Product Pricing

- Added section on managerial decision making. Objective 1 now includes a new flowchart depicting the steps that define the decision-making process.
- Added equations (e.g., markup percentages, desired profit) to "Setting Normal Product Selling Prices" Section.
- Adopted a stepwise approach to setting normal prices for each cost-plus (total, product, variable) concept.
- Added Exhibit 11 to summarize cost-plus approaches to setting normal prices.
- Added equation to determine "contribution margin per bottleneck constraint."
- Presented equations for assessing product pricing and cost decisions related to bottlenecks.
- Added equation for determining "activity rate" in Activity-Based Costing appendix.

Chapter 10: Capital Investment Analysis

- Replaced XM Satellite Radio with Carnival Corporation as the opener vignette.
- Revised the learning objectives so that the nonpresent value (average rate of return and cash payback) methods have a separate learning objective from the present value (net present value and internal rate of return) methods.
- Added an equation for determining the "average investment" for use in the average rate of return method.
- Added an equation for determining the "cash payback period."
- Added a graphic for determining the present value of $1 along with additional explanations of present values.
- Added format for using the net present value method that is consistent with that shown in the solutions manual.
- Added an equation for determining the present value index.

Chapter 11: Cost Allocation and Activity-Based Costing

- Added discussion and illustration of conditions when a single-plantwide rate might cause product cost distortions.
- Added equations for determining activity rates.

Chapter 12: Cost Management for Just-in-Time Environments

- Chapter Objective 1 revised slightly.
- Added equation for computing "Value-Added Ratio" for lead time.
- Added equation for computing "Total Within-Batch Wait Time."
- Deleted Learning Objective 2 (Andersen Metal Fabricators" illustration) from previous edition.
- Moved discussion of JIT for nonmanufacturing setting to precede implications of JIT for cost accounting.

Chapter 13: Statement of Cash Flows

- Revised beginning section discussing the statement of cash flows (SCF) and illustrating the format for the SCF under the direct and indirect methods.
- Revised beginning discussion of direct method to emphasize conversion of accrual income statement to cash flows from operations (on an item-by-item basis). New graphic for conversion of interest expense to cash payments for interest provides visual reinforcement for this topic.
- Used stepwise format for preparing the statement of cash flows under indirect and direct methods.
- Used stepwise format for preparing the work sheet for the indirect method in the end-of-chapter appendix.

Chapter 14: Financial Statement Analysis

- New chapter opener features Nike, Inc.
- Real world financial statement analysis problem features data from the Nike, Inc. 2007 10K, which can be found in Appendix B in the back of the text.
- Each ratio is highlighted in a boxed screen for easier review.
- Appendix on "Unusual Items on the Income Statement" was added.

Leading by Example

Managerial Accounting, 10e, is unparalleled in pedagogical innovation. Our constant dialogue with accounting faculty continues to affect how we refine and improve the text to meet the needs of today's students. Our goal is to provide a logical framework and pedagogical system that caters to how students of today study and learn.

Clear Objectives and Key Learning Outcomes

1 Describe and illustrate reporting income from operations under absorption and variable costing.

To help guide students, the authors provide clear chapter objectives and important learning outcomes. All aspects of the chapter materials relate back to these key points and outcomes, which keeps students focused on the most important topics and concepts in order to succeed in the course.

EX 5-1
Inventory valuation under absorption costing and variable costing

obj. 1

✔ b. Inventory, $294,840

At the end of the first year of operations, 5,200 units remained in the finished goods inventory. The unit manufacturing costs during the year were as follows:

Direct materials	$35.00
Direct labor	16.80
Fixed factory overhead	5.60
Variable factory overhead	4.90

Determine the cost of the finished goods inventory reported on the balance sheet under (a) the absorption costing concept and (b) the variable costing concept.

Example Exercises

Example Exercises were developed to reinforce concepts and procedures in a bold, new way. Like a teacher in the classroom, students follow the authors' example to see how to complete accounting applications as they are presented in the text. This feature also provides a list of Practice Exercises that parallel the Example Exercises so students get the practice they need. In addition, the Practice Exercises also include references to the chapter Example Exercises so that students can easily cross-reference when completing homework.

See the example of the application being presented.

Follow along as the authors work through the Example Exercise.

Try these corresponding end-of-chapter exercises for practice!

Example Exercise 2-2 Direct Labor Costs 2

During March, Hatch Company accumulated 800 hours of direct labor costs on Job 101 and 600 hours on Job 102. The total direct labor was incurred at a rate of $16 per direct labor hour for Job 101 and $12 per direct labor hour for Job 102. Journalize the entry to record the flow of labor costs into production during March.

Follow My Example 2-2

Work in Process	20,000*	
Wages Payable		20,000

*Job 101 $12,800 = 800 hrs. × $16
Job 102 7,200 = 600 hrs. × $12
Total $20,000

For Practice: PE 2-2A, PE 2-2B

"At a Glance" Chapter Summary

The "At a Glance" summary grid ties everything together and helps students stay on track. First, the Key Points recap the chapter content for each chapter objective. Second, the related Key Learning Outcomes list all of the expected student performance capabilities that come from completing each objective. In case students need further practice on a specific outcome, the last two columns reference related Example Exercises and their corresponding Practice Exercises. In addition, the "At a Glance" grid guides struggling students from the assignable Practice Exercises to the resources in the chapter that will help them complete their homework. Through this intuitive grid, all of the chapter pedagogy links together in one cleanly integrated summary.

2 Prepare a cost of production report.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Manufacturing costs must be allocated between the units that have been completed and those that remain within the department. This allocation is accomplished by allocating costs using equivalent units of production during the period for the beginning inventory, units started and completed, and the ending inventory.	• Determine the whole units charged to production and to be assigned costs.	3-2	3-2A, 3-2B
	• Compute the equivalent units with respect to materials.	3-3	3-3A, 3-3B
	• Compute the equivalent units with respect to conversion.	3-4	3-4A, 3-4B
	• Compute the costs per equivalent unit.	3-5	3-5A, 3-5B
	• Allocate the costs to beginning inventory, units started and completed, and ending inventory.	3-6	3-6A, 3-6B
	• Prepare a cost of production report.		

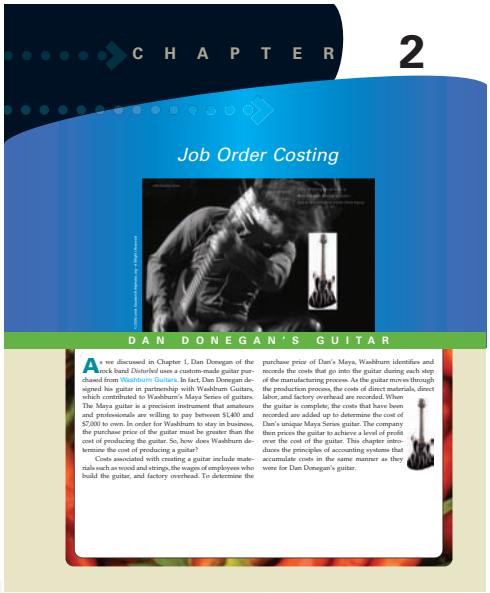
Provides a conceptual review of each objective.

Creates a checklist of skills to help review for a test.

Directs the student to this helpful feature!

Real-World Chapter Openers

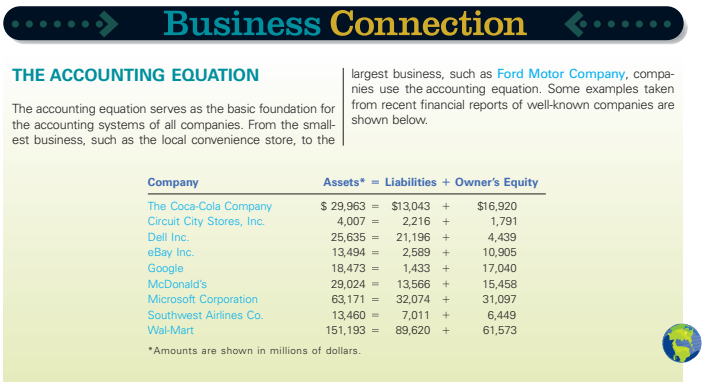
Building on the strengths of past editions, these openers continue to relate the accounting and business concepts in the chapter to students' lives. These openers employ examples of real companies and provide invaluable insight into real practice. Several of the openers created especially for this edition focus on interesting companies such as Washburn Guitars, The North Face, and Netflix.



Leading by Example

Business Connection and Comprehensive Real-World Notes

Students get a close-up look at how accounting operates in the marketplace through a variety of items in the margins and in the "Business Connection" boxed features. In addition, a variety of end-of-chapter exercises and problems employ real-world data to give students a feel for the material that accountants see daily. No matter where they are found, elements that use material from real companies are indicated with a unique icon for a consistent presentation.



Business Connection

THE ACCOUNTING EQUATION

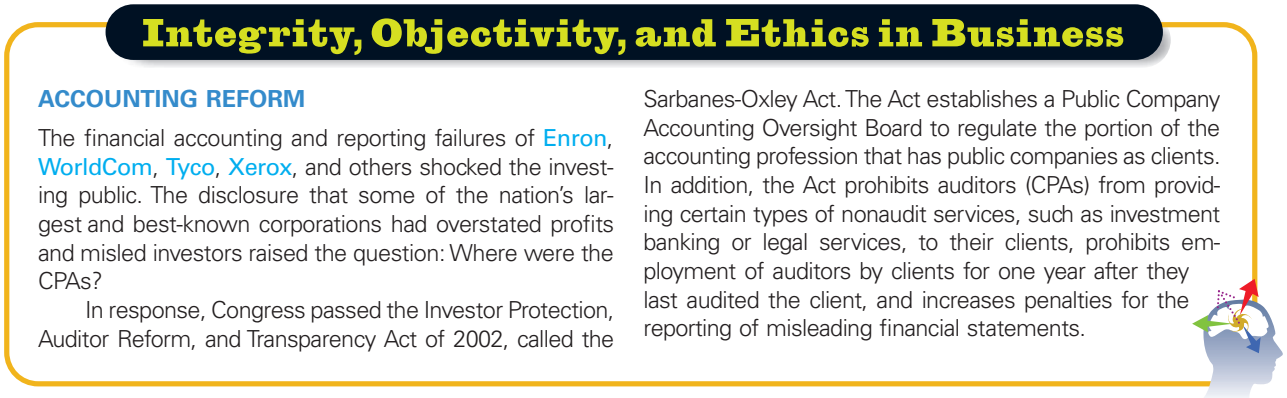
The accounting equation serves as the basic foundation for the accounting systems of all companies. From the smallest business, such as the local convenience store, to the largest business, such as Ford Motor Company, companies use the accounting equation. Some examples taken from recent financial reports of well-known companies are shown below.

Company	Assets*	=	Liabilities	+	Owner's Equity
The Coca-Cola Company	$ 29,963	=	$13,043	+	$16,920
Circuit City Stores, Inc.	4,007	=	2,216	+	1,791
Dell Inc.	25,635	=	21,196	+	4,439
eBay Inc.	13,494	=	2,589	+	10,905
Google	18,473	=	1,433	+	17,040
McDonald's	29,024	=	13,566	+	15,458
Microsoft Corporation	63,171	=	32,074	+	31,097
Southwest Airlines Co.	13,460	=	7,011	+	6,449
Wal-Mart	151,193	=	89,620	+	61,573

*Amounts are shown in millions of dollars.

Integrity, Objectivity, and Ethics in Business

In each chapter, these cases help students develop their ethical compass. Often coupled with related end-of-chapter activities, these cases can be discussed in class or students can consider the cases as they read the chapter. Both the section and related end-of-chapter materials are indicated with a unique icon for a consistent presentation.



Integrity, Objectivity, and Ethics in Business

ACCOUNTING REFORM

The financial accounting and reporting failures of Enron, WorldCom, Tyco, Xerox, and others shocked the investing public. The disclosure that some of the nation's largest and best-known corporations had overstated profits and misled investors raised the question: Where were the CPAs?

In response, Congress passed the Investor Protection, Auditor Reform, and Transparency Act of 2002, called the Sarbanes-Oxley Act. The Act establishes a Public Company Accounting Oversight Board to regulate the portion of the accounting profession that has public companies as clients. In addition, the Act prohibits auditors (CPAs) from providing certain types of nonaudit services, such as investment banking or legal services, to their clients, prohibits employment of auditors by clients for one year after they last audited the client, and increases penalties for the reporting of misleading financial statements.

Leading by Example

Summaries

Within each chapter, these synopses draw special attention to important points and help clarify difficult concepts.

Self-Examination Questions

Five multiple-choice questions, with answers at the end of the chapter, help students review and retain chapter concepts.

Illustrative Problem and Solution

A solved problem models one or more of the chapter's assignment problems so that students can apply the modeled procedures to end-of-chapter materials.

Market Leading End-of-Chapter Material

Students need to practice accounting so that they can understand and use it. To give students the greatest possible advantage in the real world, *Managerial Accounting*, *10e*, goes beyond presenting theory and procedure with comprehensive, time-tested, end-of-chapter material.

Online Solutions

South-Western, a division of Cengage Learning, offers a vast array of online solutions to suit your course needs. Choose the product that best meets your classroom needs and course goals. Please check with your Cengage representative for more details or for ordering information.

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- Straightforward Assignment Creation: Select required exercises and problems, and CengageNOW *Express* automatically applies faculty approved, Accounting Homework Options.
- Automatic grading and tracking student progress: CengageNOW *Express* grades and captures students' scores to easily monitor their progress. Export the grade book to Excel for easy data management.
- Instant feedback for students: Students stay on track with instructor-written hints and immediate feedback with every assignment. Links to the e-book, animated exercise demonstrations, and Excel spreadsheets from specific assignments are ideal for student review.

Online Solutions

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CengageNOW for Warren/Reeve/Duchac *Managerial Accounting*, 10e, is a powerful and fully integrated online teaching and learning system that provides you with flexibility and control. This complete digital solution offers a comprehensive set of digital tools to power your course. CengageNOW offers the following:

- Homework, including algorithmic variations
- Integrated E-book
- Personalized Study Plans, which include a variety of multimedia assets (from exercise demonstrations to video to iPod content) for students as they master the chapter materials
- Assessment options which include the full test bank, including algorithmic variations
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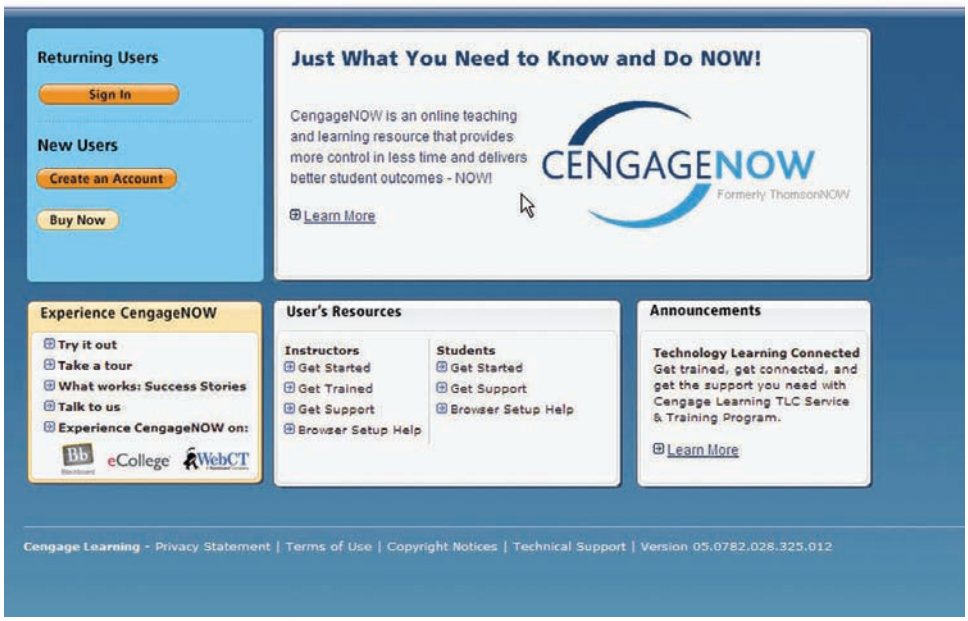

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Instructor's Manual This manual contains a number of resources designed to aid instructors as they prepare lectures, assign homework, and teach in the classroom. For each chapter, the instructor is given a brief synopsis and a list of objectives. Then each objective is explored, including information on Key Terms, Ideas for Class Discussion, Lecture Aids, Demonstration Problems, Group Learning Activities, Exercises and Problems for Reinforcement, and Internet Activities. Also, Suggested Approaches are included that incorporate many of the teaching initiatives being stressed in higher education today, including active learning, collaborative learning, critical thinking, and writing across the curriculum.

Solutions Manual The Solutions Manual contains answers to all exercises, problems, and activities that appear in the text. As always, the solutions are author-written and verified multiple times for numerical accuracy and consistency with the core text. Solutions transparencies are also available.

Test Bank For each chapter, the Test Bank includes True/False questions, Multiple-Choice questions, and Problems, each marked with a difficulty level, chapter objective association, and a tie-in to standard course outcomes. Along with the normal update and upgrade of the 2,800 test bank questions, variations of the new Example Exercises have been added to this bank for further quizzing and better integration with the textbook. In addition, the bank provides a grid for each chapter that compiles the correlation of each question to the individual chapter's objectives, as well as a ranking of difficulty based on a clearly described categorization. Through this helpful grid, making a test that is comprehensive and well-balanced is a snap!

ExamView® Pro Testing Software This intuitive software allows you to easily customize exams, practice tests, and tutorials and deliver them over a network, on the Internet, or in printed form. In addition, ExamView comes with searching capabilities that make sorting the wealth of questions from the printed test bank easy. The software and files are found on the IRCD.

PowerPoint® Each presentation, which is included on the IRCD and on the product support site, enhances lectures and simplifies class preparation. Each chapter contains objectives followed by a thorough outline of the chapter that easily provide an entire lecture model. Also, exhibits from the chapter, such as the new Example Exercises, have been recreated as colorful PowerPoint slides to create a powerful, customizable tool.

Instructor Excel® Templates These templates provide the solutions for the problems and exercises that have Enhanced Excel® templates for students. Through these files, instructors can see the solutions in the same format as the students. All problems with accompanying templates are marked in the book with an icon and are listed in the information grid in the solutions manual. These templates are available for download on www.cengage.com/accounting/warren or on the IRCD.

Instructor's Resource CD-ROM This convenient resource includes the PowerPoint® Presentations, Instructor's Manual, Solutions Manual, Test Bank, ExamView®, An Instructor's Guide to Online Resources, and Excel Application Solutions. Lively demonstrations of support technology are also included. All the basic material an instructor would need is available in one place on this IRCD.

For the Student

Students come to accounting with a variety of learning needs. *Managerial Accounting, 10e*, offers a broad range of supplements in both printed form and easy-to-use technology. We continue to refine our entire supplement package around the comments instructors have provided about their courses and teaching needs.

Study Guide This author-written guide provides students Quiz and Test Hints, Matching questions, Fill-in-the-Blank questions (Parts A & B), Multiple-Choice questions, True/False questions, Exercises, and Problems for each chapter. Designed to assist students in comprehending the concepts and principles in the text, solutions for all of these items are available in the guide for quick reference.

Working Papers for Exercises and Problems The traditional working papers include problem-specific forms for preparing solutions for Exercises, A & B Problems, the Continuing Problem, and the Comprehensive Problems from the textbook. These forms, with preprinted headings, provide a structure for the problems, which helps students get started and saves them time. Additional blank forms are included.

Blank Working Papers These Working Papers are available for completing exercises and problems either from the text or prepared by the instructor. They have no preprinted headings. A guide at the front of the Working Papers tells students which form they will need for each problem.

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Product Support Web Site www.cengage.com/accounting/warren. This site provides students with a wealth of introductory accounting resources, including quizzing and supplement downloads and access to the Enhanced Excel® Templates.

Acknowledgments

Many of the enhancements made to *Managerial Accounting, 10e,* are a direct result of countless conversations we've had with principles of accounting students over the past several years. We want to take this opportunity to thank them for their perspectives and feedback on textbook use; we think that *10e* represents our finest edition yet!

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BRIEF CONTENTS

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MANAGERIAL ACCOUNTING

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CHAPTER 1

Managerial Accounting Concepts and Principles

WASHBURN GUITARS

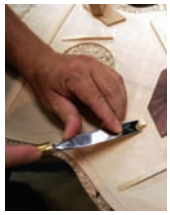
Dan Donegan, guitarist for the rock band *Disturbed*, entertains millions of fans each year playing his guitar. His guitar was built by quality craftsmen at Washburn Guitars in Chicago. Washburn Guitars is well-known in the music industry and has been in business for over 120 years.

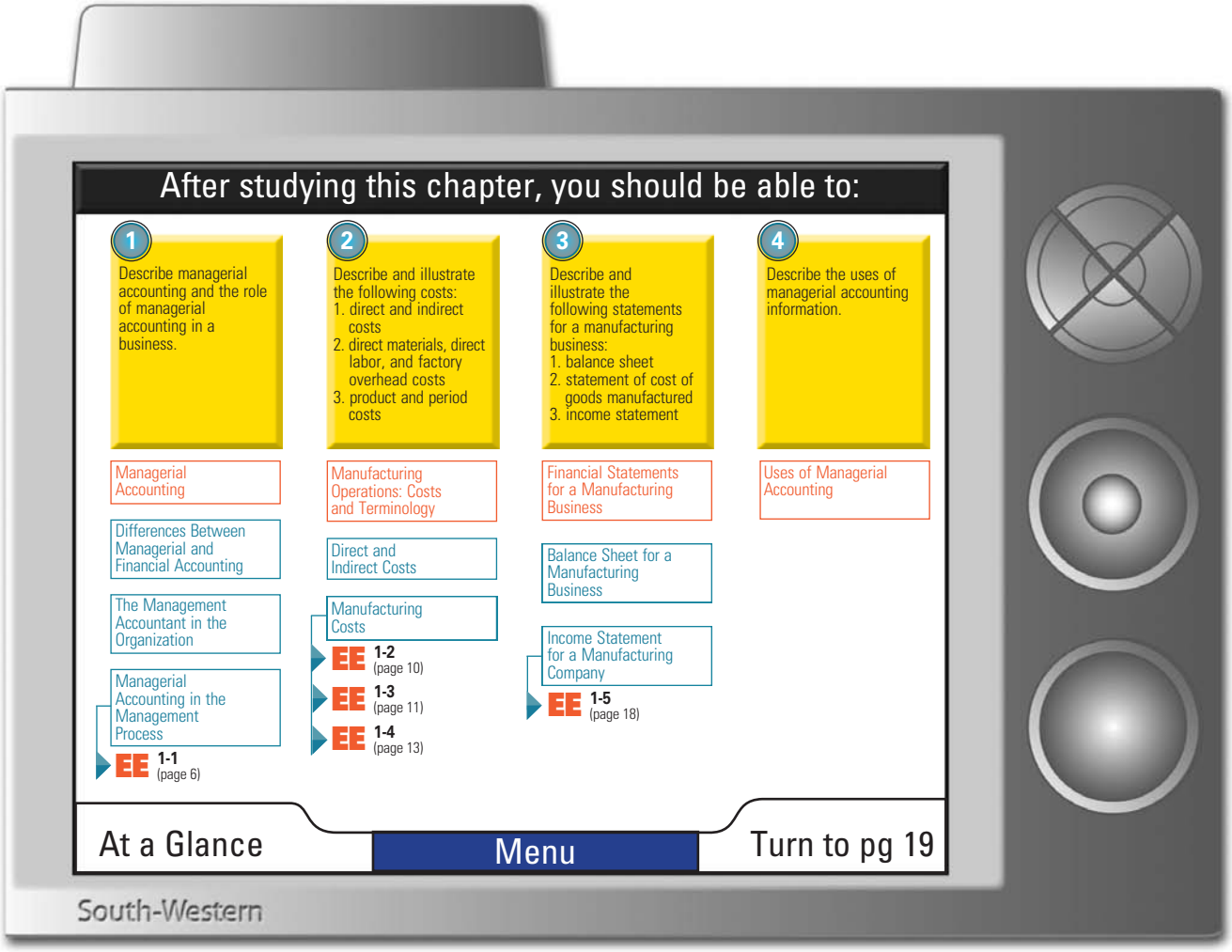
Staying in business for 120 years requires a thorough understanding of how to manufacture high-quality guitars. In addition, it requires knowledge of how to account for the costs of making guitars. For example, Washburn needs cost information to answer the following questions:

- How much should be charged for its guitars?
- How many guitars does it have to sell in a year to cover its costs and earn a profit?
- How many employees should the company have working on each stage of the manufacturing process?
- How would purchasing automated equipment affect the costs of its guitars?

This chapter introduces managerial accounting concepts that are useful in addressing the preceding questions.

This chapter begins by describing managerial accounting and its relationship to financial accounting. Following this overview, the management process is described along with the role of managerial accounting in this process. Finally, characteristics of managerial accounting reports, managerial accounting terms, and uses of managerial accounting information are described and illustrated.





1 Describe managerial accounting and the role of managerial accounting in a business.

Managerial Accounting

Managers make numerous decisions during the day-to-day operations of a business and in planning for the future. Managerial accounting provides much of the information used for these decisions.

Some examples of managerial accounting information along with the chapter in which it is described and illustrated are listed below.

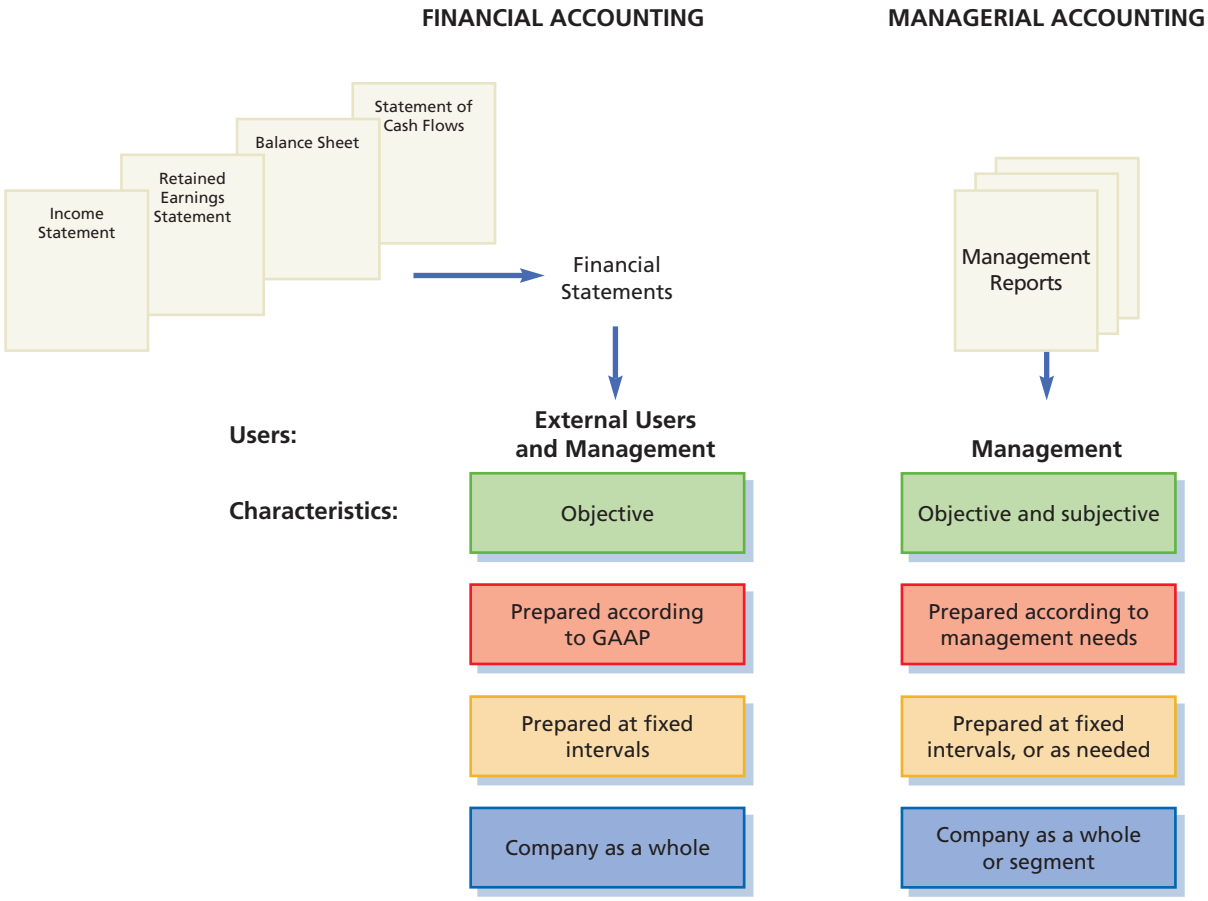
1. Classifying manufacturing and other costs and reporting them in the financial statements (Chapter 1)
2. Determining the cost of manufacturing a product or providing a service (Chapters 2 and 3)
3. Estimating the behavior of costs for various levels of activity and assessing cost-volume-profit relationships (Chapter 4)
4. Analyzing changes in operating income (Chapter 5)
5. Planning for the future by preparing budgets (Chapter 6)
6. Evaluating manufacturing costs by comparing actual with expected results (Chapter 7)
7. Evaluating decentralized operations by comparing actual and budgeted costs as well as computing various measures of profitability (Chapter 8)
8. Evaluating special decision-making situations by comparing differential revenues and costs (Chapter 9)
9. Evaluating alternative proposals for long-term investments in fixed assets (Chapter 10)
10. Evaluating the impact of cost allocation on pricing of products and services (Chapter 11)
11. Planning operations using just-in-time concepts (Chapter 12)

Differences Between Managerial and Financial Accounting

Accounting information is often divided into two types: financial and managerial. Exhibit 1 shows the relationship between financial accounting and managerial accounting.

Exhibit 1

Financial Accounting and Managerial Accounting



Financial accounting information is reported at fixed intervals (monthly, quarterly, yearly) in general-purpose financial statements. These financial statements—the income statement, retained earnings statement, balance sheet, and statement of cash flows—are prepared according to generally accepted accounting principles (GAAP). These statements are used by external users such as the following:

1. Shareholders
2. Creditors
3. Government agencies
4. The general public

Managers of a company also use general-purpose financial statements. For example, in planning future operations, managers often begin by evaluating the current income statement and statement of cash flows.

Managerial accounting information is designed to meet the specific needs of a company's management. This information includes the following:

1. Historical data, which provide *objective measures* of past operations
2. Estimated data, which provide *subjective estimates* about future decisions

Management uses both types of information in directing daily operations, planning future operations, and developing business strategies.

Unlike the financial statements prepared in financial accounting, managerial accounting reports do *not* always have to be:

1. Prepared according to generally accepted accounting principles. This is because *only* the company's management uses the information. Also, in many cases, GAAP are not relevant to the specific decision-making needs of management.
2. Prepared at fixed intervals (monthly, quarterly, yearly). Although some management reports are prepared at fixed intervals, most reports are prepared as management needs the information.
3. Prepared for the business as a whole. Most management reports are prepared for products, projects, sales territories, or other segments of the company.

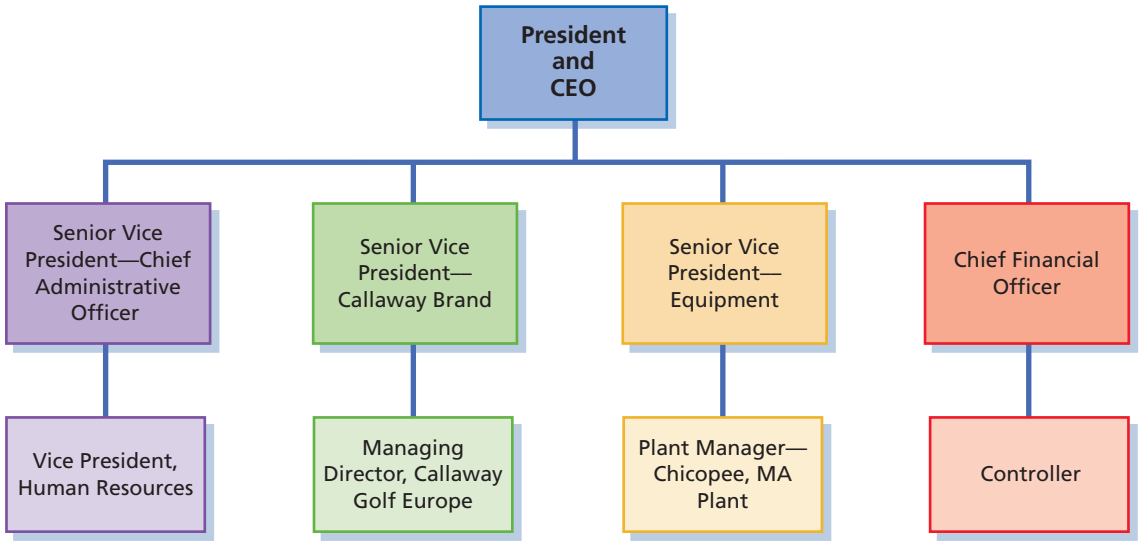
The Management Accountant in the Organization

In most companies, departments or similar organizational units are assigned responsibilities for specific functions or activities. The operating structure of a company can be shown in an *organization chart*.

Exhibit 2 is a partial organization chart for Callaway Golf Company, the manufacturer and distributor of Hyper X® golf clubs.

Exhibit 2

Partial Organizational Chart for Callaway Golf Company



The departments in a company can be viewed as having either of the following:

1. Line responsibilities
2. Staff responsibilities

A **line department** is directly involved in providing goods or services to the customers of the company. For Callaway Golf (shown in Exhibit 2), the following occupy line positions:

1. Senior Vice President—Equipment
2. Plant Manager—Chicopee, MA Plant
3. Senior Vice President—Callaway Brand
4. Managing Director, Callaway Golf Europe

The preceding occupy line positions because they are responsible for manufacturing and selling Callaway's products.

The terms *line* and *staff* may be applied to service organizations. For example, the line positions in a hospital would be the nurses, doctors, and other caregivers. Staff positions would include admissions and records.

A **staff department** provides services, assistance, and advice to the departments with line or other staff responsibilities. A staff department has no direct authority over a line department. For Callaway Golf (shown in Exhibit 2), the following occupy staff positions:

1. Senior Vice President—Chief Administrative Officer
2. Vice President, Human Resources
3. Chief Financial Officer
4. Controller

As shown above, the chief financial officer (CFO) and the controller occupy staff positions. In most companies, the **controller** is the chief management accountant. The controller's staff consists of a variety of other accountants who are responsible for specialized accounting functions such as the following:

1. Systems and procedures
2. General accounting
3. Budgets and budget analysis
4. Special reports and analysis
5. Taxes
6. Cost accounting

Experience in managerial accounting is often an excellent training ground for senior management positions. This is not surprising, since accounting touches all phases of a company's operations.

Managerial Accounting in the Management Process

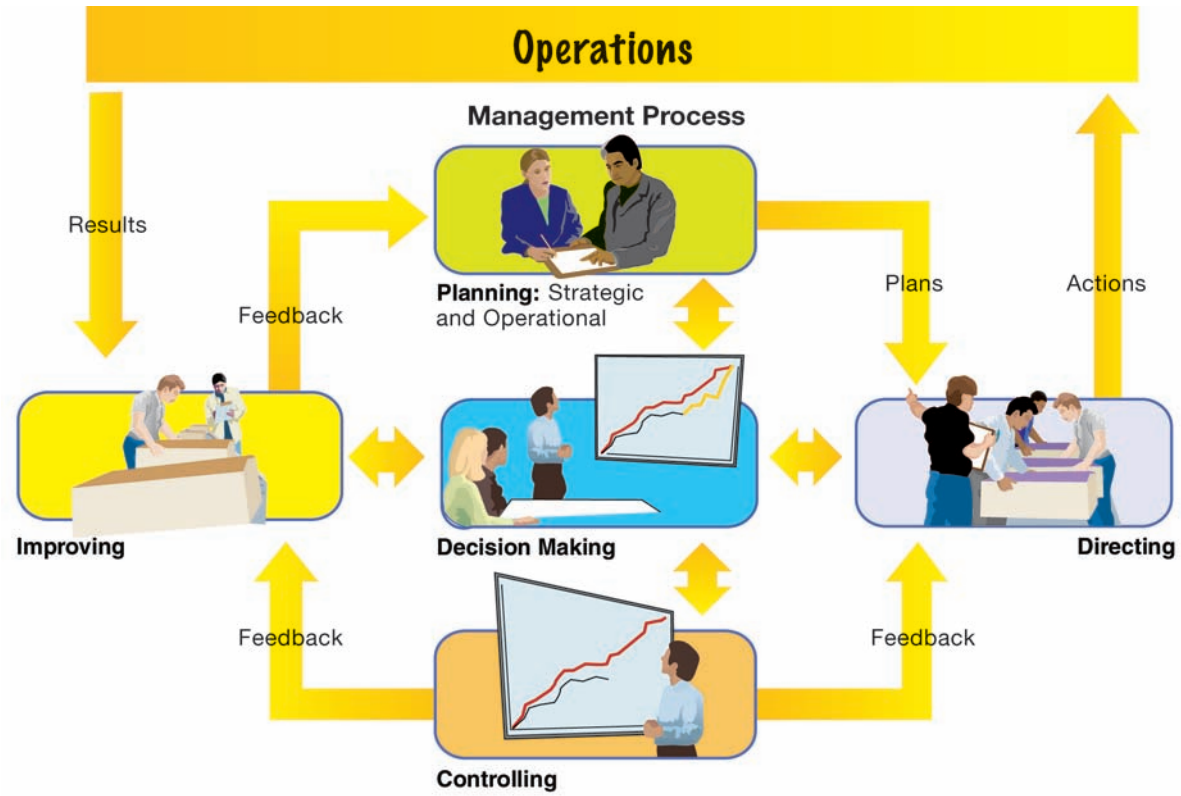
As a staff department, managerial accounting supports management and the management process. The **management process** has the following five basic phases as shown in Exhibit 3.

1. Planning
2. Directing
3. Controlling
4. Improving
5. Decision making

As Exhibit 3 illustrates, the five phases interact with each other.

Exhibit 3

The Management Process



Planning Management uses **planning** in developing the company's **objectives (goals)** and translating these objectives into courses of action. For example, a company may set an objective to increase market share by 15 percent by introducing three new products. The actions to achieve this objective might be as follows:

1. Increase the advertising budget
2. Open a new sales territory
3. Increase the research and development budget

Planning may be classified as follows:

1. **Strategic planning**, which is developing long-term actions to achieve the company's objectives. These long-term actions are called **strategies**, which often involve periods of 5 to 10 years.
2. **Operational planning**, which develops short-term actions for managing the day-to-day operations of the company.

Directing The process by which managers run day-to-day operations is called **directing**. An example of directing is a production supervisor's efforts to keep the production line moving without interruption (downtime). A credit manager's development of guidelines for assessing the ability of potential customers to pay their bills is also an example of directing.

Controlling Monitoring operating results and comparing actual results with the expected results is **controlling**. This **feedback** allows management to isolate areas for further investigation and possible remedial action. It may also lead to revising future plans. This philosophy of controlling by comparing actual and expected results is called **management by exception**.

Improving Feedback is also used by managers to support continuous process improvement. **Continuous process improvement** is the philosophy of continually improving employees, business processes, and products. The objective of continuous improvement is to eliminate the *source* of problems in a process. In this way, the right products (services) are delivered in the right quantities at the right time.

Decision Making Inherent in each of the preceding management processes is **decision making**. In managing a company, management must continually decide among alternative actions. For example, in directing operations, managers must decide on an operating structure, training procedures, and staffing of day-to-day operations.

Managerial accounting supports managers in all phases of the management process. For example, accounting reports comparing actual and expected operating results aid managers in planning and improving current operations. Such a report might compare the actual and expected costs of defective materials. If the cost of defective materials is unusually high, management might decide to change suppliers.

Example Exercise 1-1 Management Process

1

Three phases of the management process are planning, controlling, and improving. Match the following descriptions to the proper phase:

Phase of management process	Description
Planning	a. Monitoring the operating results of implemented plans and comparing the actual results with expected results.
Controlling	b. Rejects solving individual problems with temporary solutions that fail to address the root cause of the problem.
Improving	c. Used by management to develop the company's objectives.

(continued)

Follow My Example 1-1

Phase of management process

Planning (c)
Controlling (a)
Improving (b)

For Practice: PE 1-1A, PE 1-1B

Integrity, Objectivity, and Ethics in Business

ENVIRONMENTAL ACCOUNTING

In recent years, the environmental impact of a business has become an increasingly important issue. Multinational agreements such as the Montreal Protocol and Kyoto Protocol have acknowledged the impact that society has on the environment and raised public awareness of the impact that businesses have on the environment. As a result, environmental issues have become an important operational issue for most businesses. Managers must now consider the environmental impact of their decisions in the same way that they would consider other operational issues.

To help managers understand the environmental impact of their business decisions, new managerial accounting measures are being developed. The emerging field of environmental management accounting focuses on developing various measures of the environmental-related costs of a business. These measures can evaluate a variety of issues including the volume and level of emissions, the estimated costs of different levels of emissions, and the impact that environmental costs have on product cost. Thus, environmental managerial accounting can provide managers with important information to help them more clearly consider the environmental effects of their decisions.

2 Describe and illustrate the following costs:

1. direct and indirect costs
2. direct materials, direct labor, and factory overhead costs
3. product and period costs

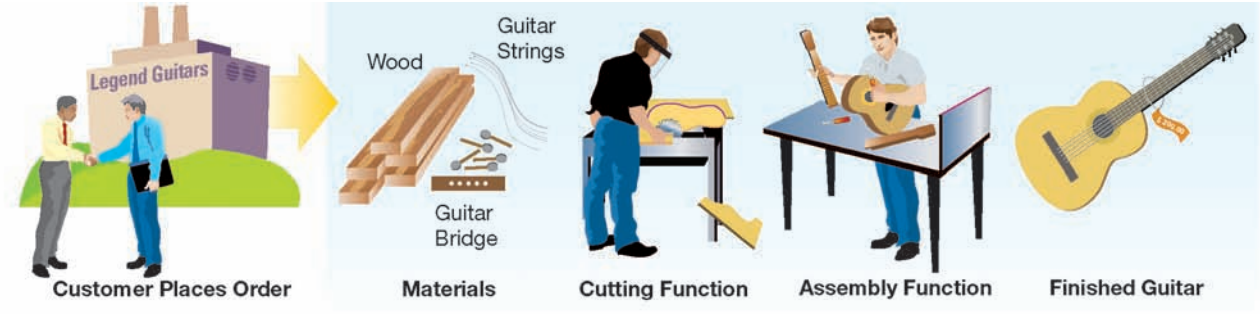
Manufacturing Operations: Costs and Terminology

The operations of a business can be classified as service, merchandising, or manufacturing. The accounting for service and merchandising businesses has been described and illustrated in earlier chapters. For this reason, the remaining chapters of this text focus primarily on manufacturing businesses. Most of the managerial accounting concepts discussed, however, also apply to service and merchandising businesses.

As a basis for illustration of manufacturing operations, a guitar manufacturer, Legend Guitars, is used. Exhibit 4 is an overview of Legend's guitar manufacturing operations.

Exhibit 4

Guitar Making Operations of Legend Guitars



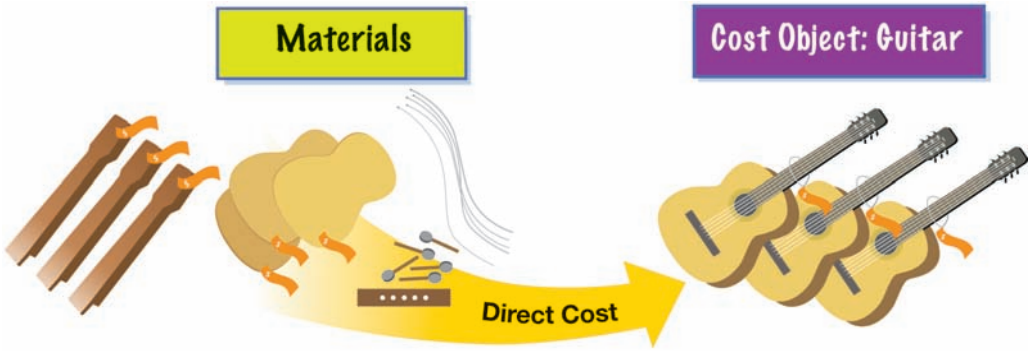
Legend's guitar making process begins when a customer places an order for a guitar. Once the order is accepted, the manufacturing process begins by obtaining the necessary materials. An employee then cuts the body and neck of the guitar out of raw lumber. Once the wood is cut, the body and neck of the guitar are assembled. When the assembly is complete, the guitar is painted and finished.

Direct and Indirect Costs

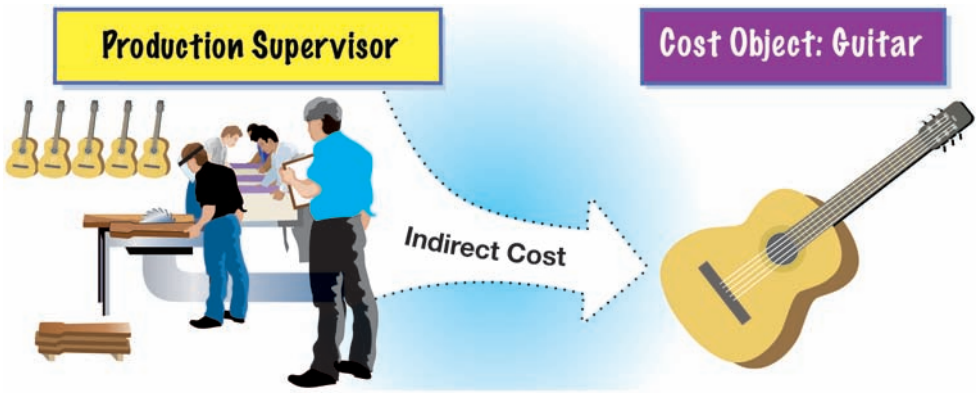
A **cost** is a payment of cash or the commitment to pay cash in the future for the purpose of generating revenues. For example, cash (or credit) used to purchase equipment is the cost of the equipment. If equipment is purchased by exchanging assets other than cash, the current market value of the assets given up is the cost of the equipment purchased.

In managerial accounting, costs are classified according to the decision-making needs of management. For example, costs are often classified by their relationship to a segment of operations, called a **cost object**. A cost object may be a product, a sales territory, a department, or an activity, such as research and development. Costs identified with cost objects are either direct costs or indirect costs.

Direct costs are identified with and can be traced to a cost object. For example, the cost of wood (materials) used by Legend Guitars in manufacturing a guitar is a direct cost of the guitar.



Indirect costs cannot be identified with or traced to a cost object. For example, the salaries of the Legend Guitars production supervisors are indirect costs of producing a guitar. While the production supervisors contribute to the production of a guitar, their salaries cannot be identified with or traced to any individual guitar.

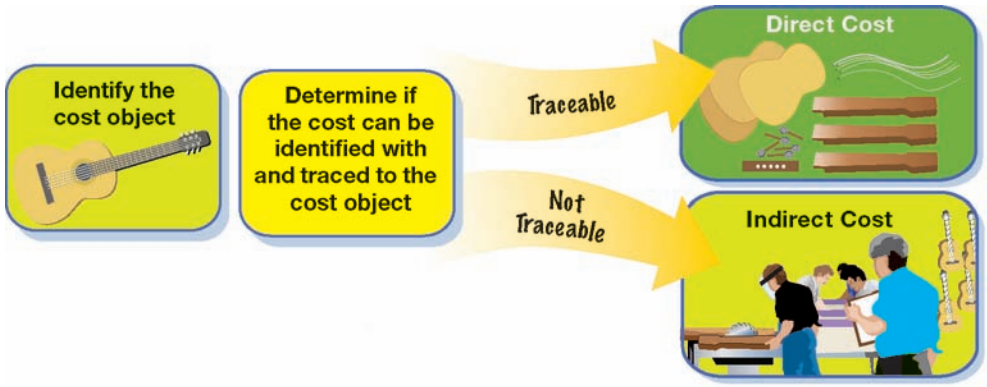


Depending on the cost object, a cost may be either a direct or an indirect cost. For example, the salaries of production supervisors are indirect costs when the cost object is an individual guitar. If, however, the cost object is Legend Guitars' overall production process, then the salaries of production supervisors are direct costs.

This process of classifying a cost as direct or indirect is illustrated in Exhibit 5.

Exhibit 5

Classifying Direct and Indirect Costs



Manufacturing Costs

The cost of a manufactured product includes the cost of materials used in making the product. In addition, the cost of a manufactured product includes the cost of converting the materials into a finished product. For example, Legend Guitars uses employees and machines to convert wood (and other supplies) into finished guitars. Thus, the cost of a finished guitar (the cost object) includes the following:

1. Direct materials cost
2. Direct labor cost
3. Factory overhead cost

Direct Materials Cost Manufactured products begin with raw materials that are converted into finished products. The cost of any material that is an integral part of the finished product is classified as a **direct materials cost**. For Legend Guitars, direct materials cost includes the cost of the wood used in producing each guitar. Other examples of direct materials costs include the cost of electronic components for a television, silicon wafers for microcomputer chips, and tires for an automobile.

To be classified as a direct materials cost, the cost must be *both* of the following:

1. An integral part of the finished product
2. A significant portion of the total cost of the product

For Legend Guitars, the cost of the guitar strings is not a direct materials cost. This is because the cost of guitar strings is an insignificant part of the total cost of each guitar. Instead, the cost of guitar string is classified as a factory overhead cost, which is discussed later.

Direct Labor Cost Most manufacturing processes use employees to convert materials into finished products. The cost of employee wages that is an integral part of the finished product is classified as **direct labor cost**. For Legend Guitars, direct labor cost includes the wages of the employees who cut each guitar out of raw lumber and assemble it. Other examples of direct labor costs include mechanics' wages for repairing an automobile, machine operators' wages for manufacturing tools, and assemblers' wages for assembling a laptop computer.

Like a direct materials cost, a direct labor cost must be *both* of the following:

1. An integral part of the finished product
2. A significant portion of the total cost of the product

For Legend Guitars, the wages of the janitors who clean the factory are not a direct labor cost. This is because janitorial costs are not an integral part or a significant cost of each guitar. Instead, janitorial costs are classified as a factory overhead cost, which is discussed next.

Factory Overhead Cost Costs other than direct materials cost and direct labor cost that are incurred in the manufacturing process are combined and classified as **factory overhead cost**. Factory overhead is sometimes called **manufacturing overhead** or **factory burden**.

All factory overhead costs are indirect costs of the product. Some factory overhead costs include the following:

1. Heating and lighting the factory
2. Repairing and maintaining factory equipment
3. Property taxes on factory buildings and land
4. Insurance on factory buildings
5. Depreciation on factory plant and equipment

As manufacturing processes have become more automated, direct labor costs have become so small that they are often included as part of factory overhead.

Factory overhead cost also includes materials and labor costs that do not enter directly into the finished product. Examples include the cost of oil used to lubricate machinery and the wages of janitorial and supervisory employees. Also, if the costs of direct materials or direct labor are not a significant portion of the total product cost, these costs may be classified as factory overhead costs.

For Legend Guitars, the costs of guitar strings and janitorial wages are factory overhead costs. Additional factory overhead costs of making guitars are as follows:

1. Sandpaper
2. Buffing compound
3. Glue
4. Power (electricity) to run the machines
5. Depreciation of the machines and building
6. Salaries of production supervisors

Example Exercise 1-2 Direct Materials, Direct Labor, and Factory Overhead 2

Identify the following costs as direct materials (DM), direct labor (DL), or factory overhead (FO) for a baseball glove manufacturer.

a. Leather used to make a baseball glove
b. Coolants for machines that sew baseball gloves
c. Wages of assembly line employees
d. Ink used to print a player's autograph on a baseball glove

Follow My Example 1-2

a. DM
b. FO
c. DL
d. FO

For Practice: PE 1-2A, PE 1-2B

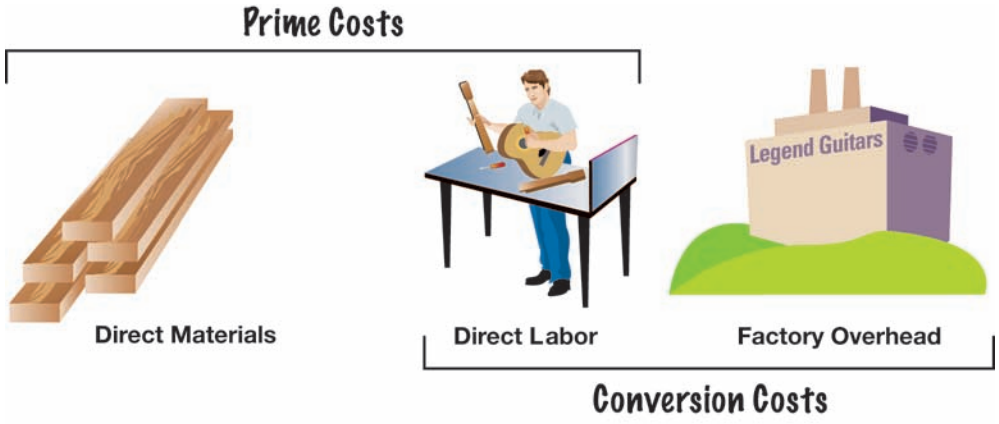
Prime Costs and Conversion Costs Direct materials, direct labor, and factory overhead costs may be grouped together for analysis and reporting. Two such common groupings are as follows:

1. **Prime costs**, which consist of direct materials and direct labor costs
2. **Conversion costs**, which consist of direct labor and factory overhead costs

Conversion costs are the costs of converting the materials into a finished product. Direct labor is both a prime cost and a conversion cost, as shown in Exhibit 6.

Exhibit 6

Prime Costs and Conversion Costs



Example Exercise 1-3 Prime and Conversion Costs 2

Identify the following costs as a prime cost (P), conversion cost (C), or both (B) for a baseball glove manufacturer.

a. Leather used to make a baseball glove
b. Coolants for machines that sew baseball gloves
c. Wages of assembly line employees
d. Ink used to print a player's autograph on a baseball glove

Follow My Example 1-3

a. P
b. C
c. B
d. C

For Practice: PE 1-3A, PE 1-3B

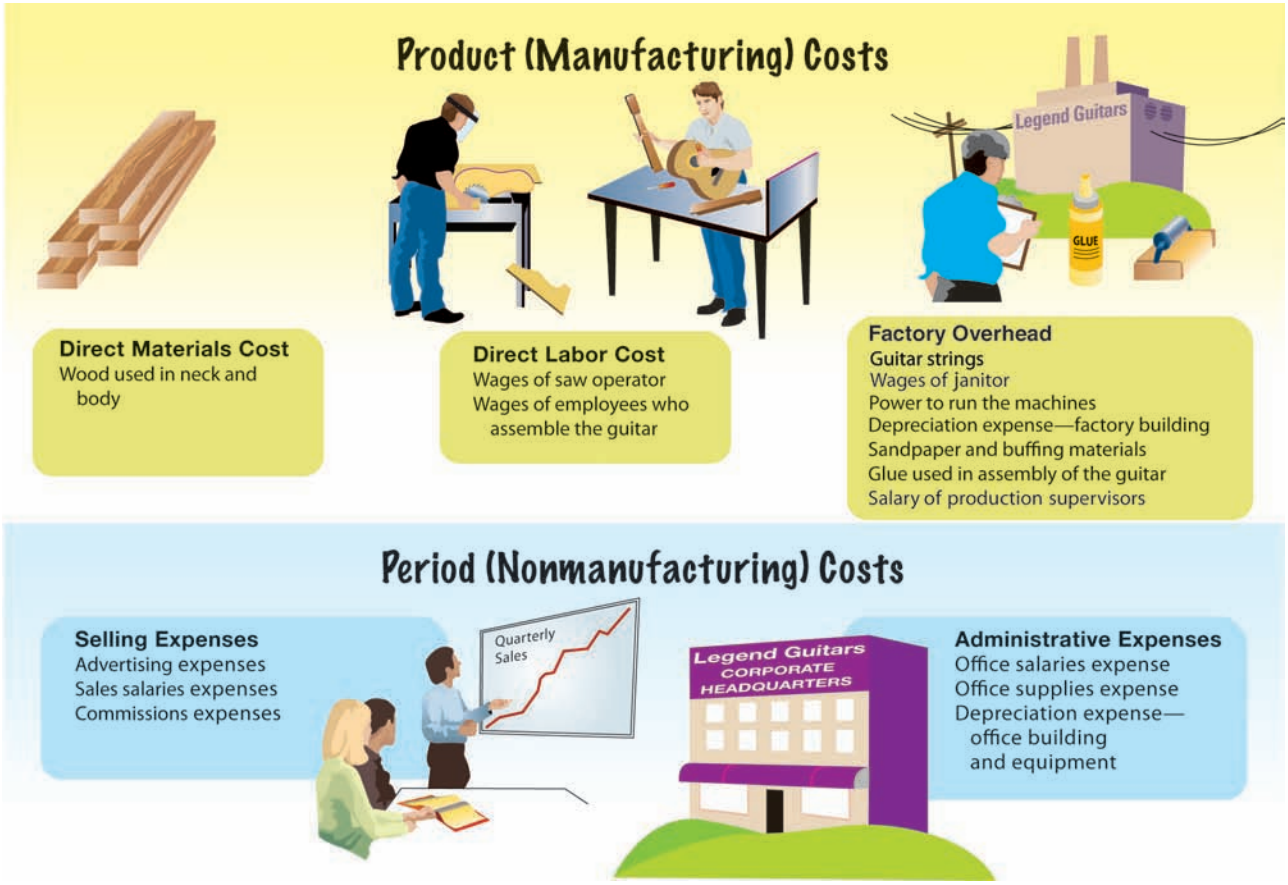
Product Costs and Period Costs For financial reporting purposes, costs are classified as product costs or period costs.

1. **Product costs** consist of manufacturing costs: direct materials, direct labor, and factory overhead.
2. **Period costs** consist of selling and administrative expenses. *Selling expenses* are incurred in marketing the product and delivering the product to customers. *Administrative expenses* are incurred in managing the company and are not directly related to the manufacturing or selling functions.

Examples of product costs and period costs for Legend Guitars are presented in Exhibit 7.

Exhibit 7

Examples of Product Costs and Period Costs—Legend Guitars



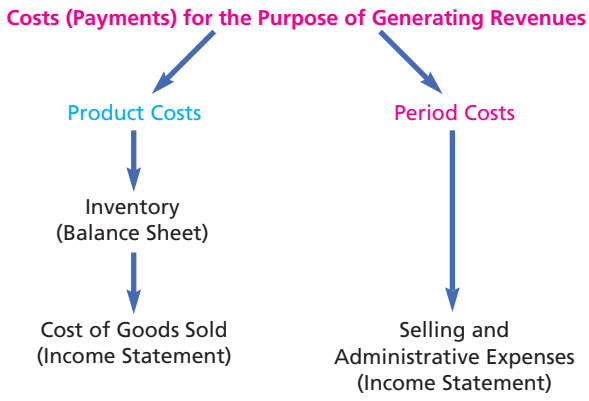
To facilitate control, selling and administrative expenses may be reported by level of responsibility. For example, selling expenses may be reported by products, salespersons, departments, divisions, or territories. Likewise, administrative expenses may be reported by areas such as human resources, computer services, legal, accounting, or finance.

Product costs consist of direct materials, direct labor, and factory overhead costs.

The impact on the financial statements of product and period costs is summarized in Exhibit 8. As product costs are incurred, they are recorded and reported on the balance sheet as *inventory*. When the inventory is sold, the cost of the manufactured product sold is

Exhibit 8

Product Costs, Period Costs, and the Financial Statements



reported as *cost of goods sold* on the income statement. Period costs are reported as *expenses* on the income statement in the period in which they are incurred and, thus, never appear on the balance sheet.

Example Exercise 1-4 Product and Period Costs 2

Identify the following costs as a product cost or a period cost for a baseball glove manufacturer.

a. Leather used to make a baseball glove
b. Cost of endorsement from a professional baseball player
c. Office supplies used at the company headquarters
d. Ink used to print a player's autograph on the baseball glove

Follow My Example 1-4

a. Product cost
b. Period cost
c. Period cost
d. Product cost

For Practice: PE 1-4A, PE 1-4B

3 Describe and illustrate the following statements for a manufacturing business:

1. balance sheet
2. statement of cost of goods manufactured
3. income statement

Financial Statements for a Manufacturing Business

The retained earnings and cash flow statements for a manufacturing business are similar to those illustrated in earlier chapters for service and merchandising businesses. However, the balance sheet and income statement for a manufacturing business are more complex. This is because a manufacturer makes the products that it sells and, thus, must record and report product costs. The reporting of product costs primarily affects the balance sheet and the income statement.

Balance Sheet for a Manufacturing Business

A manufacturing business reports three types of inventory on its balance sheet as follows:

1. **Materials inventory** (sometimes called raw materials inventory). This inventory consists of the costs of the direct and indirect materials that have not entered the manufacturing process.

   Examples for Legend Guitars: Wood, guitar strings, glue, sandpaper

2. **Work in process inventory**. This inventory consists of the direct materials, direct labor, and factory overhead costs for products that have entered the manufacturing process, but are not yet completed (in process).

   Example for Legend Guitars: Unfinished (partially assembled) guitars

3. **Finished goods inventory**. This inventory consists of completed (or finished) products that have not been sold.

   Example for Legend Guitars: Unsold guitars

Exhibit 9 illustrates the reporting of inventory on the balance sheet for a merchandising and a manufacturing business. MusicLand Stores, Inc., a retailer of musical instruments, reports only *Merchandise Inventory*. In contrast, Legend

Exhibit 9

Balance Sheet Presentation of Inventory in Manufacturing and Merchandising Companies

MusicLand Stores, Inc.
Balance Sheet
December 31, 2010

Current assets:	
Cash	$ 25,000
Accounts receivable (net)	85,000
Merchandise inventory	**142,000**
Supplies	10,000
Total current assets	$ 262,000

Legend Guitars
Balance Sheet
December 31, 2010

Current assets:		
Cash		$ 21,000
Accounts receivable (net)		120,000
Inventories:		
Finished goods	**$62,500**	
Work in process	**24,000**	
Materials	**35,000**	**121,500**
Supplies		2,000
Total current assets		$ 264,500

Guitars, a manufacturer of guitars, reports *Finished Goods*, *Work in Process*, and *Materials* inventories. In both balance sheets, inventory is reported in the *Current Assets* section.

Income Statement for a Manufacturing Company

The income statements for merchandising and manufacturing businesses differ primarily in the reporting of the cost of merchandise (goods) *available for sale* and *sold* during the period. These differences are shown below.

Merchandising Business

Sales		$XXX
Beginning merchandise inventory	$XXX	
Plus net purchases	XXX	
Merchandise available for sale	$XXX	
Less ending merchandise inventory	XXX	
Cost of merchandise sold		XXX
Gross profit		$XXX

Manufacturing Business

Sales		$XXX
Beginning finished goods inventory	$XXX	
Plus **cost of goods manufactured**	XXX	
Cost of finished goods available for sale	$XXX	
Less ending finished goods inventory	XXX	
Cost of goods sold		XXX
Gross profit		$XXX

A merchandising business purchases merchandise ready for resale to customers. The total cost of the **merchandise available for sale** during the period is determined by adding the beginning merchandise inventory to the net purchases. The **cost of merchandise sold** is determined by subtracting the ending merchandise inventory from the cost of merchandise available for sale.

A manufacturer makes the products it sells, using direct materials, direct labor, and factory overhead. The total cost of making products that are available for sale during the period is called the **cost of goods manufactured.** The **cost of finished goods available for sale** is determined by adding the beginning finished goods inventory to the cost of goods manufactured during the period. The **cost of goods sold** is determined by subtracting the ending finished goods inventory from the cost of finished goods available for sale.

C*ost of goods manufactured* is required to determine the *cost of goods sold*, and thus to prepare the income statement. The cost of goods manufactured is often determined by preparing a **statement of cost of goods manufactured**.[1] This statement summarizes the cost of goods manufactured during the period as shown below.

Statement of Cost of Goods Manufactured

Beginning work in process inventory			$XXX
Direct materials:			
Beginning materials inventory	$XXX		
Purchases	XXX		
Cost of materials available for use	$XXX		
Less ending materials inventory	XXX		
Cost of direct materials used		$ XXX	
Direct labor		XXX	
Factory overhead		XXX	
Total manufacturing costs incurred			XXX
Total manufacturing costs			$XXX
Less ending work in process inventory			XXX
Cost of goods manufactured			$XXX

To illustrate, the following data for Legend Guitars are used:

	Jan. 1, 2010	Dec. 31, 2010
Inventories:		
Materials	$ 65,000	$ 35,000
Work in process	30,000	24,000
Finished goods	60,000	62,500
Total inventories	$155,000	$121,500
Manufacturing costs incurred during 2010:		
Materials purchased		$100,000
Direct labor		110,000
Factory overhead:		
Indirect labor	$ 24,000	
Depreciation on factory equipment	10,000	
Factory supplies and utility costs	10,000	44,000
Total		$254,000
Sales		$366,000
Selling expenses		20,000
Administrative expenses		15,000

1 Chapters 2 and 3 describe and illustrate the use of job order and process cost systems. As will be discussed, these systems do not require a statement of cost of goods manufactured.

The statement of cost of goods manufactured is prepared using the following three steps:

Step 1. Determine the *cost of materials used*.
Step 2. Determine the *total manufacturing costs incurred*
Step 3. Determine the *cost of goods manufactured*.

Using the preceding data for Legend Guitars, the preparation of the statement of cost of goods manufactured is illustrated below.

Step 1. The *cost of materials used* in production is determined as follows:

Materials inventory, January 1, 2010	$ 65,000
Add materials purchased	100,000
Cost of materials available for use	$165,000
Less materials inventory, December 31, 2010	35,000
Cost of direct materials used	$130,000

The January 1, 2010 (beginning), materials inventory of $65,000 is added to the cost of materials purchased of $100,000 to yield the total cost of materials that are available for use during 2010 of $165,000. Deducting the December 31, 2010 (ending), materials inventory of $35,000 yields the cost of direct materials used in production of $130,000.

Step 2. The *total manufacturing costs incurred* is determined as follows:

Direct materials used in production (Step 1)	$130,000
Direct labor	110,000
Factory overhead	44,000
Total manufacturing costs incurred	$284,000

The total manufacturing costs incurred in 2010 of $284,000 are determined by adding the direct materials used in production (Step 1), the direct labor cost, and the factory overhead costs.

Step 3. The *cost of goods manufactured* is determined as follows:

Work in process inventory, January 1, 2010	$ 30,000
Total manufacturing costs incurred (Step 2)	284,000
Total manufacturing costs	$314,000
Less work in process inventory, December 31, 2010	24,000
Cost of goods manufactured	$290,000

The cost of goods manufactured of $290,000 is determined by adding the total manufacturing costs incurred (Step 2) to the January 1, 2010 (beginning), work in process inventory of $30,000. This yields total manufacturing costs of $314,000. The December 31, 2010 (ending), work in process of $24,000 is then deducted to determine the cost of goods manufactured of $290,000.

The income statement and statement of cost of goods manufactured for Legend Guitars is shown in Exhibit 10.

Exhibit 11, on page 18, summarizes how manufacturing costs flow to the income statement and balance sheet of a manufacturing business.

4 Describe the uses of managerial accounting information.

Uses of Managerial Accounting

As mentioned earlier, managerial accounting provides information and reports for managers to use in operating a business. Some examples of how managerial accounting could be used by Legend Guitars include the following:

1. The cost of manufacturing each guitar could be used to determine its selling price.
2. Comparing the costs of guitars over time can be used to monitor and control the cost of direct materials, direct labor, and factory overhead.

Exhibit 10

Manufacturing Company—Income Statement with Statement of Cost of Goods Manufactured

Legend Guitars
Income Statement
For the Year Ended December 31, 2010

Sales		$366,000
Cost of goods sold:		
Finished goods inventory, January 1, 2010	$ 60,000	
Cost of goods manufactured	290,000	
Cost of finished goods available for sale	$350,000	
Less finished goods inventory, December 31, 2010	62,500	
Cost of goods sold		287,500
Gross profit		$ 78,500
Operating expenses:		
Selling expenses	$ 20,000	
Administrative expenses	15,000	
Total operating expenses		35,000
Net income		$ 43,500

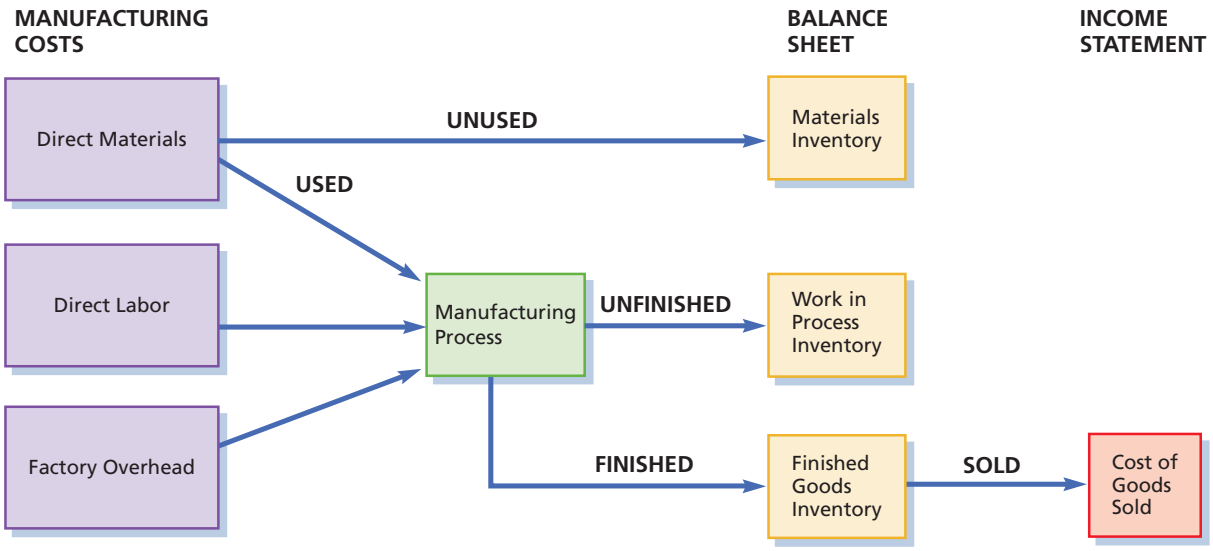
Legend Guitars
Statement of Cost of Goods Manufactured
For the Year Ended December 31, 2010

Work in process inventory, January 1, 2010			$ 30,000
Direct materials:			
Materials inventory, January 1, 2010	$ 65,000		
Purchases	100,000		
Cost of materials available for use	$165,000		
Less materials inventory, December 31, 2010	35,000		
Cost of direct materials used		$130,000	
Direct labor		110,000	
Factory overhead:			
Indirect labor	$ 24,000		
Depreciation on factory equipment	10,000		
Factory supplies and utility costs	10,000		
Total factory overhead		44,000	
Total manufacturing costs incurred			284,000
Total manufacturing costs			$314,000
Less work in process inventory, December 31, 2010			24,000
Cost of goods manufactured			$290,000

3. Performance reports could be used to identify any large amounts of scrap or employee downtime. For example, large amounts of unusable wood (scrap) after the cutting process should be investigated to determine the underlying cause. Such scrap may be caused by saws that have not been properly maintained.
4. A report could analyze the potential efficiencies and dollar savings of purchasing a new computerized saw to speed up the production process.
5. A report could analyze how many guitars need to be sold to cover operating costs and expenses. Such information could be used to set monthly selling targets and bonuses for sales personnel.

Exhibit 11

Flow of Manufacturing Costs



Example Exercise 1-5 Cost of Goods Sold, Cost of Goods Manufactured

3

Gauntlet Company has the following information for January:

Cost of direct materials used in production	$25,000
Direct labor	35,000
Factory overhead	20,000
Work in process inventory, January 1	30,000
Work in process inventory, January 31	25,000
Finished goods inventory, January 1	15,000
Finished goods inventory, January 31	12,000

For January, determine (a) the cost of goods manufactured and (b) the cost of goods sold.

Follow My Example 1-5

a.

Work in process inventory, January 1		$ 30,000
Cost of direct materials used in production	$25,000	
Direct labor	35,000	
Factory overhead	20,000	
Total manufacturing costs incurred during January		80,000
Total manufacturing costs		$110,000
Less work in process inventory, January 31		25,000
Cost of goods manufactured		$ 85,000

b.

Finished goods inventory, January 1	$ 15,000
Cost of goods manufactured	85,000
Cost of finished goods available for sale	$100,000
Less finished goods inventory, January 31	12,000
Cost of goods sold	$ 88,000

For Practice: PE 1-5A, PE 1-5B

As the prior examples illustrate, managerial accounting information can be used for a variety of purposes. In the remaining chapters of this text, we examine these and other areas of managerial accounting.

Business Connection

NAVIGATING THE INFORMATION HIGHWAY

Dell Inc. follows a build-to-order manufacturing process, where each computer is manufactured based on a specific customer order. In a build-to-order manufacturing process like this, customers select the features they want on their computer from the company's Web site. Once the order is submitted, the manufacturing process begins. The parts required for each feature are removed from inventory, and the computer is manufactured and shipped within days of the order. Inventory items are scanned as they are removed from inventory to keep accurate track of inventory levels and help the manufacturer determine when to reorder.

But calculating the amount of materials to reorder is not the only use of these data. Data on which parts are included in each order are placed in the company's database. This information can then be used to track manufacturing patterns such as the type of features that are frequently ordered together and seasonal changes in the features that are ordered.

In recent years, information systems have become more sophisticated, making it easier and less expensive for companies to gather large amounts of data on their manufacturing processes and customers. If used effectively, these new data sources can help a business like Dell decide what features to offer for its products, what features to discontinue, and how to combine features into a package. For example, manufacturing data might indicate that the demand for DVD drives on computers increases significantly each summer right before school starts. A build-to-order manufacturer like Dell might use this information to realign the manufacturing process during that time of year, or to offer certain packages of features in July and August.

However, the ability to generate value from this information depends on a company's ability to merge these new data with existing accounting information in a meaningful manner. The managerial accountant must now be prepared to analyze and evaluate a broader set of information and determine how it will affect a company's operational performance and profitability.

Source: "Delivering Strategic Business Value: Business Intelligence Can Help Management Accounting Reclaim Its Relevance and Rightful Role," Steve Williams, *Strategic Finance*, August 2004.

At a Glance 1

1 Describe managerial accounting and the role of managerial accounting in a business.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Managerial accounting is a staff function that supports the management process by providing reports to aid management in planning, directing, controlling, improving, and decision making. This differs from financial accounting, which provides information to users outside of the organization. Managerial accounting reports are designed to meet the specific needs of management and aid management in planning long-term strategies and running the day-to-day operations.	• Describe the differences between financial accounting and managerial accounting. • Describe the role of the management accountant in the organization. • Describe the role of managerial accounting in the management process.	1-1	1-1A, 1-1B

2 Describe and illustrate the following costs: (1) direct and indirect costs; (2) direct materials, direct labor, and factory overhead costs; and (3) product and period costs.

Key Points

Manufacturing companies use machinery and labor to convert materials into a finished product. A direct cost can be directly traced to a finished product, while an indirect cost cannot. The cost of a finished product is made up of three components: (1) direct materials, (2) direct labor, and (3) factory overhead.

These three manufacturing costs can be categorized into prime costs (direct material and direct labor) or conversion costs (direct labor and factory overhead). Product costs consist of the elements of manufacturing cost—direct materials, direct labor, and factory overhead—while period costs consist of selling and administrative expenses.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe a cost object.		
• Classify a cost as a direct or indirect cost for a cost object.		
• Describe direct materials cost.	**1-2**	1-2A, 1-2B
• Describe direct labor cost.	**1-2**	1-2A, 1-2B
• Describe factory overhead cost.	**1-2**	1-2A, 1-2B
• Describe prime costs and conversion costs.	**1-3**	1-3A, 1-3B
• Describe product costs and period costs.	**1-4**	1-4A, 1-4B

3 Describe and illustrate the following statements for a manufacturing business: (1) balance sheet, (2) statement of cost of goods manufactured, (3) income statement.

Key Points

The financial statements of manufacturing companies differ from those of merchandising companies. Manufacturing company balance sheets report three types of inventory: materials, work in process, and finished goods. The income statement of manufacturing companies reports cost of goods sold, which is the total manufacturing cost of the goods sold. The income statement is supported by the statement of cost of goods manufactured, which provides the details of the cost of goods manufactured during the period.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe materials inventory.		
• Describe work in process inventory.		
• Describe finished goods inventory.		
• Describe the differences between merchandising and manufacturing company balance sheets.		
• Prepare a statement of cost of goods manufactured.	**1-5**	1-5A, 1-5B
• Prepare an income statement for a manufacturing company.	**1-5**	1-5A, 1-5B

4 Describe the uses of managerial accounting information.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Managers need information to guide their decision making. Managerial accounting provides a variety of information and reports that help managers run the operations of their business.	• Describe examples of how managerial accounting aids managers in decision making.		

Key Terms

continuous process improvement (6)
controller (5)
controlling (6)
conversion costs (11)
cost (8)
cost object (8)
cost of finished goods available for sale (15)
cost of goods manufactured (15)
cost of goods sold (15)
cost of merchandise sold (14)
decision making (6)
direct costs (8)
direct labor cost (10)
direct materials cost (9)
directing (6)
factory burden (10)
factory overhead cost (10)
feedback (6)
financial accounting (3)
finished goods inventory (13)
indirect costs (8)
line department (4)
management by exception (6)
management process (5)
managerial accounting (3)
manufacturing overhead (10)
materials inventory (13)
merchandise available for sale (14)
objectives (goals) (6)
operational planning (6)
period costs (11)
planning (6)
prime costs (11)
product costs (11)
staff department (5)
statement of cost of goods manufactured (15)
strategic planning (6)
strategies (6)
work in process inventory (13)

Illustrative Problem

The following is a list of costs that were incurred in producing this textbook:

a. Insurance on the factory building and equipment
b. Salary of the vice president of finance
c. Hourly wages of printing press operators during production
d. Straight-line depreciation on the printing presses used to manufacture the text
e. Electricity used to run the presses during the printing of the text
f. Sales commissions paid to textbook representatives for each text sold
g. Paper on which the text is printed
h. Book covers used to bind the pages
i. Straight-line depreciation on an office building
j. Salaries of staff used to develop artwork for the text
k. Glue used to bind pages to cover

Instructions

With respect to the manufacture and sale of this text, classify each cost as either a product cost or a period cost. Indicate whether each product cost is a direct materials cost, a

direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense.

Solution

	Product Cost			Period Cost	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense
a.			X		
b.					X
c.		X			
d.			X		
e.			X		
f.				X	
g.	X				
h.	X				
i.					X
j.			X		
k.			X		

Self-Examination Questions (Answers at End of Chapter)

1. Which of the following best describes the difference between financial and managerial accounting?
   A. Managerial accounting provides information to support decisions, while financial accounting does not.
   B. Managerial accounting is not restricted to generally accepted accounting principles, while financial accounting is restricted to GAAP.
   C. Managerial accounting does not result in financial reports, while financial accounting does result in financial reports.
   D. Managerial accounting is concerned solely with the future and does not record events from the past, while financial accounting records only events from past transactions.
2. Which of the following is *not* one of the five basic phases of the management process?
   A. Planning
   B. Controlling
   C. Decision making
   D. Operating
3. Which of the following is *not* considered a cost of manufacturing a product?
   A. Direct materials cost
   B. Factory overhead cost
   C. Sales salaries
   D. Direct labor cost
4. Which of the following costs would be included as part of the factory overhead costs of a microcomputer manufacturer?
   A. The cost of memory chips
   B. Depreciation of testing equipment
   C. Wages of microcomputer assemblers
   D. The cost of disk drives
5. For the month of May, Latter Company has beginning finished goods inventory of $50,000, ending finished goods inventory of $35,000, and cost of goods manufactured of $125,000. What is the cost of goods sold for May?
   A. $90,000
   B. $110,000
   C. $140,000
   D. $170,000

Eye Openers

1. What are the major differences between managerial accounting and financial accounting?
2. a. Differentiate between a department with line responsibility and a department with staff responsibility.
   b. In an organization that has a Sales Department and a Personnel Department, among others, which of the two departments has (1) line responsibility and (2) staff responsibility?
3. a. What is the role of the controller in a business organization?
   b. Does the controller have a line or staff responsibility?

4. What are the five basic phases of the management process?
5. What is the term for a plan that encompasses a period ranging from five or more years and that serves as a basis for long-range actions?
6. What is the process by which management runs day-to-day operations?
7. What is the process by which management assesses how well a plan is working?
8. Describe what is meant by *management by exception*.
9. What term describes a payment in cash or the commitment to pay cash in the future for the purpose of generating revenues?
10. For a company that produces desktop computers, would memory chips be considered a direct or an indirect cost of each microcomputer produced?
11. What three costs make up the cost of manufacturing a product?
12. What manufacturing cost term is used to describe the cost of materials that are an integral part of the manufactured end product?
13. If the cost of wages paid to employees who are directly involved in converting raw materials into a manufactured end product is not a significant portion of the total product cost, how would the wages cost be classified as to type of manufacturing cost?
14. Distinguish between prime costs and conversion costs.
15. What is the difference between a product cost and a period cost?
16. Name the three inventory accounts for a manufacturing business, and describe what each balance represents at the end of an accounting period.
17. In what order should the three inventories of a manufacturing business be presented on the balance sheet?
18. What are the three categories of manufacturing costs included in the cost of finished goods and the cost of work in process?
19. For a manufacturer, what is the description of the amount that is comparable to a merchandising business's cost of merchandise sold?
20. For June, Fosina Company had beginning materials inventory of $50,000, ending materials inventory of $60,000, and materials purchases of $280,000. What is the cost of direct materials used in production?
21. How does the Cost of Goods Sold section of the income statement differ between merchandising and manufacturing companies?
22. Describe how an automobile manufacturer might use managerial accounting information to (a) evaluate the performance of the company and (b) make strategic decisions.

Practice Exercises

PE 1-1A
Management process

obj. 1

EE 1-1 p. 6

Three phases of the management process are controlling, planning, and decision making. Match the following descriptions to the proper phase.

Phase of management process	Description
Planning	a. Monitoring the operating results of implemented plans and comparing the actual results with expected results.
Controlling	b. Inherent in planning, directing, controlling, and improving.
Decision making	c. Long-range courses of action.

PE 1-1B
Management process

obj. 1

EE 1-1 p. 6

Three phases of the management process are planning, directing, and controlling. Match the following descriptions to the proper phase.

Phase of management process	Description
Directing	a. Process by which managers, given their assigned levels of responsibilities, run day-to-day operations.
Planning	b. Isolating significant departures from plans for further investigation and possible remedial action. It may lead to a revision of future plans.
Controlling	c. Developing long-range courses of action to achieve goals.

PE 1-2A
Direct materials, direct labor, and factory overhead
obj. 2
EE 1-2 p. 10

Identify the following costs as direct materials (DM), direct labor (DL), or factory overhead (FO) for an automobile manufacturer.

a. Oil used for assembly line machinery
b. Wages of the plant manager
c. Wages of employees that operate painting equipment
d. Steel

PE 1-2B
Direct materials, direct labor, and factory overhead
obj. 2
EE 1-2 p. 10

Identify the following costs as direct materials (DM), direct labor (DL), or factory overhead (FO) for a textbook publisher.

a. Wages of printing machine employees
b. Maintenance on printing machines
c. Paper used to make a textbook
d. Glue used to bind books

PE 1-3A
Prime and conversion costs
obj. 2
EE 1-3 p. 11

Identify the following costs as a prime cost (P), conversion cost (C), or both (B) for an automobile manufacturer.

a. Oil used for assembly line machinery
b. Wages of employees that operate painting equipment
c. Steel
d. Wages of the plant manager

PE 1-3B
Prime and conversion costs
obj. 2
EE 1-3 p. 11

Identify the following costs as a prime cost (P), conversion cost (C), or both (B) for a textbook publisher.

a. Glue used to bind books
b. Maintenance on printing machines
c. Paper used to make a textbook
d. Wages of printing machine employees

PE 1-4A
Product and period costs
obj. 2
EE 1-4 p. 13

Identify the following costs as a product cost or a period cost for an automobile manufacturer.

a. Rent on office building
b. Accounting staff salaries
c. Steel
d. Wages of employees that operate painting equipment

PE 1-4B
Product and period costs
obj. 2
EE 1-4 p. 13

Identify the following costs as a product cost or a period cost for a textbook publisher.

a. Paper used to make a textbook
b. Depreciation expense—corporate headquarters
c. Sales salaries
d. Maintenance on printing machines

PE 1-5A
Cost of goods sold, cost of goods manufactured
obj. 3
EE 1-5 p. 18

Siler Company has the following information for February:

Cost of direct materials used in production	$ 9,000
Direct labor	27,000
Factory overhead	18,000
Work in process inventory, February 1	25,000
Work in process inventory, February 28	26,000
Finished goods inventory, February 1	11,000
Finished goods inventory, February 28	13,000

For February, determine (a) the cost of goods manufactured and (b) the cost of goods sold.

PE 1-5B
Cost of goods sold, cost of goods manufactured

obj. 3

EE 1-5 p. 18

Davidson Company has the following information for August:

Cost of direct materials used in production	$60,000
Direct labor	90,000
Factory overhead	44,000
Work in process inventory, August 1	20,000
Work in process inventory, August 31	16,000
Finished goods inventory, August 1	36,000
Finished goods inventory, August 31	20,000

For August, determine (a) the cost of goods manufactured and (b) the cost of goods sold.

Exercises

EX 1-1
Classifying costs as materials, labor, or factory overhead

obj. 2

Indicate whether each of the following costs of an airplane manufacturer would be classified as direct materials cost, direct labor cost, or factory overhead cost:

a. Controls for flight deck
b. Aircraft engines
c. Depreciation of welding equipment
d. Welding machinery lubricants
e. Salary of test pilot
f. Steel used in landing gear
g. Wages of assembly line worker
h. Tires

EX 1-2
Classifying costs as materials, labor, or factory overhead

obj. 2

Indicate whether the following costs of Colgate-Palmolive Company would be classified as direct materials cost, direct labor cost, or factory overhead cost:

a. Wages paid to Packaging Department employees
b. Maintenance supplies
c. Plant manager salary for the Morristown, Tennessee, toothpaste plant
d. Packaging materials
e. Depreciation on production machinery
f. Salary of process engineers
g. Depreciation on the Clarksville, Indiana, soap plant
h. Resins for soap and shampoo products
i. Scents and fragrances
j. Wages of production line employees

EX 1-3
Classifying costs as factory overhead

obj. 2

Which of the following items are properly classified as part of factory overhead for Caterpillar?

a. Factory supplies used in the Morganton, North Carolina, engine parts plant
b. Amortization of patents on new assembly process
c. Steel plate
d. Vice president of finance's salary
e. Sales incentive fees to dealers
f. Depreciation on Peoria, Illinois, headquarters building
g. Interest expense on debt
h. Plant manager's salary at Aurora, Illinois, manufacturing plant
i. Consultant fees for a study of production line employee productivity
j. Property taxes on the Danville, Kentucky, tractor tread plant

EX 1-4
Classifying costs as product or period costs
obj. 2

For apparel manufacturer Ann Taylor, Inc., classify each of the following costs as either a product cost or a period cost:

a. Travel costs of salespersons
b. Fabric used during production
c. Salaries of distribution center personnel
d. Factory janitorial supplies
e. Repairs and maintenance costs for sewing machines
f. Corporate controller's salary
g. Depreciation on office equipment
h. Advertising expenses
i. Utility costs for office building
j. Depreciation on sewing machines
k. Property taxes on factory building and equipment
l. Research and development costs
m. Sales commissions
n. Oil used to lubricate sewing machines
o. Factory supervisors' salaries
p. Wages of sewing machine operators
q. Salary of production quality control supervisor

EX 1-5
Concepts and terminology
objs. 1, 2

From the choices presented in parentheses, choose the appropriate term for completing each of the following sentences:

a. Payments of cash or the commitment to pay cash in the future for the purpose of generating revenues are (costs, expenses).
b. The implementation of automatic, robotic factory equipment normally (increases, decreases) the direct labor component of product costs.
c. Feedback is often used to (improve, direct) operations.
d. A product, sales territory, department, or activity to which costs are traced is called a (direct cost, cost object).
e. The balance sheet of a manufacturer would include an account for (cost of goods sold, work in process inventory).
f. Factory overhead costs combined with direct labor costs are called (prime, conversion) costs.
g. Advertising costs are usually viewed as (period, product) costs.

EX 1-6
Concepts and terminology
objs. 1, 2

From the choices presented in parentheses, choose the appropriate term for completing each of the following sentences:

a. Short-term plans are called (strategic, operational) plans.
b. The plant manager's salary would be considered (direct, indirect) to the product.
c. The phase of the management process that uses process information to eliminate the source of problems in a process so that the process delivers the correct product in the correct quantities is called (directing, improving).
d. The wages of an assembly worker are normally considered a (period, product) cost.
e. Materials for use in production are called (supplies, materials inventory).
f. Direct materials costs combined with direct labor costs are called (prime, conversion) costs.
g. An example of factory overhead is (sales office depreciation, plant depreciation).

EX 1-7
Classifying costs in a service company
obj. 2

A partial list of the costs for Mountain Lakes Railroad, a short hauler of freight, is provided below. Classify each cost as either indirect or direct. For purposes of classifying each cost as direct or indirect, use the train as the cost object.

a. Wages of switch and classification yard personnel
b. Cost to lease (rent) railroad cars
c. Depreciation of terminal facilities
d. Payroll clerk salaries
e. Salaries of dispatching and communications personnel

f. Safety training costs
g. Cost to lease (rent) train locomotives.
h. Wages of train engineers
i. Cost of track and bed (ballast) replacement
j. Costs of accident cleanup
k. Fuel costs
l. Maintenance costs of right of way, bridges, and buildings

EX 1-8
Classifying costs

objs. 2, 3

The following report was prepared for evaluating the performance of the plant manager of Second Hand Inc. Evaluate and correct this report.

Second Hand Inc.
Manufacturing Costs
For the Quarter Ended March 31, 2010

Materials used in production (including $50,000 of indirect materials)	$ 540,000
Direct labor (including $75,000 maintenance salaries)	500,000
Factory overhead:	
Supervisor salaries	460,000
Heat, light, and power	125,000
Sales salaries	310,000
Promotional expenses	280,000
Insurance and property taxes—plant	135,000
Insurance and property taxes—corporate offices	195,000
Depreciation—plant and equipment	110,000
Depreciation—corporate offices	80,000
Total	$2,735,000

EX 1-9
Financial statements of a manufacturing firm

obj. 3

✔ a. Net income, $48,000

The following events took place for LAE Manufacturing Company during March, the first month of its operations as a producer of digital clocks:

a. Purchased $52,000 of materials.
b. Used $40,000 of direct materials in production.
c. Incurred $60,000 of direct labor wages.
d. Incurred $84,000 of factory overhead.
e. Transferred $140,000 of work in process to finished goods.
f. Sold goods with a cost of $110,000.
g. Earned revenues of $250,000.
h. Incurred $64,000 of selling expenses.
i. Incurred $28,000 of administrative expenses.

a. Prepare the March income statement for LAE Manufacturing Company.
b. Determine the inventory balances at the end of the first month of operations.

EX 1-10
Manufacturing company balance sheet

obj. 3

Partial balance sheet data for Lawson Company at December 31, 2010, are as follows:

Finished goods inventory	$10,000	Supplies	$18,000
Prepaid insurance	10,000	Materials inventory	22,000
Accounts receivable	26,000	Cash	28,000
Work in process inventory	40,000		

Prepare the Current Assets section of Lawson Company's balance sheet at December 31, 2010.

EX 1-11
Cost of direct materials used in production for a manufacturing company

obj. 3

Monterey Manufacturing Company reported the following materials data for the month ending October 31, 2010:

Materials purchased	$160,000
Materials inventory, October 1	50,000
Materials inventory, October 31	42,000

Determine the cost of direct materials used in production by Monterey during the month ended October 31, 2010.

EX 1-12
Cost of goods manufactured for a manufacturing company

obj. 3

✔ e. $6,000

Two items are omitted from each of the following three lists of cost of goods manufactured statement data. Determine the amounts of the missing items, identifying them by letter.

Work in process inventory, December 1	$ 2,000	$ 12,000	(e)
Total manufacturing costs incurred during December	14,000	(c)	70,000
Total manufacturing costs	(a)	$140,000	$76,000
Work in process inventory, December 31	3,000	30,000	(f)
Cost of goods manufactured	(b)	(d)	$62,000

EX 1-13
Cost of goods manufactured for a manufacturing company

obj. 3

The following information is available for O'Neal Manufacturing Company for the month ending January 31, 2010:

Cost of direct materials used in production	$132,000
Direct labor	158,000
Work in process inventory, January 1	60,000
Work in process inventory, January 31	80,000
Total factory overhead	72,000

Determine O'Neal's cost of goods manufactured for the month ended January 31, 2010.

EX 1-14
Income statement for a manufacturing company

obj. 3

✔ d. $160,000

Two items are omitted from each of the following three lists of cost of goods sold data from a manufacturing company income statement. Determine the amounts of the missing items, identifying them by letter.

Finished goods inventory, November 1	$ 60,000	$ 20,000	(e)
Cost of goods manufactured	300,000	(c)	260,000
Cost of finished goods available for sale	(a)	$190,000	$300,000
Finished goods inventory, November 30	70,000	30,000	(f)
Cost of goods sold	(b)	(d)	$275,000

EX 1-15
Statement of cost of goods manufactured for a manufacturing company

obj. 3

✔ a. Total manufacturing costs, $871,200

Cost data for F. Mills Manufacturing Company for the month ending April 30, 2010, are as follows:

Inventories	April 1	April 30
Materials	$175,000	$154,000
Work in process	119,000	133,000
Finished goods	91,000	105,000

Direct labor	$315,000
Materials purchased during April	336,000
Factory overhead incurred during April:	
Indirect labor	33,600
Machinery depreciation	20,000
Heat, light, and power	7,000
Supplies	5,600
Property taxes	4,900
Miscellaneous cost	9,100

a. Prepare a cost of goods manufactured statement for April 2010.
b. Determine the cost of goods sold for April 2010.

EX 1-16
Cost of goods sold, profit margin, and net income for a manufacturing company

obj. 3

✔ a. Cost of goods sold, $244,000

The following information is available for Gonzalez Manufacturing Company for the month ending March 31, 2010:

Cost of goods manufactured	$240,000
Selling expenses	76,500
Administrative expenses	40,500
Sales	486,000
Finished goods inventory, March 1	54,000
Finished goods inventory, March 31	50,000

For the month ended March 31, 2010, determine Gonzalez's (a) cost of goods sold, (b) gross profit, and (c) net income.

EX 1-17
Cost flow relationships

obj. 3

✔ a. $150,000

The following information is available for the first month of operations of Zahorik Company, a manufacturer of mechanical pencils:

Sales	$360,000
Gross profit	210,000
Cost of goods manufactured	180,000
Indirect labor	78,000
Factory depreciation	12,000
Materials purchased	111,000
Total manufacturing costs for the period	207,000
Materials inventory	15,000

Using the above information, determine the following missing amounts:

a. Cost of goods sold
b. Finished goods inventory
c. Direct materials cost
d. Direct labor cost
e. Work in process inventory

Problems Series A

PR 1-1A
Classifying costs

obj. 2

The following is a list of costs that were incurred in the production and sale of lawn mowers:

a. Attorney fees for drafting a new lease for headquarters offices.
b. Commissions paid to sales representatives, based on the number of lawn mowers sold.
c. Property taxes on the factory building and equipment.
d. Hourly wages of operators of robotic machinery used in production.
e. Salary of vice president of marketing.
f. Gasoline engines used for lawn mowers.
g. Factory cafeteria cashier's wages.
h. Electricity used to run the robotic machinery.
i. Maintenance costs for new robotic factory equipment, based on hours of usage.
j. License fees for use of patent for lawn mower blade, based on the number of lawn mowers produced.
k. Salary of factory supervisor.
l. Steel used in producing the lawn mowers.
m. Telephone charges for company controller's office.
n. Paint used to coat the lawn mowers.
o. Straight-line depreciation on the robotic machinery used to manufacture the lawn mowers.
p. Tires for lawn mowers.
q. Engine oil used in mower engines prior to shipment.
r. Cash paid to outside firm for janitorial services for factory.
s. Cost of advertising in a national magazine.
t. Salary of quality control supervisor who inspects each lawn mower before it is shipped.
u. Plastic for outside housing of lawn mowers.
v. Steering wheels for lawn mowers.
w. Filter for spray gun used to paint the lawn mowers.
x. Cost of boxes used in packaging lawn mowers.
y. Premiums on insurance policy for factory buildings.
z. Payroll taxes on hourly assembly line employees.

Instructions

Classify each cost as either a product cost or a period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense.

(continued)

Use the following tabular headings for your answer, placing an "X" in the appropriate column.

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-2A
Classifying costs
obj. 2

The following is a list of costs incurred by several businesses:

a. Costs for television advertisement.
b. Disk drives for a microcomputer manufacturer.
c. Executive bonus for vice president of marketing.
d. Packing supplies for products sold.
e. Protective glasses for factory machine operators.
f. Cost of telephone operators for a toll-free hotline to help customers operate products.
g. Entertainment expenses for sales representatives.
h. Wages of a machine operator on the production line.
i. Seed for grain farmer.
j. Tires for an automobile manufacturer.
k. Costs of operating a research laboratory.
l. Paper used by Computer Department in processing various managerial reports.
m. Hourly wages of warehouse laborers.
n. Wages of company controller's secretary.
o. Factory operating supplies.
p. First-aid supplies for factory workers.
q. Depreciation of factory equipment.
r. Salary of quality control supervisor.
s. Sales commissions.
t. Paper used by commercial printer.
u. Lumber used by furniture manufacturer.
v. Health insurance premiums paid for factory workers.
w. Cost of hogs for meat processor.
x. Maintenance and repair costs for factory equipment.

Instructions

Classify each of the preceding costs as a product cost or period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for preparing your answer. Place an "X" in the appropriate column.

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-3A
Cost classifications—service company
obj. 2

A partial list of Frend Hotel's costs is provided below.

a. Champagne for guests.
b. Cost to mail a customer survey.
c. Training for hotel restaurant servers.
d. Cost to replace lobby furniture.
e. Cost of soaps and shampoos for rooms.
f. Cost of food.
g. Wages of desk clerks.
h. Cost to paint lobby.
i. Cost of advertising in local newspaper.
j. Cost of laundering towels and bedding.
k. Wages of kitchen employees.
l. Guest room telephone costs for long-distance calls.
m. Cost of room mini-bar supplies.

n. Utility cost.
o. Cost of valet service.
p. General maintenance supplies.
q. Wages of maids.
r. Salary of the hotel president.
s. Depreciation of the hotel.
t. Cost of new carpeting.
u. Wages of bellhops.
v. Wages of convention setup employees.
w. Pay-per-view movie rental costs (in rooms).

Instructions

1. What would be Frend's most logical definition for the final cost object?
2. Identify whether each of the costs is to be classified as direct or indirect. Define direct costs in terms of a hotel guest as the cost object.

PR 1-4A

Manufacturing income statement, statement of cost of goods manufactured

objs. 2, 3

✔ 1. b. Grant $594,000

Several items are omitted from each of the following income statement and cost of goods manufactured statement data for the month of December 2010:

	Grant Company	McClellan Company
Materials inventory, December 1	$ 78,000	$ 102,000
Materials inventory, December 31	(a)	115,000
Materials purchased	198,000	230,000
Cost of direct materials used in production	209,000	(a)
Direct labor	294,000	(b)
Factory overhead	91,000	114,000
Total manufacturing costs incurred during December	(b)	660,000
Total manufacturing costs	744,000	906,000
Work in process inventory, December 1	150,000	246,000
Work in process inventory, December 31	126,000	(c)
Cost of goods manufactured	(c)	654,000
Finished goods inventory, December 1	132,000	114,000
Finished goods inventory, December 31	138,000	(d)
Sales	1,150,000	1,020,000
Cost of goods sold	(d)	660,000
Gross profit	(e)	(e)
Operating expenses	150,000	(f)
Net income	(f)	226,000

Instructions

1. Determine the amounts of the missing items, identifying them by letter.
2. Prepare a statement of cost of goods manufactured for McClellan Company.
3. Prepare an income statement for McClellan Company.

PR 1-5A

Statement of cost of goods manufactured and income statement for a manufacturing company

objs. 2, 3

The following information is available for Deutsch Corporation for 2010:

Inventories	January 1	December 31
Materials	$225,000	$280,000
Work in process	405,000	380,000
Finished goods	390,000	380,000

Advertising expense	$ 190,000
Depreciation expense—office equipment	27,000
Depreciation expense—factory equipment	36,000
Direct labor	430,000
Heat, light, and power—factory	14,400
Indirect labor	50,400
Materials purchased	423,000
Office salaries expense	147,500
Property taxes—factory	11,700
Property taxes—office building	24,300
Rent expense—factory	19,800
Sales	1,980,000
Sales salaries expense	243,000
Supplies—factory	9,900
Miscellaneous cost—factory	6,120

Instructions

1. Prepare the 2010 statement of cost of goods manufactured.
2. Prepare the 2010 income statement.

Problems Series B

PR 1-1B
Classifying costs
obj. 2

The following is a list of costs that were incurred in the production and sale of boats:

a. Cost of electrical wiring for boats.
b. Commissions to sales representatives, based upon the number of boats sold.
c. Salary of shop supervisor.
d. Salary of president of company.
e. Cost of boat for "grand prize" promotion in local bass tournament.
f. Power used by sanding equipment.
g. Hourly wages of assembly line workers.
h. Boat chairs.
i. Legal department costs for the year.
j. Memberships for key executives in the Bass World Association.
k. Cost of normal scrap from defective hulls.
l. Fiberglass for producing the boat hull.
m. Decals for boat hull.
n. Annual fee to pro-fisherman Jim Bo Wilks to promote the boats.
o. Yearly cost maintenance contract for robotic equipment.
p. Annual bonus paid to top executives of the company.
q. Masks for use by sanders in smoothing boat hulls.
r. Special advertising campaign in *Bass World*.
s. Cost of metal hardware for boats, such as ornaments and tie-down grasps.
t. Straight-line depreciation on factory equipment.
u. Oil to lubricate factory equipment.
v. Salary of chief financial officer.
w. Canvas top for boats.
x. Wood paneling for use in interior boat trim.
y. Cost of paving the headquarters employee parking lot.
z. Steering wheels.

Instructions

Classify each cost as either a product cost or a period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for your answer, placing an "X" in the appropriate column.

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-2B
Classifying costs
obj. 2

The following is a list of costs incurred by several businesses:

a. Charitable contribution to United Fund.
b. Fees charged by collection agency on past-due customer accounts.
c. Maintenance costs for factory equipment.
d. Cost of fabric used by clothing manufacturer.
e. Salary of the vice president of manufacturing logistics.
f. Rent for a warehouse used to store finished products.
g. Wages of a machine operator on the production line.
h. Depreciation of tools used in production.

i. Travel costs of marketing executives to annual sales meeting.
j. Cost of sewing machine needles used by a shirt manufacturer.
k. Depreciation of microcomputers used in the factory to coordinate and monitor the production schedules.
l. Maintenance and repair costs for factory equipment.
m. Wages of production quality control personnel.
n. Depreciation of robot used to assemble a product.
o. Cost of a 30-second television commercial.
p. Pens, paper, and other supplies used by the Accounting Department in preparing various managerial reports.
q. Electricity used to operate factory machinery.
r. Factory janitorial supplies.
s. Oil lubricants for factory plant and equipment.
t. Cost of plastic for a telephone being manufactured.
u. Fees paid to lawn service for office grounds upkeep.
v. Telephone charges by president's office.
w. Surgeon's fee for knee replacement.
x. Depreciation of copying machines used by the Marketing Department.

Instructions

Classify each of the preceding costs as a product cost or period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for preparing your answer, placing an "X" in the appropriate column.

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-3B
Cost classifications—service company

obj. 2

A partial list of Gaelic Medical Center's costs is provided below.

a. Operating room supplies used on patients (catheters, sutures, etc.).
b. Utility costs of the hospital.
c. Training costs for nurses.
d. Cost of maintaining the staff and visitors' cafeteria.
e. Cost of intravenous solutions.
f. Cost of blood tests.
g. Cost of improvements on the employee parking lot.
h. Salary of the nutritionist.
i. General maintenance of the hospital.
j. Cost of patient meals.
k. Cost of laundry services for operating room personnel.
l. Depreciation on patient rooms.
m. Depreciation of X-ray equipment.
n. Cost of drugs used for patients.
o. Doctor's fee.
p. Nurses' salaries.
q. Overtime incurred in the Records Department due to a computer failure.
r. Salary of intensive care personnel.
s. Cost of X-ray test.
t. Cost of new heart wing.
u. Cost of advertising hospital services on television.

Instructions

1. What would be Gaelic's most logical definition for the final cost object?
2. Identify whether each of the costs is to be classified as direct or indirect. Define direct costs in terms of a patient as a cost object.

PR 1-4B
Manufacturing income statement, statement of cost of goods manufactured

objs. 2, 3

✔ 1. McCain, c. $423,000

Several items are omitted from each of the following income statement and cost of goods manufactured statement data for the month of December 2010:

	McCain Company	Buffet Company
Materials inventory, December 1	$ 35,000	$ 45,000
Materials inventory, December 31	(a)	21,000
Materials purchased	150,000	(a)
Cost of direct materials used in production	168,000	(b)
Direct labor	205,000	133,000
Factory overhead	78,000	59,000
Total manufacturing costs incurred in December	(b)	350,000
Total manufacturing costs	514,000	398,000
Work in process inventory, December 1	63,000	48,000
Work in process inventory, December 31	91,000	(c)
Cost of goods manufactured	(c)	353,000
Finished goods inventory, December 1	118,000	62,000
Finished goods inventory, December 31	104,000	(d)
Sales	595,000	448,000
Cost of goods sold	(d)	356,000
Gross profit	(e)	(e)
Operating expenses	62,000	(f)
Net income	(f)	38,000

Instructions

1. Determine the amounts of the missing items, identifying them by letter.
2. Prepare a statement of cost of goods manufactured for McCain Company.
3. Prepare an income statement for McCain Company.

PR 1-5B
Statement of cost of goods manufactured and income statement for a manufacturing company

objs. 2, 3

The following information is available for Rosetta Company for 2010:

Inventories	January 1	December 31
Materials	$59,500	$73,500
Work in process	84,000	73,500
Finished goods	87,500	77,000

Advertising expense	$ 52,500
Depreciation expense—office equipment	17,500
Depreciation expense—factory equipment	11,200
Direct labor	143,500
Heat, light, and power—factory	4,500
Indirect labor	18,200
Materials purchased	95,000
Office salaries expense	59,500
Property taxes—factory	3,150
Property taxes—headquarters building	10,500
Rent expense—factory	5,250
Sales	665,000
Sales salaries expense	105,000
Supplies—factory	2,500
Miscellaneous cost—factory	3,400

Instructions

1. Prepare the 2010 statement of cost of goods manufactured.
2. Prepare the 2010 income statement.

Special Activities

SA 1-1
Ethics and professional conduct in business

Earnhart Manufacturing Company allows employees to purchase, at cost, manufacturing materials, such as metal and lumber, for personal use. To purchase materials for personal use, an employee must complete a materials requisition form, which must then be approved by the employee's immediate supervisor. Gretchen MacCauley, an assistant cost accountant, charges the employee an amount based on Earnhart's net purchase cost.

Gretchen MacCauley is in the process of replacing a deck on her home and has requisitioned lumber for personal use, which has been approved in accordance with company policy. In computing the cost of the lumber, Gretchen reviewed all the purchase invoices for the past year. She then used the lowest price to compute the amount due the company for the lumber.

Discuss whether Gretchen behaved in an ethical manner.

SA 1-2
Financial vs. managerial accounting

The following statement was made by the vice president of finance of Orville Inc.: "The managers of a company should use the same information as the shareholders of the firm. When managers use the same information in guiding their internal operations as shareholders use in evaluating their investments, the managers will be aligned with the stockholders' profit objectives."

Respond to the vice president's statement.

SA 1-3
Managerial accounting in the management process

For each of the following managers, describe how managerial accounting could be used to satisfy strategic or operational objectives:

1. The vice president of the Information Systems Division of a bank.
2. A hospital administrator.
3. The chief executive officer of a food company. The food company is divided into three divisions: Nonalcoholic Beverages, Snack Foods, and Fast Food Restaurants.
4. The manager of the local campus copy shop.

SA 1-4
Classifying costs

The Nerd Squad provides computer repair services for the community. Jane Doe's computer was not working, and she called The Nerd Squad for a home repair visit. The Nerd Squad's technician arrived at 2:00 P.M. to begin work. By 4:00 P.M. the problem was diagnosed as a failed circuit board. Unfortunately, the technician did not have a new circuit board in the truck, since the technician's previous customer had the same problem, and a board was used on that visit. Replacement boards were available back at The Nerd Squad's shop. Therefore, the technician drove back to the shop to retrieve a replacement board. From 4:00 to 5:00 P.M., The Nerd Squad's technician drove the round trip to retrieve the replacement board from the shop.

At 5:00 P.M. the technician was back on the job at Jane's home. The replacement procedure is somewhat complex, since a variety of tests must be performed once the board is installed. The job was completed at 6:00 P.M.

Jane's repair bill showed the following:

Circuit board	$ 60
Labor charges	255
Total	$315

Jane was surprised at the size of the bill and asked for some greater detail supporting the calculations. The Nerd Squad responded with the following explanations:

Cost of materials:	
Purchase price of circuit board	$45
Markup on purchase price to cover storage and handling	15
Total materials charge	$60

The labor charge per hour is detailed as follows:

2:00–3:00 P.M.	$ 55
3:00–4:00 P.M.	45
4:00–5:00 P.M.	65
5:00–6:00 P.M.	90
Total labor charge	$255

Further explanations in the differences in the hourly rates are as follows:

First hour:	
Base labor rate	$25
Fringe benefits	10
Overhead (other than storage and handling)	10
Total base labor rate	$45
Additional charge for first hour of any job to cover the cost of vehicle depreciation, fuel, and employee time in transit. A 30-minute transit time is assumed.	10
	$55
Third hour:	
Base labor rate	$45
The trip back to the shop includes vehicle depreciation and fuel; therefore, a charge was added to the hourly rate to cover these costs. The round trip took an hour.	20
	$65
Fourth hour:	
Base labor rate	$45
Overtime premium for time worked in excess of an eight-hour day (starting at 5:00 P.M.) is equal to the base rate.	45
	$90

1. If you were in Jane's position, how would you respond to the bill? Are there parts of the bill that appear incorrect to you? If so, what argument would you employ to convince The Nerd Squad that the bill is too high?
2. Use the headings below to construct a table. Fill in the table by first listing the costs identified in the activity in the left-hand column. For each cost, place a check mark in the appropriate column identifying the correct cost classification. Assume that each service call is a job.

Cost	Direct Materials	Direct Labor	Overhead

SA 1-5
Using managerial accounting information

The following situations describe decision scenarios that could use managerial accounting information:

1. The manager of Burger Barn wishes to determine the price to charge for various lunch plates.
2. By evaluating the cost of leftover materials, the plant manager of a precision machining facility wishes to determine how effectively the plant is being run.
3. The division controller needs to determine the cost of products left in inventory.
4. The manager of the Maintenance Department wishes to plan next year's anticipated expenditures.

For each situation, discuss how managerial accounting information could be used.

SA 1-6
Classifying costs

Group Project

With a group of students, visit a local copy and graphics shop or a pizza restaurant. As you observe the operation, consider the costs associated with running the business. As a group, identify as many costs as you can and classify them according to the following table headings:

Cost	Direct Materials	Direct Labor	Overhead	Selling Expenses

Answers to Self-Examination Questions

1. **B** Managerial accounting is not restricted to generally accepted accounting principles, as is financial accounting (answer B). Both financial and managerial accounting support decision making (answer A). Financial accounting is mostly concerned with the decision making of external users, while managerial accounting supports decision making of management. Both financial and managerial accounting can result in financial reports (answer C). Managerial accounting reports are developed for internal use by managers at various levels in the organization. Both managerial and financial accounting record events from the past (answer D); however, managerial accounting can also include information about the future in the form of budgets and cash flow projections.
2. **D** The five basic phases of the management process are planning (answer A), directing (not listed), controlling (answer B), improving (not listed), and decision making (answer C). Operating (answer D) is not one of the five basic phases, but operations are the object of managers' attention.
3. **C** Sales salaries (answer C) is a selling expense and is not considered a cost of manufacturing a product. Direct materials cost (answer A), factory overhead cost (answer B), and direct labor cost (answer D) are costs of manufacturing a product.
4. **B** Depreciation of testing equipment (answer B) is included as part of the factory overhead costs of the microcomputer manufacturer. The cost of memory chips (answer A) and the cost of disk drives (answer D) are both considered a part of direct materials cost. The wages of microcomputer assemblers (answer C) are part of direct labor costs.
5. **C** Cost of goods sold is calculated as follows:

Beginning finished goods inventory	$ 50,000
Add: Cost of goods manufactured	125,000
Less: Ending finished goods inventory	(35,000)
Cost of goods sold	$140,000

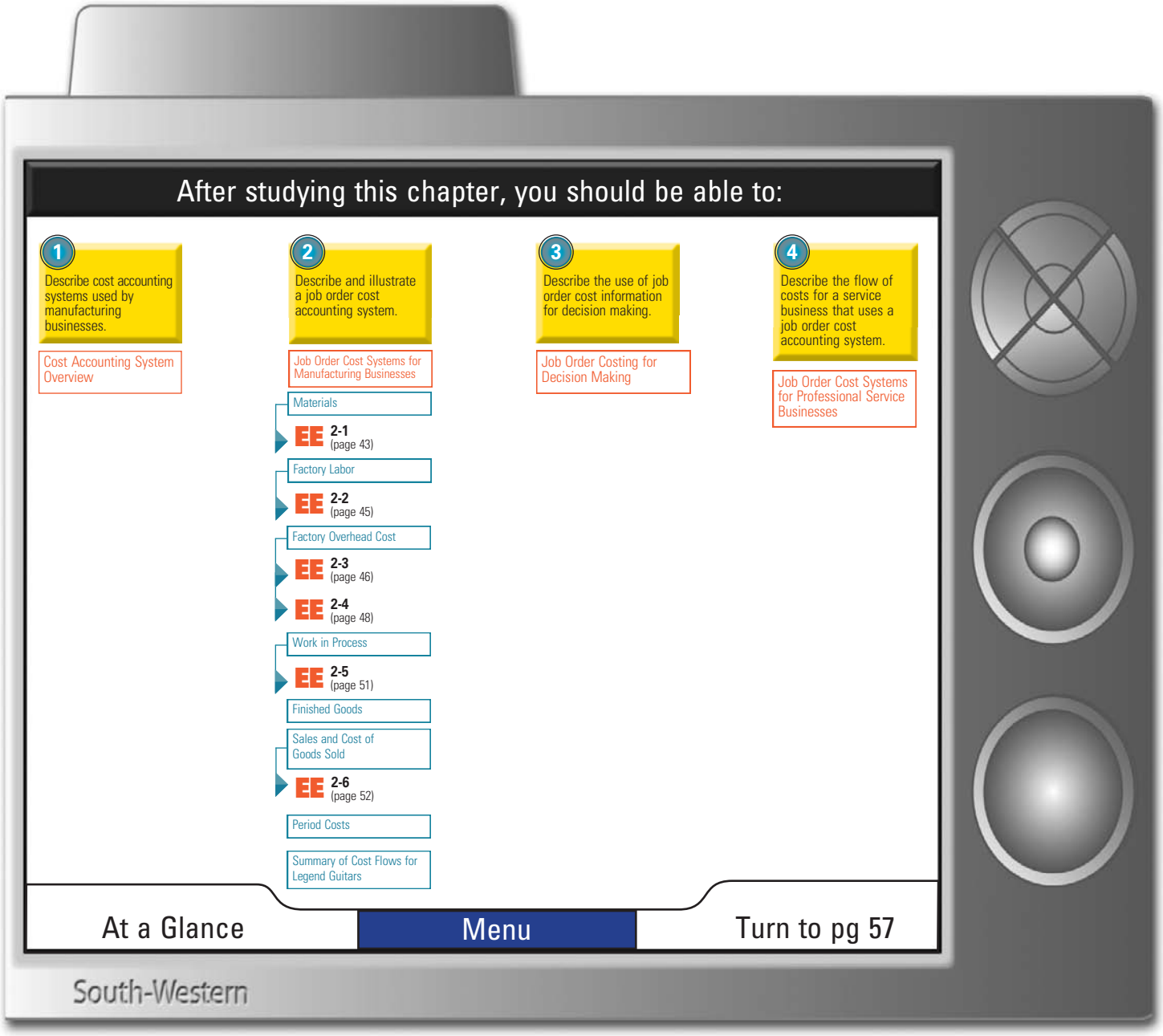
CHAPTER 2

Job Order Costing

DAN DONEGAN'S GUITAR

As we discussed in Chapter 1, Dan Donegan of the rock band *Disturbed* uses a custom-made guitar purchased from Washburn Guitars. In fact, Dan Donegan designed his guitar in partnership with Washburn Guitars, which contributed to Washburn's Maya Series of guitars. The Maya guitar is a precision instrument that amateurs and professionals are willing to pay between $1,400 and $7,000 to own. In order for Washburn to stay in business, the purchase price of the guitar must be greater than the cost of producing the guitar. So, how does Washburn determine the cost of producing a guitar?

Costs associated with creating a guitar include materials such as wood and strings, the wages of employees who build the guitar, and factory overhead. To determine the purchase price of Dan's Maya, Washburn identifies and records the costs that go into the guitar during each step of the manufacturing process. As the guitar moves through the production process, the costs of direct materials, direct labor, and factory overhead are recorded. When the guitar is complete, the costs that have been recorded are added up to determine the cost of Dan's unique Maya Series guitar. The company then prices the guitar to achieve a level of profit over the cost of the guitar. This chapter introduces the principles of accounting systems that accumulate costs in the same manner as they were for Dan Donegan's guitar.



1 Describe cost accounting systems used by manufacturing businesses.

Cost Accounting System Overview

Cost accounting systems measure, record, and report product costs. Managers use product costs for setting product prices, controlling operations, and developing financial statements.

The two main types of cost accounting systems for manufacturing operations are:

1. Job order cost systems
2. Process cost systems

A **job order cost system** provides product costs for each quantity of product that is manufactured. Each quantity of product that is manufactured is called a *job*. Job order cost systems are often used by companies that manufacture custom products for customers or batches of similar products. Manufacturers that use a job order cost

Warner Bros. and other movie studios use job order cost systems to accumulate movie production and distribution costs. Costs such as actor salaries, production costs, movie print costs, and marketing costs are accumulated in a job account for a particular movie.

system are sometimes called *job shops*. An example of a job shop would be an apparel manufacturer, such as Levi Strauss & Co., or a guitar manufacturer such as Washburn Guitars.

A **process cost system** provides product costs for each manufacturing department or process. Process cost systems are often used by companies that manufacture units of a product that are indistinguishable from each other and are manufactured using a continuous production process. Examples would be oil refineries, paper producers, chemical processors, and food processors.

Job order and process cost systems are widely used. A company may use a job order cost system for some of its products and a process cost system for other products.

The process cost system is illustrated in Chapter 3. In this chapter, the job order cost system is illustrated. As a basis for illustration, Legend Guitars, a manufacturer of guitars, is used. Exhibit 1 provides a summary of Legend Guitars' manufacturing operations, which were described in Chapter 1.

Exhibit 1

Summary of Legend Guitars' Manufacturing Operations

Manufacturing Operations	
Cutting	Employees cut the body and neck of the guitar out of wood.
Assembling	Employees assemble and finish the guitars.
Product Costs	
Direct materials	The cost of material that is an integral part of and a significant portion of the total cost of the final product. The cost of wood used in the neck and body of the guitars.
Direct labor	The cost of employee wages that is an integral part of and a significant portion of the total cost of the final product. The wages of the cutting and assembling employees.
Factory overhead	Costs other than direct materials and direct labor that are incurred in the manufacturing process. The cost of guitar strings, glue, sandpaper, buffing compound, paint, salaries of production supervisors, janitorial salaries, and factory utilities.
Inventories	
Materials	Includes the cost of direct and indirect materials used to produce the guitars. Direct materials include the cost of wood used in the neck and body of the guitars. Indirect materials include guitar strings, glue, sandpaper, buffing compound, varnish, and paint.
Work in process	Includes the product costs of units that have entered the manufacturing process, but have not been completed. The product costs of guitars for which the neck and body have been cut, but not yet assembled.
Finished goods	Includes the cost of completed (or finished) products that have not been sold. The product costs assigned to completed guitars that have not yet been sold.

2 Describe and illustrate a job order cost accounting system.

Job Order Cost Systems for Manufacturing Businesses

A job order cost system records and summarizes manufacturing costs by jobs. The flow of manufacturing costs in a job order system is illustrated in Exhibit 2.

Exhibit 2

Flow of Manufacturing Costs

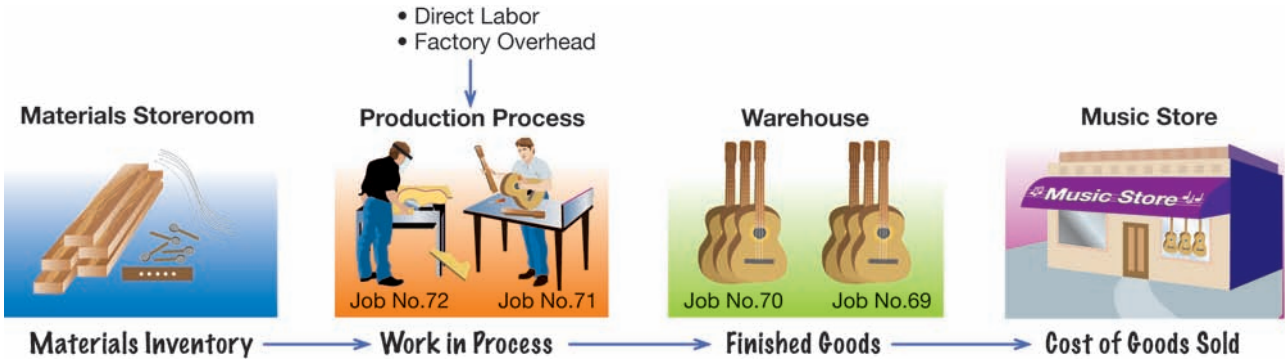
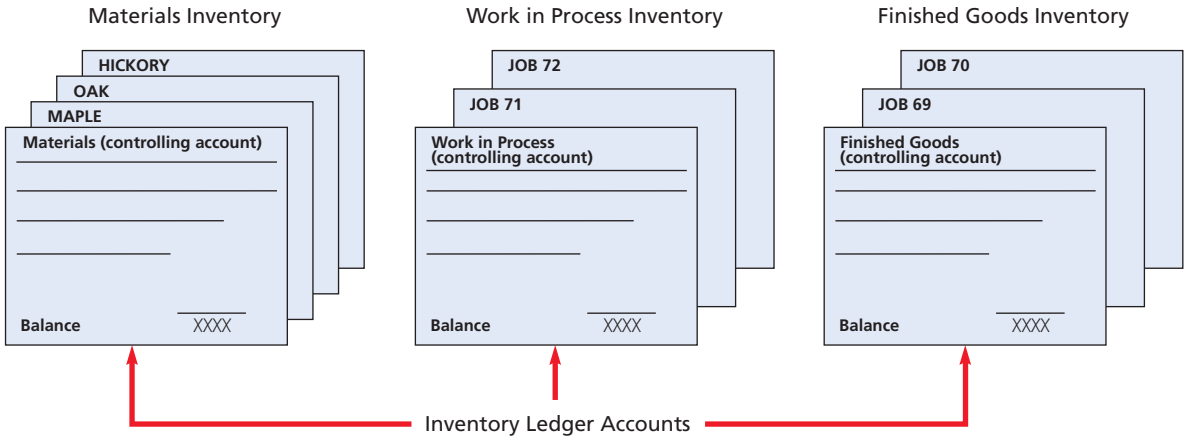


Exhibit 2 indicates that although the materials for Jobs 71 and 72 have been added, both jobs are still in the production process. Thus, Jobs 71 and 72 are part of *Work in Process Inventory*. In contrast, Exhibit 2 indicates that Jobs 69 and 70 have been completed. Thus, Jobs 69 and 70 are part of *Finished Goods Inventory*. Exhibit 2 also indicates that when finished guitars are sold to music stores, their costs become part of *Cost of Goods Sold*.

In a job order cost accounting system, perpetual inventory controlling accounts and subsidiary ledgers are maintained for materials, work in process, and finished goods inventories as shown below.



Materials

The materials account in the general ledger is a controlling account. A separate account for each type of material is maintained in a subsidiary **materials ledger**.

Exhibit 3 shows Legend Guitars' materials ledger account for maple. Increases (debits) and decreases (credits) to the account are as follows:

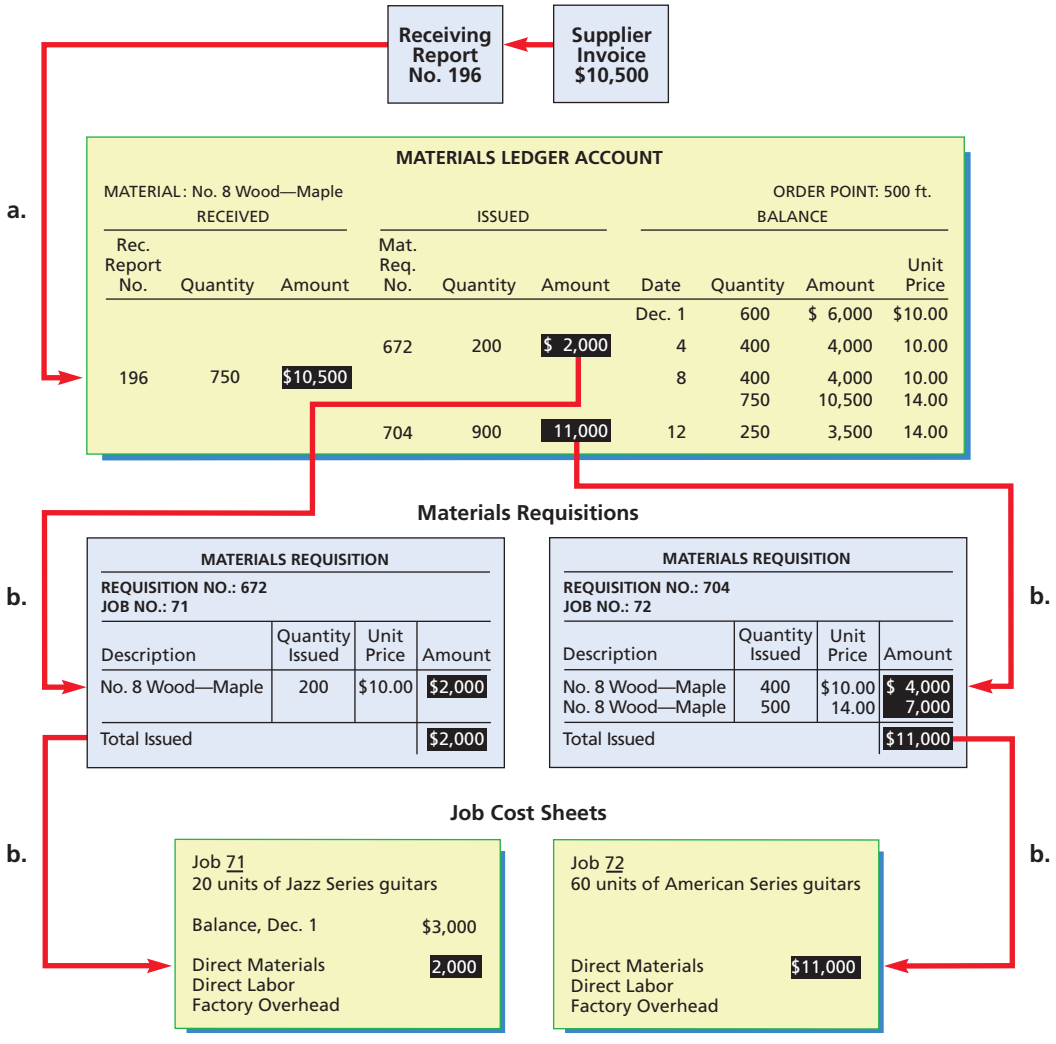
1. Increases (debits) are based on *receiving reports* such as Receiving Report No. 196 for $10,500, which is supported by the supplier's invoice.
2. Decreases (credits) are based on *materials requisitions* such as Requisition No. 672 for $2,000 for Job 71 and Requisition No. 704 for $11,000 for Job 72.

Many companies use bar code scanning devices in place of receiving reports to record and electronically transmit incoming materials data.

A **receiving report** is prepared when materials that have been ordered are received and inspected. The quantity received and the condition of the materials are entered on the receiving report. When the supplier's invoice is received, it is compared to the receiving report. If there are no discrepancies, a journal entry is made to record the

Exhibit 3

Materials Information and Cost Flows



purchase. The journal entry to record the supplier's invoice related to Receiving Report No. 196 in Exhibit 3 is as follows:

	a.	Materials		10,500	
		Accounts Payable			10,500
		Materials purchased during December.			

The storeroom releases materials for use in manufacturing when a **materials requisition** is received. An example of a materials requisition is shown in Exhibit 3.

The materials requisitions for each job serve as the basis for recording materials used. For direct materials, the quantities and amounts from the materials requisitions are posted to job cost sheets. **Job cost sheets**, which are illustrated in Exhibit 3, make up the work in process subsidiary ledger.

Exhibit 3 shows the posting of $2,000 of direct materials to Job 71 and $11,000 of direct materials to Job 72.[1] Job 71 is an order for 20 units of Jazz Series guitars, while Job 72 is an order for 60 units of American Series guitars.

1 To simplify, Exhibit 3 and this chapter use the first-in, first-out cost flow method.

For many manufacturing firms, the direct materials cost can be greater than 50% of the total cost to manufacture a product. This is why controlling materials costs is very important.

A summary of the materials requisitions is used as a basis for the journal entry recording the materials used for the month. For direct materials, this entry increases (debits) Work in Process and decreases (credits) Materials as shown below.

	b.	Work in Process		13,000	
		Materials			13,000
		Materials requisitioned to jobs ($2,000 + $11,000).			

Many companies use computerized information processes to record the use of materials. In such cases, storeroom employees electronically record the release of materials, which automatically updates the materials ledger and job cost sheets.

Integrity, Objectivity, and Ethics in Business

PHONY INVOICE SCAMS

A popular method for defrauding a company is to issue a phony invoice. The scam begins by initially contacting the target firm to discover details of key business contacts, business operations, and products. The swindler then uses this information to create a fictitious invoice. The invoice will include names, figures, and other details to give it the appearance of legitimacy. This type of scam can be avoided if invoices are matched with receiving documents prior to issuing a check.

Example Exercise 2-1 Issuance of Materials

2

On March 5, Hatch Company purchased 400 units of raw materials at $14 per unit. On March 10, raw materials were requisitioned for production as follows: 200 units for Job 101 at $12 per unit and 300 units for Job 102 at $14 per unit. Journalize the entry on March 5 to record the purchase and on March 10 to record the requisition from the materials storeroom.

Follow My Example 2-1

Mar.	5	Materials	5,600	
		Accounts Payable		5,600
		$5,600 = 400 × $14.		
	10	Work in Process	6,600*	
		Materials		6,600

*Job 101	$2,400	= 200 × $12
Job 102	4,200	= 300 × $14
Total	$6,600	

For Practice: PE 2-1A, PE 2-1B

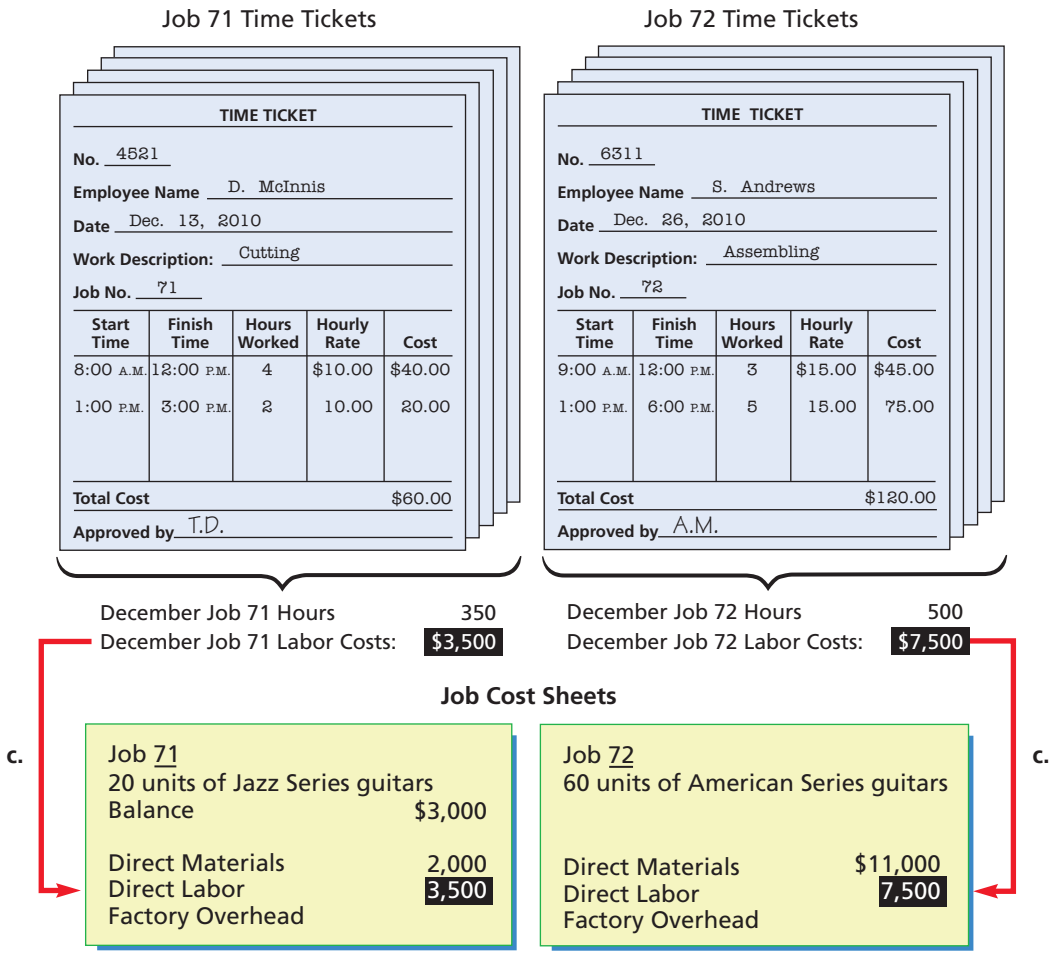
Factory Labor

When employees report for work, they may use *clock cards*, *in-and-out cards*, or *electronic badges* to clock in. When employees work on an individual job, they use **time tickets**. Exhibit 4 illustrates time tickets for Jobs 71 and 72.

Exhibit 4 shows that on December 13, 2010, D. McInnis spent six hours working on Job 71 at an hourly rate of $10 for a cost of $60 (6 hrs. × $ 10). Exhibit 4 also indicates that a total of 350 hours was spent by employees on Job 71 during December for a total cost of $3,500. This total direct labor cost of $3,500 is posted to the job cost sheet for Job 71, as shown in Exhibit 4.

Exhibit 4

Labor Information and Cost Flows



Likewise, Exhibit 4 shows that on December 26, 2010, S. Andrews spent eight hours on Job 72 at an hourly rate of $15 for a cost of $120 (8 hrs. × $15). A total of 500 hours was spent by employees on Job 72 during December for a total cost of $7,500. This total direct labor cost of $7,500 is posted to the job cost sheet for Job 72, as shown in Exhibit 4.

A summary of the time tickets is used as the basis for the journal entry recording direct labor for the month. This entry increases (debits) Work in Process and increases (credits) Wages Payable, as shown below.

	c.	Work in Process	11,000	
		Wages Payable		11,000
		Factory labor used in production of jobs ($3,500 + $7,500).		

Shell Group uses a magnetic card system to track the work of maintenance crews in its refinery operations.

As with direct materials, many businesses use computerized information processing to record direct labor. In such cases, employees may log their time directly into computer terminals at their workstations. In other cases, employees may be issued magnetic cards, much like credit cards, to log in and out of work assignments.

Example Exercise 2-2 Direct Labor Costs 2

During March, Hatch Company accumulated 800 hours of direct labor costs on Job 101 and 600 hours on Job 102. The total direct labor was incurred at a rate of $16 per direct labor hour for Job 101 and $12 per direct labor hour for Job 102. Journalize the entry to record the flow of labor costs into production during March.

Follow My Example 2-2

Work in Process	20,000*	
Wages Payable		20,000

*Job 101 $12,800 = 800 hrs. × $16
Job 102 7,200 = 600 hrs. × $12
Total $20,000

For Practice: PE 2-2A, PE 2-2B

Integrity, Objectivity, and Ethics in Business

GHOST EMPLOYEES

Companies must guard against the fraudulent creation and cashing of payroll checks. Numerous payroll frauds involve supervisors adding fictitious employees to or failing to remove departing employees from the payroll and then cashing the check. This type of fraud can be minimized by requiring proper authorization and approval of employee additions, removals, or changes in pay rates.

Factory Overhead Cost

Factory overhead includes all manufacturing costs except direct materials and direct labor.

A summary of factory overhead costs comes from a variety of sources including the following:

1. *Indirect materials* comes from a summary of materials requisitions.
2. *Indirect labor* comes from the salaries of production supervisors and the wages of other employees such as janitors.
3. *Factory power* comes from utility bills.
4. *Factory depreciation* comes from Accounting Department computations of depreciation.

To illustrate the recording of factory overhead, assume that Legend Guitars incurred $4,600 of overhead in December. The entry to record the factory overhead is shown below.

	d.	Factory Overhead		4,600	
		Materials			500
		Wages Payable			2,000
		Utilities Payable			900
		Accumulated Depreciation			1,200
		Factory overhead incurred in production.			

Example Exercise 2-3 Factory Overhead Costs 2

During March, Hatch Company incurred factory overhead costs as follows: indirect materials, $800; indirect labor, $3,400; utilities cost, $1,600; and factory depreciation, $2,500. Journalize the entry to record the factory overhead incurred during March.

Follow My Example 2-3

Factory Overhead	8,300	
Materials		800
Wages Payable		3,400
Utilities Payable		1,600
Accumulated Depreciation		2,500

For Practice: PE 2-3A, PE 2-3B

Allocating Factory Overhead

Factory overhead is different from direct labor and direct materials in that it is *indirectly* related to the jobs. That is, factory overhead costs cannot be identified with or traced to specific jobs. For this reason, factory overhead costs are allocated to jobs. The process by which factory overhead or other costs are assigned to a cost object, such as a job, is called **cost allocation**.

The factory overhead costs are *allocated* to jobs using a common measure related to each job. This measure is called an **activity base**, *allocation base*, or *activity driver*. The activity base used to allocate overhead should reflect the consumption or use of factory overhead costs. For example, production supervisor salaries could be allocated on the basis of direct labor hours or direct labor cost of each job.

Predetermined Factory Overhead Rate

Factory overhead costs are normally allocated or *applied* to jobs using a **predetermined factory overhead rate**. The predetermined factory overhead rate is computed as follows:

$$\text{Predetermined Factory Overhead Rate} = \frac{\text{Estimated Total Factory Overhead Costs}}{\text{Estimated Activity Base}}$$

To illustrate, assume that Legend Guitars estimates the total factory overhead cost as $50,000 for the year and the activity base as 10,000 direct labor hours. The predetermined factory overhead rate of $5 per direct labor hour is computed as follows:

$$\text{Predetermined Factory Overhead Rate} = \frac{\text{Estimated Total Factory Overhead Costs}}{\text{Estimated Activity Base}}$$

$$\text{Predetermined Factory Overhead Rate} = \frac{\$50{,}000}{10{,}000 \text{ direct labor hours}} = \$5 \text{ per direct labor hour}$$

A survey conducted by the Cost Management Group of the Institute for Management Accountants found that 20% of survey respondents had adopted activity-based costing.

As shown above, the predetermined overhead rate is computed using *estimated* amounts at the beginning of the period. This is because managers need timely information on the product costs of each job. If a company waited until all overhead costs were known at the end of the period, the allocated factory overhead would be accurate, but not timely. Only through timely reporting can managers adjust manufacturing methods or product pricing.

Many companies are using a method for accumulating and allocating factory overhead costs. This method, called **activity-based costing**, uses a different overhead rate for each type of factory overhead activity, such as inspecting, moving, and machining. Activity-based costing is discussed and illustrated in Chapter 11.

Applying Factory Overhead to Work in Process

Legend Guitars applies factory overhead using a rate of $5 per direct labor hour. The factory overhead applied to each job is recorded in the job cost sheets, as shown in Exhibit 5.

Exhibit 5

Applying Factory Overhead to Jobs

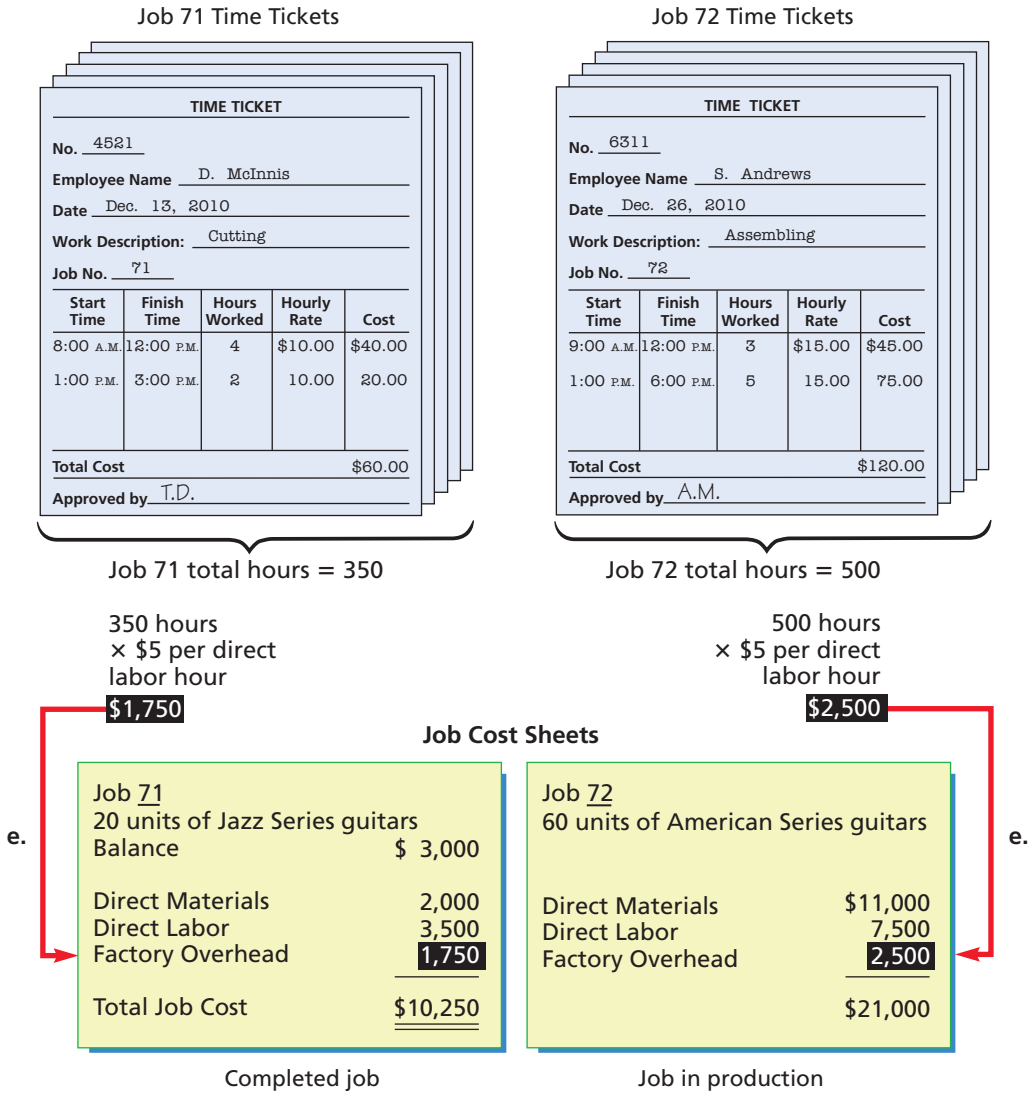


Exhibit 5 shows that 850 direct labor hours were used in Legend Guitars' December operations. Based on the time tickets, 350 hours can be traced to Job 71, and 500 hours can be traced to Job 72.

Using a factory overhead rate of $5 per direct labor hour, $4,250 of factory overhead is applied as follows:

	Direct Labor Hours	Factory Overhead Rate	Factory Overhead Applied
Job 71	350	$5	$1,750 (350 hrs. × $5)
Job 72	500	$5	2,500 (500 hrs. × $5)
Total	850		$4,250

As shown in Exhibit 5, the applied overhead is posted to each job cost sheet. Factory overhead of $1,750 is posted to Job 71, which results in a total product cost on December 31, 2010, of $10,250. Factory overhead of $2,500 is posted to Job 72, which results in a total product cost on December 31, 2010, of $21,000.

The journal entry to apply factory overhead increases (debits) Work in Process and credits Factory Overhead. This journal entry to apply overhead to Jobs 71 and 72 is shown at the top of the next page.

	e.	Work in Process		4,250	
		Factory Overhead			4,250
		Factory overhead applied to jobs according to the predetermined overhead rate (850 hrs. × $5).			

To summarize, the factory overhead account is:

1. Increased (debited) for the *actual overhead* costs incurred, as shown earlier for transaction (d) on page 773.
2. Decreased (credited) for the *applied overhead*, as shown above for transaction (e).

The actual and applied overhead usually differ because the actual overhead costs are normally different from the estimated overhead costs. Depending on whether actual overhead is greater or less than applied overhead, the factory overhead account will either have a debit or credit ending balance as follows:

1. If the applied overhead is *less than* the actual overhead incurred, the factory overhead account will have a debit balance. This debit balance is called **underapplied factory overhead** or *underabsorbed factory overhead*.
2. If the applied overhead is *more than* the actual overhead incurred, the factory overhead account will have a credit balance. This credit balance is called **overapplied factory overhead** or *overabsorbed factory overhead*.

The factory overhead account for Legend Guitars shown below illustrates both underapplied and overapplied factory overhead. Specifically, the December 1, 2010, credit balance of $200 represents overapplied factory overhead. In contrast, the December 31, 2010, debit balance of $150 represents underapplied factory overhead.

Account *Factory Overhead* Account No.

Date		Item	Post. Ref.	Debit	Credit	Balance Debit	Balance Credit
2010 Dec.	1	Balance					200
	31	Factory overhead cost incurred		4,600		4,400	
	31	Factory overhead cost applied			4,250	150	

Underapplied balance

Overapplied balance

If the balance of factory overhead (either underapplied or overapplied) becomes large, the balance and related overhead rate should be investigated. For example, a large balance could be caused by changes in manufacturing methods. In this case, the factory overhead rate should be revised.

Example Exercise 2-4 Applying Factory Overhead

2

Hatch Company estimates that total factory overhead costs will be $100,000 for the year. Direct labor hours are estimated to be 25,000. For Hatch Company, (a) determine the predetermined factory overhead rate, (b) determine the amount of factory overhead applied to Jobs 101 and 102 in March using the data on direct labor hours from Example Exercise 2-2, and (c) prepare the journal entry to apply factory overhead to both jobs in March according to the predetermined overhead rate.

(continued)

Follow My Example 2-4

a. $4.00 = $100,000/25,000 direct labor hours

b.

Job 101	$3,200	= 800 hours × $4.00 per hour
Job 102	2,400	= 600 hours × $4.00 per hour
Total	$5,600	

c.

Work in Process	5,600	
Factory Overhead		5,600

For Practice: PE 2-4A, PE 2-4B

Disposal of Factory Overhead Balance During the year, the balance in the factory overhead account is carried forward and reported as a deferred debit or credit on the monthly (interim) balance sheets. However, any balance in the factory overhead account should not be carried over to the next year. This is because any such balance applies only to operations of the current year.

If the estimates for computing the predetermined overhead rate are reasonably accurate, the ending balance of Factory Overhead should be relatively small. For this reason, the balance of Factory Overhead at the end of the year is disposed of by transferring it to the cost of goods sold account as follows:[2]

1. If there is an ending debit balance (underapplied overhead) in the factory overhead account, it is disposed of by the entry shown below.

		Cost of Goods Sold	XXX	
		Factory Overhead		XXX
		Transfer of underapplied overhead to cost of goods sold.		

2. If there is an ending credit balance (overapplied overhead) in the factory overhead account, it is disposed of by the entry shown below.

		Factory Overhead	XXX	
		Cost of Goods Sold		XXX
		Transfer of overapplied overhead to cost of goods sold.		

To illustrate, the journal entry to dispose of Legend Guitars' December 31, 2010, underapplied overhead balance of $150 is as follows:

	f.	Cost of Goods Sold	150	
		Factory Overhead		150
		Closed underapplied factory overhead to cost of goods sold.		

2 An ending balance in the factory overhead account may also be allocated among the work in process, finished goods, and cost of goods sold accounts. This brings these accounts into agreement with the actual costs incurred. This approach is rarely used and is only required for large ending balances in the factory overhead account. For this reason, it will not be used in this text.

Work in Process

During the period, Work in Process is increased (debited) for the following:

1. Direct materials cost
2. Direct labor cost
3. Applied factory overhead cost

To illustrate, the work in process account for Legend Guitars is shown in Exhibit 6. The balance of Work in Process on December 1, 2010 (beginning balance), was $3,000. As shown in Exhibit 6, this balance relates to Job 71, which was the only job in process on this date. During December, Work in Process was debited for the following:

1. Direct materials cost of $13,000 [transaction (b)] based on materials requisitions.
2. Direct labor cost of $11,000 [transaction (c)] based on time tickets.
3. Applied factory overhead of $4,250 [transaction (e)] based on the predetermined overhead rate of $5 per direct labor hour.

The preceding Work in Process debits are supported by the detail postings to job cost sheets for Jobs 71 and 72, as shown in Exhibit 6.

Exhibit 6

Job Cost Sheets and the Work in Process Controlling Account

Job Cost Sheets

Job 71
20 units of Jazz Series guitars

Balance	$ 3,000
Direct Materials	2,000
Direct Labor	3,500
Factory Overhead	1,750
Total Job Cost	$10,250
Unit Cost	$512.50

Job 72
60 units of American Series guitars

Direct Materials	$11,000
Direct Labor	7,500
Factory Overhead	2,500
	$21,000

g.

Account *Work in Process* Account No.

Date		Item	Post. Ref.	Debit	Credit	Balance Debit	Balance Credit
2010 Dec.	1	Balance				3,000	
	31	Direct materials		13,000		16,000	
	31	Direct labor		11,000		27,000	
	31	Factory overhead		4,250		31,250	
	31	Jobs completed—Job 71			10,250	21,000	

During December, Job 71 was completed. Upon completion, the product costs (direct materials, direct labor, factory overhead) are totaled. This total is divided by the number of units produced to determine the cost per unit. Thus, the 20 Jazz Series guitars produced as Job 71 cost $512.50 ($10,250/20) per guitar.

After completion, Job 71 is transferred from Work in Process to Finished Goods by the entry shown at the top of the next page.

	g.	Finished Goods		10,250	
		Work in Process			10,250
		Job 71 completed in December.			

Job 72 was started in December, but was not completed by December 31, 2010. Thus, Job 72 is still part of work in process on December 31, 2010. As shown in Exhibit 6, the balance of the job cost sheet for Job 72 ($21,000) is also the December 31, 2010, balance of Work in Process.

Example Exercise 2-5 Job Costs

2

At the end of March, Hatch Company had completed Jobs 101 and 102. Job 101 is for 500 units, and Job 102 is for 1,000 units. Using the data from Example Exercises 2-1, 2-2, and 2-4, determine (a) the balance on the job cost sheets for Jobs 101 and 102 at the end of March and (b) the cost per unit for Jobs 101 and 102 at the end of March.

Follow My Example 2-5

a.

	Job 101	Job 102
Direct materials	$ 2,400	$ 4,200
Direct labor	12,800	7,200
Factory overhead	3,200	2,400
Total costs	$18,400	$13,800

b. Job 101 $36.80 = $18,400/500 units
Job 102 $13.80 = $13,800/1,000 units

For Practice: PE 2-5A, PE 2-5B

Finished Goods

The finished goods account is a controlling account for the subsidiary **finished goods ledger** or *stock ledger*. Each account in the finished goods ledger contains cost data for the units manufactured, units sold, and units on hand.

Exhibit 7 illustrates the finished goods ledger account for Jazz Series guitars.

Exhibit 7

Finished Goods Ledger Account

ITEM: *Jazz Series guitars*

Manufactured			Shipped			Balance			
Job Order No.	Quantity	Amount	Ship Order No.	Quantity	Amount	Date	Quantity	Amount	Unit Cost
						Dec. 1	40	$20,000	$500.00
			643	40	$20,000	9	—	—	—
71	20	$10,250				31	20	10,250	512.50

Exhibit 7 indicates that there were 40 Jazz Series guitars on hand on December 1, 2010. During the month, 20 additional Jazz guitars were completed and transferred to Finished Goods from the completion of Job 71. In addition, the beginning inventory of 40 Jazz guitars were sold during the month.

Sales and Cost of Goods Sold

During December, Legend Guitars sold 40 Jazz Series guitars for $850 each, generating total sales of $34,000 ($850 × 40 guitars). Exhibit 7 indicates that the cost of these guitars was $500 per guitar or a total cost of $20,000 ($500 × 40 guitars). The entries to record the sale and related cost of goods sold are as follows:

	h.	Accounts Receivable		34,000	
		Sales			34,000
		Revenue received from guitars sold on account.			

	i.	Cost of Goods Sold		20,000	
		Finished Goods			20,000
		Cost of 40 Jazz Series guitars sold.			

In a job order cost accounting system, the preparation of a statement of cost of goods manufactured, which was discussed in Chapter 1, is not necessary. This is because job order costing uses the perpetual inventory system and, thus, the cost of goods sold can be directly determined from the finished goods ledger as illustrated in Exhibit 7.

Example Exercise 2-6 Cost of Goods Sold 2

Nejedly Company completed 80,000 units during the year at a cost of $680,000. The beginning finished goods inventory was 10,000 units at $80,000. Determine the cost of goods sold for 60,000 units, assuming a FIFO cost flow.

Follow My Example 2-6

$505,000 = $80,000 + (50,000 × $8.50*)

*Cost per unit of goods produced during the year = $8.50 = $680,000/80,000 units

For Practice: PE 2-6A, PE 2-6B

Service companies, such as telecommunications, insurance, banking, broadcasting, and hospitality, typically have a large portion of their total costs as period costs with few product costs.

Period Costs

Period costs are used in generating revenue during the current period, but are not involved in the manufacturing process. As discussed in Chapter 1, **period costs** are recorded as expenses of the current period as either selling or administrative expenses.

Selling expenses are incurred in marketing the product and delivering sold products to customers. Administrative expenses are incurred in managing the company, but are not related to the manufacturing or selling functions. During December, Legend Guitars recorded the following selling and administrative expenses:

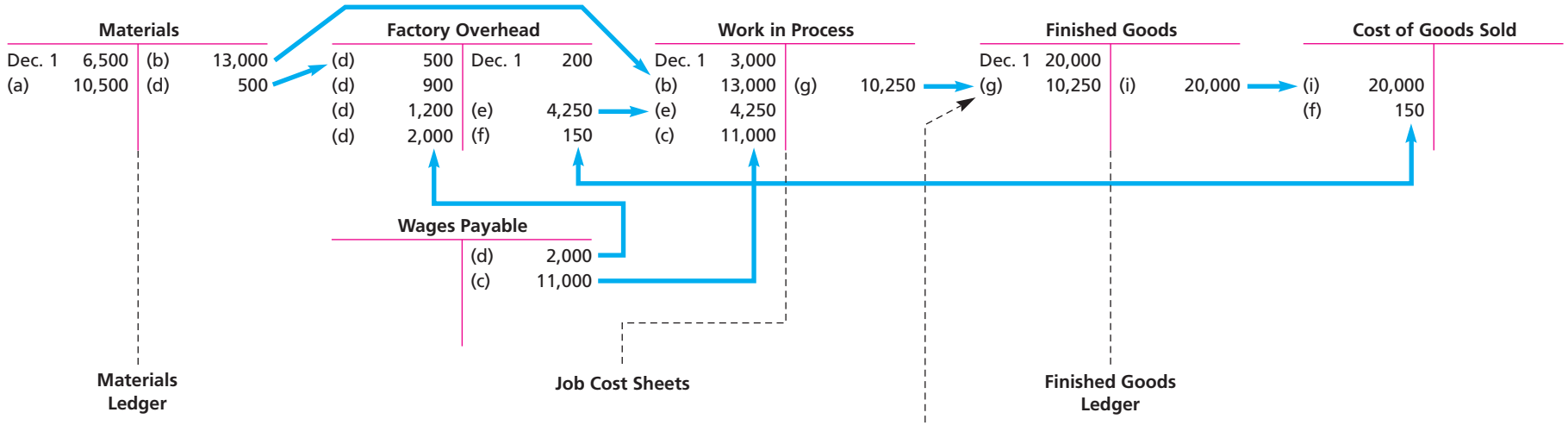
	j.	Sales Salaries Expense		2,000	
		Office Salaries Expense		1,500	
		Salaries Payable			3,500
		Recorded December period costs.			

Summary of Cost Flows for Legend Guitars

Exhibit 8 shows the cost flows through the manufacturing accounts of Legend Guitars for December.

Exhibit 8

Flow of Manufacturing Costs for Legend Guitars



Materials Ledger

No. 8 Wood—Maple

Dec. 1	6,000	(b)	13,000
(a)	10,500		

Glue

Dec. 1	200	(d)	200

Sandpaper

Dec. 1	300	(d)	300

Job Cost Sheets

20 Units of Jazz Series Guitars, Job 71

Dec. 1	3,000
(b) Direct materials	2,000
(c) Direct labor	3,500
(e) Factory overhead	1,750
	10,250

60 Units of American Series Guitars, Job 72

(b) Direct materials	11,000
(c) Direct labor	7,500
(e) Factory overhead	2,500
	21,000

Finished Goods Ledger

Jazz Series Guitars

Dec. 1	20,000		
(g)	10,250	(i)	20,000

Transactions

a. Materials purchased during December
b. Materials requisitioned to jobs
c. Factory labor used in production of jobs
d. Factory overhead incurred in production
e. Factory overhead applied to jobs according to the predetermined overhead rate
f. Closed underapplied factory overhead to cost of goods sold
g. Job 71 completed in December
h. Sold 40 units of Jazz Series guitars (not shown)
i. Cost of 40 units of Jazz Series guitars sold

In addition, summary details of the following subsidiary ledgers are shown:

1. *Materials Ledger*—the subsidiary ledger for Materials.
2. *Job Cost Sheets*—the subsidiary ledger for Work in Process.
3. *Finished Goods Ledger*—the subsidiary ledger for Finished Goods.

Entries in the accounts shown in Exhibit 8 are identified by letters. These letters refer to the journal entries described and illustrated in the chapter. Entry (h) is not shown because it does not involve a cost flow.

As shown in Exhibit 8, the balances of Materials, Work in Process, and Finished Goods are supported by their subsidiary ledgers. These balances are as follows:

Controlling Account	Balance and Total of Related Subsidiary Ledger
Materials	$ 3,500
Work in Process	21,000
Finished Goods	10,250

The income statement for Legend Guitars is shown in Exhibit 9.

Exhibit 9

Income Statement of Legend Guitars

Legend Guitars
Income Statement
For the Month Ended December 31, 2010

Sales		$34,000
Cost of goods sold		20,150
Gross profit		$13,850
Selling and administrative expenses:		
Sales salaries expense	$2,000	
Office salaries expense	1,500	
Total selling and administrative expenses		3,500
Income from operations		$10,350

3 Describe the use of job order cost information for decision making.

Job Order Costing for Decision Making

A job order cost accounting system accumulates and records product costs by jobs. The resulting total and unit product costs can be compared to similar jobs, compared over time, or compared to expected costs. In this way, a job order cost system can be used by managers for cost evaluation and control.

To illustrate, Exhibit 10 shows the direct materials used for Jobs 54 and 63 for Legend Guitars. The wood used in manufacturing guitars is measured in board feet. Since Jobs 54 and 63 produced the same type and number of guitars, the direct materials cost per unit should be about the same. However, the materials cost per guitar for Job 54 is $100, while for Job 63 it is $125. Thus, the materials costs are significantly more for Job 63.

The job cost sheets shown in Exhibit 10 can be analyzed for possible reasons for the increased materials cost for Job 63. Since the materials price did not change ($10 per board foot), the increased materials cost must be related to wood consumption.

Comparing wood consumed for Jobs 54 and 63 shows that 400 board feet were used in Job 54 to produce 40 guitars. In contrast, Job 63 used 500 board feet to produce the same number of guitars. Thus, an investigation should be undertaken to determine

Major electric utilities such as Tennessee Valley Authority, Consolidated Edison Inc., and Pacific Gas and Electric Company use job order accounting to control the costs associated with major repairs and overhauls that occur during maintenance shutdowns.

Exhibit 10

Comparing Data from Job Cost Sheets

Job 54
Item: 40 Jazz Series guitars

	Materials Quantity (board feet)	Materials Price	Materials Amount
Direct materials:			
No. 8 Wood—Maple	400	$10.00	$4,000
Direct materials per guitar			$ 100

Job 63
Item: 40 Jazz Series guitars

	Materials Quantity (board feet)	Materials Price	Materials Amount
Direct materials:			
No. 8 Wood—Maple	500	$10.00	$5,000
Direct materials per guitar			$ 125

the cause of the extra 100 board feet used for Job 63. Possible explanations could include the following:

1. A new employee, who was not properly trained, cut the wood for Job 63. As a result, there was excess waste and scrap.
2. The wood used for Job 63 was purchased from a new supplier. The wood was of poor quality, which created excessive waste and scrap.
3. The cutting tools needed repair and were not properly maintained. As a result, the wood was miscut, which created excessive waste and scrap.
4. The instructions attached to the job were incorrect. The wood was cut according to the instructions. The incorrect instructions were discovered later in assembly. As a result, the wood had to be recut and the initial cuttings scrapped.

4 Describe the flow of costs for a service business that uses a job order cost accounting system.

Job Order Cost Systems for Professional Service Businesses

A job order cost accounting system may be used for a professional service business. For example, an advertising agency, an attorney, and a physician provide services to individual customers, clients, or patients. In such cases, the customer, client, or patient can be viewed as a job for which costs are accumulated and reported.

The primary product costs for a service business are direct labor and overhead costs. Any materials or supplies used in rendering services are normally insignificant. As a result, materials and supply costs are included as part of the overhead cost.

Like a manufacturing business, direct labor and overhead costs of rendering services to clients are accumulated in a work in process account. *Work in Process* is supported by a cost ledger with a job cost sheet for each client.

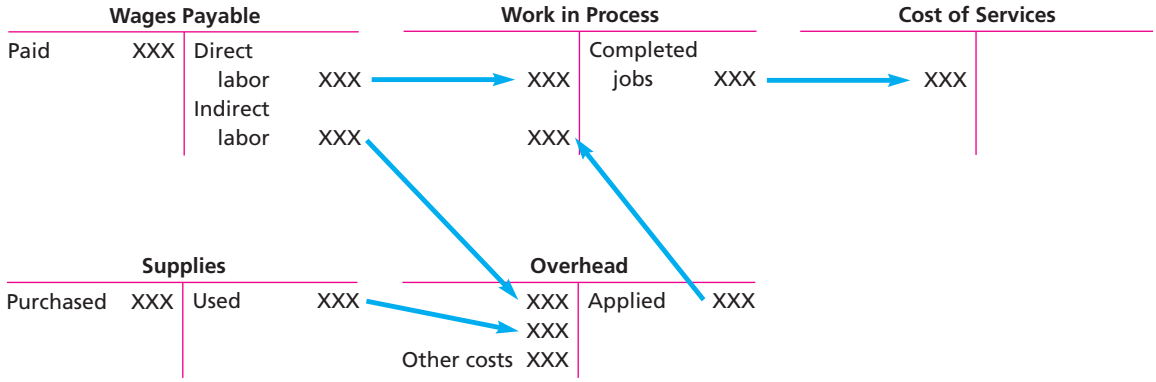
When a job is completed and the client is billed, the costs are transferred to a cost of services account. *Cost of Services* is similar to the cost of merchandise sold account

for a merchandising business or the cost of goods sold account for a manufacturing business. A finished goods account and related finished goods ledger are not necessary. This is because the revenues for the services are recorded only after the services are provided.

The flow of costs through a service business using a job order cost accounting system is shown in Exhibit 11.

Exhibit 11

Flow of Costs Through a Service Business



In practice, other considerations unique to service businesses may need to be considered. For example, a service business may bill clients on a weekly or monthly basis rather than when a job is completed. In such cases, a portion of the costs related to each billing is transferred from the work in process account to the cost of services account. A service business may also bill clients for services in advance, which would be accounted for as deferred revenue until the services are completed.

Business Connection

MAKING MONEY IN THE MOVIE BUSINESS

Movie making is a high risk venture. The movie must be produced and marketed before the first dollar is received from the box office. If the movie is a hit, then all is well; but if the movie is a bomb, money will be lost. This is termed a "Blockbuster" business strategy and is common in businesses that have large up-front costs in the face of uncertain follow-up revenues, such as pharmaceuticals, video games, and publishing.

The profitability of a movie depends on its revenue and cost. A movie's cost is determined using job order costing; however, how costs are assigned to a movie is often complex and may be subject to disagreement. For example, in Hollywood's competitive environment, studios often negotiate payments to producers and actors based on a percentage of the film's gross revenues. This is termed "contingent compensation." As movies become hits, compensation costs increase in proportion to the movie's revenues, which eats into a hit's profitability.

As the dollars involved get bigger, disagreements often develop between movie studios and actors or producers over the amount of contingent compensation. For example, the producer of the 2002 hit movie *Chicago* sued Miramax Film Corp. for failing to include foreign receipts and DVD sales in the revenue that was used to determine his payments. The controversial nature of contingent compensation is illustrated by the suit's claim that the accounting for contingent compensation leads to confusing and meaningless results.

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1 Describe cost accounting systems used by manufacturing businesses.

Key Points

A cost accounting system accumulates product costs. Management uses cost accounting systems to determine product cost, establish product prices, control operations, and develop financial statements. The two primary cost accounting systems are job order and process cost systems. Job order cost systems accumulate costs for each quantity of product that passes through the factory. Process cost systems accumulate costs for each department or process within the factory.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe a cost accounting system.		
• Describe a job order cost system.		
• Describe a process cost system.		

2 Describe and illustrate a job order cost accounting system.

Key Points

A job order cost system accumulates costs for each quantity of product, or "job," that passes through the factory. Direct materials, direct labor, and factory overhead are accumulated on the job cost sheet, which is the subsidiary cost ledger for each job. Direct materials and direct labor are assigned to individual jobs based on the quantity used. Factory overhead costs are assigned to each job based on an activity base that reflects the use of factory overhead costs. As a job is finished, its costs are transferred to the finished goods ledger. When goods are sold, the cost is transferred from finished goods inventory to cost of goods sold.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe the flow of materials and how materials costs are assigned in a job order cost system.		
• Prepare the journal entry to record materials used in production.	**2-1**	2-1A, 2-1B
• Describe how factory labor hours are recorded and how labor costs are assigned in a job order cost system.		
• Prepare the journal entry to record factory labor used in production.	**2-2**	2-2A, 2-2B
• Describe and illustrate how factory overhead costs are accumulated and assigned in a job order cost system.	**2-3** **2-4**	2-3A, 2-3B 2-4A, 2-4B
• Compute the predetermined overhead rate.	**2-4**	2-4A, 2-4B
• Describe and illustrate how to dispose of the balance in the factory overhead account.		
• Describe and illustrate how costs are accumulated for work in process and finished goods inventory and assigned to cost of goods sold in a job order cost system.	**2-5** **2-6**	2-5A, 2-5B 2-6A, 2-6B
• Describe and illustrate the flow of costs in a job order cost system.		

3 Describe the use of job order cost information for decision making.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Job order cost systems can be used to evaluate cost performance. Unit costs can be compared over time to determine if product costs are staying within expected ranges.	• Describe and illustrate how job cost sheets can be used to investigate possible reasons for increased product costs.		

4 Describe the flow of costs for a service business that uses a job order cost accounting system.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Job order cost accounting systems can be used by service businesses to plan and control operations. Since the product is a service, the focus is on direct labor and overhead costs. The costs of providing a service are accumulated in a work in process account and transferred to a cost of services account upon completion.	• Describe how service businesses use a job order cost system.		

Key Terms

activity base (46)
activity-based costing (46)
cost accounting systems (39)
cost allocation (46)
finished goods ledger (51)
job cost sheets (42)
job order cost system (39)
materials ledger (41)
materials requisition (42)
overapplied factory overhead (48)
period costs (52)
predetermined factory overhead rate (46)
process cost system (40)
receiving report (41)
time tickets (43)
underapplied factory overhead (48)

Illustrative Problem

Derby Music Company specializes in producing and packaging compact discs (CDs) for the music recording industry. Derby uses a job order cost system. The following data summarize the operations related to production for March, the first month of operations:

a. Materials purchased on account, $15,500.

b. Materials requisitioned and labor used:

	Materials	Factory Labor
Job No. 100	$2,650	$1,770
Job No. 101	1,240	650
Job No. 102	980	420
Job No. 103	3,420	1,900
Job No. 104	1,000	500
Job No. 105	2,100	1,760
For general factory use	450	650

c. Factory overhead costs incurred on account, $2,700.
d. Depreciation of machinery, $1,750.
e. Factory overhead is applied at a rate of 70% of direct labor cost.
f. Jobs completed: Nos. 100, 101, 102, 104.
g. Jobs 100, 101, and 102 were shipped, and customers were billed for $8,100, $3,800, and $3,500, respectively.

Instructions

1. Journalize the entries to record the transactions identified above.
2. Determine the account balances for Work in Process and Finished Goods.
3. Prepare a schedule of unfinished jobs to support the balance in the work in process account.
4. Prepare a schedule of completed jobs on hand to support the balance in the finished goods account.

Solution

1.

a.	Materials		15,500	
	Accounts Payable			15,500
b.	Work in Process		11,390	
	Materials			11,390
	Work in Process		7,000	
	Wages Payable			7,000
	Factory Overhead		1,100	
	Materials			450
	Wages Payable			650
c.	Factory Overhead		2,700	
	Accounts Payable			2,700
d.	Factory Overhead		1,750	
	Accumulated Depreciation—Machinery			1,750
e.	Work in Process		4,900	
	Factory Overhead (70% of $7,000)			4,900
f.	Finished Goods		11,548	
	Work in Process			11,548

Computation of the cost of jobs finished:

Job	Direct Materials	Direct Labor	Factory Overhead	Total
Job No. 100	$2,650	$1,770	$1,239	$ 5,659
Job No. 101	1,240	650	455	2,345
Job No. 102	980	420	294	1,694
Job No. 104	1,000	500	350	1,850
				$11,548

g.	Accounts Receivable		15,400	
	Sales			15,400
	Cost of Goods Sold		9,698	
	Finished Goods			9,698

Cost of jobs sold computation:

Job No. 100	$5,659
Job No. 101	2,345
Job No. 102	1,694
	$9,698

2. Work in Process: $11,742 ($11,390 + $7,000 + $4,900 − $11,548)
   Finished Goods: $1,850 ($11,548 − $9,698)

3.

Schedule of Unfinished Jobs

Job	Direct Materials	Direct Labor	Factory Overhead	Total
Job No. 103	$3,420	$1,900	$1,330	$ 6,650
Job No. 105	2,100	1,760	1,232	5,092
Balance of Work in Process, March 31				$11,742

4.

Schedule of Completed Jobs

Job No. 104:	
Direct materials	$1,000
Direct labor	500
Factory overhead	350
Balance of Finished Goods, March 31	$1,850

Self-Examination Questions (Answers at End of Chapter)

1. For which of the following would the job order cost system be appropriate?
   A. Antique furniture repair shop
   B. Rubber manufacturer
   C. Coal manufacturer
   D. Computer chip manufacturer

2. The journal entry to record the requisition of materials to the factory in a job order cost system is a debit to:
   A. Materials.
   B. Accounts Payable.
   C. Work in Process.
   D. Cost of Goods Sold.

3. Job order cost sheets accumulate all of the following costs *except* for:
   A. direct materials.
   B. indirect materials.
   C. direct labor.
   D. factory overhead applied.

4. A company estimated $420,000 of factory overhead cost and 16,000 direct labor hours for the period. During the period, a job was completed with $4,500 of direct materials and $3,000 of direct labor. The direct labor rate was $15 per hour. What is the factory overhead applied to this job?
   A. $2,100
   B. $5,250
   C. $78,750
   D. $420,000

5. If the factory overhead account has a credit balance, factory overhead is said to be:
   A. underapplied.
   B. overapplied.
   C. underabsorbed.
   D. in error.

Eye Openers

1. How is product cost information used by managers?
2. a. Name two principal types of cost accounting systems.
   b. Which system provides for a separate record of each particular quantity of product that passes through the factory?
   c. Which system accumulates the costs for each department or process within the factory?
3. What kind of firm would use a job order cost system?
4. Hewlett-Packard Company assembles ink jet printers in which a high volume of standardized units are assembled and tested. Is the job order cost system appropriate in this situation?
5. Which account is used in the job order cost system to accumulate direct materials, direct labor, and factory overhead applied to production costs for individual jobs?
6. How does the use of the materials requisition help control the issuance of materials from the storeroom?

7. What document is the source for (a) debiting the accounts in the materials ledger and (b) crediting the accounts in the materials ledger?
8. What is a job cost sheet?
9. a. Differentiate between the clock card and the time ticket.
   b. Why should the total time reported on an employee's time tickets for a payroll period be compared with the time reported on the employee's clock cards for the same period?
10. Describe the source of the data for debiting Work in Process for (a) direct materials, (b) direct labor, and (c) factory overhead.
11. Discuss how the predetermined factory overhead rate can be used in job order cost accounting to assist management in pricing jobs.
12. a. How is a predetermined factory overhead rate calculated?
    b. Name three common bases used in calculating the rate.
13. a. What is (1) overapplied factory overhead and (2) underapplied factory overhead?
    b. If the factory overhead account has a debit balance, was factory overhead underapplied or overapplied?
    c. If the factory overhead account has a credit balance at the end of the first month of the fiscal year, where will the amount of this balance be reported on the interim balance sheet?
14. At the end of the fiscal year, there was a relatively minor balance in the factory overhead account. What procedure can be used for disposing of the balance in the account?
15. What account is the controlling account for (a) the materials ledger, (b) the job cost sheets, and (c) the finished goods ledger?
16. How can job cost information be used to identify cost improvement opportunities?
17. Describe how a job order cost system can be used for professional service businesses.

Practice Exercises

PE 2-1A
Issuance of materials
obj. 2
EE 2-1 p. 43

On May 9, Thomson Company purchased 54,000 units of raw materials at $6 per unit. On May 21, raw materials were requisitioned for production as follows: 22,000 units for Job 70 at $5 per unit and 24,000 units for Job 71 at $6 per unit. Journalize the entry on May 9 to record the purchase and on May 21 to record the requisition from the materials storeroom.

PE 2-1B
Issuance of materials
obj. 2
EE 2-1 p. 43

On June 2, Lewis Company purchased 4,000 units of raw materials at $8 per unit. On June 12, raw materials were requisitioned for production as follows: 1,200 units for Job 30 at $6 per unit and 800 units for Job 32 at $8 per unit. Journalize the entry on June 2 to record the purchase and on June 12 to record the requisition from the materials storeroom.

PE 2-2A
Direct labor costs
obj. 2
EE 2-2 p. 45

During May, Thomson Company accumulated 10,000 hours of direct labor costs on Job 70 and 12,000 hours on Job 71. The total direct labor was incurred at a rate of $18 per direct labor hour for Job 70 and $20 per direct labor hour for Job 71. Journalize the entry to record the flow of labor costs into production during May.

PE 2-2B
Direct labor costs
obj. 2
EE 2-2 p. 45

During June, Lewis Company accumulated 1,200 hours of direct labor costs on Job 30 and 1,300 hours on Job 32. The total direct labor was incurred at a rate of $16 per direct labor hour for Job 30 and $14 per direct labor hour for Job 32. Journalize the entry to record the flow of labor costs into production during June.

PE 2-3A
Factory overhead costs
obj. 2
EE 2-3 p. 46

During May, Thomson Company incurred factory overhead costs as follows: indirect materials, $24,500; indirect labor, $64,500; utilities cost, $5,800; and factory depreciation, $45,200. Journalize the entry to record the factory overhead incurred during May.

PE 2-3B
Factory overhead costs
obj. 2
EE 2-3 p. 46

During June, Lewis Company incurred factory overhead costs as follows: indirect materials, $6,000; indirect labor, $7,600; utilities cost, $3,200; and factory depreciation $7,200. Journalize the entry to record the factory overhead incurred during June.

PE 2-4A
Applying factory overhead
obj. 2
EE 2-4 p. 48

Thomson Company estimates that total factory overhead costs will be $600,000 for the year. Direct labor hours are estimated to be 250,000. For Thomson Company, (a) determine the predetermined factory overhead rate, (b) determine the amount of factory overhead applied to Jobs 70 and 71 in May using the data on direct labor hours from Practice Exercise 2-2A, and (c) prepare the journal entry to apply factory overhead to both jobs in May according to the predetermined overhead rate.

PE 2-4B
Applying factory overhead
obj. 2
EE 2-4 p. 48

Lewis Company estimates that total factory overhead costs will be $200,000 for the year. Direct labor hours are estimated to be 25,000. For Lewis Company, (a) determine the predetermined factory overhead rate, (b) determine the amount of factory overhead applied to Jobs 30 and 32 in June using the data on direct labor hours from Practice Exercise 2-2B, and (c) prepare the journal entry to apply factory overhead to both jobs in June according to the predetermined overhead rate.

PE 2-5A
Job costs
obj. 2
EE 2-5 p. 51

At the end of May, Thomson Company had completed Jobs 70 and 71. Job 70 is for 8,000 units, and Job 71 is for 10,000 units. Using the data from Practice Exercises 2-1A, 2-2A, and 2-4A, determine (a) the balance on the job cost sheets for Jobs 70 and 71 at the end of May and (b) the cost per unit for Jobs 70 and 71 at the end of May.

PE 2-5B
Job costs
obj. 2
EE 2-5 p. 51

At the end of June, Lewis Company had completed Jobs 30 and 32. Job 30 is for 1,600 units, and Job 32 is for 1,750 units. Using the data from Practice Exercises 2-1B, 2-2B, and 2-4B, determine (a) the balance on the job cost sheets for Jobs 30 and 32 at the end of June and (b) the cost per unit for Jobs 30 and 32 at the end of June.

PE 2-6A
Cost of goods sold
obj. 2
EE 2-6 p. 52

Luek Company completed 60,000 units during the year at a cost of $900,000. The beginning finished goods inventory was 10,000 units at $140,000. Determine the cost of goods sold for 45,000 units, assuming a FIFO cost flow.

PE 2-6B
Cost of goods sold
obj. 2
EE 2-6 p. 52

Suo Company completed 20,000 units during the year at a cost of $120,000. The beginning finished goods inventory was 2,500 units at $14,000. Determine the cost of goods sold for 12,000 units, assuming a FIFO cost flow.

Exercises

EX 2-1
Transactions in a job order cost system

obj. 2

Five selected transactions for the current month are indicated by letters in the following T accounts in a job order cost accounting system:

Materials	
	(a)

Work in Process	
(a)	(d)
(b)	
(c)	

Wages Payable	
	(b)

Finished Goods	
(d)	(e)

Factory Overhead	
(a)	(c)
(b)	

Cost of Goods Sold	
(e)	

Describe each of the five transactions.

EX 2-2
Cost flow relationships

obj. 2

✔ c. $630,000

The following information is available for the first month of operations of Url Inc., a manufacturer of art and craft items:

Sales	$1,200,000
Gross profit	320,000
Indirect labor	110,000
Indirect materials	45,000
Other factory overhead	20,000
Materials purchased	610,000
Total manufacturing costs for the period	1,325,000
Materials inventory, end of period	45,000

Using the above information, determine the following missing amounts:

a. Cost of goods sold
b. Direct materials cost
c. Direct labor cost

EX 2-3
Cost of materials issuances under the FIFO method

obj. 2

✔ b. $1,320

An incomplete subsidiary ledger of wire cable for May is as follows:

RECEIVED			ISSUED			BALANCE			
Receiving Report Number	Quantity	Unit Price	Materials Requisition Number	Quantity	Amount	Date	Quantity	Amount	Unit Price
						May 1	300	$2,400	$8.00
24	210	$10.00				May 2			
			101	340		May 6			
30	140	12.00				May 12			
			114	200		May 21			

a. Complete the materials issuances and balances for the wire cable subsidiary ledger under FIFO.
b. Determine the balance of wire cable at the end of May.
c. Journalize the summary entry to transfer materials to work in process.
d. Explain how the materials ledger might be used as an aid in maintaining inventory quantities on hand.

EX 2-4
Entry for issuing materials

obj. 2

Materials issued for the current month are as follows:

Requisition No.	Material	Job No.	Amount
101	Steel	210	$25,400
102	Plastic	215	19,600
103	Glue	Indirect	1,450
104	Rubber	222	1,200
105	Aluminum	231	52,400

Journalize the entry to record the issuance of materials.

EX 2-5
Entries for materials

obj. 2

✔ c. fabric, $33,500

Bullock Furniture Company manufactures furniture. Bullock uses a job order cost system. Balances on June 1 from the materials ledger are as follows:

Fabric	$25,000
Polyester filling	7,500
Lumber	56,000
Glue	2,400

The materials purchased during June are summarized from the receiving reports as follows:

Fabric	$126,000
Polyester filling	175,000
Lumber	345,000
Glue	12,000

Materials were requisitioned to individual jobs as follows:

	Fabric	Polyester Filling	Lumber	Glue	Total
Job 101	$ 47,500	$ 60,000	$160,000		$267,500
Job 102	36,500	54,000	140,000		230,500
Job 103	33,500	44,000	78,000		155,500
Factory overhead—indirect materials				$13,000	13,000
Total	$117,500	$158,000	$378,000	$13,000	$666,500

The glue is not a significant cost, so it is treated as indirect materials (factory overhead).

a. Journalize the entry to record the purchase of materials in June.
b. Journalize the entry to record the requisition of materials in June.
c. Determine the June 30 balances that would be shown in the materials ledger accounts.

EX 2-6
Entry for factory labor costs

obj. 2

A summary of the time tickets for the current month follows:

Job No.	Amount	Job No.	Amount
201	$ 2,100	220	$3,650
204	1,750	224	2,240
205	3,200	228	1,460
Indirect labor	11,200	236	9,875

Journalize the entry to record the factory labor costs.

EX 2-7
Entry for factory labor costs

obj. 2

The weekly time tickets indicate the following distribution of labor hours for three direct labor employees:

	Hours			
	Job 201	Job 202	Job 203	Process Improvement
John Washington	20	10	7	3
George Jefferson	10	15	13	2
Thomas Adams	12	14	10	4

The direct labor rate earned by the three employees is as follows:

Washington	$20.00
Jefferson	22.00
Adams	18.00

The process improvement category includes training, quality improvement, housekeeping, and other indirect tasks.

a. Journalize the entry to record the factory labor costs for the week.
b. Assume that Jobs 201 and 202 were completed but not sold during the week and that Job 203 remained incomplete at the end of the week. How would the direct labor costs for all three jobs be reflected on the financial statements at the end of the week?

EX 2-8
Entries for direct labor and factory overhead

obj. 2

Moura Industries Inc. manufactures recreational vehicles. Moura uses a job order cost system. The time tickets from August jobs are summarized below.

Job 410	$3,400
Job 411	1,700
Job 412	1,400
Job 413	2,500
Factory supervision	1,900

Factory overhead is applied to jobs on the basis of a predetermined overhead rate of $25 per direct labor hour. The direct labor rate is $15 per hour.

a. Journalize the entry to record the factory labor costs.
b. Journalize the entry to apply factory overhead to production for August.

EX 2-9
Factory overhead rates, entries, and account balance

obj. 2

✔ b. $40.00 per direct labor hour

Hudson Company operates two factories. The company applies factory overhead to jobs on the basis of machine hours in Factory 1 and on the basis of direct labor hours in Factory 2. Estimated factory overhead costs, direct labor hours, and machine hours are as follows:

	Factory 1	Factory 2
Estimated factory overhead cost for fiscal year beginning June 1	$475,000	$600,000
Estimated direct labor hours for year		15,000
Estimated machine hours for year	20,000	
Actual factory overhead costs for June	$38,000	$52,000
Actual direct labor hours for June		1,350
Actual machine hours for June	1,560	

a. Determine the factory overhead rate for Factory 1.
b. Determine the factory overhead rate for Factory 2.
c. Journalize the entries to apply factory overhead to production in each factory for June.
d. Determine the balances of the factory accounts for each factory as of June 30, and indicate whether the amounts represent overapplied or underapplied factory overhead.

EX 2-10
Predetermined factory overhead rate

obj. 2

Willies Engine Shop uses a job order cost system to determine the cost of performing engine repair work. Estimated costs and expenses for the coming period are as follows:

Engine parts	$ 875,000
Shop direct labor	640,000
Shop and repair equipment depreciation	45,000
Shop supervisor salaries	125,800
Shop property tax	22,600
Shop supplies	16,600
Advertising expense	17,800
Administrative office salaries	75,000
Administrative office depreciation expense	10,000
Total costs and expenses	$1,827,800

The average shop direct labor rate is $16 per hour.
Determine the predetermined shop overhead rate per direct labor hour.

EX 2-11
Predetermined factory overhead rate

obj. 2

✔ a. $205 per hour

The Medical Center has a single operating room that is used by local physicians to perform surgical procedures. The cost of using the operating room is accumulated by each patient procedure and includes the direct materials costs (drugs and medical devices), physician surgical time, and operating room overhead. On November 1 of the current year, the annual operating room overhead is estimated to be:

Disposable supplies	$150,000
Depreciation expense	27,000
Utilities	15,500
Nurse salaries	225,500
Technician wages	74,000
Total operating room overhead	$492,000

The overhead costs will be assigned to procedures based on the number of surgical room hours. The Medical Center expects to use the operating room an average of eight hours per day, six days per week. In addition, the operating room will be shut down two weeks per year for general repairs.

a. Determine the predetermined operating room overhead rate for the year.
b. Gretchen Kelton had a 6-hour procedure on November 10. How much operating room overhead would be charged to her procedure, using the rate determined in part (a)?
c. During November, the operating room was used 192 hours. The actual overhead costs incurred for November were $38,500. Determine the overhead under- or overapplied for the period.

EX 2-12
Entry for jobs completed; cost of unfinished jobs

obj. 2

✔ b. $13,500

The following account appears in the ledger after only part of the postings have been completed for January:

Work in Process	
Balance, January 1	$ 14,200
Direct materials	115,400
Direct labor	124,500
Factory overhead	65,400

Jobs finished during January are summarized as follows:

Job 710	$62,500	Job 727	$ 35,400
Job 714	75,600	Job 732	132,500

a. Journalize the entry to record the jobs completed.
b. Determine the cost of the unfinished jobs at January 31.

EX 2-13
Entries for factory costs and jobs completed

obj. 2

✔ d. $31,160

Munch Printing Inc. began printing operations on July 1. Jobs 10 and 11 were completed during the month, and all costs applicable to them were recorded on the related cost sheets. Jobs 12 and 13 are still in process at the end of the month, and all applicable costs except factory overhead have been recorded on the related cost sheets. In addition to the materials and labor charged directly to the jobs, $1,200 of indirect materials and $14,500 of indirect labor were used during the month. The cost sheets for the four jobs entering production during the month are as follows, in summary form:

Job 10	
Direct materials	12,400
Direct labor	4,750
Factory overhead	3,800
Total	20,950

Job 11	
Direct materials	5,800
Direct labor	2,450
Factory overhead	1,960
Total	10,210

Job 12	
Direct materials	17,400
Direct labor	5,250
Factory overhead	

Job 13	
Direct materials	3,500
Direct labor	700
Factory overhead	

Journalize the summary entry to record each of the following operations for July (one entry for each operation):

a. Direct and indirect materials used.
b. Direct and indirect labor used.
c. Factory overhead applied (a single overhead rate is used based on direct labor cost).
d. Completion of Jobs 10 and 11.

EX 2-14
Financial statements of a manufacturing firm

obj. 2

✔ a. Income from operations, $99,600

The following events took place for Salsa Inc. during May 2010, the first month of operations as a producer of road bikes:

- Purchased $244,000 of materials.
- Used $210,000 of direct materials in production.
- Incurred $180,000 of direct labor wages.
- Applied factory overhead at a rate of 75% of direct labor cost.
- Transferred $510,000 of work in process to finished goods.
- Sold goods with a cost of $485,000.
- Sold goods for $870,000.
- Incurred $210,000 of selling expenses.
- Incurred $75,400 of administrative expenses.

a. Prepare the May income statement for Salsa. Assume that Salsa uses the perpetual inventory method.
b. Determine the inventory balances at the end of the first month of operations.

EX 2-15
Decision making with job order costs

obj. 3

Letson Manufacturing Inc. is a job shop. The management of Letson Manufacturing uses the cost information from the job sheets to assess their cost performance. Information on the total cost, product type, and quantity of items produced is as follows:

Date	Job No.	Quantity	Product	Amount
Jan. 2	1	240	Alpha	$ 6,000
Jan. 15	22	1,100	Beta	8,800
Feb. 3	38	800	Beta	8,000
Mar. 7	56	400	Alpha	8,800
Mar. 24	65	1,500	Gamma	6,000
May 19	74	1,750	Gamma	10,500
June 12	87	350	Alpha	6,300
Aug. 18	92	2,200	Gamma	19,800
Sept. 2	100	600	Beta	4,800
Nov. 14	110	500	Alpha	7,000
Dec. 12	116	2,000	Gamma	24,000

a. Develop a graph for *each* product (three graphs), with Job No. (in date order) on the horizontal axis and unit cost on the vertical axis. Use this information to determine Letson Manufacturing's cost performance over time for the three products.
b. What additional information would you require to investigate Letson Manufacturing's cost performance more precisely?

EX 2-16
Decision making with job order costs

obj. 3

Duncan Trophies Inc. uses a job order cost system for determining the cost to manufacture award products (plaques and trophies). Among the company's products is an engraved plaque that is awarded to participants who complete an executive education program at a local university. The company sells the plaque to the university for $160 each.

Each plaque has a brass plate engraved with the name of the participant. Engraving requires approximately 20 minutes per name. Improperly engraved names must be redone. The plate is screwed to a walnut backboard. This assembly takes approximately 10 minutes per unit. Improper assembly must be redone using a new walnut backboard.

During the first half of the year, the university had two separate executive education classes. The job cost sheets for the two separate jobs indicated the following information:

Job 201	**April 12**		
	Cost per Unit	**Units**	**Job Cost**
Direct materials:			
Wood	$32.00/unit	60 units	$ 1,920
Brass	24.00/unit	60 units	1,440
Engraving labor	60.00/hr.	20 hrs.	1,200
Assembly labor	45.00/hr.	10 hrs.	450
Factory overhead	35.00/hr.	30 hrs.	1,050
			$ 6,060
Plaques shipped			÷ 60
Cost per plaque			$ 101.00

Job 212	**May 6**		
	Cost per Unit	**Units**	**Job Cost**
Direct materials:			
Wood	$32.00/unit	48 units	$ 1,536
Brass	24.00/unit	48 units	1,152
Engraving labor	60.00/hr.	28 hrs.	1,680
Assembly labor	45.00/hr.	14 hrs.	630
Factory overhead	35.00/hr.	42 hrs.	1,470
			$ 6,468
Plaques shipped			÷ 42
Cost per plaque			$ 154.00

a. Why did the cost per plaque increase from $101.00 to $154.00?
b. What improvements would you recommend for Duncan Trophies Inc.?

EX 2-17
Job order cost accounting entries for a service business

obj. 4

The consulting firm of Tilton and Henderson accumulates costs associated with individual cases, using a job order cost system. The following transactions occurred during June:

June 4. Charged 600 hours of professional (lawyer) time to the Rucker Co. breech of contract suit to prepare for the trial, at a rate of $200 per hour.
8. Reimbursed travel costs to employees for depositions related to the Rucker case, $21,000.
12. Charged 300 hours of professional time for the Rucker trial at a rate of $260 per hour.
16. Received invoice from consultants Wenzel and Lachgar for $64,000 for expert testimony related to the Rucker trial.
24. Applied office overhead at a rate of $55 per professional hour charged to the Rucker case.
30. Paid secretarial and administrative salaries of $35,000 for the month.
30. Used office supplies for the month, $12,000.

June 30. Paid professional salaries of $180,000 for the month.
30. Billed Rucker $380,000 for successful defense of the case.

a. Provide the journal entries for each of the above transactions.
b. How much office overhead is over- or underapplied?
c. Determine the gross profit on the Rucker case, assuming that over- or underapplied office overhead is closed monthly to cost of services.

EX 2-18
Job order cost accounting entries for a service business

obj. 4

✔ d. Dr. Cost of Services, $777,500

The Ad Guys Inc. provides advertising services for clients across the nation. The Ad Guys is presently working on four projects, each for a different client. The Ad Guys accumulates costs for each account (client) on the basis of both direct costs and allocated indirect costs. The direct costs include the charged time of professional personnel and media purchases (air time and ad space). Overhead is allocated to each project as a percentage of media purchases. The predetermined overhead rate is 50% of media purchases.

On June 1, the four advertising projects had the following accumulated costs:

	June 1 Balances
Clinton Bank	$80,000
Pryor Airlines	24,000
O'Ryan Hotels	56,000
Marshall Beverages	34,000

During June, The Ad Guys incurred the following direct labor and media purchase costs related to preparing advertising for each of the four accounts:

	Direct Labor	Media Purchases
Clinton Bank	$ 56,000	$210,000
Pryor Airlines	25,000	185,000
O'Ryan Hotels	110,000	135,000
Marshall Beverages	125,000	101,000
Total	$316,000	$631,000

At the end of June, both the Clinton Bank and Pryor Airlines campaigns were completed. The costs of completed campaigns are debited to the cost of services account.

Journalize the summary entry to record each of the following for the month:

a. Direct labor costs
b. Media purchases
c. Overhead applied
d. Completion of Clinton Bank and Pryor Airlines campaigns

Problems Series A

PR 2-1A
Entries for costs in a job order cost system

obj. 2

Keltner Co. uses a job order cost system. The following data summarize the operations related to production for November:

a. Materials purchased on account, $350,000.
b. Materials requisitioned, $275,000, of which $35,000 was for general factory use.
c. Factory labor used, $324,500, of which $45,500 was indirect.
d. Other costs incurred on account were for factory overhead, $128,600; selling expenses, $116,400; and administrative expenses, $72,500.
e. Prepaid expenses expired for factory overhead were $14,500; for selling expenses, $12,300; and for administrative expenses, $8,900.
f. Depreciation of office building was $42,000; of office equipment, $21,500; and of factory equipment, $14,500.
g. Factory overhead costs applied to jobs, $256,400.
h. Jobs completed, $726,500.
i. Cost of goods sold, $715,000.

Instructions

Journalize the entries to record the summarized operations.

PR 2-2A
Entries and schedules for unfinished jobs and completed jobs

obj. 2

✔ 3. Work in Process balance, $22,290

Staircase Equipment Company uses a job order cost system. The following data summarize the operations related to production for April 2010, the first month of operations:

a. Materials purchased on account, $23,400.
b. Materials requisitioned and factory labor used:

Job	Materials	Factory Labor
No. 201	$2,350	$2,200
No. 202	2,875	2,970
No. 203	1,900	1,490
No. 204	6,450	5,460
No. 205	4,100	4,150
No. 206	2,980	2,650
For general factory use	860	3,250

c. Factory overhead costs incurred on account, $4,500.
d. Depreciation of machinery and equipment, $1,560.
e. The factory overhead rate is $50 per machine hour. Machine hours used:

Job	Machine Hours
No. 201	18
No. 202	30
No. 203	24
No. 204	75
No. 205	33
No. 206	20
Total	200

f. Jobs completed: 201, 202, 203, and 205.
g. Jobs were shipped and customers were billed as follows: Job 201, $6,540; Job 202, $8,820; Job 203, $11,880.

Instructions

1. Journalize the entries to record the summarized operations.
2. Post the appropriate entries to T accounts for Work in Process and Finished Goods, using the identifying letters as dates. Insert memo account balances as of the end of the month.
3. Prepare a schedule of unfinished jobs to support the balance in the work in process account.
4. Prepare a schedule of completed jobs on hand to support the balance in the finished goods account.

PR 2-3A
Job order cost sheet

objs. 2, 3

If the working papers correlating with the textbook are not used, omit Problem 2-3A.

Lynch Furniture Company refinishes and reupholsters furniture. Lynch uses a job order cost system. When a prospective customer asks for a price quote on a job, the estimated cost data are inserted on an unnumbered job cost sheet. If the offer is accepted, a number is assigned to the job, and the costs incurred are recorded in the usual manner on the job cost sheet. After the job is completed, reasons for the variances between the estimated and actual costs are noted on the sheet. The data are then available to management in evaluating the efficiency of operations and in preparing quotes on future jobs. On May 10, 2010, an estimate of $1,530.00 for reupholstering a chair and couch was given to Queen Mercury. The estimate was based on the following data:

Estimated direct materials:	
40 meters at $12 per meter	$ 480.00
Estimated direct labor:	
24 hours at $15 per hour	360.00
Estimated factory overhead (50% of direct labor cost)	180.00
Total estimated costs	$1,020.00
Markup (50% of production costs)	510.00
Total estimate	$1,530.00

On May 16, the chair and couch were picked up from the residence of Queen Mercury, 10 Rhapsody Lane, Lake Forest, with a commitment to return it on June 12. The job was completed on June 8.

The related materials requisitions and time tickets are summarized as follows:

Materials Requisition No.	Description	Amount
210	24 meters at $12	$288
212	21 meters at $12	252
Time Ticket No.	**Description**	**Amount**
H25	18 hours at $14.50	$261.00
H34	9 hours at $14.50	130.50

Instructions

1. Complete that portion of the job order cost sheet that would be prepared when the estimate is given to the customer.
2. Assign number 10-206 to the job, record the costs incurred, and complete the job order cost sheet. Comment on the reasons for the variances between actual costs and estimated costs. For this purpose, assume that five meters of materials were spoiled, the factory overhead rate has been proved to be satisfactory, and an inexperienced employee performed the work.

PR 2-4A Analyzing manufacturing cost accounts

obj. 2

✔ G. $282,130

Big Wave Company manufactures surf boards in a wide variety of sizes and styles. The following incomplete ledger accounts refer to transactions that are summarized for July:

Materials

July 1	Balance	30,000	July 31	Requisitions	(A)
31	Purchases	120,000			

Work in Process

July 1	Balance	(B)	July 31	Completed jobs	(F)
31	Materials	(C)			
31	Direct labor	(D)			
31	Factory overhead applied	(E)			

Finished Goods

July 1	Balance	0	July 31	Cost of goods sold	(G)
31	Completed jobs	(F)			

Wages Payable

			July 31	Wages incurred	120,000

Factory Overhead

July 1	Balance	22,000	July 31	Factory overhead applied	(E)
31	Indirect labor	(H)			
31	Indirect materials	16,000			
31	Other overhead	95,000			

In addition, the following information is available:

a. Materials and direct labor were applied to six jobs in July:

Job No.	Style	Quantity	Direct Materials	Direct Labor
No. 21	X-10	200	$ 20,000	$15,000
No. 22	X-20	400	34,000	26,000
No. 23	X-50	200	14,000	8,000
No. 24	T-20	250	30,000	25,000
No. 25	X-40	180	22,000	17,500
No. 26	T-10	140	8,000	4,500
	Total	1,370	$128,000	$96,000

b. Factory overhead is applied to each job at a rate of 160% of direct labor cost.
c. The July 1 Work in Process balance consisted of two jobs, as follows:

Job No.	Style	Work in Process, July 1
Job 21	X-10	$ 6,000
Job 22	X-20	16,000
Total		$22,000

d. Customer jobs completed and units sold in July were as follows:

Job No.	Style	Completed in July	Units Sold in July
No. 21	X-10	X	160
No. 22	X-20	X	320
No. 23	X-50		0
No. 24	T-20	X	210
No. 25	X-40	X	150
No. 26	T-10		0

Instructions

1. Determine the missing amounts associated with each letter. Provide supporting calculations by completing a table with the following headings:

Job No.	Quantity	July 1 Work in Process	Direct Materials	Direct Labor	Factory Overhead	Total Cost	Unit Cost	Units Sold	Cost of Goods Sold

2. Determine the July 31 balances for each of the inventory accounts and factory overhead.

PR 2-5A
Flow of costs and income statement

obj. 2

✔ 1. Income from operations, $3,300,000

Digital Tunes Inc. is in the business of developing, promoting, and selling musical talent on compact disc (CD). The company signed a new group, called *Smashing Britney*, on January 1, 2010. For the first six months of 2010, the company spent $4,000,000 on a media campaign for *Smashing Britney* and $1,200,000 in legal costs. The CD production began on February 1, 2010.

Digital Tunes uses a job order cost system to accumulate costs associated with a CD title. The unit direct materials cost for the CD is:

Blank CD	$1.80
Jewel case	0.60
Song lyric insert	0.60

The production process is straightforward. First, the blank CDs are brought to a production area where the digital soundtrack is copied onto the CD. The copying machine requires one hour per 2,400 CDs.

After the CDs are copied, they are brought to an assembly area where an employee packs the CD with a jewel case and song lyric insert. The direct labor cost is $0.25 per unit.

The CDs are sold to record stores. Each record store is given promotional materials, such as posters and aisle displays. Promotional materials cost $40 per record store. In addition, shipping costs average $0.25 per CD.

Total completed production was 1,000,000 units during the year. Other information is as follows:

Number of customers (record stores)	42,500
Number of CDs sold	850,000
Wholesale price (to record store) per CD	$16

Factory overhead cost is applied to jobs at the rate of $1,200 per copy machine hour. There were an additional 25,000 copied CDs, packages, and inserts waiting to be assembled on December 31, 2010.

Instructions

1. Prepare an annual income statement for the *Smashing Britney* CD, including supporting calculations, from the information above.
2. Determine the balances in the work in process and finished goods inventory for the *Smashing Britney* CD on December 31, 2010.

Problems Series B

PR 2-1B
Entries for costs in a job order cost system

obj. 2

Dacher Company uses a job order cost system. The following data summarize the operations related to production for October:

a. Materials purchased on account, $450,000.
b. Materials requisitioned, $425,000, of which $4,500 was for general factory use.
c. Factory labor used, $385,000, of which $95,000 was indirect.
d. Other costs incurred on account were for factory overhead, $125,400; selling expenses, $87,500; and administrative expenses, $56,400.
e. Prepaid expenses expired for factory overhead were $12,500; for selling expenses, $14,500; and for administrative expenses, $8,500.
f. Depreciation of factory equipment was $25,300; of office equipment, $31,600; and of store equipment, $7,600.
g. Factory overhead costs applied to jobs, $261,500.
h. Jobs completed, $965,000.
i. Cost of goods sold, $952,400.

Instructions

Journalize the entries to record the summarized operations.

PR 2-2B
Entries and schedules for unfinished jobs and completed jobs

obj. 2

✔ 3. Work in Process balance, $59,925

Grand Valley Apparel Co. uses a job order cost system. The following data summarize the operations related to production for May 2010, the first month of operations:

a. Materials purchased on account, $68,000.
b. Materials requisitioned and factory labor used:

Job	Materials	Factory Labor
No. 401	$ 9,200	$ 9,250
No. 402	11,000	13,400
No. 403	6,400	5,000
No. 404	18,200	17,400
No. 405	8,600	7,400
No. 406	8,500	8,900
For general factory use	4,100	9,600

c. Factory overhead costs incurred on account, $2,750.
d. Depreciation of machinery and equipment, $1,870.
e. The factory overhead rate is $25 per machine hour. Machine hours used:

Job	Machine Hours
No. 401	108
No. 402	110
No. 403	86
No. 404	160
No. 405	109
No. 406	117
Total	690

f. Jobs completed: 401, 402 , 403, and 405.
g. Jobs were shipped and customers were billed as follows: Job 401, $26,000; Job 402, $33,400; Job 405, $23,400.

Instructions

1. Journalize the entries to record the summarized operations.
2. Post the appropriate entries to T accounts for Work in Process and Finished Goods, using the identifying letters as dates. Insert memo account balances as of the end of the month.
3. Prepare a schedule of unfinished jobs to support the balance in the work in process account.
4. Prepare a schedule of completed jobs on hand to support the balance in the finished goods account.

PR 2-3B
Job order cost sheet

objs. 2, 3

If the working papers correlating with the textbook are not used, omit Problem 2-3B.

Terry Furniture Company refinishes and reupholsters furniture. Terry uses a job order cost system. When a prospective customer asks for a price quote on a job, the estimated cost data are inserted on an unnumbered job cost sheet. If the offer is accepted, a number is assigned to the job, and the costs incurred are recorded in the usual manner on the job cost sheet. After the job is completed, reasons for the variances between the estimated and actual costs are noted on the sheet. The data are then available to management in evaluating the efficiency of operations and in preparing quotes on future jobs. On June 1, 2010, an estimate of $1,087.80 for reupholstering two chairs and a couch was given to Ted Austin. The estimate was based on the following data:

Estimated direct materials:	
24 meters at $14 per meter	$ 336.00
Estimated direct labor:	
14 hours at $18 per hour	252.00
Estimated factory overhead (75% of direct labor cost)	189.00
Total estimated costs	$ 777.00
Markup (40% of production costs)	310.80
Total estimate	$1,087.80

On June 4, the chairs and couch were picked up from the residence of Ted Austin, 409 Patterson St., Vienna, with a commitment to return them on August 5. The job was completed on August 2.

The related materials requisitions and time tickets are summarized as follows:

Materials Requisition No.	Description	Amount
210	10 meters at $14	$140
212	16 meters at $14	224

Time Ticket No.	Description	Amount
H16	6 hours at $18	$108
H21	10 hours at $18	180

Instructions

1. Complete that portion of the job order cost sheet that would be prepared when the estimate is given to the customer.
2. Assign number 10-110 to the job, record the costs incurred, and complete the job order cost sheet. Comment on the reasons for the variances between actual costs and estimated costs. For this purpose, assume that two meters of materials were spoiled, the factory overhead rate has been proved to be satisfactory, and an inexperienced employee performed the work.

PR 2-4B
Analyzing manufacturing cost accounts

obj. 2

✔ G. $205,970

Davidson Outdoor Equipment Company manufactures kayaks in a wide variety of lengths and styles. The following incomplete ledger accounts refer to transactions that are summarized for August:

Materials

Aug. 1	Balance	32,000	Aug. 31	Requisitions	(A)
31	Purchases	150,000			

Work in Process

Aug. 1	Balance	(B)	Aug. 31	Completed jobs	(F)
31	Materials	(C)			
31	Direct labor	(D)			
31	Factory overhead applied	(E)			

Finished Goods

Aug. 1	Balance	0	Aug. 31	Cost of goods sold	(G)
31	Completed jobs	(F)			

Wages Payable

			Aug. 31	Wages incurred	120,000

Factory Overhead

Aug. 1	Balance	8,000	Aug. 31	Factory overhead applied	(E)
31	Indirect labor	(H)			
31	Indirect materials	4,500			
31	Other overhead	51,500			

In addition, the following information is available:

a. Materials and direct labor were applied to six jobs in August:

Job No.	Style	Quantity	Direct Materials	Direct Labor
No. 101	T-100	100	$ 25,000	$ 18,000
No. 102	T-300	125	32,000	22,000
No. 103	T-200	150	40,000	34,000
No. 104	S-100	125	20,000	12,500
No. 105	S-200	200	36,000	20,000
No. 106	T-400	100	18,000	9,600
	Total	800	$171,000	$116,100

b. Factory overhead is applied to each job at a rate of 50% of direct labor cost.

c. The August 1 Work in Process balance consisted of two jobs, as follows:

Job No.	Style	Work in Process, August 1
Job 101	T-100	$ 8,000
Job 102	T-300	14,000
Total		$22,000

d. Customer jobs completed and units sold in August were as follows:

Job No.	Style	Completed in August	Units Sold in August
Job 101	T-100	X	80
Job 102	T-300	X	110
Job 103	T-200		0
Job 104	S-100	X	115
Job 105	S-200	X	160
Job 106	T-400		0

Instructions

1. Determine the missing amounts associated with each letter. Provide supporting calculations by completing a table with the following headings:

Job No.	Quantity	Aug. 1 Work in Process	Direct Materials	Direct Labor	Factory Overhead	Total Cost	Unit Cost	Units Sold	Cost of Goods Sold

2. Determine the August 31 balances for each of the inventory accounts and factory overhead.

PR 2-5B

Flow of costs and income statement

obj. 2

✔ 1. Income from operations, $2,400,000

My Way Software Inc. is a designer, manufacturer, and distributor of software for microcomputers. A new product, *Movie Design 2010*, was released for production and distribution in early 2010. In January, $1,400,000 was spent to design print advertisement. For the first six months of 2010, the company spent $1,380,000 promoting *Movie Design 2010* in trade magazines. The product was ready for manufacture on January 10, 2010.

My Way uses a job order cost system to accumulate costs associated with each software title. Direct materials unit costs are as follows:

Blank CD	$ 2.50
Packaging	4.00
Manual	12.00
Total	$18.50

The actual production process for the software product is fairly straightforward. First, blank CDs are brought to a CD copying machine. The copying machine requires 1 hour per 2,000 CDs.

After the program is copied onto the CD, the CD is brought to assembly, where assembly personnel pack the CD and manual for shipping. The direct labor cost for this work is $0.50 per unit.

The completed packages are then sold to retail outlets through a sales force. The sales force is compensated by a 15% commission on the wholesale price for all sales.

Total completed production was 100,000 units during the year. Other information is as follows:

Number of software units sold in 2010	80,000
Wholesale price per unit	$100

Factory overhead cost is applied to jobs at the rate of $2,500 per copy machine hour. There were an additional 4,000 copied CDs, packaging, and manuals waiting to be assembled on December 31, 2010.

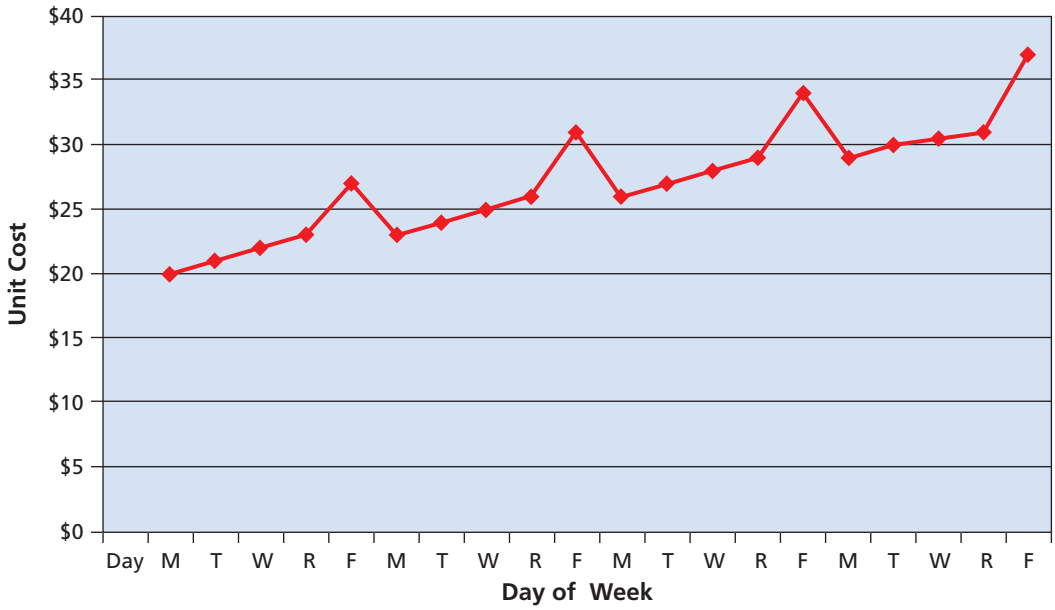
Instructions

1. Prepare an annual income statement for the *Movie Design 2010* product, including supporting calculations, from the information above.
2. Determine the balances in the finished goods and work in process inventory for the *Movie Design 2010* product on December 31, 2010.

Special Activities

SA 2-1
Managerial analysis

The controller of the plant of Berry Building Supplies prepared a graph of the unit costs from the job cost reports for Product X-S1. The graph appeared as follows:



How would you interpret this information? What further information would you request?

SA 2-2
Job order decision making and rate deficiencies

Antelope Company makes attachments, such as backhoes and grader and bulldozer blades, for construction equipment. The company uses a job order cost system. Management is concerned about cost performance and evaluates the job cost sheets to learn more about the cost effectiveness of the operations. To facilitate a comparison, the cost sheet for Job 110 (20 Z-15 backhoe buckets completed in April) was compared with Job 130, which was for 40 Z-15 backhoe buckets completed in October. The two job cost sheets follow.

Job 110

Item: 20 Z-15 backhoe buckets

Materials:	Direct Materials Quantity	×	Direct Materials Price	=	Amount
Steel (tons)	60		$750.00		$45,000
Steel components (pieces)	350		4.00		1,400
Total materials					$46,400

Direct labor	Direct Labor Hours	×	Direct Labor Rate	=	Amount
Foundry	220		$15.00		$ 3,300
Welding	320		17.00		5,440
Shipping	100		12.00		1,200
Total direct labor	640				$ 9,940

	Direct Total Labor Cost	×	Factory Overhead Rate	=	Amount
Factory overhead (200% of direct labor dollars)	$9,940	×	200%		$19,880
Total cost					$76,220
Total units					÷ 20
Unit cost					$ 3,811

Job 130

Item: 40 Z-15 backhoe buckets

Materials:	Direct Materials Quantity	×	Direct Materials Price	=	Amount
Steel (tons)	140		$740.00		$103,600
Steel components (pieces)	700		4.00		2,800
Total materials					$106,400

Direct labor	Direct Labor Hours	×	Direct Labor Rate	=	Amount
Foundry	500		15.00		$ 7,500
Welding	700		17.00		11,900
Shipping	200		12.00		2,400
Total direct labor	1,400				$ 21,800

	Direct Total Labor Cost	×	Factory Overhead Rate	=	Amount
Factory overhead (200% of direct labor dollars)	$21,800	×	200%		$ 43,600
Total cost					$171,800
Total units					÷ 40
Unit cost					$ 4,295

Management is concerned with the increase in unit costs over the months from April to October. To understand what has occurred, management interviewed the purchasing manager and quality manager.

Purchasing Manager: Prices have been holding steady for our raw materials during the first half of the year. I found a new supplier for our bulk steel that was willing to offer a better price than we received in the past. I saw these lower steel prices and jumped at them, knowing that a reduction in steel prices would have a very favorable impact on our costs.

Quality Manager: Something happened around mid-year. All of a sudden, we were experiencing problems with respect to the quality of our steel. As a result, we've been having all sorts of problems on the shop floor in our foundry and welding operation.

1. Analyze the two job cost sheets, and identify why the unit costs have changed for the Z-15 backhoe buckets. Complete the following schedule to help you in your analysis:

Item	Input Quantity per Unit—Job 110	Input Quantity per Unit—Job 130
Steel		
Foundry labor		
Welding labor		

2. How would you interpret what has happened in light of your analysis and the interviews?

SA 2-3
Factory overhead rate

Digital-Tech Inc., a specialized equipment manufacturer, uses a job order costing system. The overhead is allocated to jobs on the basis of direct labor hours. The overhead rate is now $2,500 per direct labor hour. The design engineer thinks that this is illogical. The design engineer has stated the following:

Our accounting system doesn't make any sense to me. It tells me that every labor hour carries an additional burden of $2,500. This means that direct labor makes up only 7% of our total product cost, yet it drives all our costs. In addition, these rates give my design engineers incentives to "design out" direct labor by using machine technology. Yet, over the past years as we have had less and less direct labor, the overhead rate keeps going up and up. I won't be surprised if next year the rate is $3,000 per direct labor hour. I'm also concerned because small errors in our estimates of the direct labor content can have a large impact on our estimated costs. Just a 30-minute error in our estimate of assembly time is worth $1,250. Small mistakes in our direct labor time estimates really swing our bids around. I think this puts us at a disadvantage when we are going after business.

1. What is the engineer's concern about the overhead rate going "up and up"?
2. What did the engineer mean about the large overhead rate being a disadvantage when placing bids and seeking new business?
3. What do you think is a possible solution?

SA 2-4
Recording manufacturing costs

Jack Thule just began working as a cost accountant for Toad Industries Inc., which manufactures gift items. Jack is preparing to record summary journal entries for the month. Jack begins by recording the factory wages as follows:

Wages Expense	60,000	
Wages Payable		60,000

Then the factory depreciation:

Depreciation Expense—Factory Machinery	16,000	
Accumulated Depreciation—Factory Machinery		16,000

Jack's supervisor, Duke Fulbright, walks by and notices the entries. The following conversation takes place:

Duke: That's a very unusual way to record our factory wages and depreciation for the month.

Jack: What do you mean? This is exactly the way we were taught to record wages and depreciation in school. You know, debit an expense and credit Cash or payables, or in the case of depreciation, credit Accumulated Depreciation.

Duke: Well, it's not the credits I'm concerned about. It's the debits—I don't think you've recorded the debits correctly. I wouldn't mind if you were recording the administrative wages or office equipment depreciation this way, but I've got real questions about recording factory wages and factory machinery depreciation this way.

Jack: Now I'm really confused. You mean this is correct for administrative costs, but not for factory costs? Well, what am I supposed to do—and why?

1. Play the role of Duke and answer Jack's questions.
2. Why would Duke accept the journal entries if they were for administrative costs?

SA 2-5
Predetermined overhead rates

As an assistant cost accountant for Spears Industries, you have been assigned to review the activity base for the predetermined factory overhead rate. The president, Jessica Romo, has expressed concern that the over- or underapplied overhead has fluctuated excessively over the years.

An analysis of the company's operations and use of the current overhead rate (direct materials usage) has narrowed the possible alternative overhead bases to direct labor cost and machine hours. For the past five years, the following data have been gathered:

	2010	2009	2008	2007	2006
Actual overhead	$ 710,000	$ 860,000	$ 680,000	$ 640,000	$ 610,000
Applied overhead	706,000	866,000	675,000	642,000	611,000
(Over-) underapplied overhead	$ 4,000	$ (6,000)	$ 5,000	$ (2,000)	$ (1,000)
Direct labor cost	$2,820,000	$3,450,000	$2,700,000	$2,580,000	$2,450,000
Machine hours	102,000	122,000	98,000	92,000	86,000

1. Calculate a predetermined factory overhead rate for each alternative base, assuming that rates would have been determined by relating the amount of factory overhead for the past five years to the base.
2. For each of the past five years, determine the over- or underapplied overhead, based on the two predetermined overhead rates developed in part (1).
3. Which predetermined overhead rate would you recommend? Discuss the basis for your recommendation.

Answers to Self-Examination Questions

1. **A** Job order cost systems are best suited to businesses manufacturing special orders from customers, such as would be the case for a repair shop for antique furniture (answer A). A process cost system is best suited for manufacturers of similar units of products such as rubber manufacturers (answer B), coal manufacturers (answer C), and computer chip manufacturers (answer D).
2. **C** The journal entry to record the requisition of materials to the factory in a job order cost system is a debit to Work in Process and a credit to Materials.
3. **B** The job cost sheet accumulates the cost of materials (answer A), direct labor (answer C), and factory overhead applied (answer D). Indirect materials are NOT accumulated on the job order cost sheets, but are included as part of factory overhead applied.
4. **B**

$$\text{Predetermined Factory Overhead Rate} = \frac{\text{Estimated Total Factory Overhead Costs}}{\text{Estimated Activity Base}}$$

$$\text{Predetermined Factory Overhead Rate} = \frac{\$420{,}000}{16{,}000 \text{ dlh}} = \$26.25$$

$$\text{Hours applied to the job: } \frac{\$3{,}000}{\$15 \text{ per hour}} = 200 \text{ hours}$$

Factory overhead applied to the job: 200 hours × $26.25 = $5,250

5. **B** If the amount of factory overhead applied during a particular period exceeds the actual overhead costs, the factory overhead account will have a credit balance and is said to be overapplied (answer B) or overabsorbed. If the amount applied is less than the actual costs, the account will have a debit balance and is said to be underapplied (answer A) or underabsorbed (answer C). Since an "estimated" predetermined overhead rate is used to apply overhead, a credit balance does not necessarily represent an error (answer D).

CHAPTER 3

Process Cost Systems

DREYER'S GRAND ICE CREAM, INC.

In making ice cream, an electric ice cream maker is used to mix ingredients, which include milk, cream, sugar, and flavoring. After the ingredients are added, the mixer is packed with ice and salt to cool the ingredients, and it is then turned on.

After mixing for half of the required time, would you have ice cream? Of course not, because the ice cream needs to mix longer to freeze. Now, assume that you ask the question:

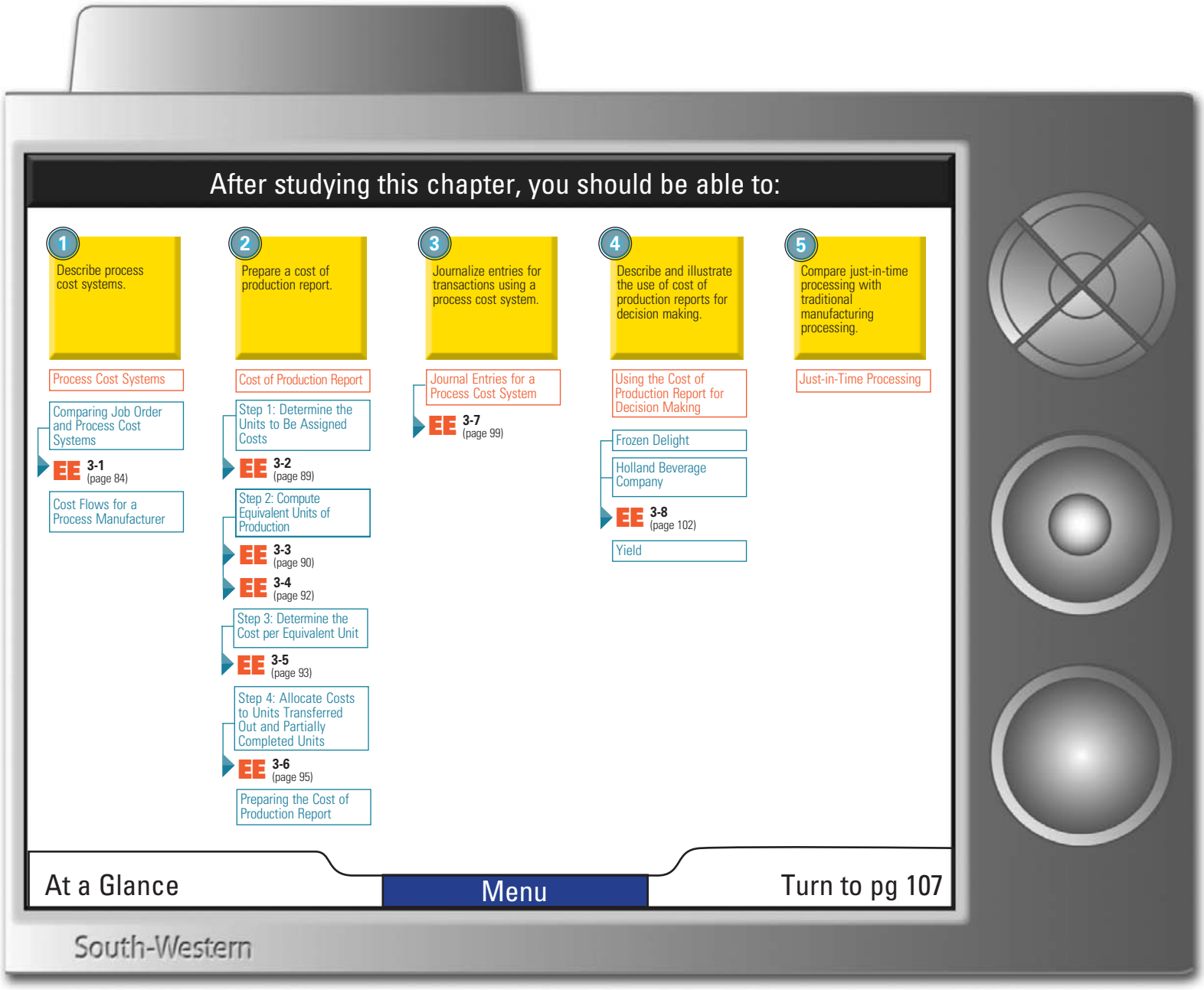
What costs have I incurred so far in making ice cream?

The answer to this question requires knowing the cost of the ingredients and electricity. The ingredients are added at the beginning; thus, all the ingredient costs have been incurred. Since the mixing is only half complete, only 50% of the electricity costs has been incurred. Therefore, the answer to the preceding question is:

All the materials costs and half the electricity costs have been incurred.

The same cost concepts described above apply to larger ice cream processes like those of Dreyer's Grand Ice Cream, Inc., manufacturer of Häagen-Dazs®, Edys®, Dreyer's®, and Nestle® ice cream. Dreyer's mixes ingredients in 3,000-gallon vats in much the same way you would with an electric ice cream maker. Dreyer's also records the costs of the ingredients, labor, and factory overhead used in making ice cream. These costs are used by managers for decisions such as setting prices and improving operations.

This chapter describes and illustrates process cost systems that are used by manufacturers such as Dreyer's. In addition, the use of cost of production reports in decision making is described. Finally, just-in-time cost systems are discussed.



1 Describe process cost systems.

Process Cost Systems

A **process manufacturer** produces products that are indistinguishable from each other using a continuous production process. For example, an oil refinery processes crude oil through a series of steps to produce a barrel of gasoline. One barrel of gasoline, the product, cannot be distinguished from another barrel. Other examples of process manufacturers include paper producers, chemical processors, aluminum smelters, and food processors.

The cost accounting system used by process manufacturers is called the **process cost system.** A process cost system records product costs for each manufacturing department or process.

In contrast, a job order manufacturer produces custom products for customers or batches of similar products. For example, a custom printer produces wedding invitations,

graduation announcements, or other special print items that are tailored to the specifications of each customer. Each item manufactured is unique to itself. Other examples of job order manufacturers include furniture manufacturers, shipbuilders, and home builders.

As described and illustrated in Chapter 2, the cost accounting system used by job order manufacturers is called the *job order cost system*. A job order cost system records product cost for each job using job cost sheets.

Some examples of process and job order manufacturers are shown below.

Process Manufacturers		Job Order Manufacturers	
Company	**Product**	**Company**	**Product**
Pepsi	soft drinks	Walt Disney	movies
Alcoa	aluminum	Nike, Inc.	athletic shoes
Intel	computer chip	Tiger Woods Design	golf courses
Apple	iPhone	Heritage Log Homes	log homes
Hershey Foods	chocolate bars	DDB Advertising Agency	advertising

Comparing Job Order and Process Cost Systems

Process and job order cost systems are similar in that each system:

1. Records and summarizes product costs.
2. Classifies product costs as direct materials, direct labor, and factory overhead.
3. Allocates factory overhead costs to products.
4. Uses perpetual inventory system for materials, work in process, and finished goods.
5. Provides useful product cost information for decision making.

Process and job costing systems are different in several ways. As a basis for illustrating these differences, the cost systems for Frozen Delight and Legend Guitars are used.

Exhibit 1 illustrates the process cost system for Frozen Delight, an ice cream manufacturer. As a basis for comparison, Exhibit 1 also illustrates the job order cost system for Legend Guitars, a custom guitar manufacturer. Legend Guitars was described and illustrated in Chapters 1 and 2.

Exhibit 1 indicates that Frozen Delight manufactures ice cream using two departments:

1. Mixing Department mixes the ingredients using large vats.
2. Packaging Department puts the ice cream into cartons for shipping to customers.

Integrity, Objectivity, and Ethics in Business

ON BEING GREEN

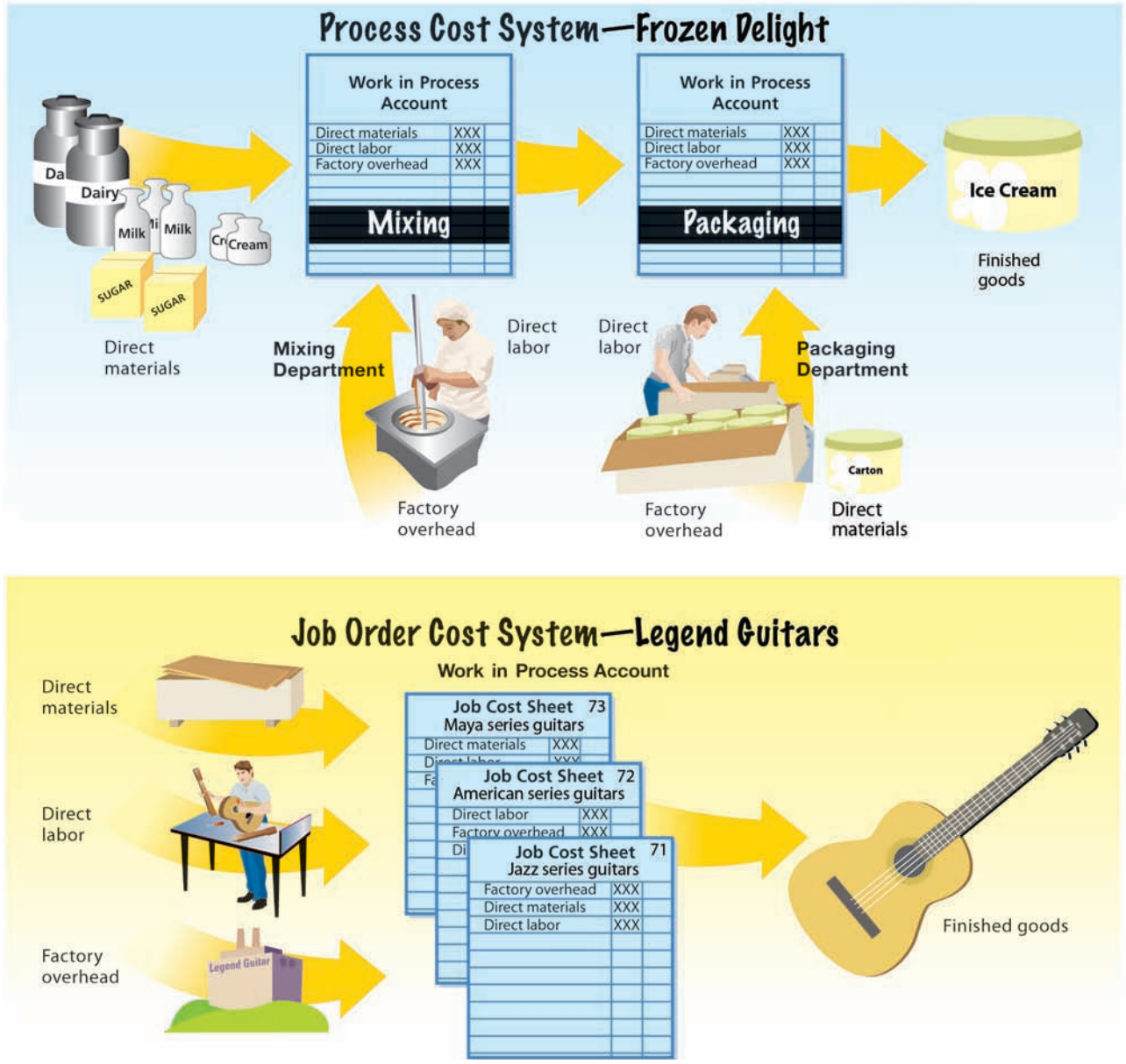
Building a world with environmentally sustainable resources is one of the largest challenges of today's corporate community. E. I. du Pont de Nemours and Company (DuPont) states: *As a science company, (we have) the experience and expertise to put our science to work in ways that can design in—at the early stages of product development—attributes that help protect or enhance human health, safety, and the environment.* As a result, DuPont has developed a set of product and manufacturing related goals for the year 2015.

- Double investment in R&D programs with direct and quantifiable environmental benefits.
- Grow annual revenues by $2 billion from products that reduce greenhouse emissions.
- Double revenues from nondepletable resources to at least $8 billion.
- Reduce greenhouse gas emissions from its processing facilities by 15%.
- Reduce air carcinogens from its processing facilities by 50%.

Source: DuPont website

Exhibit 1

Process Cost and Job Order Cost Systems



Since each gallon of ice cream is similar, product costs are recorded in each department's work in process account. As shown in Exhibit 1, Frozen Delight accumulates (records) the cost of making ice cream in *work in process accounts* for the Mixing and Packaging departments. The product costs of making a gallon of ice cream include:

1. *Direct materials cost,* which include milk, cream, sugar, and packing cartons. All materials costs are added at the beginning of the process for both the Mixing Department and the Packaging Department.
2. *Direct labor cost*, which is incurred by employees in each department who run the equipment and load and unload product.
3. *Factory overhead costs,* which include the utility costs (power) and depreciation on the equipment.

When the Mixing Department completes the mixing process, its product costs are transferred to the Packaging Department. When the Packaging Department completes its process, the product costs are transferred to Finished Goods. In this way, the cost of the product (a gallon of ice cream) accumulates across the entire production process.

In contrast, Exhibit 1 shows that Legend Guitars accumulates (records) product costs by jobs using a job cost sheet for each type of guitar. Thus, Legend Guitars uses just one work in process account. As each job is completed, its product costs are transferred to Finished Goods.

In a job order cost system, the work in process at the end of the period is the sum of the job cost sheets for partially completed jobs. In a process cost system, the work in process at the end of the period is determined by allocating costs between completed and partially completed units within each department.

Example Exercise 3-1 Job Order vs. Process Costing

1

Which of the following industries would normally use job order costing systems, and which would normally use process costing systems?

Home construction	Computer chips
Beverages	Cookies
Military aircraft	Video game design and production

Follow My Example 3-1

Home construction	Job order
Beverages	Process
Military aircraft	Job order
Computer chips	Process
Cookies	Process
Video game design and production	Job order

For Practice: PE 3-1A, PE 3-1B

Materials costs can be as high as 70% of the total product costs for many process manufacturers.

Cost Flows for a Process Manufacturer

Exhibit 2 illustrates the *physical flow* of materials for Frozen Delight. Ice cream is made in a manufacturing plant in a similar way as you would at home except on a larger scale.

In the Mixing Department, direct materials in the form of milk, cream, and sugar are placed into a vat. An employee (direct labor) fills each vat, sets the cooling temperature, and sets the mix speed. The vat is cooled (refrigerated) as the direct materials are being mixed by agitators (paddles). Factory overhead is incurred in the form of power to run the vat (electricity) and vat (equipment) depreciation.

In the Packaging Department, the ice cream is received from the Mixing Department in a form ready for packaging. The Packaging Department uses direct labor and factory overhead (conversion costs) to package the ice cream into one-gallon containers (direct materials). The ice cream is then transferred to finished goods where it is frozen and stored in refrigerators prior to shipment to customers (stores).

Exhibit 2

Physical Flows for a Process Manufacturer

The *cost flows* in a process cost accounting system are similar to the *physical flow* of materials described above. The cost flows for Frozen Delight are illustrated in Exhibit 3 as follows:

a. The cost of materials purchased is recorded in the materials account.
b. The cost of direct materials used by the Mixing and Packaging departments is recorded in the work in process accounts for each department.
c. The cost of direct labor used by the Mixing and Packaging departments is recorded in work in process accounts for each department.
d. The cost of factory overhead incurred for indirect materials and other factory overhead such as depreciation is recorded in the factory overhead accounts for each department.
e. The factory overhead incurred in the Mixing and Packaging departments is applied to the work in process accounts for each department.
f. The cost of units completed in the Mixing Department is transferred to the Packaging Department.
g. The cost of units completed in the Packaging Department is transferred to Finished Goods.
h. The cost of units sold is transferred to Cost of Goods Sold.

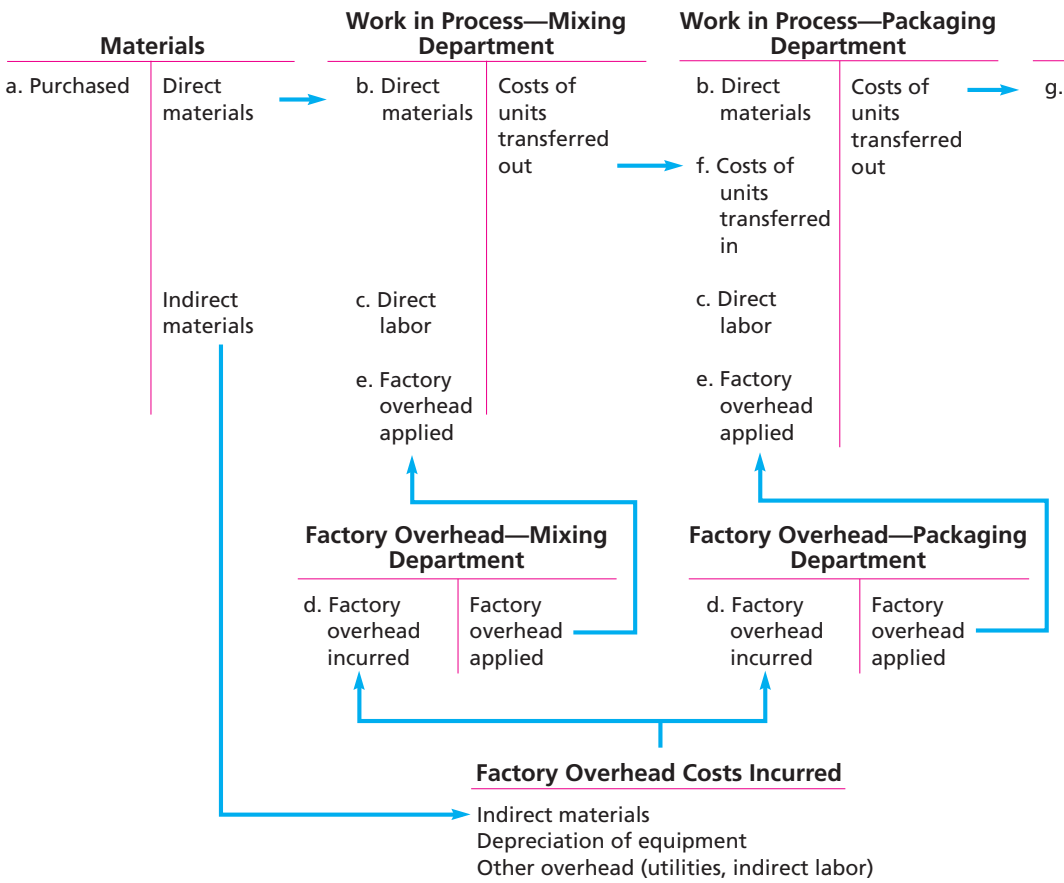
As shown in Exhibit 3, the Mixing and Packaging departments have separate factory overhead accounts. The factory overhead costs incurred for indirect materials, depreciation, and other overhead are debited to each department's factory overhead account. The overhead is applied to work in process by debiting each department's work in process account and crediting the department's factory overhead account.

Exhibit 3 illustrates how the Mixing and Packaging departments have separate work in process accounts. Each work in process account is debited for the direct materials, direct labor, and applied factory overhead. In addition, the work in process account for the Packaging Department is debited for the cost of the units transferred in from the Mixing Department. Each work in process account is credited for the cost of the units transferred to the next department.

Lastly, Exhibit 3 shows that the finished goods account is debited for the cost of the units transferred from the Packaging Department. The finished goods account is credited for the cost of the units sold, which is debited to the cost of goods sold account.

Exhibit 3

Cost Flows for a Process Manufacturer—Frozen Delight



Cost Flows for Frozen Delight

a. The cost of materials purchased is recorded in the materials account.
b. The cost of direct materials used by the Mixing and Packaging departments is recorded in the work in process accounts for each department.
c. The cost of direct labor used by the Mixing and Packaging departments is recorded in work in process accounts for each department.
d. The cost of factory overhead incurred for indirect materials and other factory overhead such as depreciation is recorded in the factory overhead accounts for each department.
e. The factory overhead incurred in the Mixing and Packaging departments is applied to the work in process accounts for each department.
f. The cost of units completed in the Mixing Department is transferred to the Packaging Department.
g. The cost of units completed in the Packaging Department is transferred to Finished Goods.
h. The cost of units sold is transferred to Cost of Goods Sold.

2 Prepare a cost of production report.

Cost of Production Report

In a process cost system, the cost of units transferred out of each processing department must be determined along with the cost of any partially completed units remaining in the department. The report that summarizes these costs is a cost of production report.

The **cost of production report** summarizes the production and cost data for a department as follows:

1. The units the department is accountable for and the disposition of those units.
2. The product costs incurred by the department and the allocation of those costs between completed (transferred out) and partially completed units.

A cost of production report is prepared using the following four steps:

Step 1. Determine the units to be assigned costs.
Step 2. Compute equivalent units of production.
Step 3. Determine the cost per equivalent unit.
Step 4. Allocate costs to units transferred out and partially completed units.

Preparing a cost of production report requires making a cost flow assumption. Like merchandise inventory, costs can be assumed to flow through the manufacturing process using the first-in, first-out (FIFO), last in, first-out (LIFO), or average cost methods. Because the **first-in, first-out (FIFO) method** is often the same as the physical flow of units, the FIFO method is used in this chapter.[1]

To illustrate, a cost of production report for the Mixing Department of Frozen Delight for July 2010 is prepared. The July data for the Mixing Department are as follows:

Inventory in process, July I, 5,000 gallons:		
Direct materials cost, for 5,000 gallons	$5,000	
Conversion costs, for 5,000 gallons, 70% completed	1,225	
Total inventory in process, July 1		$ 6,225
Direct materials cost for July, 60,000 gallons		66,000
Direct labor cost for July		10,500
Factory overhead applied for July		7,275
Total production costs to account for		$90,000
Gallons transferred to Packaging in July (includes units in process on July 1), 62,000 gallons		?
Inventory in process, July 31, 3,000 gallons, 25% completed as to conversion costs		?

By preparing a cost of production report, the cost of the gallons transferred to the Packaging Department in July and the ending work in process inventory in the Mixing Department is determined. These amounts are indicated by question marks (?).

Step 1: Determine the Units to Be Assigned Costs

The first step is to determine the units to be assigned costs. A unit can be any measure of completed production, such as tons, gallons, pounds, barrels, or cases. For Frozen Delight, a unit is a gallon of ice cream.

1 The average cost method is illustrated in an appendix to this chapter.

The Mixing Department is accountable for 65,000 gallons of direct materials during July, as shown below.

Total units (gallons) charged to production:	
In process, July 1	5,000 gallons
Received from materials storage	60,000
Total units (gallons) accounted for	65,000 gallons

For July, the following three groups of units (gallons) are assigned costs:

Group 1. Units (gallons) in beginning work in process inventory on July 1.
Group 2. Units (gallons) started and completed during July.
Group 3. Units (gallons) in ending work in process inventory on July 31.

Exhibit 4 illustrates these groups of units (gallons) in the Mixing Department for July. The 5,000 gallons of beginning inventory were completed and transferred to the Packaging Department. During July, 60,000 gallons of material were started (entered into mixing). Of the 60,000 gallons started in July, 3,000 gallons were incomplete on July 31. Thus, 57,000 gallons (60,000 − 3,000) were started and completed in July.

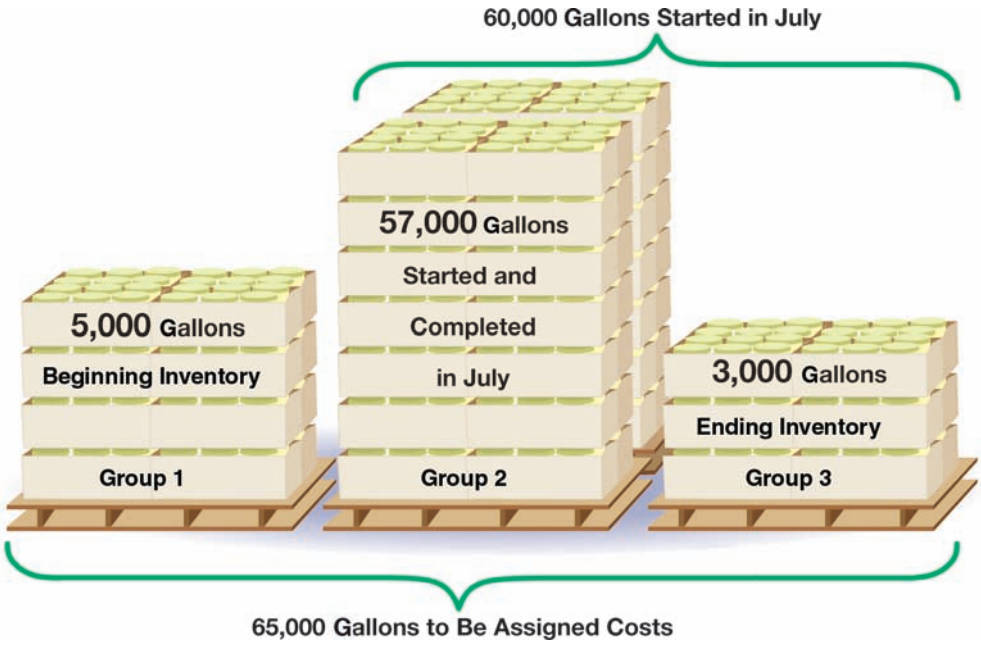
The total units (gallons) to be assigned costs for July are summarized below.

Group 1	Inventory in process, July 1, completed in July	5,000 gallons
Group 2	Started and completed in July	57,000
	Transferred out to the Packaging Department in July	62,000 gallons
Group 3	Inventory in process, July 31	3,000
	Total units (gallons) to be assigned costs	65,000 gallons

The total gallons to be assigned costs (65,000) equal the total gallons accounted for (65,000) by the Mixing Department.

Exhibit 4

July Units to Be Costed—Mixing Department



Example Exercise 3-2 Units to Be Assigned Costs 2

Rocky Springs Beverage Company has two departments, Blending and Bottling. The Bottling Department received 57,000 liters from the Blending Department. During the period, the Bottling Department completed 58,000 liters, including 4,000 liters of work in process at the beginning of the period. The ending work in process was 3,000 liters. How many liters were started and completed during the period?

Follow My Example 3-2

54,000 liters started and completed (58,000 completed − 4,000 beginning WIP), or (57,000 started − 3,000 WIP)

For Practice: PE 3-2A, PE 3-2B

Step 2: Compute Equivalent Units of Production

Whole units are the number of units in production during a period, whether completed or not. **Equivalent units of production** are the portion of whole units that are complete with respect to materials or conversion (direct labor and factory overhead) costs.

To illustrate, assume that a 1,000-gallon batch (vessel) of ice cream is only 40% complete in the mixing process on July 31. Thus, the batch is only 40% complete as to conversion costs such as power. In this case, the whole units and equivalent units of production are as follows:

	Whole Units	Equivalent Units
Materials costs	1,000 gallons	1,000 gallons
Conversion costs	1,000 gallons	400 gallons (1,000 × 40%)

Since the materials costs are all added at the beginning of the process, the materials costs are 100% complete for the 1,000-gallon batch of ice cream. Thus, the whole units and equivalent units for materials costs are 1,000 gallons. However, since the batch is only 40% complete as to conversion costs, the equivalent units for conversion costs are 400 gallons.

Equivalent units for materials and conversion costs are usually determined separately as shown above. This is because materials and conversion costs normally enter production at different times and rates. In contrast, direct labor and factory overhead normally enter production at the same time and rate. For this reason, direct labor and factory overhead are combined as conversion costs in computing equivalent units.

Materials Equivalent Units To compute equivalent units for materials, it is necessary to know how materials are added during the manufacturing process. In the case of Frozen Delight, all the materials are added at the beginning of the mixing process. Thus, the equivalent units for materials in July are computed as follows:

		Total Whole Units	Percent Materials Added in July	Equivalent Units for Direct Materials
Group 1	Inventory in process, July 1	5,000	0%	0
Group 2	Started and completed in July (62,000 − 5,000)	57,000	100%	57,000
	Transferred out to Packaging Department in July	62,000	—	57,000
Group 3	Inventory in process, July 31	3,000	100%	3,000
	Total gallons to be assigned cost . . .	65,000		60,000

As shown on the previous page, the whole units for the three groups of units determined in Step 1 are listed in the first column. The percent of materials added in July is then listed. The equivalent units are determined by multiplying the whole units by the percent of materials added.

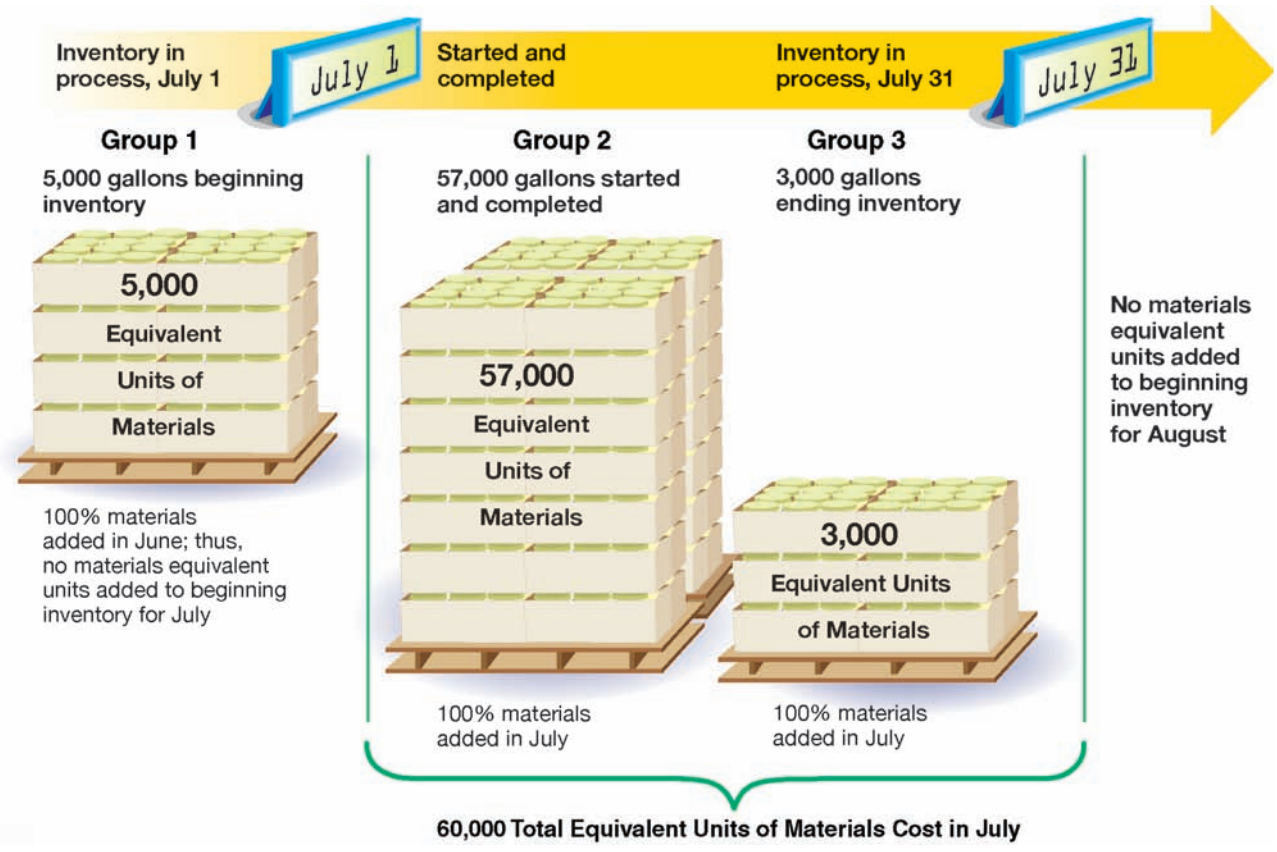
To illustrate, the July 1 inventory (Group 1) has 5,000 gallons of whole units, which are complete as to materials. That is, all the direct materials for the 5,000 gallons in process on July 1 were added in June. Thus, the percent of materials added in July is zero, and the equivalent units added in July are zero.

The 57,000 gallons started and completed in July (Group 2) are 100% complete as to materials. The 3,000 gallons in process on July 31 (Group 3) are also 100% complete as to materials since all materials are added at the beginning of the process. Thus, the equivalent units for the gallons started and completed in July are 57,000 (57,000 × 100%) gallons. For the inventory in process on July 31, the equivalent units is 3,000 (3,000 × 100%) gallons.

The equivalent units for direct materials are summarized in Exhibit 5.

Exhibit 5

Direct Materials Equivalent Units



Example Exercise 3-3 Equivalent Units of Materials Cost

2

The Bottling Department of Rocky Springs Beverage Company had 4,000 liters in beginning work in process inventory (30% complete). During the period, 58,000 liters were completed. The ending work in process inventory was 3,000 liters (60% complete). What are the total equivalent units for direct materials if materials are added at the beginning of the process?

(continued)

Follow My Example 3-3

Total equivalent units for direct materials is 57,000, computed as follows:

	Total Whole Units	Percent Materials Added in Period	Equivalent Units for Direct Materials
Inventory in process, beginning of period	4,000	0%	0
Started and completed during the period	54,000*	100%	54,000
Transferred out of Bottling (completed)	58,000	—	54,000
Inventory in process, end of period	3,000	100%	3,000
Total units to be assigned costs	61,000		57,000

*(58,000 − 4,000)

For Practice: PE 3-3A, PE 3-3B

Conversion Equivalent Units To compute equivalent units for conversion costs, it is necessary to know how direct labor and factory overhead enter the manufacturing process. Direct labor, utilities, and equipment depreciation are often incurred uniformly during processing. For this reason, it is assumed that Frozen Delight incurs conversion costs evenly throughout its manufacturing process. Thus, the equivalent units for conversion costs in July are computed as follows:

		Total Whole Units	Percent Conversion Completed in July	Equivalent Units for Conversion
Group 1	Inventory in process, July 1 (70% completed)	5,000	30%	1,500
Group 2	Started and completed in July (62,000 − 5,000)	57,000	100%	57,000
	Transferred out to Packaging Department in July	62,000	—	58,500
Group 3	Inventory in process, July 31 (25% completed)	3,000	25%	750
	Total gallons to be assigned cost	65,000		59,250

As shown above, the whole units for the three groups of units determined in Step 1 are listed in the first column. The percent of conversion costs added in July is then listed. The equivalent units are determined by multiplying the whole units by the percent of conversion costs added.

To illustrate, the July 1 inventory has 5,000 gallons of whole units (Group 1) that are 70% complete as to conversion costs. During July, the remaining 30% (100% − 70%) of conversion costs was added. Therefore, the equivalent units of conversion costs added in July are 1,500 (5,000 × 30%) gallons.

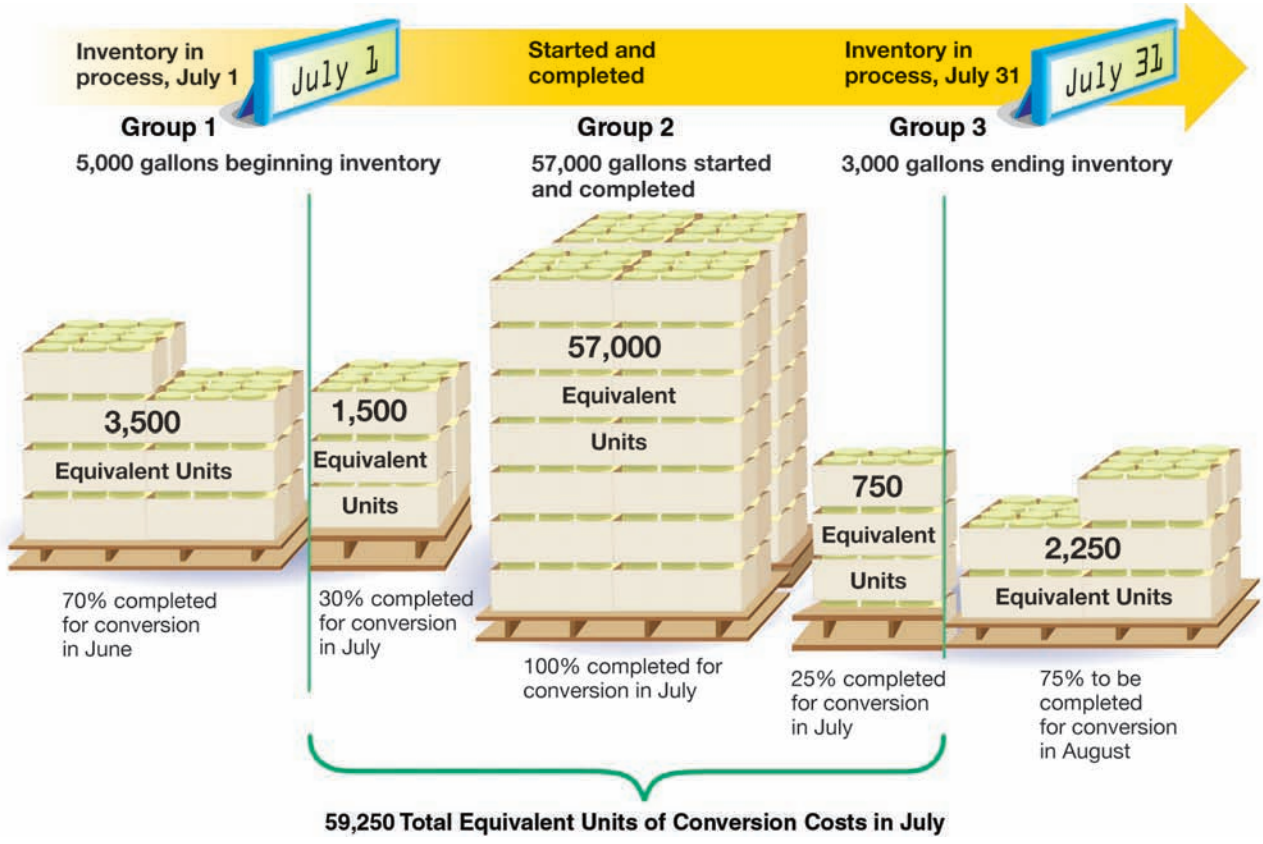
The 57,000 gallons started and completed in July (Group 2) are 100% complete as to conversion costs. Thus, the equivalent units of conversion costs for the gallons started and completed in July are 57,000 (57,000 × 100%) gallons.

The 3,000 gallons in process on July 31 (Group 3) are 25% complete as to conversion costs. Hence, the equivalent units for the inventory in process on July 31 are 750 (3,000 × 25%) gallons.

The equivalent units for conversion costs are summarized in Exhibit 6.

Exhibit 6

Conversion Equivalent Units



Example Exercise 3-4 Equivalent Units of Conversion Costs

2

The Bottling Department of Rocky Springs Beverage Company had 4,000 liters in beginning work in process inventory (30% complete). During the period, 58,000 liters were completed. The ending work in process inventory was 3,000 liters (60% complete). What are the total equivalent units for conversion costs?

Follow My Example 3-4

	Total Whole Units	Percent Conversion Completed in Period	Equivalent Units for Conversion
Inventory in process, beginning of period	4,000	70%	2,800
Started and completed during the period	54,000*	100%	54,000
Transferred out of Bottling (completed)	58,000	—	56,800
Inventory in process, end of period	3,000	60%	1,800
Total units to be assigned costs	61,000		58,600

*(58,000 − 4,000)

For Practice: PE 3-4A, PE 3-4B

Step 3: Determine the Cost per Equivalent Unit

The next step in preparing the cost of production report is to compute the cost per equivalent unit for direct materials and conversion costs. The **cost per equivalent unit** for direct materials and conversion costs is computed as follows:

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

The July direct materials and conversion cost equivalent units for Frozen Delight's Mixing Department from Step 2 are shown below.

		Equivalent Units	
		Direct Materials	Conversion
Group 1	Inventory in process, July 1	0	1,500
Group 2	Started and completed in July (62,000 − 5,000)	57,000	57,000
	Transferred out to Packaging Department in July	57,000	58,500
Group 3	Inventory in process, July 31	3,000	750
	Total gallons to be assigned cost	60,000	59,250

The direct materials and conversion costs incurred by Frozen Delight in July are as follows:

Direct materials		$66,000
Conversion costs:		
Direct labor	$10,500	
Factory overhead	7,275	17,775
Total product costs incurred in July		$83,775

The direct materials and conversion costs per equivalent unit are $1.10 and $0.30 per gallon, as computed below.

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\$66{,}000}{60{,}000 \text{ gallons}} = \$1.10 \text{ per gallon}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\$17{,}775}{59{,}250 \text{ gallons}} = \$0.30 \text{ per gallon}$$

The preceding costs per equivalent unit are used in Step 4 to allocate the direct materials and conversion costs to the completed and partially completed units.

Example Exercise 3-5 Cost per Equivalent Unit

2

The cost of direct materials transferred into the Bottling Department of Rocky Springs Beverage Company is $22,800. The conversion cost for the period in the Bottling Department is $8,790. The total equivalent units for direct materials and conversion are 57,000 liters and 58,600 liters, respectively. Determine the direct materials and conversion costs per equivalent unit.

Follow My Example 3-5

$$\text{Direct materials cost per equivalent unit} = \frac{\$22{,}800}{57{,}000 \text{ liters}} = \$0.40 \text{ per liter}$$

$$\text{Conversion cost per equivalent unit} = \frac{\$8{,}790}{58{,}600 \text{ liters}} = \$0.15 \text{ per liter}$$

For Practice: PE 3-5A, PE 3-5B

Step 4: Allocate Costs to Units Transferred Out and Partially Completed Units

Product costs must be allocated to the units transferred out and the partially completed units on hand at the end of the period. The product costs are allocated using the costs per equivalent unit for materials and conversion costs that were computed in Step 3.

The total production costs to be assigned for Frozen Delight in July are $90,000 as shown below.

Inventory in process, July 1, 5,000 gallons:	
Direct materials cost, for 5,000 gallons	$ 5,000
Conversion costs, for 5,000 gallons, 70% completed	1,225
Total inventory in process, July 1	$ 6,225
Direct materials cost for July, 60,000 gallons	66,000
Direct labor cost for July	10,500
Factory overhead applied for July	7,275
Total production costs to account for	$90,000

The units to be assigned these costs are shown below. The costs to be assigned these units are indicated by question marks (?).

		Units	Total Cost
Group 1	Inventory in process, July 1, completed in July	5,000 gallons	?
Group 2	Started and completed in July	57,000	?
	Transferred out to the Packaging Department in July	62,000 gallons	?
Group 3	Inventory in process, July 31	3,000	?
	Total	65,000 gallons	$90,000

Group 1: Inventory in Process on July 1 The 5,000 gallons of inventory in process on July 1 (Group 1) were completed and transferred out to the Packaging Department in July. The cost of these units of $6,675 is determined as follows:

	Direct Materials Costs	Conversion Costs	Total Costs
Inventory in process, July 1 balance			$6,225
Equivalent units for completing the July 1 in-process inventory	0	1,500	
Cost per equivalent unit	× $1.10	× $0.30	
Cost of completed July 1 in-process inventory	0	$ 450	450
Cost of July 1 in-process inventory transferred to Packaging Department			$6,675

As shown above, $6,225 of the cost of the July 1 in-process inventory of 5,000 gallons was carried over from June. This cost plus the cost of completing the 5,000 gallons in July was transferred to the Packaging Department during July. The cost of completing the 5,000 gallons during July is $450. The $450 represents the conversion costs necessary to complete the remaining 30% of the processing. There were no direct materials costs added in July because all the materials costs had been added in June. Thus, the cost of the 5,000 gallons in process on July 1 (Group 1) transferred to the Packaging Department is $6,675.

Group 2: Started and Completed The 57,000 units started and completed in July (Group 2) incurred all (100%) of their direct materials and conversion costs in July. Thus, the cost of the 57,000 gallons started and completed is $79,800 computed by multiplying 57,000 gallons by the costs per equivalent unit for materials and conversion costs as shown on the next page.

	Direct Materials Costs	Conversion Costs	Total Costs
Units started and completed in July. . . .	57,000 gallons	57,000 gallons	
Cost per equivalent unit	× $1.10	× $0.30	
Cost of the units started and completed in July.	$62,700	$17,100	$79,800

The total cost transferred to the Packaging Department in July of $86,475 is the sum of the beginning inventory cost and the costs of the units started and completed in July as shown below.

Group 1	Cost of July 1 in-process inventory	$ 6,675
Group 2	Cost of the units started and completed in July	79,800
	Total costs transferred to Packaging Department in July	$86,475

Group 3: Inventory in Process on July 31 The 3,000 gallons in process on July 31 (Group 3) incurred all their direct materials costs and 25% of their conversion costs in July. The cost of these partially completed units of $3,525 is computed below.

	Direct Materials Costs	Conversion Costs	Total Costs
Equivalent units in ending inventory	3,000 gallons	750 gallons	
Cost per equivalent unit	× $1.10	× $0.30	
Cost of July 31 in-process inventory	$3,300	$225	$3,525

The 3,000 gallons in process on July 31 received all (100%) of their materials in July. Therefore, the direct materials cost incurred in July is $3,300 (3,000 × $1.10). The conversion costs of $225 represent the cost of the 750 (3,000 × 25%) equivalent gallons times the cost per equivalent unit for conversion costs of $0.30. The sum of the direct materials cost ($3,300) and the conversion costs ($225) equals the total cost of the July 31 work in process inventory of $3,525 ($3,300 + $225).

To summarize, the total manufacturing costs for Frozen Delight in July were assigned as shown below. In doing so, the question marks (?) on page 94 have been answered.

		Units	Total Cost
Group 1	Inventory in process, July 1, completed in July . .	5,000 gallons	$ 6,675
Group 2	Started and completed in July	57,000	79,800
	Transferred out to the Packaging Department in July	62,000 gallons	$86,475
Group 3	Inventory in process, July 31	3,000	3,525
	Total	65,000 gallons	$90,000

Example Exercise 3-6 Cost of Units Transferred Out and Ending Work in Process

2

The costs per equivalent unit of direct materials and conversion in the Bottling Department of Rocky Springs Beverage Company are $0.40 and $0.15, respectively. The equivalent units to be assigned costs are as follows:

	Equivalent Units	
	Direct Materials	Conversion
Inventory in process, beginning of period	0	2,800
Started and completed during the period	54,000	54,000
Transferred out of Bottling (completed)	54,000	56,800
Inventory in process, end of period	3,000	1,800
Total units to be assigned costs	57,000	58,600

The beginning work in process inventory had a cost of $1,860. Determine the cost of units transferred out and the ending work in process inventory.

(continued)

Follow My Example 3-6

	Direct Materials Costs		Conversion Costs	Total Costs
Inventory in process, beginning of period				$ 1,860
Inventory in process, beginning of period	0	+	2,800 × $0.15	420
Started and completed during the period	54,000 × $0.40	+	54,000 × $0.15	29,700
Transferred out of Bottling (completed)				$31,980
Inventory in process, end of period	3,000 × $0.40	+	1,800 × $0.15	1,470
Total costs assigned by the Bottling Department				$33,450
Completed and transferred out of production	$31,980			
Inventory in process, ending	$ 1,470			

For Practice: PE 3-6A, PE 3-6B

Preparing the Cost of Production Report

A cost of production report is prepared for each processing department at periodic intervals. The report summarizes the following production quantity and cost data:

1. The units for which the department is accountable and the disposition of those units.
2. The production costs incurred by the department and the allocation of those costs between completed (transferred out) and partially completed units.

Using Steps 1–4, the July cost of production report for Frozen Delight's Mixing Department is shown in Exhibit 7.

As shown in Exhibit 7, the Mixing Department was accountable for 65,000 units (gallons). Of these units, 62,000 units were completed and transferred to the Packaging Department. The remaining 3,000 units are partially completed and are part of in-process inventory as of July 31.

The Mixing Department was responsible for $90,000 of production costs during July. The cost of goods transferred to the Packaging Department in July was $86,475. The remaining cost of $3,525 is part of in-process inventory as of July 31.

Exhibit 7

Cost of Production Report for Frozen Delight's Mixing Department—FIFO

	A	B	C	D	E
1	Frozen Delight				
2	Cost of Production Report—Mixing Department				
3	For the Month Ended July 31, 2010				
4					
5		Whole Units	Equivalent Units		
6	UNITS		Direct Materials	Conversion	
7	Units charged to production:				
8	Inventory in process, July 1	5,000			
9	Received from materials storeroom	60,000			
10	Total units accounted for by the Mixing Department	65,000			
11					
12	Units to be assigned costs:				
13	Inventory in process, July 1 (70% completed)	5,000	0	1,500	
14	Started and completed in July	57,000	57,000	57,000	
15	Transferred to Packaging Department in July	62,000	57,000	58,500	
16	Inventory in process, July 31 (25% completed)	3,000	3,000	750	
17	Total units to be assigned costs	65,000	60,000	59,250	
18					

Step 1 Step 2

(continued)

Exhibit 7

Cost of Production Report for Frozen Delight's Mixing Department—FIFO *(concluded)*

			Costs				
	COSTS		Direct Materials		Conversion		Total
	Costs per equivalent unit:						
	Total costs for July in Mixing Department		$ 66,000		$ 17,775		
	Total equivalent units (from step 2 above)		÷60,000		÷59,250		
Step 3	Cost per equivalent unit		$ 1.10		$ 0.30		
	Costs assigned to production:						
	Inventory in process, July 1						$ 6,225
	Costs incurred in July						83,775[a]
	Total costs accounted for by the Mixing Department						$90,000
	Cost allocated to completed and partially						
	completed units:						
	Inventory in process, July 1—balance						$ 6,225
	To complete inventory in process, July 1		$ 0	+	$ 450[b]	=	450
Step 4	Cost of completed July 1 work in process						$ 6,675
	Started and completed in July		$ 62,700[c]	+	$17,100[d]	=	79,800
	Transferred to Packaging Department in July						$86,475
	Inventory in process, July 31		$ 3,300[e]	+	$ 225[f]	=	3,525
	Total costs assigned by the Mixing Department						$90,000

[a]$66,000 + $10,500 + $7,275 = $83,775 [b]1,500 units × $0.30 = $450 [c]57,000 units × $1.10 = $62,700 [d]57,000 units × $0.30 = $17,100
[e]3,000 units × $1.10 = $3,300 [f]750 units × $0.30 = $225

3 Journalize entries for transactions using a process cost system.

Journal Entries for a Process Cost System

The journal entries to record the cost flows and transactions for a process cost system are illustrated in this section. As a basis for illustration, the July transactions for Frozen Delight are used. To simplify, the entries are shown in summary form, even though many of the transactions would be recorded daily.

a. Purchased materials, including milk, cream, sugar, packaging, and indirect materials on account, $88,000.

		Materials	88,000	
		Accounts Payable		88,000

b. The Mixing Department requisitioned milk, cream, and sugar, $66,000. This is the amount indicated on page 87. Packaging materials of $8,000 were requisitioned by the Packaging Department. Indirect materials for the Mixing and Packaging departments were $4,125 and $3,000, respectively.

		Work in Process—Mixing	66,000	
		Work in Process—Packaging	8,000	
		Factory Overhead—Mixing	4,125	
		Factory Overhead—Packaging	3,000	
		Materials		81,125

c. Incurred direct labor in the Mixing and Packaging departments of $10,500 and $12,000, respectively.

		Work in Process—Mixing	10,500	
		Work in Process—Packaging	12,000	
		Wages Payable		22,500

d. Recognized equipment depreciation for the Mixing and Packaging departments of $3,350 and $1,000, respectively.

		Factory Overhead—Mixing	3,350	
		Factory Overhead—Packaging	1,000	
		Accumulated Depreciation—Equipment		4,350

e. Applied factory overhead to Mixing and Packaging departments of $7,275 and $3,500, respectively.

		Work in Process—Mixing	7,275	
		Work in Process—Packaging	3,500	
		Factory Overhead—Mixing		7,275
		Factory Overhead—Packaging		3,500

f. Transferred costs of $86,475 from the Mixing Department to the Packaging Department per the cost of production report in Exhibit 7.

		Work in Process—Packaging	86,475	
		Work in Process—Mixing		86,475

g. Transferred goods of $106,000 out of the Packaging Department to Finished Goods according to the Packaging Department cost of production report (not illustrated).

		Finished Goods—Ice Cream	106,000	
		Work in Process—Packaging		106,000

h. Recorded cost of goods sold out of the finished goods inventory of $107,000.

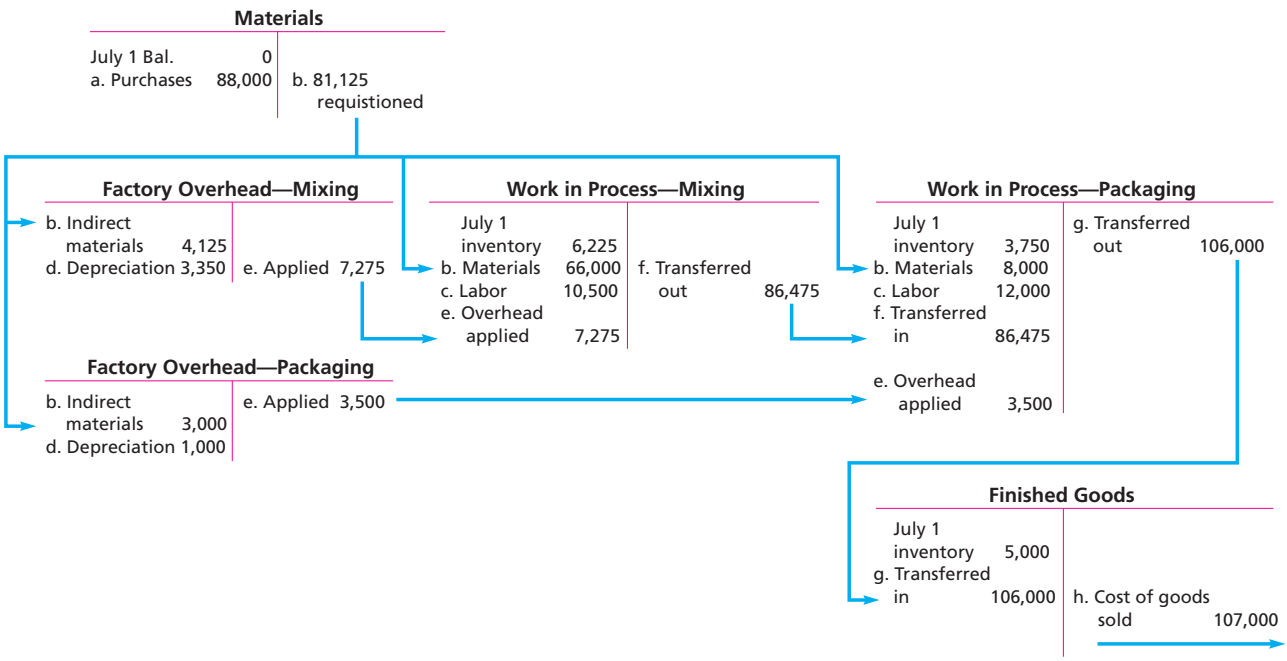
		Cost of Goods Sold	107,000	
		Finished Goods—Ice Cream		107,000

Exhibit 8 shows the flow of costs for each transaction. The highlighted amounts in Exhibit 8 were determined from assigning the costs in the Mixing Department. These

amounts were computed and are shown at the bottom of the cost of production report for the Mixing Department in Exhibit 7. Likewise, the amount transferred out of the Packaging Department to Finished Goods would have also been determined from a cost of production report for the Packaging Department.

Exhibit 8

Frozen Delight's Cost Flows



The ending inventories for Frozen Delight are reported on the July 31 balance sheet as follows:

Materials	$ 6,875
Work in Process—Mixing Department	3,525
Work in Process—Packaging Department	7,725
Finished Goods	4,000
Total inventories	$22,125

The $3,525 of Work in Process—Mixing Department is the amount determined from the bottom of the cost of production report in Exhibit 7.

Example Exercise 3-7 Process Cost Journal Entries

3

The cost of materials transferred into the Bottling Department of Rocky Springs Beverage Company is $22,800, including $20,000 from the Blending Department and $2,800 from the materials storeroom. The conversion cost for the period in the Bottling Department is $8,790 ($3,790 factory overhead applied and $5,000 direct labor). The total cost transferred to Finished Goods for the period was $31,980. The Bottling Department had a beginning inventory of $1,860.

a. Journalize (1) the cost of transferred-in materials, (2) conversion costs, and (3) the costs transferred out to Finished Goods.
b. Determine the balance of Work in Process—Bottling at the end of the period.

(continued)

Follow My Example 3-7

a. 1. Work in Process—Bottling 22,800
Work in Process—Blending 20,000
Materials 2,800

2. Work in Process—Bottling 8,790
Factory Overhead—Bottling 3,790
Wages Payable 5,000

3. Finished Goods 31,980
Work in Process—Bottling 31,980

b. $1,470 ($1,860 + $22,800 + $8,790 − $31,980)

For Practice: PE 3-7A, PE 3-7B

4 Describe and illustrate the use of cost of production reports for decision making.

Using the Cost of Production Report for Decision Making

The cost of production report is often used by managers for decisions involving the control and improvement of operations. To illustrate, cost of production reports for Frozen Delight and Holland Beverage Company are used. Finally, the computation and use of yield is discussed.

Frozen Delight

The cost of production report for the Mixing Department is shown in Exhibit 7. The cost per equivalent unit for June can be determined from the beginning inventory. The Frozen Delight data on page 87 indicate that the July 1 inventory in process of $6,225 consists of the following costs:

Direct materials cost, 5,000 gallons	$5,000
Conversion costs, 5,000 gallons, 70% completed	1,225
Total inventory in process, July 1	$6,225

Using the preceding data, the June costs per equivalent unit of materials and conversion costs can be determined as follows:

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\$5{,}000}{5{,}000 \text{ gallons}} = \$1.00 \text{ per gallon}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\$1{,}225}{(5{,}000 \times 70\%) \text{ gallons}} = \$0.35 \text{ per gallon}$$

In July the cost per equivalent unit of materials increased by $0.10 per gallon, while the cost per equivalent unit for conversion costs decreased by $0.05 per gallon, as shown below.

	July	June	Increase (Decrease)
Cost per equivalent unit for direct materials	$1.10	$1.00	$0.10
Cost per equivalent unit for conversion costs	0.30	0.35	(0.05)

Frozen Delight's management could use the preceding analysis as a basis for investigating the increase in the direct materials cost per equivalent unit and the decrease in the conversion cost per equivalent unit.

Holland Beverage Company

A cost of production report may be prepared in greater detail than shown in Exhibit 7. This greater detail can help managers isolate problems and seek opportunities for improvement.

To illustrate, the Blending Department of Holland Beverage Company prepared cost of production reports for April and May. To simplify, assume that the Blending Department had no beginning or ending work in process inventory in either month. In other words, all units started were completed in each month. The cost of production reports for April and May in the Blending Department are as follows:

	A	B	C	D
1	Cost of Production Reports			
2	Holland Beverage Company—Blending Department			
3	For the Months Ended April 30 and May 31, 2010			
4		April	May	
5	Direct materials	$ 20,000	$ 40,600	
6	Direct labor	15,000	29,400	
7	Energy	8,000	20,000	
8	Repairs	4,000	8,000	
9	Tank cleaning	3,000	8,000	
10	Total	$ 50,000	$106,000	
11	Units completed	÷100,000	÷200,000	
12	Cost per unit	$ 0.50	$ 0.53	
13				

The May results indicate that total unit costs have increased from $0.50 to $0.53, or 6% from April. To determine the possible causes for this increase, the cost of production report is restated in per-unit terms by dividing the costs by the number of units completed, as shown below.

	A	B	C	D
1	Blending Department			
2	Per-Unit Expense Comparisons			
3		April	May	% Change
4	Direct materials	$0.200	$0.203	1.50%
5	Direct labor	0.150	0.147	−2.00%
6	Energy	0.080	0.100	25.00%
7	Repairs	0.040	0.040	0.00%
8	Tank cleaning	0.030	0.040	33.33%
9	Total	$0.500	$0.530	6.00%
10				

Both energy and tank cleaning per-unit costs have increased significantly in May. These increases should be further investigated. For example, the increase in energy may be due to the machines losing fuel efficiency. This could lead management to repair the machines. The tank cleaning costs could be investigated in a similar fashion.

Yield

In addition to unit costs, managers of process manufacturers are also concerned about yield. The **yield** is computed as follows:

$$\text{Yield} = \frac{\text{Quantity of Material Output}}{\text{Quantity of Material Input}}$$

To illustrate, assume that 1,000 pounds of sugar enter the Packaging Department, and 980 pounds of sugar were packed. The yield is 98% as computed below.

$$\text{Yield} = \frac{\text{Quantity of Material Output}}{\text{Quantity of Material Input}} = \frac{980 \text{ pounds}}{1{,}000 \text{ pounds}} = 98\%$$

Thus, two percent (100% − 98%) or 20 pounds of sugar was lost or spilled during the packing process. Managers can investigate significant changes in yield over time or significant differences in yield from industry standards.

Example Exercise 3-8 Using Process Costs for Decision Making 4

The cost of energy consumed in producing good units in the Bottling Department of Rocky Springs Beverage Company was $4,200 and $3,700 for March and April, respectively. The number of equivalent units produced in March and April was 70,000 liters and 74,000 liters, respectively. Evaluate the cost of energy between the two months.

Follow My Example 3-8

$$\text{Energy cost per liter, March} = \frac{\$4{,}200}{70{,}000 \text{ liters}} = \$0.06$$

$$\text{Energy cost per liter, April} = \frac{\$3{,}700}{74{,}000 \text{ liters}} = \$0.05$$

The cost of energy has appeared to improve by 1 cent per liter between March and April.

For Practice: PE 3-8A, PE 3-8B

5 Compare just-in-time processing with traditional manufacturing processing.

Just-in-Time Processing

The objective of most manufacturers is to produce products with high quality, low cost, and instant availability. In attempting to achieve this objective, many manufacturers have implemented just-in-time processing. **Just-in-time (JIT) processing** is a management approach that focuses on reducing time and cost and eliminating poor quality. A JIT system obtains efficiencies and flexibility by reorganizing the traditional production process.

A traditional manufacturing process for a furniture manufacturer is shown in Exhibit 9. The product (chair) moves through seven processes. In each process, workers are assigned a specific job, which is performed repeatedly as unfinished products are received from the preceding department. The product moves from process to process as each function or step is completed.

EXHIBIT 9

Traditional Production Line

For the furniture maker in Exhibit 9, the product (chair) moves through the following processes:

1. In the Cutting Department, the wood is cut to design specifications.
2. In the Drilling Department, the wood is drilled to design specifications.
3. In the Sanding Department, the wood is sanded.
4. In the Staining Department, the wood is stained.
5. In the Varnishing Department, varnish and other protective coatings are applied.
6. In the Upholstery Department, fabric and other materials are added.
7. In the Assembly Department, the product (chair) is assembled.

In the traditional production process, supervisors enter materials into manufacturing so as to keep all the manufacturing departments (processes) operating. Some departments, however, may process materials more rapidly than others. In addition, if one department stops because of machine breakdowns, for example, the preceding departments usually continue production in order to avoid idle time. In such cases, a buildup of work in process inventories results in some departments.

In a just-in-time system, processing functions are combined into work centers, sometimes called **manufacturing cells**. For example, the seven departments illustrated in Exhibit 9 might be reorganized into the following three work centers:

1. Work Center 1 performs the cutting, drilling, and sanding functions.
2. Work Center 2 performs the staining and varnishing functions.
3. Work Center 3 performs the upholstery and assembly functions.

The preceding JIT manufacturing process is illustrated in Exhibit 10.

Exhibit 10

Just-in-Time Production Line

Before Caterpillar implemented JIT, a transmission traveled 10 miles through the factory and required 1,000 pieces of paper to support the manufacturing process. After implementing JIT, a transmission travels only 200 feet and requires only 10 pieces of paper.

In traditional manufacturing, a worker typically performs only one function. However, in JIT manufacturing, work centers complete several functions. Thus, workers are often cross-trained to perform more than one function. Research has indicated that workers who perform several functions identify better with the end product. This creates pride in the product and improves quality and productivity.

The activities supporting the manufacturing process are called *service activities*. For example, repair and maintenance of manufacturing equipment are service activities. In a JIT manufacturing process, service activities may be assigned to individual work centers, rather than to centralized service departments. For example, each work center may be assigned responsibility for the repair and maintenance of its machinery and equipment. This creates an environment in which workers gain a better understanding of the production process and their machinery. In turn, workers tend to take better care of the

The Internet complements a just-in-time processing strategy. Ford Motor Company states that the impact of the Internet is the equivalent of "the moving assembly line of the 21st Century." This is because the Internet will connect the whole supply chain—from customers to suppliers—to create a fast and efficient manufacturing system.

machinery, which decreases repairs and maintenance costs, reduces machine downtime, and improves product quality.

In a JIT system, the product is often placed on a movable carrier that is centrally located in the work center. After the workers in a work center have completed their activities with the product, the entire carrier and any additional materials are moved just in time to satisfy the demand or need of the next work center. In this sense, the product is said to be "pulled through." Each work center is connected to other work centers through information contained on a Kanban, which is a Japanese term for cards.

In summary, the primary objective of JIT systems is to increase the efficiency of operations. This is achieved by eliminating waste and simplifying the production process. At the same time, JIT systems emphasize continually improving the manufacturing process and product quality. JIT systems, including cost management in JIT systems, are further described and illustrated in Chapter 12.

Business Connection

RADICAL IMPROVEMENT: JUST IN TIME FOR PULASKI'S CUSTOMERS

Pulaski Furniture Corporation embraced just-in-time manufacturing principles and revolutionized its business. The company wanted to "be easier to do business with" by offering its customers smaller shipments more frequently. It was able to accomplish this by taking the following steps:

- Mapping processes to properly align labor, machines, and materials.
- Eliminating 100 feet of conveyor line.
- Moving machines into manufacturing cells.
- Reducing manufacturing run sizes by simplifying the product design.
- Making every product more frequently in order to reduce the customer's waiting time for a product.

As a result of these just-in-time changes, the company significantly improved its inventory position while simultaneously improving its shipping times to the customer. Its lumber inventory was reduced by 25%, finished goods inventory was reduced by 40%, and work in process inventory was reduced by 50%. At the same time, customers' shipment waiting times were shortened from months to weeks.

Source: Jeff Linville, "Pulaski's Passion for Lean Plumps up Dealer Service," *Furniture Today*, June 2006.

APPENDIX

Average Cost Method

A cost flow assumption must be used as product costs flow through manufacturing processes. In this chapter, the first-in, first-out cost flow method was used for the Mixing Department of Frozen Delight. In this appendix, the average cost flow method is illustrated for S&W Ice Cream Company (S&W).

Determining Costs Using the Average Cost Method

S&W's operations are similar to those of Frozen Delight. Like Frozen Delight, S&W mixes direct materials (milk, cream, sugar) in refrigerated vessels and has two manufacturing departments, Mixing and Packaging.

The manufacturing data for the Mixing Department for July 2010 are as follows:

Work in process inventory, July 1, 5,000 gallons (70% completed)	$ 6,200
Direct materials cost incurred in July, 60,000 gallons	66,000
Direct labor cost incurred in July	10,500
Factory overhead applied in July	6,405
Total production costs to account for	$89,105
Cost of goods transferred to Packaging in July (includes units in process on July 1), 62,000 gallons	?
Cost of work in process inventory, July 31, 3,000 gallons, 25% completed as to conversion costs	?

Using the average cost method, the objective is to allocate the total costs of production of $89,105 to the following:

1. The 62,000 gallons completed and transferred to the Packaging Department
2. The 3,000 gallons in the July 31 (ending) work in process inventory

The preceding costs show two question marks. These amounts are determined by preparing a cost of production report using the following four steps:

Step 1. Determine the units to be assigned costs.
Step 2. Compute equivalent units of production.
Step 3. Determine the cost per equivalent unit.
Step 4. Allocate costs to transferred out and partially completed units.

Under the average cost method, all production costs (materials and conversion costs) are combined together for determining equivalent units and cost per equivalent unit. To simplify, this approach is used in this appendix.

Step 1: Determine the Units to Be Assigned Costs The first step is to determine the units to be assigned costs. A unit can be any measure of completed production, such as tons, gallons, pounds, barrels, or cases. For S&W, a unit is a gallon of ice cream.

S&W's Mixing Department had 65,000 gallons of direct materials to account for during July, as shown here.

Total gallons to account for:	
Work in process, July	5,000 gallons
Received from materials storeroom	60,000
Total units to account for by the Packaging Department	65,000 gallons

There are two groups of units to be assigned costs for the period.

Group 1	Units completed and transferred out
Group 2	Units in the July 31 (ending) work in process inventory

During July, the Mixing Department completed and transferred 62,000 gallons to the Packaging Department. Of the 60,000 gallons started in July, 57,000 (60,000 − 3,000) gallons were completed and transferred to the Packaging Department. Thus, the ending work in process inventory consists of 3,000 gallons.

The total units (gallons) to be assigned costs for S&W can be summarized as follows:

Group 1	Units transferred out to the Packaging Department in July	62,000 gallons
Group 2	Work in process inventory, July 31	3,000
	Total gallons to be assigned costs	65,000 gallons

The total units (gallons) to be assigned costs (65,000 gallons) equal the total units to account for (65,000 gallons).

Step 2: Compute Equivalent Units of Production S&W has 3,000 gallons of whole units in the work in process inventory for the Mixing Department on July 31. Since these units are 25% complete, the number of equivalent units in process in the Mixing Department on July 31 is 750 gallons (3,000 gallons × 25%). Since the units transferred to the Packaging Department have been completed, the whole units (62,000 gallons) transferred are the same as the equivalent units transferred.

The total equivalent units of production for the Mixing Department are determined by adding the equivalent units in the ending work in process inventory to the units transferred and completed during the period as shown below.

Equivalent units completed and transferred to the Packaging Department during July	62,000 gallons
Equivalent units in ending work in process, July 31	750
Total equivalent units	62,750 gallons

Step 3: Determine the Cost per Equivalent Unit Since materials and conversion costs are combined under the average cost method, the cost per equivalent unit is determined by dividing the total production costs by the total equivalent units of production as follows:

$$\text{Cost per Equivalent Unit} = \frac{\text{Total Production Costs}}{\text{Total Equivalent Units}}$$

$$\text{Cost per Equivalent Unit} = \frac{\text{Total Production Costs}}{\text{Total Equivalent Units}} = \frac{\$89{,}105}{62{,}750 \text{ gallons}} = \$1.42$$

The cost per equivalent unit shown above is used in Step 4 to allocate the production costs to the completed and partially completed units.

Step 4: Allocate Costs to Transferred Out and Partially Completed Units The cost of transferred and partially completed units is determined by multiplying the cost per equivalent unit times the equivalent units of production. For the Mixing Department, these costs are determined as follows:

Group 1	Transferred out to the Packaging Department (62,000 gallons × $1.42)	$88,040
Group 2	Work in process inventory, July 31 (3,000 gallons × 25% × $1.42)	1,065
	Total production costs assigned	$89,105

The Cost of Production Report

The July cost of production report for S&W's Mixing Department is shown in Exhibit 11. This cost of production report summarizes the following:

1. The units for which the department is accountable and the disposition of those units
2. The production costs incurred by the department and the allocation of those costs between completed and partially completed units

Exhibit 11

Cost of Production Report for S&W's Mixing Department—Average Cost

	A	B	C
1	S&W Ice Cream Company		
2	Cost of Production Report—Mixing Department		
3	For the Month Ended July 31, 2010		
4	UNITS		
5		Whole Units	Equivalent Units
6			of Production
7	Units to account for during production:		
8	Work in process inventory, July 1	5,000	
9	Received from materials storeroom	60,000	
10	Total units accounted for by the Mixing Department	65,000	
11			
12	Units to be assigned costs:		
13	Transferred to Packaging Department in July	62,000	62,000
14	Inventory in process, July 31 (25% completed)	3,000	750
15	Total units to be assigned costs	65,000	62,750
16			
17	COSTS		
18			
19	Cost per equivalent unit:		
20	Total production costs for July in Mixing Department		$89,105
21	Total equivalent units (from Step 2 above)		÷62,750
22	Cost per equivalent unit		$ 1.42
23			
24	Costs assigned to production:		
25	Inventory in process, July 1		$ 6,200
26	Direct materials, direct labor, and factory overhead incurred in July		82,905
27	Total costs accounted for by the Mixing Department		$89,105
28			
29			
30	Costs allocated to completed and partially completed units:		
31	Transferred to Packaging Department in July (62,000 gallons × $1.42)		$88,040
32	Inventory in process, July 31 (3,000 gallons × 25% × $1.42)		1,065
33	Total costs assigned by the Mixing Department		$89,105
34			

Step 1 — Whole Units
Step 2 — Equivalent Units of Production
Step 3 — rows 19–27
Step 4 — rows 30–33

At a Glance 3

1 Describe process cost systems.

Key Points

The process cost system is best suited for industries that mass produce identical units of a product. Costs are charged to processing departments, rather than to jobs as with the job order cost system. These costs are transferred from one department to the next until production is completed.

Key Learning Outcomes

- Identify the characteristics of a process manufacturer.
- Compare and contrast the job order cost system with the process cost system.
- Describe the physical and cost flows of a process manufacturer.

Example Exercises	Practice Exercises
3-1	3-1A, 3-1B

2 Prepare a cost of production report.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Manufacturing costs must be allocated between the units that have been completed and those that remain within the department. This allocation is accomplished by allocating costs using equivalent units of production during the period for the beginning inventory, units started and completed, and the ending inventory.	• Determine the whole units charged to production and to be assigned costs.	**3-2**	3-2A, 3-2B
	• Compute the equivalent units with respect to materials.	**3-3**	3-3A, 3-3B
	• Compute the equivalent units with respect to conversion.	**3-4**	3-4A, 3-4B
	• Compute the costs per equivalent unit.	**3-5**	3-5A, 3-5B
	• Allocate the costs to beginning inventory, units started and completed, and ending inventory.	**3-6**	3-6A, 3-6B
	• Prepare a cost of production report.		

3 Journalize entries for transactions using a process cost system.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Prepare the summary journal entries for materials, labor, applied factory overhead, and transferred costs incurred in production.	• Prepare journal entries for process costing transactions.	**3-7**	3-7A, 3-7B
	• Summarize cost flows in T account form.		
	• Compute the ending inventory balances.		

4 Describe and illustrate the use of cost of production reports for decision making.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The cost of production report provides information for controlling and improving operations. The report(s) can provide details of a department for a single period, or over a period of time.	• Prepare and evaluate a report showing the change in costs per unit by cost element for comparative periods.	**3-8**	3-8A, 3-8B
Yield measures the quantity of output of production relative to the inputs.	• Compute and interpret yield.		

5 Compare just-in-time processing with traditional manufacturing processing.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The just-in-time processing philosophy focuses on reducing time, cost, and poor quality within the process.	• Identify the characteristics of a just-in-time process.		

Key Terms

cost of production report (87)
cost per equivalent unit (92)
equivalent units of production (89)
first-in, first-out (FIFO) method (87)
just-in-time (JIT) processing (102)
manufacturing cells (103)
process cost system (81)
process manufacturer (81)
whole units (89)
yield (101)

Illustrative Problem

Southern Aggregate Company manufactures concrete by a series of four processes. All materials are introduced in Crushing. From Crushing, the materials pass through Sifting, Baking, and Mixing, emerging as finished concrete. All inventories are costed by the first-in, first-out method.

The balances in the accounts Work in Process—Mixing and Finished Goods were as follows on May 1, 2010:

Work in Process—Mixing (2,000 units, 1/4 completed)	$13,700
Finished Goods (1,800 units at $8.00 a unit)	14,400

The following costs were charged to Work in Process—Mixing during May:

Direct materials transferred from Baking:	
15,200 units at $6.50 a unit	$98,800
Direct labor	17,200
Factory overhead	11,780

During May, 16,000 units of concrete were completed, and 15,800 units were sold. Inventories on May 31 were as follows:

Work in Process—Mixing: 1,200 units, 1/2 completed
Finished Goods: 2,000 units

Instructions

1. Prepare a cost of production report for the Mixing Department.
2. Determine the cost of goods sold (indicate number of units and unit costs).
3. Determine the finished goods inventory, May 31, 2010.

Solution

1. See page 838 for the cost of production report.
2. Cost of goods sold:

1,800 units at $8.00	$ 14,400	(from finished goods beginning inventory)
2,000 units at $8.20*	16,400	(from work in process beginning inventory)
12,000 units at $8.30**	99,600	(from May production started and completed)
15,800 units	$130,400	

*($13,700 + $2,700)/2,000
**$116,200/14,000

3. Finished goods inventory, May 31:

2,000 units at $8.30 $16,600

	A	B	C	D	E
1	Southern Aggregate Company				
2	Cost of Production Report—Mixing Department				
3	For the Month Ended May 31, 2010				
4			Equivalent Units		
5	UNITS	Whole Units	Direct Materials	Conversion	
6	Units charged to production:				
7	Inventory in process, May 1	2,000			
8	Received from Baking	15,200			
9	Total units accounted for by the Mixing Department	17,200			
10					
11	Units to be assigned costs:				
12	Inventory in process, May 1 (25% completed)	2,000	0	1,500	
13	Started and completed in May	14,000	14,000	14,000	
14	Transferred to finished goods in May	16,000	14,000	15,500	
15	Inventory in process, May 31 (50% completed)	1,200	1,200	600	
16	Total units to be assigned costs	17,200	15,200	16,100	
17					
18			Costs		
19	COSTS		Direct Materials	Conversion	Total
20	Unit costs:				
21	Total costs for May in Mixing		$ 98,800	$ 28,980	
22	Total equivalent units (row 16)		÷15,200	÷16,100	
23	Cost per equivalent unit		$ 6.50	$ 1.80	
24					
25	Costs assigned to production:				
26	Inventory in process, May 1				$ 13,700
27	Costs incurred in May				127,780
28	Total costs accounted for by the Mixing Department				$141,480
29					
30	Cost allocated to completed and partially				
31	completed units:				
32	Inventory in process, May 1—balance				$ 13,700
33	To complete inventory in process, May 1		$ 0	$ 2,700[a]	2,700
34	Cost of completed May 1 work in process				$ 16,400
35	Started and completed in May		$91,000[b]	$25,200[c]	116,200
36	Transferred to finished goods in May				$132,600
37	Inventory in process, May 31		$ 7,800[d]	$ 1,080[e]	8,880
38	Total costs assigned by the Mixing Department				$141,480
39					

[a] 1,500 × $1.80 = $2,700 [b] 14,000 × $6.50 = $91,000 [c] 14,000 × $1.80 = $25,200 [d] 1,200 × $6.50 = $7,800
[e] 600 × $1.80 = $1,080

Self-Examination Questions (Answers at End of Chapter)

1. For which of the following businesses would the process cost system be most appropriate?
   A. Custom furniture manufacturer
   B. Commercial building contractor
   C. Crude oil refinery
   D. Automobile repair shop
2. There were 2,000 pounds in process at the beginning of the period in the Packing Department. Packing received 24,000 pounds from the Blending Department during the month, of which 3,000 pounds were in process at the end of the month. How many pounds were completed and transferred to finished goods from the Packing Department?
   A. 23,000 C. 26,000
   B. 21,000 D. 29,000
3. Information relating to production in Department A for May is as follows:

May 1	Balance, 1,000 units, ¾ completed	$22,150
31	Direct materials, 5,000 units	75,000
31	Direct labor	32,500
31	Factory overhead	16,250

If 500 units were one-fourth completed at May 31, 5,500 units were completed during May, and inventories are costed by the first-in, first-out method, what was the number of equivalent units of production with respect to conversion costs for May?
   A. 4,500 C. 5,500
   B. 4,875 D. 6,000

4. Based on the data presented in Question 3, what is the conversion cost per equivalent unit?
   A. $10 C. $25
   B. $15 D. $32
5. Information from the accounting system revealed the following:

	Day 1	Day 2	Day 3	Day 4	Day 5
Materials	$20,000	$18,000	$22,000	$20,000	$20,000
Electricity	2,500	3,000	3,500	4,000	4,700
Maintenance	4,000	3,750	3,400	3,000	2,800
Total costs	$26,500	$24,750	$28,900	$27,000	$27,500
Pounds produced	÷10,000	÷9,000	÷11,000	÷10,000	÷10,000
Cost per unit	$ 2.65	$ 2.75	$ 2.63	$ 2.70	$ 2.75

Which of the following statements best interprets this information?
A. The total costs are out of control.
B. The product costs have steadily increased because of higher electricity costs.
C. Electricity costs have steadily increased because of lack of maintenance.
D. The unit costs reveal a significant operating problem.

Eye Openers

1. Which type of cost system, process or job order, would be best suited for each of the following: (a) TV assembler, (b) building contractor, (c) automobile repair shop, (d) paper manufacturer, (e) custom jewelry manufacturer? Give reasons for your answers.
2. In job order cost accounting, the three elements of manufacturing cost are charged directly to job orders. Why is it not necessary to charge manufacturing costs in process cost accounting to job orders?
3. In a job order cost system, direct labor and factory overhead applied are debited to individual jobs. How are these items treated in a process cost system and why?
4. What are transferred-out materials?
5. What are the four steps for determining the cost of goods completed and the ending inventory?
6. What is meant by the term *equivalent units?*
7. Why is the cost per equivalent unit often determined separately for direct materials and conversion costs?
8. What is the purpose for determining the cost per equivalent unit?
9. Rameriz Company is a process manufacturer with two production departments, Blending and Filling. All direct materials are introduced in Blending from the materials store area. What is included in the cost transferred to Filling?
10. How is actual factory overhead accounted for in a process manufacturer?
11. What is the most important purpose of the cost of production report?
12. How are cost of production reports used for controlling and improving operations?
13. How is "yield" determined for a process manufacturer?
14. What is just-in-time processing?
15. How does just-in-time processing differ from the conventional manufacturing process?

Practice Exercises

PE 3-1A
Job order vs. process costing

obj. 1

EE 3-1 p. 84

Which of the following industries would typically use job order costing, and which would typically use process costing?

Designer clothes manufacturing
Business consulting
CD manufacturing
Home construction
Plastic manufacturing
Steel manufacturing

PE 3-1B
Job order vs. process costing
obj. 1
EE 3-1 p. 84

Which of the following industries would typically use job order costing, and which would typically use process costing?

Aluminum production	Papermaking
Gasoline refining	Print shop
Movie studio	Web designer

PE 3-2A
Units to be assigned costs
obj. 2
EE 3-2 p. 89

Atlas Steel Company has two departments, Casting and Rolling. In the Rolling Department, ingots from the Casting Department are rolled into steel sheet. The Rolling Department received 86,200 tons from the Casting Department. During the period, the Rolling Department completed 83,580 tons, including 4,150 tons of work in process at the beginning of the period. The ending work in process inventory was 6,770 tons. How many tons were started and completed during the period?

PE 3-2B
Units to be assigned costs
obj. 2
EE 3-2 p. 89

Satin Skin Lotion Company consists of two departments, Blending and Filling. The Filling Department received 480,000 ounces from the Blending Department. During the period, the Filling Department completed 486,000 ounces, including 25,000 ounces of work in process at the beginning of the period. The ending work in process inventory was 19,000 ounces. How many ounces were started and completed during the period?

PE 3-3A
Equivalent units of materials cost
obj. 2
EE 3-3 p. 90

The Rolling Department of Atlas Steel Company had 4,150 tons in beginning work in process inventory (40% complete). During the period, 83,580 tons were completed. The ending work in process inventory was 6,770 tons (30% complete). What are the total equivalent units for direct materials if materials are added at the beginning of the process?

PE 3-3B
Equivalent units of materials cost
obj. 2
EE 3-3 p. 90

The Filling Department of Satin Skin Lotion Company had 25,000 ounces in beginning work in process inventory (70% complete). During the period, 486,000 ounces were completed. The ending work in process inventory was 19,000 ounces (25% complete). What are the total equivalent units for direct materials if materials are added at the beginning of the process?

PE 3-4A
Equivalent units of conversion costs
obj. 2
EE 3-4 p. 92

The Rolling Department of Atlas Steel Company had 4,150 tons in beginning work in process inventory (40% complete). During the period, 83,580 tons were completed. The ending work in process inventory was 6,770 tons (30% complete). What are the total equivalent units for conversion costs?

PE 3-4B
Equivalent units of conversion costs
obj. 2
EE 3-4 p. 92

The Filling Department of Satin Skin Lotion Company had 25,000 ounces in beginning work in process inventory (70% complete). During the period, 486,000 ounces were completed. The ending work in process inventory was 19,000 ounces (25% complete). What are the total equivalent units for conversion costs?

PE 3-5A
Cost per equivalent unit

obj. 2

EE 3-5 p. 93

The cost of direct materials transferred into the Rolling Department of Atlas Steel Company is $4,654,800. The conversion cost for the period in the Rolling Department is $1,091,363. The total equivalent units for direct materials and conversion are 86,200 tons and 83,951 tons, respectively. Determine the direct materials and conversion costs per equivalent unit.

PE 3-5B
Cost per equivalent unit

obj. 2

EE 3-5 p. 93

The cost of direct materials transferred into the Filling Department of Satin Skin Lotion Company is $216,000. The conversion cost for the period in the Filling Department is $47,325. The total equivalent units for direct materials and conversion are 480,000 ounces and 473,250 ounces, respectively. Determine the direct materials and conversion costs per equivalent unit.

PE 3-6A
Cost of units transferred out and ending work in process

obj. 2

EE 3-6 p. 95

The costs per equivalent unit of direct materials and conversion in the Rolling Department of Atlas Steel Company are $54 and $13, respectively. The equivalent units to be assigned costs are as follows:

	Equivalent Units	
	Direct Materials	**Conversion**
Inventory in process, beginning of period	0	2,490
Started and completed during the period	79,430	79,430
Transferred out of Rolling (completed)	79,430	81,920
Inventory in process, end of period	6,770	2,031
Total units to be assigned costs	86,200	83,951

The beginning work in process inventory had a cost of $246,000. Determine the cost of completed and transferred-out production and the ending work in process inventory.

PE 3-6B
Cost of units transferred out and ending work in process

obj. 2

EE 3-6 p. 95

The costs per equivalent unit of direct materials and conversion in the Filling Department of Satin Skin Lotion Company are $0.45 and $0.10, respectively. The equivalent units to be assigned costs are as follows:

	Equivalent Units	
	Direct Materials	**Conversion**
Inventory in process, beginning of period	0	7,500
Started and completed during the period	461,000	461,000
Transferred out of Filling (completed)	461,000	468,500
Inventory in process, end of period	19,000	4,750
Total units to be assigned costs	480,000	473,250

The beginning work in process inventory had a cost of $13,000. Determine the cost of completed and transferred-out production and the ending work in process inventory.

PE 3-7A
Process cost journal entries

obj. 3

EE 3-7 p. 99

The cost of materials transferred into the Rolling Department of Atlas Steel Company is $4,654,800 from the Casting Department. The conversion cost for the period in the Rolling Department is $1,091,363 ($666,563 factory overhead applied and $424,800 direct labor). The total cost transferred to Finished Goods for the period was $5,600,180. The Rolling Department had a beginning inventory of $246,000.

a. Journalize (1) the cost of transferred-in materials, (2) conversion costs, and (3) the costs transferred out to Finished Goods.
b. Determine the balance of Work in Process—Rolling at the end of the period.

PE 3-7B
Process cost journal entries
obj. 3
EE 3-7 p. 99

The cost of materials transferred into the Filling Department of Satin Skin Lotion Company is $216,000, including $55,600 from the Blending Department and $160,400 from the materials storeroom. The conversion cost for the period in the Filling Department is $47,325 ($29,300 factory overhead applied and $18,025 direct labor). The total cost transferred to Finished Goods for the period was $267,300. The Filling Department had a beginning inventory of $13,000.

a. Journalize (1) the cost of transferred-in materials, (2) conversion costs, and (3) the costs transferred out to Finished Goods.
b. Determine the balance of Work in Process—Filling at the end of the period.

PE 3-8A
Using process costs for decision making
obj. 4
EE 3-8 p. 102

The costs of materials consumed in producing good units in the Forming Department were $94,000 and $82,800 for May and June, respectively. The number of equivalent units produced in May and June was 500 tons and 450 tons, respectively. Evaluate the cost of materials between the two months.

PE 3-8B
Using process costs for decision making
obj. 4
EE 3-8 p. 102

The costs of energy consumed in producing good units in the Baking Department were $162,000 and $160,000 for August and September, respectively. The number of equivalent units produced in August and September was 450,000 pounds and 400,000 pounds, respectively. Evaluate the cost of energy between the two months.

Exercises

EX 3-1
Entries for materials cost flows in a process cost system
objs. 1, 3

The Hershey Foods Company manufactures chocolate confectionery products. The three largest raw materials are cocoa beans, sugar, and dehydrated milk. These raw materials first go into the Blending Department. The blended product is then sent to the Molding Department, where the bars of candy are formed. The candy is then sent to the Packing Department, where the bars are wrapped and boxed. The boxed candy is then sent to the distribution center, where it is eventually sold to food brokers and retailers.

Show the accounts debited and credited for each of the following business events:

a. Materials used by the Blending Department.
b. Transfer of blended product to the Molding Department.
c. Transfer of chocolate to the Packing Department.
d. Transfer of boxed chocolate to the distribution center.
e. Sale of boxed chocolate.

EX 3-2
Flowchart of accounts related to service and processing departments
obj. 1

Alcoa Inc. is the world's largest producer of aluminum products. One product that Alcoa manufactures is aluminum sheet products for the aerospace industry. The entire output of the Smelting Department is transferred to the Rolling Department. Part of the fully processed goods from the Rolling Department are sold as rolled sheet, and the remainder of the goods are transferred to the Converting Department for further processing into sheared sheet.

Prepare a chart of the flow of costs from the processing department accounts into the finished goods accounts and then into the cost of goods sold account. The relevant accounts are as follows:

Cost of Goods Sold
Materials
Factory Overhead—Smelting Department
Factory Overhead—Rolling Department
Factory Overhead—Converting Department
Finished Goods—Rolled Sheet
Finished Goods—Sheared Sheet
Work in Process—Smelting Department
Work in Process—Rolling Department
Work in Process—Converting Department

EX 3-3
Entries for flow of factory costs for process cost system

objs. 1, 3

Domino Foods, Inc., manufactures a sugar product by a continuous process, involving three production departments—Refining, Sifting, and Packing. Assume that records indicate that direct materials, direct labor, and applied factory overhead for the first department, Refining, were $420,000, $148,000, and $97,300, respectively. Also, work in process in the Refining Department at the beginning of the period totaled $23,700, and work in process at the end of the period totaled $29,100.

Journalize the entries to record (a) the flow of costs into the Refining Department during the period for (1) direct materials, (2) direct labor, and (3) factory overhead, and (b) the transfer of production costs to the second department, Sifting.

EX 3-4
Factory overhead rate, entry for applying factory overhead, and factory overhead account balance

objs. 1, 3

✔ a. 130%

The chief cost accountant for Mountain Glade Beverage Co. estimated that total factory overhead cost for the Blending Department for the coming fiscal year beginning March 1 would be $546,000, and total direct labor costs would be $420,000. During March, the actual direct labor cost totaled $36,000, and factory overhead cost incurred totaled $45,000.

a. What is the predetermined factory overhead rate based on direct labor cost?
b. Journalize the entry to apply factory overhead to production for March.
c. What is the March 31 balance of the account Factory Overhead—Blending Department?
d. Does the balance in part (c) represent overapplied or underapplied factory overhead?

EX 3-5
Equivalent units of production

obj. 2

✔ Direct materials, 17,700 units

The Converting Department of Forever Fresh Towel and Tissue Company had 840 units in work in process at the beginning of the period, which were 75% complete. During the period, 17,600 units were completed and transferred to the Packing Department. There were 940 units in process at the end of the period, which were 25% complete. Direct materials are placed into the process at the beginning of production. Determine the number of equivalent units of production with respect to direct materials and conversion costs.

EX 3-6
Equivalent units of production

obj. 2

✔ a. Conversion, 74,095 units

Units of production data for the two departments of Continental Cable and Wire Company for April of the current fiscal year are as follows:

	Drawing Department	Winding Department
Work in process, April 1	5,400 units, 40% completed	2,200 units, 70% completed
Completed and transferred to next processing department during April	74,000 units	73,200 units
Work in process, April 30	4,100 units, 55% completed	3,000 units, 15% completed

If all direct materials are placed in process at the beginning of production, determine the direct materials and conversion equivalent units of production for April for (a) the Drawing Department and (b) the Winding Department.

EX 3-7
Equivalent units of production

obj. 2

✔ b. Conversion, 147,800

The following information concerns production in the Baking Department for March. All direct materials are placed in process at the beginning of production.

ACCOUNT *Work in Process—Baking Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
Mar.	1	Bal., 8,000 units, ⅖ completed			15,360	
	31	Direct materials, 145,000 units	232,000		247,360	
	31	Direct labor	66,400		313,760	
	31	Factory overhead	37,060		350,820	
	31	Goods finished, 148,000 units		340,720	10,100	
	31	Bal., units, ⅗ completed			10,100	

a. Determine the number of units in work in process inventory at the end of the month.
b. Determine the equivalent units of production for direct materials and conversion costs in March.

EX 3-8
Costs per equivalent unit

obj. 2

✔ a. 2. Conversion cost per equivalent unit, $0.70

a. Based upon the data in Exercise 3-7, determine the following:
   1. Direct materials cost per equivalent unit.
   2. Conversion cost per equivalent unit.
   3. Cost of the beginning work in process completed during March.
   4. Cost of units started and completed during March.
   5. Cost of the ending work in process.

b. Assuming that the direct materials cost is the same for February and March, did the conversion cost per equivalent unit increase, decrease, or remain the same in March?

EX 3-9
Equivalent units of production

obj. 2

Kellogg Company manufactures cold cereal products, such as *Frosted Flakes*. Assume that the inventory in process on October 1 for the Packing Department included 900 pounds of cereal in the packing machine hopper. In addition, there were 600 empty 24-oz. boxes held in the package carousel of the packing machine. During October, 32,800 boxes of 24-oz. cereal were packaged. Conversion costs are incurred when a box is filled with cereal. On October 31, the packing machine hopper held 1,125 pounds of cereal, and the package carousel held 750 empty 24-oz. (1½-pound) boxes. Assume that once a box is filled with cereal, it is immediately transferred to the finished goods warehouse.

Determine the equivalent units of production for cereal, boxes, and conversion costs for October. An equivalent unit is defined as "pounds" for cereal and "24-oz. boxes" for boxes and conversion costs.

EX 3-10
Costs per equivalent unit

obj. 2

✔ c. $3.10

Georgia Products Inc. completed and transferred 180,000 particle board units of production from the Pressing Department. There was no beginning inventory in process in the department. The ending in-process inventory was 15,000 units, which were ⅔ complete as to conversion cost. All materials are added at the beginning of the process. Direct materials cost incurred was $604,500, direct labor cost incurred was $99,500, and factory overhead applied was $23,350.

Determine the following for the Pressing Department:

a. Total conversion cost
b. Conversion cost per equivalent unit
c. Direct materials cost per equivalent unit

EX 3-11
Equivalent units of production and related costs

obj. 2

✔ a. 5,800 units

The charges to Work in Process—Assembly Department for a period, together with information concerning production, are as follows. All direct materials are placed in process at the beginning of production.

Work in Process—Assembly Department

Bal., 4,000 units, 35% completed	9,590	To Finished Goods, 92,200 units	?
Direct materials, 94,000 units @ $1.75	164,500		
Direct labor	134,800		
Factory overhead	52,020		
Bal. ? units, 45% completed	?		

Determine the following:

a. The number of units in work in process inventory at the end of the period.
b. Equivalent units of production for direct materials and conversion.
c. Costs per equivalent unit for direct materials and conversion.
d. Cost of the units started and completed during the period.

EX 3-12
Cost of units completed and in process

objs. 2, 4

✔ 1. $14,790

a. Based on the data in Exercise 3-11, determine the following:
   1. Cost of beginning work in process inventory completed this period.
   2. Cost of units transferred to finished goods during the period.
   3. Cost of ending work in process inventory.
   4. Cost per unit of the completed beginning work in process inventory, rounded to the nearest cent.

b. Did the production costs change from the preceding period? Explain.
c. Assuming that the direct materials cost per unit did not change from the preceding period, did the conversion costs per equivalent unit increase, decrease, or remain the same for the current period?

EX 3-13
Errors in equivalent unit computation

obj. 2

Lone Star Refining Company processes gasoline. On September 1 of the current year, 4,000 units were ⅗ completed in the Blending Department. During September, 36,000 units entered the Blending Department from the Refining Department. During September, the units in process at the beginning of the month were completed. Of the 36,000 units entering the department, all were completed except 5,500 units that were ⅕ completed. The equivalent units for conversion costs for September for the Blending Department were computed as follows:

Equivalent units of production in September:	
To process units in inventory on September 1:	
4,000 × ⅗	2,400
To process units started and completed in September:	
36,000 − 4,000	32,000
To process units in inventory on September 30:	
5,500 × ⅕	1,100
Equivalent units of production	35,500

List the errors in the computation of equivalent units for conversion costs for the Blending Department for September.

EX 3-14
Cost per equivalent unit

obj. 2

✔ a. 69,500 units

The following information concerns production in the Forging Department for June. All direct materials are placed into the process at the beginning of production, and conversion costs are incurred evenly throughout the process. The beginning inventory consists of $86,250 of direct materials.

ACCOUNT ***Work in Process—Forging Department*** **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
June	1	Bal., 7,500 units, 60% completed			98,850	
	30	Direct materials, 68,000 units	761,600		860,450	
	30	Direct labor	83,380		943,830	
	30	Factory overhead	117,300	?	1,061,130	
	30	Goods transferred, ? units			?	
	30	Bal., 6,000 units, 70% completed			?	

a. Determine the number of units transferred to the next department.
b. Determine the costs per equivalent unit of direct materials and conversion.
c. Determine the cost of units started and completed in June.

EX 3-15
Costs per equivalent unit and production costs

objs. 2, 4

✔ a. $107,550

Based on the data in Exercise 3-14, determine the following:

a. Cost of beginning work in process inventory completed in June.
b. Cost of units transferred to the next department during June.
c. Cost of ending work in process inventory on June 30.
d. Costs per equivalent unit of direct materials and conversion included in the June 1 beginning work in process.
e. The June increase or decrease in costs per equivalent unit for direct materials and conversion from the previous month.

EX 3-16
Cost of production report

obj. 2

✔ d. $2,211

The debits to Work in Process—Roasting Department for St. Arbucks Coffee Company for May 2010, together with information concerning production, are as follows:

Work in process, May 1, 800 pounds, 20% completed		$ 3,280*
*Direct materials (800 × $3.80)	$3,040	
Conversion (800 × 20% × $1.50)	240	
	$3,280	
Coffee beans added during May, 25,000 pounds		93,750
Conversion costs during May		40,560
Work in process, May 31, 500 pounds, 42% completed		?
Goods finished during May, 25,300 pounds		?

All direct materials are placed in process at the beginning of production. Prepare a cost of production report, presenting the following computations:

a. Direct materials and conversion equivalent units of production for May.
b. Direct materials and conversion costs per equivalent unit for May.
c. Cost of goods finished during May.
d. Cost of work in process at May 31, 2010.

EX 3-17
Cost of production report

obj. 2

✔ Conversion cost per equivalent unit, $3.50

Prepare a cost of production report for the Cutting Department of Perma-Wear Carpet Company for October 2010, using the following data and assuming that all materials are added at the beginning of the process:

Work in process, October 1, 6,000 units, 75% completed		$62,250*
*Direct materials (6,000 × $7.60)	$45,600	
Conversion (6,000 × 75% × $3.70)	16,650	
	$62,250	
Materials added during October from Weaving Department, 162,000 units		$1,215,000
Direct labor for October		362,080
Factory overhead for October		191,550
Goods finished during October (includes goods in process, October 1), 160,400 units		—
Work in process, October 31, 7,600 units, 30% completed		—

EX 3-18
Cost of production and journal entries

objs. 1, 2, 3

✔ b. $72,930

Performance Castings Inc. casts blades for turbine engines. Within the Casting Department, alloy is first melted in a crucible, then poured into molds to produce the castings. On December 1, there were 800 pounds of alloy in process, which were 60% complete as to conversion. The Work in Process balance for these 800 pounds was $111,680, determined as follows:

Direct materials (800 × $130)	$104,000
Conversion (800 × 60% × $16)	7,680
	$111,680

During December, the Casting Department was charged $945,000 for 7,500 pounds of alloy and $45,072 for direct labor. Factory overhead is applied to the department at a rate of 150% of direct labor. The department transferred out 7,750 pounds of finished castings to the Machining Department. The December 31 inventory in process was 44% complete as to conversion.

a. Prepare the following December journal entries for the Casting Department:
   1. The materials charged to production.
   2. The conversion costs charged to production.
   3. The completed production transferred to the Machining Department.
b. Determine the Work in Process—Casting Department December 31 balance.

EX 3-19
Cost of production and journal entries

objs. 1, 2, 3

✔ b. $37,914

Franklin Paper Company manufactures newsprint. The product is manufactured in two departments, Papermaking and Converting. Pulp is first placed into a vessel at the beginning of papermaking production. The following information concerns production in the Papermaking Department for January.

ACCOUNT *Work in Process—Papermaking Department* ACCOUNT NO.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
Jan.	1	Bal., 6,500 units, 35% completed			29,250	
	31	Direct materials, 102,000 units	397,800		427,050	
	31	Direct labor	107,600		534,650	
	31	Factory overhead	81,049		615,699	
	31	Goods transferred, 101,400 units		?	?	
	31	Bal., 7,100 units, 80% completed			?	

a. Prepare the following January journal entries for the Papermaking Department:
   1. The materials charged to production.
   2. The conversion costs charged to production.
   3. The completed production transferred to the Converting Department.
b. Determine the Work in Process—Papermaking Department January 31 balance.

EX 3-20
Decision making
obj. 4

Oasis Bottling Company bottles popular beverages in the Bottling Department. The beverages are produced by blending concentrate with water and sugar. The concentrate is purchased from a concentrate producer. The concentrate producer sets higher prices for the more popular concentrate flavors. Below is a simplified Bottling Department cost of production report separating the cost of bottling the four flavors.

	A	B	C	D	E
1		Orange	Cola	Lemon-Lime	Root Beer
2	Concentrate	$ 6,650	$135,000	$ 99,000	$ 3,600
3	Water	2,100	36,000	27,000	1,200
4	Sugar	3,500	60,000	45,000	2,000
5	Bottles	7,700	132,000	99,000	4,400
6	Flavor changeover	3,500	6,000	4,500	5,000
7	Conversion cost	2,625	24,000	18,000	1,500
8	Total cost transferred to finished goods	$26,075	$393,000	$292,500	$17,700
9	Number of cases	3,500	60,000	45,000	2,000
10					

Beginning and ending work in process inventories are negligible, so are omitted from the cost of production report. The flavor changeover cost represents the cost of cleaning the bottling machines between production runs of different flavors.

Prepare a memo to the production manager analyzing this comparative cost information. In your memo, provide recommendations for further action, along with supporting schedules showing the total cost per case and cost per case by cost element.

EX 3-21
Decision making
obj. 4

Instant Memories Inc. produces photographic paper for printing digital images. One of the processes for this operation is a coating (solvent spreading) operation, where chemicals are coated on to paper stock. There has been some concern about the cost performance of this operation. As a result, you have begun an investigation. You first discover that all materials and conversion prices have been stable for the last six months. Thus, increases in prices for inputs are not an explanation for increasing costs. However, you have discovered three possible problems from some of the operating personnel whose quotes follow:

Operator 1: "I've been keeping an eye on my operating room instruments. I feel as though our energy consumption is becoming less efficient."

Operator 2: "Every time the coating machine goes down, we produce waste on shutdown and subsequent startup. It seems like during the last half year we have had more unscheduled machine shutdowns than in the past. Thus, I feel as though our yields must be dropping."

Operator 3: "My sense is that our coating costs are going up. It seems to me like we are spreading a thicker coating than we should. Perhaps the coating machine needs to be recalibrated."

The Coating Department had no beginning or ending inventories for any month during the study period. The following data from the cost of production report are made available:

	A	B	C	D	E	F	G
1		January	February	March	April	May	June
2	Paper stock	$72,960	$69,120	$ 76,800	$69,120	$65,280	$61,440
3	Coating	$16,416	$17,280	$ 21,120	$21,600	$21,216	$23,040
4	Conversion cost (incl. energy)	$36,480	$34,560	$ 38,400	$34,560	$32,640	$30,720
5	Pounds input to the process	95,000	90,000	100,000	90,000	85,000	80,000
6	Pounds transferred out	91,200	86,400	96,000	86,400	81,600	76,800
7							

a. Prepare a table showing the paper cost per output pound, coating cost per output pound, conversion cost per output pound, and yield for each month.
b. Interpret your table results.

EX 3-22
Just-in-time manufacturing

obj. 5

The following are some quotes provided by a number of managers at Solaris Machining Company regarding the company's planned move toward a just-in-time manufacturing system:

Director of Sales: I'm afraid we'll miss some sales if we don't keep a large stock of items on hand just in case demand increases. It only makes sense to me to keep large inventories in order to assure product availability for our customers.

Director of Purchasing: I'm very concerned about moving to a just-in-time system for materials. What would happen if one of our suppliers were unable to make a shipment? A supplier could fall behind in production or have a quality problem. Without some safety stock in our materials, our whole plant would shut down.

Director of Manufacturing: If we go to just-in-time, I think our factory output will drop. We need in-process inventory in order to "smooth out" the inevitable problems that occur during manufacturing. For example, if a machine that is used to process a product breaks down, it would starve the next machine if I don't have in-process inventory between the two machines. If I have in-process inventory, then I can keep the next operation busy while I fix the broken machine. Thus, the in-process inventories give me a safety valve that I can use to keep things running when things go wrong.

How would you respond to these managers?

Appendix
EX 3-23
Equivalent units of production: average cost method

✔ a. 26,300

The Converting Department of Osaka Napkin Company uses the average cost method and had 2,000 units in work in process that were 60% complete at the beginning of the period. During the period, 25,200 units were completed and transferred to the Packing Department. There were 1,100 units in process that were 30% complete at the end of the period.

a. Determine the number of whole units to be accounted for and to be assigned costs for the period.
b. Determine the number of equivalent units of production for the period.

Appendix
EX 3-24
Equivalent units of production: average cost method

✔ a. 92,500 units to be accounted for

Units of production data for the two departments of Atlantic Cable and Wire Company for August of the current fiscal year are as follows:

	Drawing Department	Winding Department
Work in process, August 1	2,100 units, 50% completed	2,000 units, 30% completed
Completed and transferred to next processing department during August	90,000 units	89,200 units
Work in process, August 31	2,500 units, 55% completed	2,800 units, 25% completed

Each department uses the average cost method.

a. Determine the number of whole units to be accounted for and to be assigned costs and the equivalent units of production for the Drawing Department.
b. Determine the number of whole units to be accounted for and to be assigned costs and the equivalent units of production for the Winding Department.

Appendix EX 3-25
Equivalent units of production: average cost method

✔ a. 16,500

The following information concerns production in the Finishing Department for March. The Finishing Department uses the average cost method.

ACCOUNT *Work in Process—Finishing Department* ACCOUNT NO.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
Mar.	1	Bal., 15,000 units, 40% completed			24,600	
	31	Direct materials, 144,000 units	345,000		369,600	
	31	Direct labor	163,200		532,800	
	31	Factory overhead	86,700		619,500	
	31	Goods transferred, 142,500 units		578,550	40,950	
	31	Bal., ? units, 60% completed			40,950	

a. Determine the number of units in work in process inventory at the end of the month.
b. Determine the number of whole units to be accounted for and to be assigned costs and the equivalent units of production for March.

Appendix EX 3-26
Equivalent units of production and related costs

✔ b. 86,870 units

The charges to Work in Process—Baking Department for a period as well as information concerning production are as follows. The Baking Department uses the average cost method, and all direct materials are placed in process during production.

Work in Process—Baking Department

Bal., 8,000 units, 70% completed	12,900	To Finished Goods, 85,400 units	?
Direct materials, 82,300 units	161,000		
Direct labor	91,800		
Factory overhead	81,780		
Bal., 4,900 units, 30% completed	?		

Determine the following:

a. The number of whole units to be accounted for and to be assigned costs.
b. The number of equivalent units of production.
c. The cost per equivalent unit.
d. The cost of the units transferred to Finished Goods.
e. The cost of ending Work in Process.

Appendix EX 3-27
Cost per equivalent unit: average cost method

✔ a. $11.50

The following information concerns production in the Forging Department for June. The Forging Department uses the average cost method.

ACCOUNT *Work in Process—Forging Department* ACCOUNT NO.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
June	1	Bal., 2,000 units, 40% completed			9,120	
	30	Direct materials, 46,200 units	324,800		333,920	
	30	Direct labor	137,045		470,965	
	30	Factory overhead	75,400		546,365	
	30	Goods transferred, 45,900 units		?	?	
	30	Bal., 2,300 units, 70% completed			?	

a. Determine the cost per equivalent unit.
b. Determine the cost of the units transferred to Finished Goods.
c. Determine the cost of ending Work in Process.

Appendix
EX 3-28
Cost of production report: average cost method

✔ Cost per equivalent unit, $6.00

The increases to Work in Process—Roasting Department for Boston Coffee Company for December 2010 as well as information concerning production are as follows:

Work in process, December 1, 1,500 pounds, 40% completed	$ 3,600
Coffee beans added during December, 92,500 pounds	391,420
Conversion costs during December	167,900
Work in process, December 31, 900 pounds, 80% completed	—
Goods finished during December, 93,100 pounds	—

Prepare a cost of production report, using the average cost method.

Appendix
EX 3-29
Cost of production report: average cost method

✔ Cost per equivalent unit, $11.00

Prepare a cost of production report for the Cutting Department of Chota Carpet Company for October 2010. Use the average cost method with the following data:

Work in process, October 1, 9,000 units, 75% completed	$ 75,000
Materials added during October from Weaving Department, 105,000 units	807,750
Direct labor for October	175,200
Factory overhead for October	92,100
Goods finished during October (includes goods in process, October 1), 103,500 units	—
Work in process, October 31, 10,500 units, 10% completed	—

Problems Series A

PR 3-1A
Entries for process cost system

objs. 1, 3

✔ 2. Materials December 31 balance, $14,120

Cincinnati Soap Company manufactures powdered detergent. Phosphate is placed in process in the Making Department, where it is turned into granulars. The output of Making is transferred to the Packing Department, where packaging is added at the beginning of the process. On December 1, Cincinnati Soap Company had the following inventories:

Finished Goods	$12,300
Work in Process—Making	4,780
Work in Process—Packing	6,230
Materials	2,700

Departmental accounts are maintained for factory overhead, which both have zero balances on December 1.

Manufacturing operations for December are summarized as follows:

a. Materials purchased on account	$153,200
b. Materials requisitioned for use:	
Phosphate—Making Department	$101,200
Packaging—Packing Department	35,200
Indirect materials—Making Department	3,960
Indirect materials—Packing Department	1,420
c. Labor used:	
Direct labor—Making Department	$72,300
Direct labor—Packing Department	48,800
Indirect labor—Making Department	14,000
Indirect labor—Packing Department	25,100
d. Depreciation charged on fixed assets:	
Making Department	$13,200
Packing Department	10,900
e. Expired prepaid factory insurance:	
Making Department	$2,500
Packing Department	1,000
f. Applied factory overhead:	
Making Department	$34,500
Packing Department	38,120
g. Production costs transferred from Making Department to Packing Department	$208,600
h. Production costs transferred from Packing Department to Finished Goods	$328,300
i. Cost of goods sold during the period	$329,500

Instructions

1. Journalize the entries to record the operations, identifying each entry by letter.
2. Compute the December 31 balances of the inventory accounts.
3. Compute the December 31 balances of the factory overhead accounts.

PR 3-2A
Cost of production report

objs. 2, 4

✔ 1. Conversion rate per equivalent unit, $0.80

Venus Chocolate Company processes chocolate into candy bars. The process begins by placing direct materials (raw chocolate, milk, and sugar) into the Blending Department. All materials are placed into production at the beginning of the blending process. After blending, the milk chocolate is then transferred to the Molding Department, where the milk chocolate is formed into candy bars. The following is a partial work in process account of the Blending Department at January 31, 2010:

ACCOUNT *Work in Process—Blending Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Bal., 6,000 units, ⅜ completed			21,840	
	31	Direct materials, 240,000 units	768,000		789,840	
	31	Direct labor	153,200		943,040	
	31	Factory overhead	38,160		981,200	
	31	Goods transferred, 242,000 units		?		
	31	Bal., ? units, ⅛ completed			?	

Instructions

1. Prepare a cost of production report, and identify the missing amounts for Work in Process—Blending Department.
2. Assuming that the January 1 work in process inventory includes direct materials of $18,600, determine the increase or decrease in the cost per equivalent unit for direct materials and conversion between December and January.

PR 3-3A
Equivalent units and related costs; cost of production report; entries

objs. 2, 3, 4

✔ 1. Transferred to finished goods, $858,150

Wilmington Chemical Company manufactures specialty chemicals by a series of three processes, all materials being introduced in the Distilling Department. From the Distilling Department, the materials pass through the Reaction and Filling departments, emerging as finished chemicals.

The balance in the account Work in Process—Filling was as follows on December 1, 2010:

Work in Process—Filling Department	
(2,800 units, 60% completed):	
Direct materials (2,800 × $14.60)	$40,880
Conversion (2,800 × 60% × $9.25)	15,540
	$56,420

The following costs were charged to Work in Process—Filling during December:

Direct materials transferred from Reaction Department: 36,200 units at $14.40 a unit	$521,280
Direct labor	167,900
Factory overhead	166,025

During December, 35,900 units of specialty chemicals were completed. Work in Process—Filling Department on December 31 was 3,100 units, 30% completed.

Instructions

1. Prepare a cost of production report for the Filling Department for December.
2. Journalize the entries for costs transferred from Reaction to Filling and the cost transferred from filling to finished goods.

(*continued*)

3. Determine the increase or decrease in the cost per equivalent unit from November to December for direct materials and conversion costs.
4. Discuss the uses of the cost of production report and the results of part (3).

PR 3-4A
Work in process account data for two months; cost of production reports

objs. 1, 2, 3

✔ 1. c. Transferred to finished goods in June, $918,600

Pittsburgh Aluminum Company uses a process cost system to record the costs of manufacturing rolled aluminum, which requires a series of four processes. Materials are entered at the beginning of the Rolling process. The inventory of Work in Process—Rolling on June 1, 2010, and debits to the account during June were as follows:

Bal., 3,000 units, ¼ completed:	
Direct materials (3,000 × $14.00)	$42,000
Conversion (3,000 × ¼ × $8.30)	6,225
	$48,225
From Smelting Department, 42,000 units	$596,400
Direct labor	212,435
Factory overhead	156,040

During June, 3,000 units in process on June 1 were completed, and of the 42,000 units entering the department, all were completed except 4,500 units that were ⅘ completed.

Charges to Work in Process—Rolling for July were as follows:

From Smelting Department, 45,000 units	$652,500
Direct labor	219,900
Factory overhead	160,800

During July, the units in process at the beginning of the month were completed, and of the 45,000 units entering the department, all were completed except 6,000 units that were ⅔ completed.

Instructions

1. Enter the balance as of June 1, 2010, in a four-column account for Work in Process—Rolling. Record the debits and the credits in the account for June. Construct a cost of production report and present computations for determining (a) equivalent units of production for materials and conversion, (b) costs per equivalent unit, (c) cost of goods finished, differentiating between units started in the prior period and units started and finished in June, and (d) work in process inventory.
2. Provide the same information for July by recording the July transactions in the four-column work in process account. Construct a cost of production report, and present the July computations (a through d) listed in part (1).
3. Comment on the change in costs per equivalent unit for May through July for direct materials and conversion cost.

Appendix
PR 3-5A
Equivalent units and related costs; cost of production report: average cost method

✔ Transferred to Packaging Dept., $74,000

Olde Stone Mill Flour Company manufactures flour by a series of three processes, beginning in the Milling Department. From the Milling Department, the materials pass through the Sifting and Packaging departments, emerging as packaged refined flour.

The balance in the account Work in Process—Sifting Department was as follows on December 1, 2010:

Work in Process—Sifting Department (1,200 units, 75% completed)	$4,500

The following costs were charged to Work in Process—Sifting Department during December:

Direct materials transferred from Milling Department: 14,500 units	$51,400
Direct labor	14,350
Factory overhead	7,125

During December, 14,800 units of flour were completed. Work in Process—Sifting Department on December 31 was 900 units, 75% completed.

Instructions

Prepare a cost of production report for the Sifting Department for December, using the average cost method.

Problems Series B

PR 3-1B
Entries for process cost system

objs. 1, 3

✔ 2. Materials July 31 balance, $42,800

Floor Guard Carpet Company manufactures carpets. Fiber is placed in process in the Spinning Department, where it is spun into yarn. The output of the Spinning Department is transferred to the Tufting Department, where carpet backing is added at the beginning of the process and the process is completed. On July 1, Floor Guard Carpet Company had the following inventories:

Finished Goods	$51,200
Work in Process—Spinning Department	8,500
Work in Process—Tufting Department	23,600
Materials	41,100

Departmental accounts are maintained for factory overhead, and both have zero balances on July 1.

Manufacturing operations for July are summarized as follows:

a. Materials purchased on account	$825,300
b. Materials requisitioned for use:	
Fiber—Spinning Department	$547,200
Carpet backing—Tufting Department	215,300
Indirect materials—Spinning Department	44,200
Indirect materials—Tufting Department	16,900
c. Labor used:	
Direct labor—Spinning Department	$234,700
Direct labor—Tufting Department	189,900
Indirect labor—Spinning Department	124,200
Indirect labor—Tufting Department	110,000
d. Depreciation charged on fixed assets:	
Spinning Department	$56,700
Tufting Department	32,500
e. Expired prepaid factory insurance:	
Spinning Department	$12,000
Tufting Department	9,000
f. Applied factory overhead:	
Spinning Department	$235,600
Tufting Department	169,800
g. Production costs transferred from Spinning Department to Tufting Department	$1,021,600
h. Production costs transferred from Tufting Department to Finished Goods	$1,590,200
i. Cost of goods sold during the period	$1,600,700

Instructions

1. Journalize the entries to record the operations, identifying each entry by letter.
2. Compute the July 31 balances of the inventory accounts.
3. Compute the July 31 balances of the factory overhead accounts.

PR 3-2B
Cost of production report

objs. 2, 4

✔ 1. Conversion cost per equivalent unit, $1.50

Ariba Coffee Company roasts and packs coffee beans. The process begins by placing coffee beans into the Roasting Department. From the Roasting Department, coffee beans are then transferred to the Packing Department. The following is a partial work in process account of the Roasting Department at March 31, 2010:

ACCOUNT *Work in Process—Roasting Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
Mar.	1	Bal., 10,500 units, 30% completed			59,640	
	31	Direct materials, 156,000 units	780,000		839,640	
	31	Direct labor	142,225		981,865	
	31	Factory overhead	92,990		1,074,855	
	31	Goods transferred, 155,600 units		?		
	31	Bal., ? units, 40% completed			?	

Instructions

1. Prepare a cost of production report, and identify the missing amounts for Work in Process—Roasting Department.
2. Assuming that the March 1 work in process inventory includes $54,600 of direct materials, determine the increase or decrease in the cost per equivalent unit for direct materials and conversion between February and March.

PR 3-3B
Equivalent units and related costs; cost of production report; entries

objs. 2, 3, 4

✔ 1. Transferred to Packaging Dept., $1,000,460

Angel White Flour Company manufactures flour by a series of three processes, beginning with wheat grain being introduced in the Milling Department. From the Milling Department, the materials pass through the Sifting and Packaging departments, emerging as packaged refined flour.

The balance in the account Work in Process—Sifting Department was as follows on August 1, 2010:

Work in Process—Sifting Department (12,000 units, 3/5 completed):	
Direct materials (12,000 × $2.35)	$28,200
Conversion (12,000 × 3/5 × $0.70)	5,040
	$33,240

The following costs were charged to Work in Process—Sifting Department during August:

Direct materials transferred from Milling Department:	
320,000 units at $2.45 a unit	$784,000
Direct labor	179,000
Factory overhead	30,950

During August, 323,000 units of flour were completed. Work in Process—Sifting Department on August 31 was 9,000 units, 1/5 completed.

Instructions

1. Prepare a cost of production report for the Sifting Department for August.
2. Journalize the entries for costs transferred from Milling to Sifting and the costs transferred from Sifting to Packaging.
3. Determine the increase or decrease in the cost per equivalent unit from July to August for direct materials and conversion costs.
4. Discuss the uses of the cost of production report and the results of part (3).

PR 3-4B
Work in process account data for two months; cost of production reports

objs. 1, 2, 3

✔ 1. c. Transferred to finished goods in February, $452,368

Hearty Soup Co. uses a process cost system to record the costs of processing soup, which requires a series of three processes. Materials are entered at the beginning of the Filling process. The inventory of Work in Process—Filling on February 1 and debits to the account during February 2010 were as follows:

Bal., 3,200 units, 30% completed:	
Direct materials (3,200 × $4.50)	$14,400
Conversion (3,200 × 30% × $2.00)	1,920
	$16,320
From Cooking Department, 65,900 units	$303,140
Direct labor	87,450
Factory overhead	61,908

During February, 3,200 units in process on February 1 were completed, and of the 65,900 units entering the department, all were completed except 2,500 units that were 90% completed.

Charges to Work in Process—Filling for March were as follows:

From Cooking Department, 73,500 units	$352,800
Direct labor	103,345
Factory overhead	74,530

During March, the units in process at the beginning of the month were completed, and of the 73,500 units entering the department, all were completed except 4,000 units that were 35% completed.

Instructions

1. Enter the balance as of February 1, 2010, in a four-column account for Work in Process—Filling. Record the debits and the credits in the account for February. Construct a cost of production report, and present computations for determining (a) equivalent units of production for materials and conversion, (b) costs per equivalent unit, (c) cost of goods finished, differentiating between units started in the prior period and units started and finished in February, and (d) work in process inventory.
2. Provide the same information for March by recording the March transactions in the four-column work in process account. Construct a cost of production report, and present the March computations (a through d) listed in part (1).
3. Comment on the change in costs per equivalent unit for January through March for direct materials and conversion costs.

Appendix
PR 3-5B
Cost of production report: average cost method

Starburst Coffee Company roasts and packs coffee beans. The process begins in the Roasting Department. From the Roasting Department, the coffee beans are transferred to the Packing Department. The following is a partial work in process account of the Roasting Department at January 31, 2010:

✔ Cost per equivalent unit, $4.90

ACCOUNT *Work in Process—Roasting Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
Jan.	1	Bal., 9,400 units, 80% completed			37,600	
	31	Direct materials, 65,200 units	135,600		173,200	
	31	Direct labor	109,152		282,352	
	31	Factory overhead	67,900		350,252	
	31	Goods transferred, 66,800 units		?	?	
	31	Bal., ? units, 60% completed			?	

Instructions

Prepare a cost of production report, using the average cost method, and identify the missing amounts for Work in Process—Roasting Department.

Special Activities

SA 3-1
Ethics and professional conduct in business

Assume you are the division controller for Grandma Jones Cookie Company. Grandma Jones has introduced a new chocolate chip cookie called Full of Chips, and it is a success. As a result, the product manager responsible for the launch of this new cookie was promoted to division vice president and became your boss. A new product manager, Lee, has been brought in to replace the promoted manager. Lee notices that the Full of

Chips cookie uses a lot of chips, which increases the cost of the cookie. As a result, Lee has ordered that the amount of chips used in the cookies be reduced by 10%. The manager believes that a 10% reduction in chips will not adversely affect sales, but will reduce costs, and hence improve margins. The increased margins would help Lee meet profit targets for the period.

You are looking over some cost of production reports segmented by cookie line. You notice that there is a drop in the materials costs for Full of Chips. On further investigation, you discover why the chip costs have declined (fewer chips). Both you and Lee report to the division vice president, who was the original product manager for Full of Chips. You are trying to decide what to do, if anything.

Discuss the options you might consider.

SA 3-2
Accounting for materials costs

In papermaking operations for companies such as International Paper Company, wet pulp is fed into paper machines, which press and dry pulp into a continuous sheet of paper. The paper is formed at very high speeds (60 mph). Once the paper is formed, the paper is rolled onto a reel at the back end of the paper machine. One of the characteristics of papermaking is the creation of "broke" paper. Broke is paper that fails to satisfy quality standards and is therefore rejected for final shipment to customers. Broke is recycled back to the beginning of the process by combining the recycled paper with virgin (new) pulp material. The combination of virgin pulp and recycled broke is sent to the paper machine for papermaking. Broke is fed into this recycle process continuously from all over the facility.

In this industry, it is typical to charge the papermaking operation with the cost of direct materials, which is a mixture of virgin materials and broke. Broke has a much lower cost than does virgin pulp. Therefore, the more broke in the mixture, the lower the average cost of direct materials to the department. Papermaking managers will frequently comment on the importance of broke for keeping their direct materials costs down.

a. How do you react to this accounting procedure?

b. What "hidden costs" are not considered when accounting for broke as described above?

SA 3-3
Analyzing unit costs

Amcan Inc. manufactures cans for the canned food industry. The operations manager of a can manufacturing operation wants to conduct a cost study investigating the relationship of tin content in the material (can stock) to the energy cost for enameling the cans. The enameling was necessary to prepare the cans for labeling. A higher percentage of tin content in the can stock increases the cost of material. The operations manager believed that a higher tin content in the can stock would reduce the amount of energy used in enameling. During the analysis period, the amount of tin content in the steel can stock was increased for every month, from April to September. The following operating reports were available from the controller:

	A	B	C	D	E	F	G
1		April	May	June	July	August	September
2	Energy	$ 13,000	$ 28,800	$ 24,200	$ 14,000	$ 16,200	$ 15,000
3	Materials	12,000	30,000	28,600	18,900	25,200	29,000
4	Total cost	$ 25,000	$ 58,800	$ 52,800	$ 32,900	$ 41,400	$ 44,000
5	Units produced	÷ 50,000	÷ 120,000	÷ 110,000	÷ 70,000	÷ 90,000	÷ 100,000
6	Cost per unit	$ 0.50	$ 0.49	$ 0.48	$ 0.47	$ 0.46	$ 0.44
7							

Differences in materials unit costs were entirely related to the amount of tin content.

Interpret this information and report to the operations manager your recommendations with respect to tin content.

SA 3-4
Decision making

Duran Orr, plant manager of Meridian Paper Company's papermaking mill, was looking over the cost of production reports for July and August for the Papermaking Department. The reports revealed the following:

	July	August
Pulp and chemicals	$300,000	$307,000
Conversion cost	150,000	153,000
Total cost	$450,000	$460,000
Number of tons	÷ 1,200	÷ 1,150
Cost per ton	$ 375	$ 400

Duran was concerned about the increased cost per ton from the output of the department. As a result, he asked the plant controller to perform a study to help explain these results. The controller, Alicia Sparks, began the analysis by performing some interviews of key plant personnel in order to understand what the problem might be. Excerpts from an interview with Josh Wilson, a paper machine operator, follow:

Josh: We have two papermaking machines in the department. I have no data, but I think paper machine 1 is applying too much pulp, and thus is wasting both conversion and materials resources. We haven't had repairs on paper machine 1 in a while. Maybe this is the problem.

Alicia: How does too much pulp result in wasted resources?

Josh: Well, you see, if too much pulp is applied, then we will waste pulp material. The customer will not pay for the extra weight. Thus, we just lose that amount of material. Also, when there is too much pulp, the machine must be slowed down in order to complete the drying process. This results in a waste of conversion costs.

Alicia: Do you have any other suspicions?

Josh: Well, as you know, we have two products—green paper and yellow paper. They are identical except for the color. The color is added to the papermaking process in the paper machine. I think that during August these two color papers have been behaving very differently. I don't have any data, but it just seems as though the amount of waste associated with the green paper has increased.

Alicia: Why is this?

Josh: I understand that there has been a change in specifications for the green paper, starting near the beginning of August. This change could be causing the machines to run poorly when making green paper. If this is the case, the cost per ton would increase for green paper.

Alicia also asked for a database printout providing greater detail on August's operating results.

September 9 Requested by: Alicia Sparks

Papermaking Department—August detail

	A	B	C	D	E	F
1	Production					
2	Run	Paper		Material	Conversion	
3	Number	Machine	Color	Costs	Costs	Tons
4	**1**	**1**	**Green**	**38,500**	**18,200**	**150**
5	**2**	**1**	**Yellow**	**41,700**	**21,200**	**140**
6	**3**	**1**	**Green**	**44,600**	**22,500**	**150**
7	**4**	**1**	**Yellow**	**36,100**	**18,100**	**120**
8	**5**	**2**	**Green**	**38,300**	**18,900**	**160**
9	**6**	2	**Yellow**	**38,600**	**18,700**	**160**
10	**7**	2	**Green**	**35,600**	**18,400**	**130**
11	**8**	2	**Yellow**	**33,600**	**17,000**	**140**
12		**Total**		**307,000**	**153,000**	**1,150**
13						

Assuming that you're Alicia Sparks, write a memo to Duran Orr with a recommendation to management. You should analyze the August data to determine whether the paper machine or the paper color explains the increase in the unit cost from July. Include any supporting schedules that are appropriate.

SA 3-5
Process costing companies

Group Project

Internet Project

The following categories represent typical process manufacturing industries:

Beverages	Metals
Chemicals	Petroleum refining
Food	Pharmaceuticals
Forest and paper products	Soap and cosmetics

In groups of two or three, for each category identify one company (following your instructor's specific instructions) and determine the following:

1. Typical products manufactured by the selected company, including brand names.
2. Typical raw materials used by the selected company.
3. Types of processes used by the selected company.

Use annual reports, the Internet, or library resources in doing this activity.

Answers to Self-Examination Questions

1. **C** The process cost system is most appropriate for a business where manufacturing is conducted by continuous operations and involves a series of uniform production processes, such as the processing of crude oil (answer C). The job order cost system is most appropriate for a business where the product is made to customers' specifications, such as custom furniture manufacturing (answer A), commercial building construction (answer B), or automobile repair shop (answer D).
2. **A** The total pounds transferred to finished goods (23,000) are the 2,000 in-process pounds at the beginning of the period plus the number of pounds started and completed during the month, 21,000 (24,000 − 3,000). Answer B incorrectly assumes that the beginning inventory is not transferred during the month. Answer C assumes that all 24,000 pounds started during the month are transferred to finished goods, instead of only the portion started and completed. Answer D incorrectly adds all the numbers together.
3. **B** The number of units that could have been produced from start to finish during a period is termed equivalent units. The 4,875 equivalent units (answer B) is determined as follows:

To process units in inventory on May 1 (1,000 × ¼)	250
To process units started and completed in May (5,500 units − 1,000 units)	4,500
To process units in inventory on May 31 (500 units × ¼)	125
Equivalent units of production in May	4,875

4. **A** The conversion costs (direct labor and factory overhead) totaling $48,750 are divided by the number of equivalent units (4,875) to determine the unit conversion cost of $10 (answer A).
5. **C** The electricity costs have increased, and maintenance costs have decreased. Answer C would be a reasonable explanation for these results. The total costs, materials costs, and costs per unit do not reveal any type of pattern over the time period. In fact, the materials costs have stayed at exactly $2.00 per pound over the time period. This demonstrates that aggregated numbers can sometimes hide underlying information that can be used to improve the process.

CHAPTER 4

Cost Behavior and Cost-Volume-Profit Analysis

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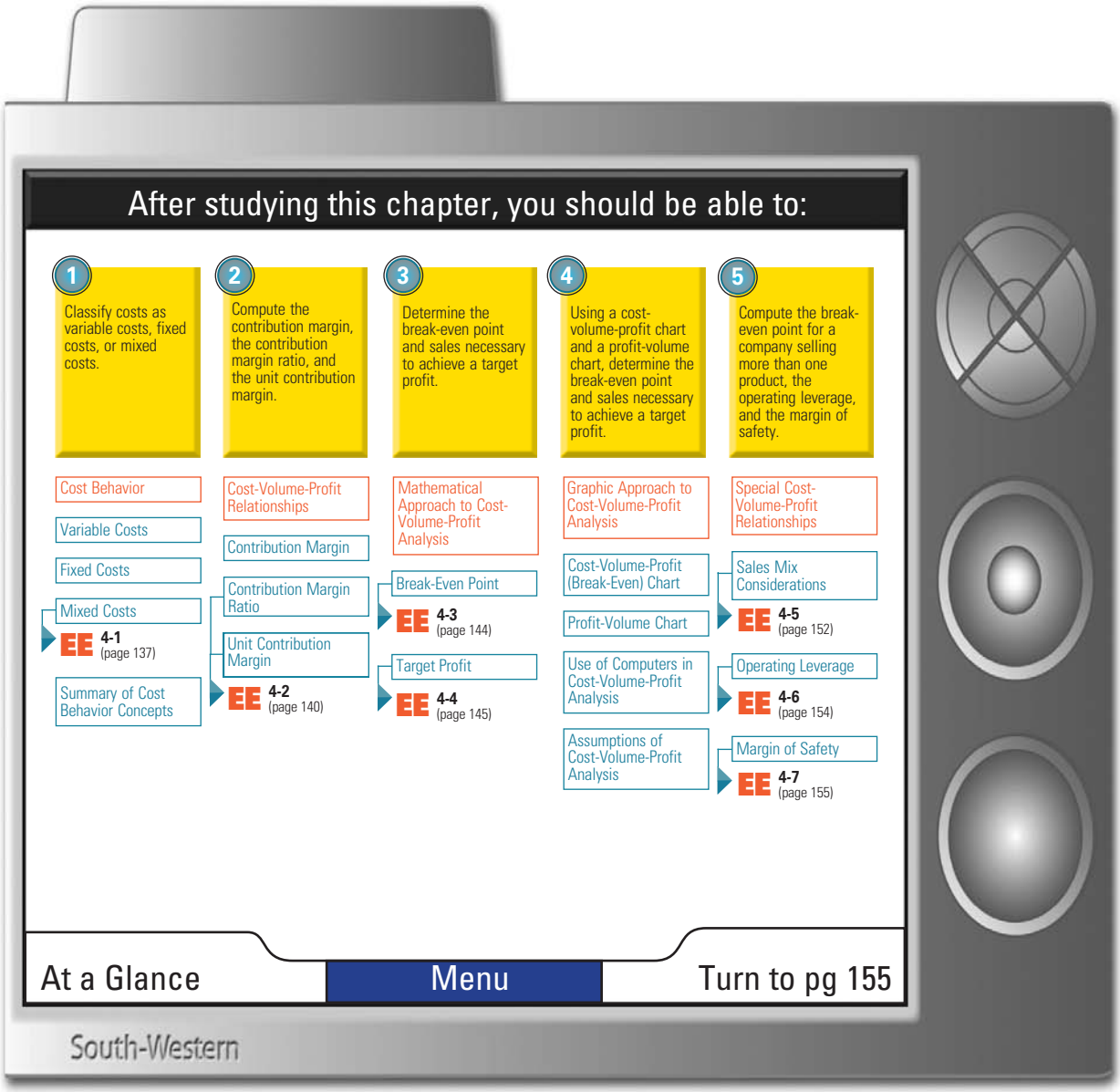
NETFLIX

How do you decide whether you are going to buy or rent a video game? It probably depends on how much you think you are going to use the game. If you are going to play the game a lot, you are probably better off buying the game than renting. The one time cost of buying the game would be much less expensive than the cost of multiple rentals. If, on the other hand, you are uncertain about how frequently you are going to play the game, it may be less expensive to rent. The cost of an individual rental is much less than the cost of purchase. Understanding how the costs of rental and purchase behave affects your decision.

Understanding how costs behave is also important to companies like Netflix, an online DVD movie rental service. For a fixed monthly fee, Netflix customers can select DVDs from their own computer, and have the DVDs delivered to their home along with a prepaid return envelope. Customers can keep the DVDs as long as they want, but must return the DVDs before they rent additional movies. The number of DVDs that members can check out at one time varies between one and three, depending on their subscription plan.

In order to entice customers to subscribe, Netflix had to invest in a well-stocked library of DVD titles, and build a warehouse to hold and distribute these titles. These costs do not change with the number of subscriptions. But how many subscriptions does Netflix need in order to make a profit? That depends on the price of each subscription, the costs incurred with each DVD rental, and the costs associated with maintaining the DVD library.

As with Netflix, understanding how costs behave, and the relationship between costs, profits, and volume is important for all businesses. This chapter discusses commonly used methods for classifying costs according to how they change. Techniques that management can use to evaluate costs in order to make sound business decisions are also discussed.



1 Classify costs as variable costs, fixed costs, or mixed costs.

Cost Behavior

Cost behavior is the manner in which a cost changes as a related activity changes. The behavior of costs is useful to managers for a variety of reasons. For example, knowing how costs behave allows managers to predict profits as sales and production volumes change. Knowing how costs behave is also useful for estimating costs, which affects a variety of decisions such as whether to replace a machine.

Understanding the behavior of a cost depends on:

1. Identifying the activities that cause the cost to change. These activities are called **activity bases** (or *activity drivers*).
2. Specifying the range of activity over which the changes in the cost are of interest. This range of activity is called the **relevant range.**

To illustrate, assume that a hospital is concerned about planning and controlling patient food costs. A good activity base is number of patients who *stay* overnight in the hospital. The number of patients who are *treated* is not as good an activity base since

some patients are outpatients and, thus, do not consume food. Once an activity base is identified, food costs can then be analyzed over the range of the number of patients who normally stay in the hospital (the relevant range).

Costs are normally classified as variable costs, fixed costs, or mixed costs.

Variable Costs

Variable costs are costs that vary in proportion to changes in the activity base. When the activity base is units produced, direct materials and direct labor costs are normally classified as variable costs.

To illustrate, assume that Jason Sound Inc. produces stereo systems. The parts for the stereo systems are purchased from suppliers for $10 per unit and are assembled by Jason Sound Inc. For Model JS-12, the direct materials costs for the relevant range of 5,000 to 30,000 units of production are shown below.

Number of Units of Model JS-12 Produced	Direct Materials Cost per Unit	Total Direct Materials Cost
5,000 units	$10	$ 50,000
10,000	10	100,000
15,000	10	150,000
20,000	10	200,000
25,000	10	250,000
30,000	10	300,000

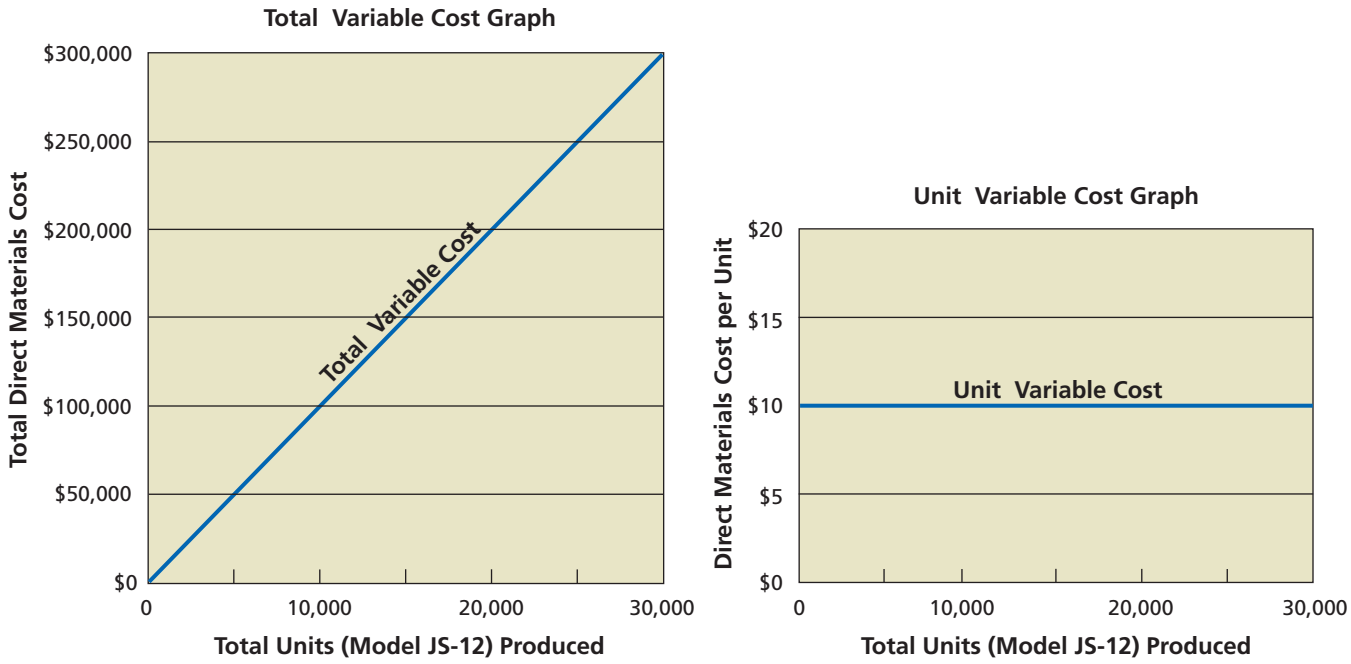
As shown above, variable costs have the following characteristics:

1. *Cost per unit* remains the same regardless of changes in the activity base. For Model JS-12, the cost per unit is $10.
2. *Total cost* changes in proportion to changes in the activity base. For Model JS-12, the direct materials cost for 10,000 units ($100,000) is twice the direct materials cost for 5,000 units ($50,000).

Exhibit 1 illustrates how the variable costs for direct materials for Model JS-12 behave in total and on a per-unit basis as production changes.

Exhibit 1

Variable Cost Graphs



Some examples of variable costs and their related activity bases for various types of businesses are shown below.

Type of Business	Cost	Activity Base
University	Instructor salaries	Number of classes
Passenger airline	Fuel	Number of miles flown
Manufacturing	Direct materials	Number of units produced
Hospital	Nurse wages	Number of patients
Hotel	Maid wages	Number of guests
Bank	Teller wages	Number of banking transactions

Fixed Costs

Fixed costs are costs that remain the same in total dollar amount as the activity base changes. When the activity base is units produced, many factory overhead costs such as straight-line depreciation are classified as fixed costs.

To illustrate, assume that Minton Inc. manufactures, bottles, and distributes perfume. The production supervisor is Jane Sovissi, who is paid a salary of $75,000 per year. For the relevant range of 50,000 to 300,000 bottles of perfume, the total fixed cost of $75,000 does not vary as production increases. However, the fixed cost per bottle decreases as the units produced increase; thus, the fixed cost is spread over a larger number of bottles, as shown below.

Number of Bottles of Perfume Produced	Total Salary for Jane Sovissi	Salary per Bottle of Perfume Produced
50,000 bottles	$75,000	$1.500
100,000	75,000	0.750
150,000	75,000	0.500
200,000	75,000	0.375
250,000	75,000	0.300
300,000	75,000	0.250

As shown above, fixed costs have the following characteristics:

1. *Cost per unit* changes inversely to changes in the activity base. For Jane Sovissi's salary, the cost per unit decreased from $1.50 for 50,000 bottles produced to $0.25 for 300,000 bottles produced.
2. *Total cost* remains the same regardless of changes in the activity base. Jane Sovissi's salary of $75,000 remained the same regardless of whether 50,000 bottles or 300,000 bottles were produced.

Exhibit 2 illustrates how Jane Sovissi's salary (fixed cost) behaves in total and on a per-unit basis as production changes.

Some examples of fixed costs and their related activity bases for various types of businesses are shown below.

Type of Business	Fixed Cost	Activity Base
University	Building (straight-line) depreciation	Number of students
Passenger airline	Airplane (straight-line) depreciation	Number of miles flown
Manufacturing	Plant manager salary	Number of units produced
Hospital	Property insurance	Number of patients
Hotel	Property taxes	Number of guests
Bank	Branch manager salary	Number of customer accounts

A salesperson's compensation can be a mixed cost comprised of a salary (fixed portion) plus a commission as a percent of sales (variable portion).

Mixed Costs

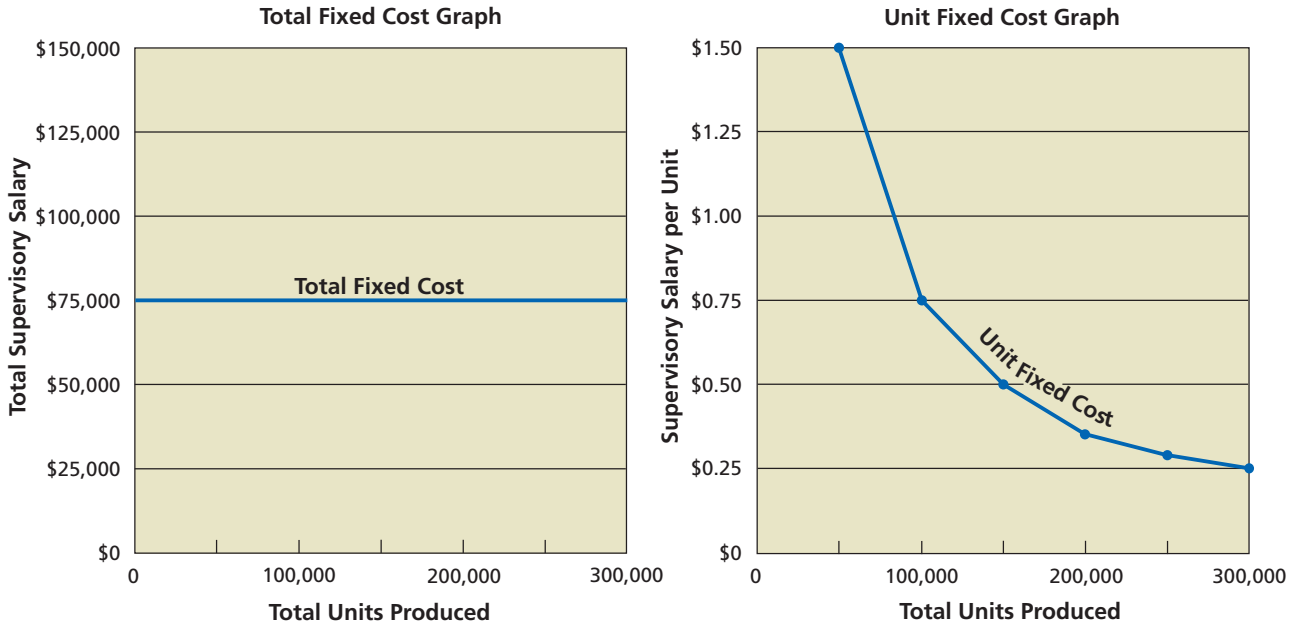
Mixed costs are costs that have characteristics of both a variable and a fixed cost. Mixed costs are sometimes called *semivariable* or *semifixed* costs.

To illustrate, assume that Simpson Inc. manufactures sails, using rented machinery. The rental charges are as follows:

Rental Charge = $15,000 per year + $1 times each machine hour over 10,000 hours

Exhibit 2

Fixed Cost Graphs



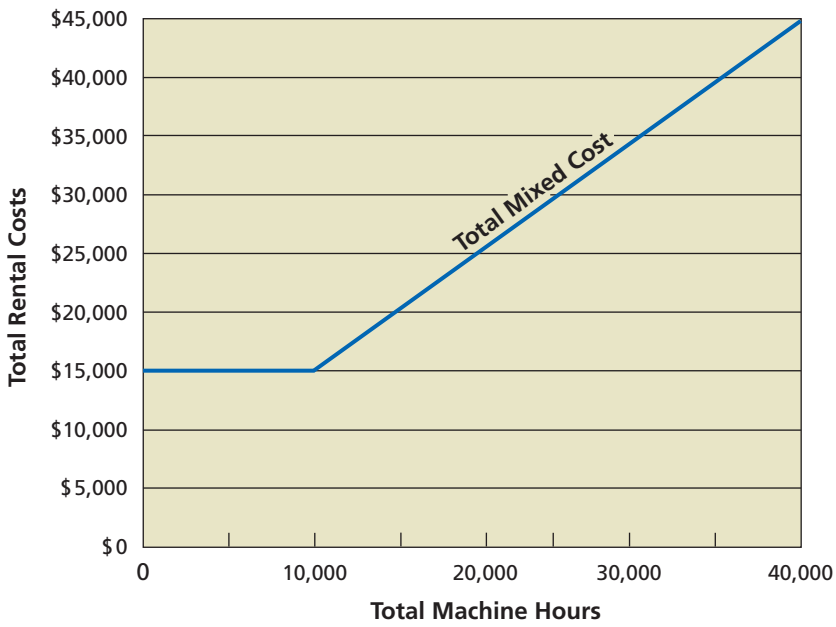
The rental charges for various hours used within the relevant range of 8,000 hours to 40,000 hours are as follows:

Hours Used	Rental Charge
8,000 hours	$15,000
12,000	$17,000 {$15,000 + [(12,000 hrs. − 10,000 hrs.) × $1]}
20,000	$25,000 {$15,000 + [(20,000 hrs. − 10,000 hrs.) × $1]}
40,000	$45,000 {$15,000 + [(40,000 hrs. − 10,000 hrs.) × $1]}

Exhibit 3 illustrates the preceding mixed cost behavior.

Exhibit 3

Mixed Costs



For purposes of analysis, mixed costs are usually separated into their fixed and variable components. The **high-low method** is a cost estimation method that may be used for this purpose.[1] The high-low method uses the highest and lowest activity levels and their related costs to estimate the variable cost per unit and the fixed cost.

To illustrate, assume that the Equipment Maintenance Department of Kason Inc. incurred the following costs during the past five months:

	Production	Total Cost
June	1,000 units	$45,550
July	1,500	52,000
August	2,100	61,500
September	1,800	57,500
October	750	41,250

The number of units produced is the activity base, and the relevant range is the units produced between June and October. For Kason Inc., the difference between the units produced and total costs at the highest and lowest levels of production are as follows:

	Production	Total Cost
Highest level	2,100 units	$61,500
Lowest level	750	41,250
Difference	1,350 units	$20,250

The total fixed cost does not change with changes in production. Thus, the $20,250 difference in the total cost is the change in the total variable cost. Dividing this difference of $20,250 by the difference in production is an estimate of the variable cost per unit. For Kason Inc., this estimate is $15, as computed below.

$$\text{Variable Cost per Unit} = \frac{\text{Difference in Total Cost}}{\text{Difference in Production}}$$

$$\text{Variable Cost per Unit} = \frac{\$20{,}250}{1{,}350 \text{ units}} = \$15 \text{ per unit}$$

The fixed cost is estimated by subtracting the total variable costs from the total costs for the units produced as shown below.

$$\text{Fixed Cost} = \text{Total Costs} - (\text{Variable Cost per Unit} \times \text{Units Produced})$$

The fixed cost is the same at the highest and the lowest levels of production as shown below for Kason Inc.

Highest level (2,100 units)

$$\text{Fixed Cost} = \text{Total Costs} - (\text{Variable Cost per Unit} \times \text{Units Produced})$$
$$\text{Fixed Cost} = \$61{,}500 - (\$15 \times 2{,}100 \text{ units})$$
$$\text{Fixed Cost} = \$61{,}500 - \$31{,}500$$
$$\text{Fixed Cost} = \$30{,}000$$

Lowest level (750 units)

$$\text{Fixed Cost} = \text{Total Costs} - (\text{Variable Cost per Unit} \times \text{Units Produced})$$
$$\text{Fixed Cost} = \$41{,}250 - (\$15 \times 750 \text{ units})$$
$$\text{Fixed Cost} = \$41{,}250 - \$11{,}250$$
$$\text{Fixed Cost} = \$30{,}000$$

Using the variable cost per unit and the fixed cost, the total equipment maintenance cost for Kason Inc. can be computed for various levels of production as follows:

$$\text{Total Cost} = (\text{Variable Cost per Unit} \times \text{Units Produced}) + \text{Fixed Costs}$$

$$\text{Total Cost} = (\$15 \times \text{Units Produced}) + \$30{,}000$$

1 Other methods of estimating costs, such as the scattergraph method and the least squares method, are discussed in cost accounting textbooks.

To illustrate, the estimated total cost of 2,000 units of production is $60,000, as computed below.

Total Cost = ($15 × Units Produced) + $30,000
Total Cost = ($15 × 2,000 units) + $30,000 = $30,000 + $30,000
Total Cost = $60,000

Example Exercise 4-1 High-Low Method 1

The manufacturing costs of Alex Industries for the first three months of the year are provided below.

	Total Cost	Production
January	$ 80,000	1,000 units
February	125,000	2,500
March	100,000	1,800

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.

Follow My Example 4-1

a. $30 per unit = ($125,000 − $80,000)/(2,500 − 1,000)
b. $50,000 = $125,000 − ($30 × 2,500) or $80,000 − ($30 × 1,000)

For Practice: PE 4-1A, PE 4-1B

Summary of Cost Behavior Concepts

The cost behavior of variable costs and fixed costs is summarized below.

	Effect of Changing Activity Level	
Cost	**Total Amount**	**Per Unit Amount**
Variable	Increases and decreases proportionately with activity level.	Remains the same regardless of activity level.
Fixed	Remains the same regardless of activity level.	Increases and decreases inversely with activity level.

Mixed costs contain a fixed cost component that is incurred even if nothing is produced. For analysis, the fixed and variable cost components of mixed costs are separated using the high-low method.

Some examples of variable, fixed, and mixed costs for the activity base *units produced* are as follows:

Variable Cost	Fixed Cost	Mixed Cost
Direct materials	Straight-line depreciation	Quality Control Department salaries
Direct labor	Property taxes	Purchasing Department salaries
Electricity expense	Production supervisor salaries	Maintenance expenses
Supplies	Insurance expense	Warehouse expenses

One method of reporting variable and fixed costs is called **variable costing** or *direct costing*. Under variable costing, only the variable manufacturing costs (direct materials, direct labor, and variable factory overhead) are included in the product cost. The fixed factory overhead is treated as an expense of the period in which it is incurred. Variable costing is described and illustrated in Chapter 5.

2 Compute the contribution margin, the contribution margin ratio, and the unit contribution margin.

Cost-Volume-Profit Relationships

Cost-volume-profit analysis is the examination of the relationships among selling prices, sales and production volume, costs, expenses, and profits. Cost-volume-profit

analysis is useful for managerial decision making. Some of the ways cost-volume-profit analysis may be used include:

1. Analyzing the effects of changes in selling prices on profits
2. Analyzing the effects of changes in costs on profits
3. Analyzing the effects of changes in volume on profits
4. Setting selling prices
5. Selecting the mix of products to sell
6. Choosing among marketing strategies

Contribution Margin

Contribution margin is especially useful because it provides insight into the profit potential of a company. **Contribution margin** is the excess of sales over variable costs, as shown below.

$$\text{Contribution Margin} = \text{Sales} - \text{Variable Costs}$$

To illustrate, assume the following data for Lambert Inc.:

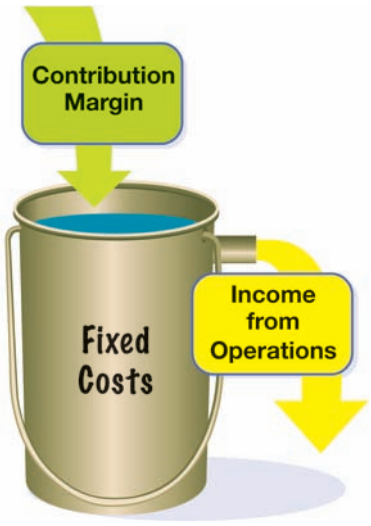
Sales	50,000 units
Sales price per unit	$20 per unit
Variable cost per unit	$12 per unit
Fixed costs	$300,000

Exhibit 4 illustrates an income statement for Lambert Inc. prepared in a contribution margin format.

Exhibit 4

Contribution Margin Income Statement

Sales (50,000 units x $20)	$1,000,000
Variable costs (50,000 units x $12)	600,000
Contribution margin (50,000 units x $8)	$ 400,000
Fixed costs	300,000
Income from operations	$ 100,000



Lambert's contribution margin of $400,000 is available to cover the fixed costs of $300,000. Once the fixed costs are covered, any additional contribution margin increases income from operations.

The graphic to the left illustrates the contribution margin and its effect on profits. The fixed costs are a bucket and the contribution margin is water filling the bucket. Once the bucket is filled, the overflow represents income from operations. Up until the point of overflow, the contribution margin contributes to fixed costs (filling the bucket).

Contribution Margin Ratio

The contribution margin can also be expressed as a percentage. The **contribution margin ratio**, sometimes called the *profit-volume ratio*, indicates the percentage of each sales dollar available to cover fixed costs and to provide income from operations. The contribution margin ratio is computed as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

The contribution margin ratio is 40% for Lambert Inc., as computed below.

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

$$\text{Contribution Margin Ratio} = \frac{\$400{,}000}{\$1{,}000{,}000} = 40\%$$

The contribution margin ratio is most useful when the increase or decrease in sales volume is measured in sales *dollars*. In this case, the change in sales dollars multiplied by the contribution margin ratio equals the change in income from operations, as shown below.

$$\text{Change in Income from Operations} = \text{Change in Sales Dollars} \times \text{Contribution Margin Ratio}$$

To illustrate, if Lambert Inc. adds $80,000 in sales orders, its income from operations will increase by $32,000, as computed below.

$$\text{Change in Income from Operations} = \text{Change in Sales Dollars} \times \text{Contribution Margin Ratio}$$
$$\text{Change in Income from Operations} = \$80{,}000 \times 40\% = \$32{,}000$$

The preceding analysis is confirmed by the following contribution margin income statement of Lambert Inc.:

Sales	$1,080,000
Variable costs ($1,080,000 × 60%)	648,000
Contribution margin ($1,080,000 × 40%)	$ 432,000
Fixed costs	300,000
Income from operations	$ 132,000

Income from operations increased from $100,000 to $132,000 when sales increased from $1,000,000 to $1,080,000. Variable costs as a percentage of sales are equal to 100% minus the contribution margin ratio. Thus, in the above income statement, the variable costs are 60% (100% − 40%) of sales, or $648,000 ($1,080,000 × 60%). The total contribution margin, $432,000, can also be computed directly by multiplying the total sales by the contribution margin ratio ($1,080,000 × 40%).

In the preceding analysis, factors other than sales volume, such as variable cost per unit and sales price, are assumed to remain constant. If such factors change, their effect must also be considered.

The contribution margin ratio is also useful in developing business strategies. For example, assume that a company has a high contribution margin ratio and is producing below 100% of capacity. In this case, a large increase in income from operations can be expected from an increase in sales volume. Therefore, the company might consider implementing a special sales campaign to increase sales. In contrast, a company with a small contribution margin ratio will probably want to give more attention to reducing costs before attempting to promote sales.

Unit Contribution Margin

The unit contribution margin is also useful for analyzing the profit potential of proposed decisions. The **unit contribution margin** is computed as follows:

$$\text{Unit Contribution Margin} = \text{Sales Price per Unit} - \text{Variable Cost per Unit}$$

To illustrate, if Lambert Inc.'s unit selling price is $20 and its variable cost per unit is $12, the unit contribution margin is $8 as shown below.

Unit Contribution Margin = Sales Price per Unit − Variable Cost per Unit
Unit Contribution Margin = $20 − $12 = $8

The unit contribution margin is most useful when the increase or decrease in sales volume is measured in sales *units* (quantities). In this case, the change in sales volume (units) multiplied by the unit contribution margin equals the change in income from operations, as shown below.

Change in Income from Operations = Change in Sales Units × Unit Contribution Margin

To illustrate, assume that Lambert Inc.'s sales could be increased by 15,000 units, from 50,000 units to 65,000 units. Lambert's income from operations would increase by $120,000 (15,000 units × $8), as shown below.

Change in Income from Operations = Change in Sales Units × Unit Contribution Margin
Change in Income from Operations = 15,000 units × $8 = $120,000

The preceding analysis is confirmed by the following contribution margin income statement of Lambert Inc., which shows that income increased to $220,000 when 65,000 units are sold. The prior income statement on page 866 indicates income of $100,000 when 50,000 units are sold. Thus, selling an additional 15,000 units increases income by $120,000 ($220,000 − $100,000).

A room night at Hilton Hotels has a high contribution margin. The high contribution margin per room night is necessary to cover the high fixed costs for the hotel.

Sales (65,000 units × $20)	$1,300,000
Variable costs (65,000 units × $12)	780,000
Contribution margin (65,000 units × $8)	$ 520,000
Fixed costs	300,000
Income from operations	$ 220,000

Unit contribution margin analysis is useful information for managers. For example, in the preceding illustration, Lambert Inc. could spend up to $120,000 for special advertising or other product promotions to increase sales by 15,000 units and still increase income by $100,000 ($220,000 − $120,000).

Example Exercise 4-2 Contribution Margin

2

Molly Company sells 20,000 units at $12 per unit. Variable costs are $9 per unit, and fixed costs are $25,000. Determine the (a) contribution margin ratio, (b) unit contribution margin, and (c) income from operations.

Follow My Example 4-2

a. 25% = ($12 − $9)/$12 or ($240,000 − $180,000)/$240,000
b. $3 per unit = $12 − $9
c.

Sales	$240,000	(20,000 units × $12 per unit)
Variable costs	180,000	(20,000 units × $9 per unit)
Contribution margin	$ 60,000	[20,000 units × ($12 − $9)]
Fixed costs	25,000	
Income from operations	$ 35,000	

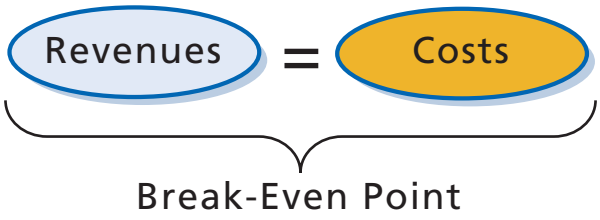
For Practice: PE 4-2A, PE 4-2B

3 Determine the break-even point and sales necessary to achieve a target profit.

Mathematical Approach to Cost-Volume-Profit Analysis

The mathematical approach to cost-volume-profit analysis uses equations to determine the following:

1. Sales necessary to break even
2. Sales necessary to make a target or desired profit



Break-Even Point

The **break-even point** is the level of operations at which a company's revenues and expenses are equal. At break-even, a company reports neither an income nor a loss from operations. The break-even point in *sales units* is computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

To illustrate, assume the following data for Baker Corporation:

Fixed costs	$90,000
Unit selling price	$25
Unit variable cost	15
Unit contribution margin	$10

The break-even point is 9,000 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$90{,}000}{\$10} = 9{,}000 \text{ units}$$

The following income statement verifies the break-even point of 9,000 units:

Sales (9,000 units × $25)	$225,000
Variable costs (9,000 units × $15)	135,000
Contribution margin	$ 90,000
Fixed costs	90,000
Income from operations	$ 0

When the owner of a shopping center was asked how he was doing, he said, "My properties are *almost* fully rented." The questioner commented, "That must be pretty good." The shopping center owner responded, "Maybe so. But as you know, the profit is in the *almost*." This exchange reveals an important business principle: Income from operations is earned only after the break-even point is reached.

As shown in the preceding income statement, the break-even point is $225,000 (9,000 units × $25) of sales. The break-even point in *sales dollars* can be determined directly as follows:

$$\text{Break-Even Sales (dollars)} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Ratio}}$$

The contribution margin ratio can be computed using the unit contribution margin and unit selling price as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Selling Price}}$$

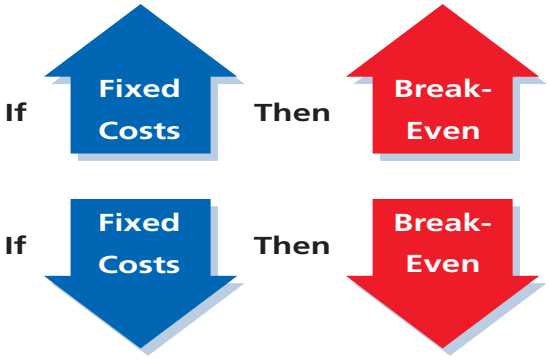
The contribution margin ratio for Baker Corporation is 40%, as shown below.

$$\text{Contribution Margin Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Selling Price}} = \frac{\$10}{\$25} = 40\%$$

Thus, the break-even sales dollars for Baker Corporation of $225,000 can be computed directly as follows:

$$\text{Break-Even Sales (dollars)} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Ratio}} = \frac{\$90{,}000}{40\%} = \$225{,}000$$

The break-even point is affected by changes in the fixed costs, unit variable costs, and the unit selling price.



Effect of Changes in Fixed Costs Fixed costs do not change in total with changes in the level of activity. However, fixed costs may change because of other factors such as changes in property tax rates or factory supervisors' salaries.

Changes in fixed costs affect the break-even point as follows:

1. Increases in fixed costs increase the break-even point.
2. Decreases in fixed costs decrease the break-even point.

To illustrate, assume that Bishop Co. is evaluating a proposal to budget an additional $100,000 for advertising. The data for Bishop Co. are as follows:

	Current	Proposed
Unit selling price	$90	$90
Unit variable cost	70	70
Unit contribution margin	$20	$20
Fixed costs	$600,000	$700,000

Indian Airlines Limited renegotiated leases on Airbus aircraft from $2,500,000 to $1,400,000 per month. This reduction in monthly fixed costs reduced the airline's break-even passenger volume.

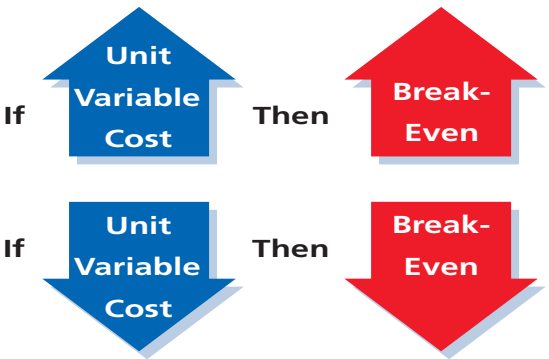
Bishop Co.'s break-even point *before* the additional advertising expense of $100,000 is 30,000 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$600{,}000}{\$20} = 30{,}000 \text{ units}$$

Bishop Co.'s break-even point *after* the additional advertising expense of $100,000 is 35,000 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$700{,}000}{\$20} = 35{,}000 \text{ units}$$

As shown above, the $100,000 increase in advertising (fixed costs) requires an additional 5,000 units (35,000 − 30,000) of sales to break even.[2] In other words, an increase in sales of 5,000 units is required in order to generate an additional $100,000 of total contribution margin (5,000 units × $20) to cover the increased fixed costs.



Effect of Changes in Unit Variable Costs Unit variable costs do not change with changes in the level of activity. However, unit variable costs may be affected by other factors such as changes in the cost per unit of direct materials.

Changes in unit variable costs affect the break-even point as follows:

1. Increases in unit variable costs increase the break-even point.
2. Decreases in unit variable costs decrease the break-even point.

2 The increase of 5,000 units can also be computed by dividing the increase in fixed costs of $100,000 by the unit contribution margin, $20, as follows: 5,000 units = $100,000/$20.

Increases in fuel prices increase the break-even freight load for the Union Pacific railroad.

To illustrate, assume that Park Co. is evaluating a proposal to pay an additional 2% commission on sales to its salespeople as an incentive to increase sales. The data for Park Co. are as follows:

	Current	Proposed
Unit selling price	$250	$250
Unit variable cost	145	150
Unit contribution margin	$105	$100
Fixed costs	$840,000	$840,000

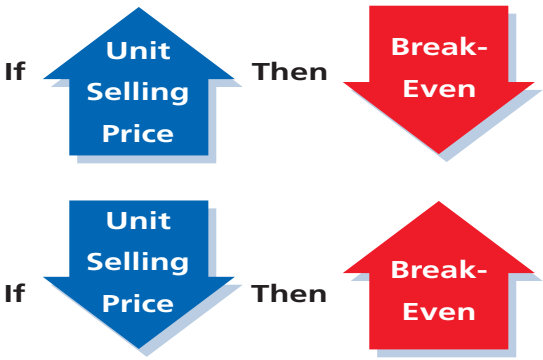
Park Co.'s break-even point *before* the additional 2% commission is 8,000 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$840{,}000}{\$105} = 8{,}000 \text{ units}$$

If the 2% sales commission proposal is adopted, unit variable costs will increase by $5 ($250 × 2%) from $145 to $150 per unit. This increase in unit variable costs will decrease the unit contribution margin from $105 to $100 ($250 − $150). Thus, Park Co.'s break-even point *after* the additional 2% commission is 8,400 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$840{,}000}{\$100} = 8{,}400 \text{ units}$$

As shown above, an additional 400 units of sales will be required in order to break even. This is because if 8,000 units are sold, the new unit contribution margin of $100 provides only $800,000 (8,000 units × $100) of contribution margin. Thus, $40,000 more contribution margin is necessary to cover the total fixed costs of $840,000. This additional $40,000 of contribution margin is provided by selling 400 more units (400 units × $100).



Effect of Changes in Unit Selling Price Changes in the unit selling price affect the unit contribution margin and, thus, the break-even point. Specifically, changes in the unit selling price affect the break-even point as follows:

1. Increases in the unit selling price decrease the break-even point.
2. Decreases in the unit selling price increase the break-even point.

To illustrate, assume that Graham Co. is evaluating a proposal to increase the unit selling price of its product from $50 to $60. The data for Graham Co. are as follows:

	Current	Proposed
Unit selling price	$50	$60
Unit variable cost	30	30
Unit contribution margin	$20	$30
Fixed costs	$600,000	$600,000

The Golf Channel went from a premium cable service price of $6.95 per month to a much lower basic cable price, causing its break-even point to increase from 6 million to 19 million subscribers. The price change was successful, however, since the subscriber numbers exceeded the new break-even point.

Graham Co.'s break-even point *before* the price increase is 30,000 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$600{,}000}{\$20} = 30{,}000 \text{ units}$$

The increase of $10 per unit in the selling price increases the unit contribution margin by $10. Thus, Graham Co.'s break-even point *after* the price increase is 20,000 units, as shown below.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$600{,}000}{\$30} = 20{,}000 \text{ units}$$

As shown on the previous page, the price increase of $10 increased the unit contribution margin by $10, which decreased the break-even point by 10,000 units (30,000 units − 20,000 units).

Summary of Effects of Changes on Break-Even Point The break-even point in sales changes in the same direction as changes in the variable cost per unit and fixed costs. In contrast, the break-even point in sales changes in the opposite direction as changes in the unit selling price. These changes on the break-even point in sales are summarized below.

Type of Change	Direction of Change	Effect of Change on Break-Even Sales
Fixed cost	Increase	Increase
	Decrease	Decrease
Unit variable cost	Increase	Increase
	Decrease	Decrease
Unit selling price	Increase	Decrease
	Decrease	Increase

Example Exercise 4-3 Break-Even Point 3

Nicolas Enterprises sells a product for $60 per unit. The variable cost is $35 per unit, while fixed costs are $80,000. Determine the (a) break-even point in sales units and (b) break-even point if the selling price were increased to $67 per unit.

Follow My Example 4-3

a. 3,200 units = $80,000/($60 − $35)
b. 2,500 units = $80,000/($67 − $35)

For Practice: PE 4-3A, PE 4-3B

Business Connection

BREAKING EVEN ON HOWARD STERN

Satellite radio, one of the fastest growing forms of entertainment, has seen remarkable growth in recent years. Customers are able to choose from a variety of types of music and talk radio and listen from just about anywhere in the country with limited commercials. The satellite radio market is dominated by two companies, XM Satellite Radio and SIRIUS Satellite Radio. XM is the older of the two companies and has the largest market share. However, in 2005, Sirius tripled its customer base by diversifying its product line and signing high profile talk personalities. As part of this strategy, Sirius signed a five-year $500 million contract with radio "shock jock" Howard Stern. But how did Sirius determine that adding the self-proclaimed "King of All Media" to its play list was worth such a large amount of money? It used break-even analysis. Prior to signing with Sirius, 12 million listeners tuned in to Stern's show on Infinity Broadcasting Corporation. At the time the contract was signed, Sirius had about 600,000 subscribers. The company estimated that it would need 1 million of Stern's fans to subscribe to Sirius in order to break even on the $500 million fixed cost of the contract. Initial projections estimated that Stern's show would attract as many as 10 million listeners. It appears that the company's strategy is beginning to work, as Sirius's subscriber base had grown to 3.3 million customers by the end of 2005.

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Target Profit

At the break-even point, sales and costs are exactly equal. However, the goal of most companies is to make a profit.

By modifying the break-even equation, the sales required to earn a target or desired amount of profit may be computed. For this purpose, target profit is added to the break-even equation as shown below.

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

To illustrate, assume the following data for Waltham Co.:

Fixed costs	$200,000
Target profit	100,000
Unit selling price	$75
Unit variable cost	45
Unit contribution margin	$30

The sales necessary to earn the target profit of $100,000 would be 10,000 units, computed as follows:

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}} = \frac{\$200{,}000 + \$100{,}000}{\$30} = 10{,}000 \text{ units}$$

The following income statement verifies this computation:

Sales (10,000 units × $75)	$750,000
Variable costs (10,000 units × $45)	450,000
Contribution margin (10,000 units × $30)	$300,000
Fixed costs	200,000
Income from operations	$100,000 ← Target profit

As shown in the preceding income statement, sales of $750,000 (10,000 units × $75) are necessary to earn the target profit of $100,000. The sales of $750,000 needed to earn the target profit of $100,000 can be computed directly using the contribution margin ratio, as shown below.

$$\text{Contribution Margin Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Selling Price}} = \frac{\$30}{\$75} = 40\%$$

$$\text{Sales (dollars)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Contribution Margin Ratio}}$$

$$= \frac{\$200{,}000 + \$100{,}000}{40\%} = \frac{\$300{,}000}{40\%} = \$750{,}000$$

Example Exercise 4-4 Target Profit 3

Forest Company sells a product for $140 per unit. The variable cost is $60 per unit, and fixed costs are $240,000. Determine the (a) break-even point in sales units and (b) break-even point in sales units if the company desires a target profit of $50,000.

Follow My Example 4-4

a. 3,000 units = $240,000/($140 − $60)
b. 3,625 units = ($240,000 + $50,000)/($140 − $60)

For Practice: PE 4-4A, PE 4-4B

Integrity, Objectivity, and Ethics in Business

ORPHAN DRUGS

Each year, pharmaceutical companies develop new drugs that cure a variety of physical conditions. In order to be profitable, drug companies must sell enough of a product to exceed break even for a reasonable selling price. Break-even points, however, create a problem for drugs targeted at rare diseases, called "orphan drugs." These drugs are typically expensive to develop and have low sales volumes, making it impossible to achieve break even. To ensure that orphan drugs are not overlooked, Congress passed the Orphan Drug Act that provides incentives for pharmaceutical companies to develop drugs for rare diseases that might not generate enough sales to reach break even. The program has been a great success. Since 1982, over 200 orphan drugs have come to market, including Jacobus Pharmaceuticals Company, Inc.'s drug for the treatment of tuberculosis and Novartis AG's drug for the treatment of Paget's disease.

4 Using a cost-volume-profit chart and a profit-volume chart, determine the break-even point and sales necessary to achieve a target profit.

Graphic Approach to Cost-Volume-Profit Analysis

Cost-volume-profit analysis can be presented graphically as well as in equation form. Many managers prefer the graphic form because the operating profit or loss for different levels of sales can readily be seen.

Cost-Volume-Profit (Break-Even) Chart

A **cost-volume-profit chart**, sometimes called a *break-even chart*, graphically shows sales, costs, and the related profit or loss for various levels of units sold. It assists in understanding the relationship among sales, costs, and operating profit or loss.

To illustrate, the cost-volume-profit chart in Exhibit 5 is based on the following data:

Total fixed costs	$100,000
Unit selling price	$50
Unit variable cost	30
Unit contribution margin	$20

The cost-volume-profit chart in Exhibit 5 is constructed using the following steps:

Step 1. Volume in units of sales is indicated along the horizontal axis. The range of volume shown is the relevant range in which the company expects to operate. Dollar amounts of total sales and costs are indicated along the vertical axis.

Step 2. A sales line is plotted by beginning at zero on the left corner of the graph. A second point is determined by multiplying any units of sales on the horizontal axis by the unit sales price of $50. For example, for 10,000 units of sales, the total sales would be $500,000 (10,000 units × $50). The sales line is drawn upward to the right from zero through the $500,000 point.

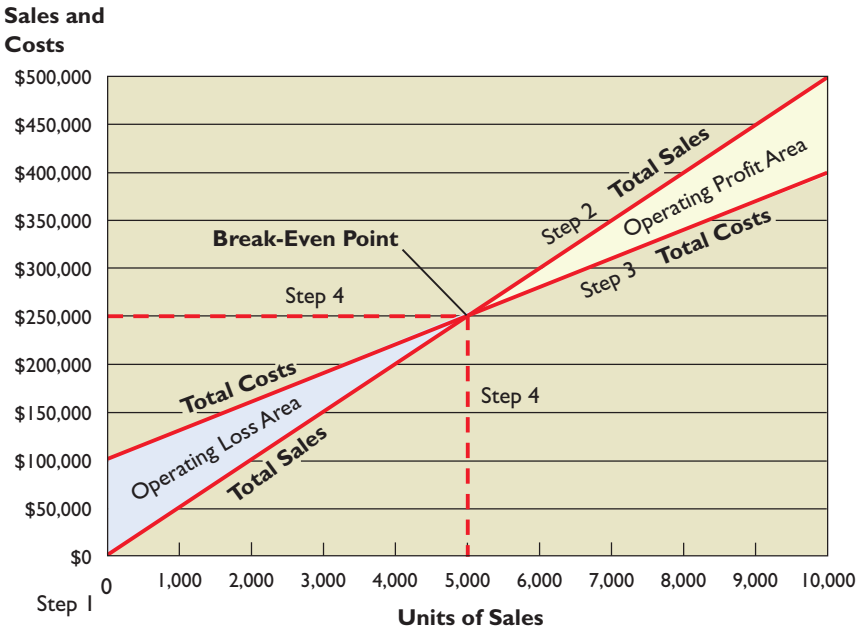
Step 3. A cost line is plotted by beginning with total fixed costs, $100,000, on the vertical axis. A second point is determined by multiplying any units of sales on the horizontal axis by the unit variable costs and adding the fixed costs. For example, for 10,000 units of sales, the total estimated costs would be $400,000 [(10,000 units × $30) + $100,000]. The cost line is drawn upward to the right from $100,000 on the vertical axis through the $400,000 point.

Step 4. The break-even point is the intersection point of the total sales and total cost lines. A vertical dotted line drawn downward at the intersection point indicates the units of sales at the break-even point. A horizontal dotted line drawn to the left at the intersection point indicates the sales dollars and costs at the break-even point.

In Exhibit 5, the break-even point is $250,000 of sales, which represents sales of 5,000 units. Operating profits will be earned when sales levels are to the right of the break-even point (*operating profit area*). Operating losses will be incurred when sales levels are to the left of the break-even point (*operating loss area*).

Exhibit 5

Cost-Volume-Profit Chart

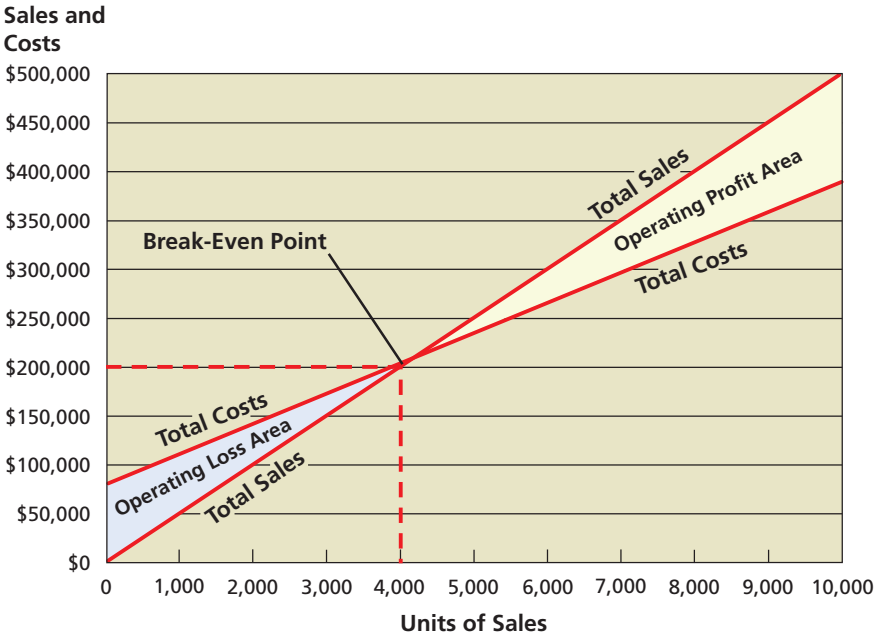


Changes in the unit selling price, total fixed costs, and unit variable costs can be analyzed by using a cost-volume-profit chart. Using the data in Exhibit 5, assume that a proposal to reduce fixed costs by $20,000 is to be evaluated. In this case, the total fixed costs would be $80,000 ($100,000 − $20,000).

As shown in Exhibit 6, the total cost line is redrawn, starting at the $80,000 point (total fixed costs) on the vertical axis. A second point is determined by multiplying any units of sales on the horizontal axis by the unit variable costs and adding the fixed costs. For example, for 10,000 units of sales, the total estimated costs would be $380,000 [(10,000 units × $30) + $80,000]. The cost line is drawn upward to the right from $80,000 on the vertical axis through the $380,000 point. The revised cost-volume-profit chart in Exhibit 6 indicates that the break-even point decreases to $200,000 and 4,000 units of sales.

Exhibit 6

Revised Cost-Volume-Profit Chart



Profit-Volume Chart

Another graphic approach to cost-volume-profit analysis is the profit-volume chart. The **profit-volume chart** plots only the difference between total sales and total costs (or profits). In this way, the profit-volume chart allows managers to determine the operating profit (or loss) for various levels of units sold.

To illustrate, the profit-volume chart in Exhibit 7 is based on the same data as used in Exhibit 5. These data are as follows:

Total fixed costs	$100,000
Unit selling price	$50
Unit variable cost	30
Unit contribution margin	$20

The maximum operating loss is equal to the fixed costs of $100,000. Assuming that the maximum units that can be sold within the relevant range is 10,000 units, the maximum operating profit is $100,000, as shown below.

Sales (10,000 units × $50)	$500,000
Variable costs (10,000 units × $30)	300,000
Contribution margin (10,000 units × $20)	$200,000
Fixed costs	100,000
Operating profit	$100,000 ← Maximum profit

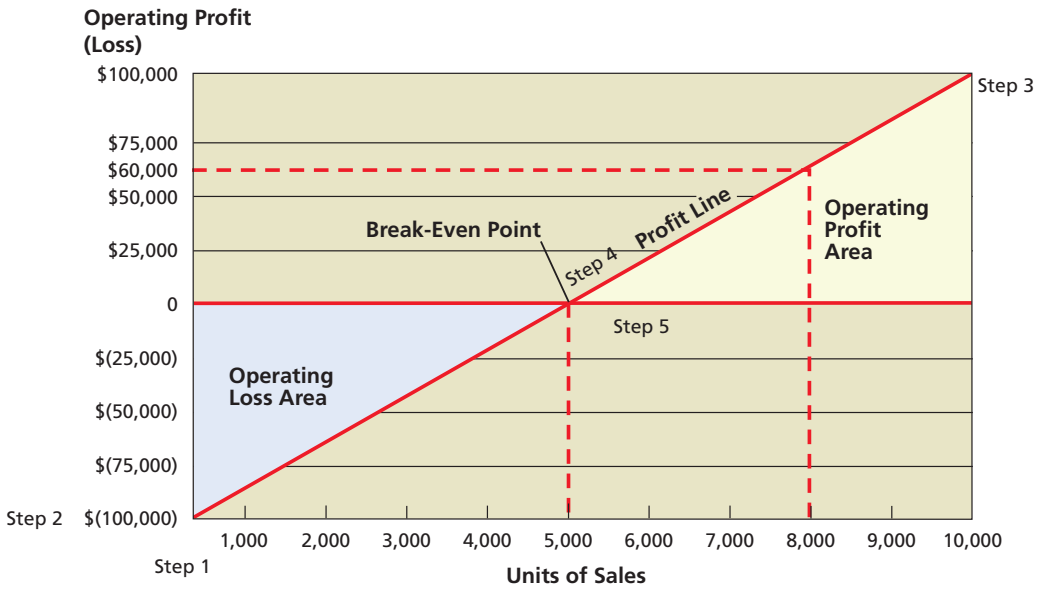
The profit-volume chart in Exhibit 7 is constructed using the following steps:

Step 1. Volume in units of sales is indicated along the horizontal axis. The range of volume shown is the relevant range in which the company expects to operate. In Exhibit 7, the maximum units of sales is 10,000 units. Dollar amounts indicating operating profits and losses are shown along the vertical axis.

Step 2. A point representing the maximum operating loss is plotted on the vertical axis at the left. This loss is equal to the total fixed costs at the zero level of sales. Thus, the maximum operating loss is equal to the fixed costs of $100,000.

Exhibit 7

Profit-Volume Chart



Many NBA franchises, such as the Los Angeles Lakers, state that their financial goal is to break even during the regular season and to make their profit during the playoffs, or basketball's so called "second season." The deeper the team goes into the playoffs, the greater the operating profit earned above break even from additional ticket sales and TV revenues.

Step 3. A point representing the maximum operating profit within the relevant range is plotted on the right. Assuming that the maximum unit sales within the relevant range is 10,000 units, the maximum operating profit is $100,000.

Step 4. A diagonal profit line is drawn connecting the maximum operating loss point with the maximum operating profit point.

Step 5. The profit line intersects the horizontal zero operating profit line at the break-even point in units of sales. The area indicating an operating profit is identified to the right of the intersection, and the area indicating an operating loss is identified to the left of the intersection.

In Exhibit 7, the break-even point is 5,000 units of sales, which is equal to total sales of $250,000 (5,000 units × $50). Operating profit will be earned when sales levels are to the right of the break-even point (*operating profit area*). Operating losses will be incurred when sales levels are to the left of the break-even point (*operating loss area*). For example, at sales of 8,000 units, an operating profit of $60,000 will be earned, as shown in Exhibit 7.

Changes in the unit selling price, total fixed costs, and unit variable costs on profit can be analyzed using a profit-volume chart. Using the data in Exhibit 7, assume the effect on profit of an increase of $20,000 in fixed costs is to be evaluated. In this case, the total fixed costs would be $120,000 ($100,000 + $20,000), and the maximum operating loss would also be $120,000. At the maximum sales of 10,000 units, the maximum operating profit would be $80,000, as shown below.

Sales (10,000 units × $50)	$500,000
Variable costs (10,000 units × $30)	300,000
Contribution margin (10,000 units × $20)	$200,000
Fixed costs	120,000
Operating profit	$ 80,000 ← Revised maximum profit

A revised profit-volume chart is constructed by plotting the maximum operating loss and maximum operating profit points and drawing the revised profit line. The original and the revised profit-volume charts are shown in Exhibit 8.

The revised profit-volume chart indicates that the break-even point is 6,000 units of sales. This is equal to total sales of $300,000 (6,000 units × $50). The operating loss area of the chart has increased, while the operating profit area has decreased.

Use of Computers in Cost-Volume-Profit Analysis

With computers, the graphic approach and the mathematical approach to cost-volume-profit analysis are easy to use. Managers can vary assumptions regarding selling prices, costs, and volume and can observe the effects of each change on the break-even point and profit. Such an analysis is called a *"what if"* analysis or *sensitivity* analysis.

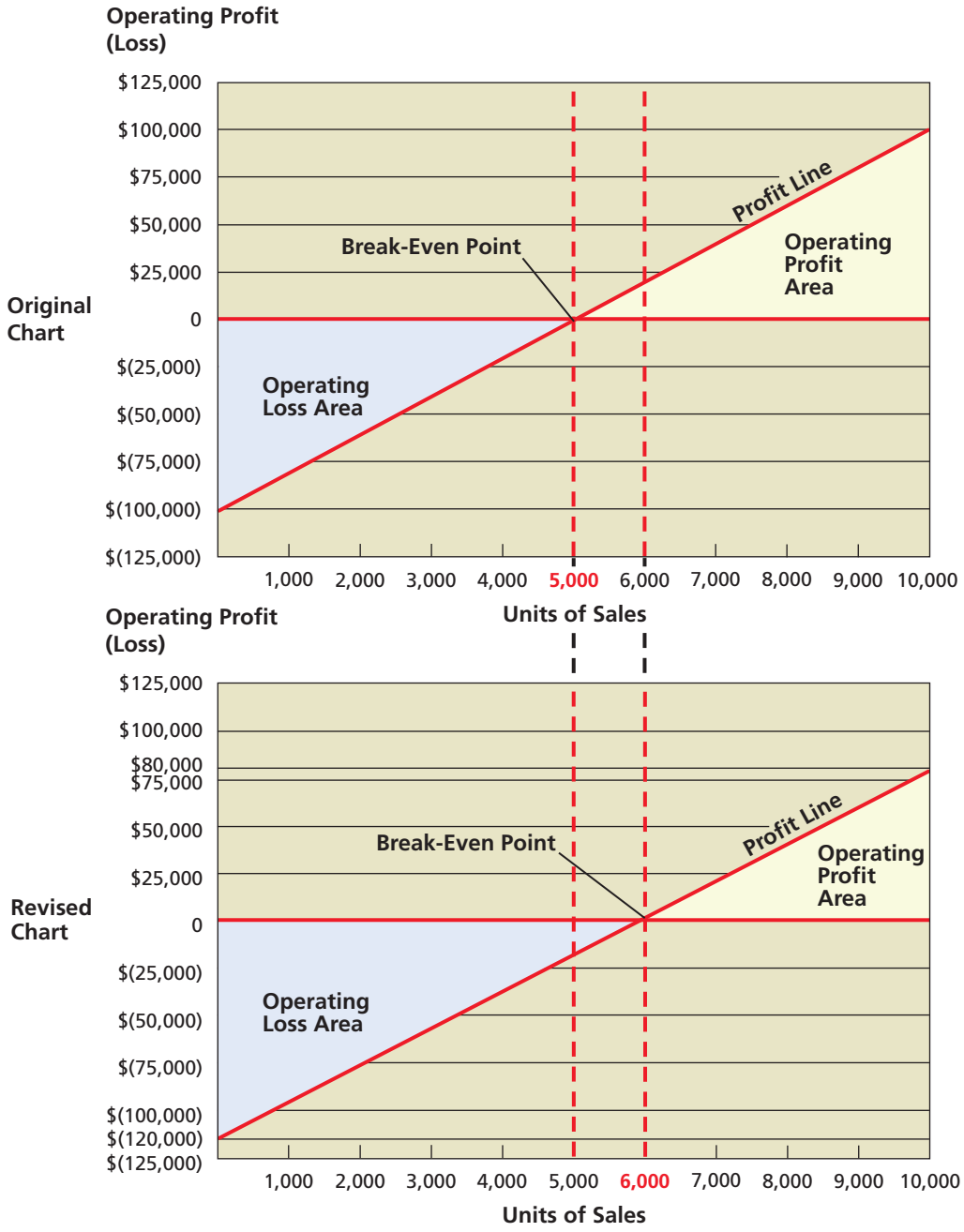
Assumptions of Cost-Volume-Profit Analysis

Cost-volume-profit analysis depends on several assumptions. The primary assumptions are listed below.

1. Total sales and total costs can be represented by straight lines.
2. Within the relevant range of operating activity, the efficiency of operations does not change.
3. Costs can be divided into fixed and variable components.
4. The sales mix is constant.
5. There is no change in the inventory quantities during the period.

Exhibit 8

Original Profit-Volume Chart and Revised Profit-Volume Chart



These assumptions simplify cost-volume-profit analysis. Since they are often valid for the relevant range of operations, cost-volume-profit analysis is useful for decision making.[3]

5 Compute the break-even point for a company selling more than one product, the operating leverage, and the margin of safety.

Special Cost-Volume-Profit Relationships

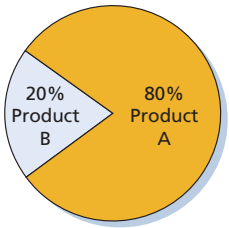
Cost-volume-profit analysis can also be used when a company sells several products with different costs and prices. In addition, operating leverage and the margin of safety are useful in analyzing cost-volume-profit relationships.

3 The impact of violating these assumptions is discussed in advanced accounting texts.

Sales Mix Considerations

Many companies sell more than one product at different selling prices. In addition, the products normally have different unit variable costs and, thus, different unit contribution margins. In such cases, break-even analysis can still be performed by considering the sales mix. The **sales mix** is the relative distribution of sales among the products sold by a company.

To illustrate, assume that Cascade Company sold Products A and B during the past year as follows:



Sales Mix

Total fixed costs	$200,000	
	Product A	**Product B**
Unit selling price	$90	$140
Unit variable cost	70	95
Unit contribution margin	$20	$ 45
Units sold	8,000	2,000
Sales mix	80%	20%

The sales mix for Products A and B is expressed as a percentage of total units sold. For Cascade Company, a total of 10,000 (8,000 + 2,000) units were sold during the year. Therefore, the sales mix is 80% (8,000/10,000) for Product A and 20% for Product B (2,000/10,000) as shown above. The sales mix could also be expressed as the ratio 80:20.

For break-even analysis, it is useful to think of Products A and B as components of one overall enterprise product called E. The unit selling price of E equals the sum of the unit selling prices of each product multiplied by its sales mix percentage. Likewise, the unit variable cost and unit contribution margin of E equal the sum of the unit variable costs and unit contribution margins of each product multiplied by its sales mix percentage.

For Cascade Company, the unit selling price, unit variable cost, and unit contribution margin for E are computed as follows:

Product E			**Product A**		**Product B**
Unit selling price of E	$100	=	($90 × 0.8)	+	($140 × 0.2)
Unit variable cost of E	75	=	($70 × 0.8)	+	($95 × 0.2)
Unit contribution margin of E	$ 25	=	($20 × 0.8)	+	($45 × 0.2)

The break-even point of 8,000 units of E can be determined in the normal manner as shown below.

$$\text{Break-Even Sales (units) for E} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$200{,}000}{\$25} = 8{,}000 \text{ units}$$

Since the sales mix for Products A and B is 80% and 20% respectively, the break-even quantity of A is 6,400 units (8,000 units × 80%) and B is 1,600 units (8,000 units × 20%).

The preceding break-even analysis is verified by the following income statement:

The daily break-even attendance at Universal Studios theme areas depends on how many tickets were sold at an *advance purchase discount* rate vs. the full gate rate. Likewise, the break-even point for an overseas flight of Delta Air Lines will be influenced by the number of first class, business class, and economy class tickets sold for the flight.

	Product A	**Product B**	**Total**
Sales:			
6,400 units × $90	$576,000		$576,000
1,600 units × $140		$224,000	224,000
Total sales	$576,000	$224,000	$800,000
Variable costs:			
6,400 units × $70	$448,000		$448,000
1,600 units × $95		$152,000	152,000
Total variable costs	$448,000	$152,000	$600,000
Contribution margin	$128,000	$ 72,000	$200,000
Fixed costs			200,000
Income from operations			$ 0 ← Break-even point

The effects of changes in the sales mix on the break-even point can be determined by assuming a different sales mix. The break-even point of E can then be recomputed.

Example Exercise 4-5 Sales Mix and Break-Even Analysis 5

Megan Company has fixed costs of $180,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products are provided below.

Product	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
Q	$160	$100	$60
Z	100	80	20

The sales mix for products Q and Z is 75% and 25%, respectively. Determine the break-even point in units of Q and Z.

Follow My Example 4-5

Unit selling price of E: [($160 × 0.75) + ($100 × 0.25)] = $145
Unit variable cost of E: [($100 × 0.75) + ($80 × 0.25)] = 95
Unit contribution margin of E: $ 50

Break-Even Sales (units) = 3,600 units = $180,000/$50

For Practice: PE 4-5A, PE 4-5B

One type of business that has high operating leverage is what is called a "network" business—one in which service is provided over a network that moves either goods or information. Examples of network businesses include American Airlines, Verizon Communications, Yahoo!, and Google.

Operating Leverage

The relationship of a company's contribution margin to income from operations is measured by **operating leverage**. A company's operating leverage is computed as follows:

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Income from Operations}}$$

The difference between contribution margin and income from operations is fixed costs. Thus, companies with high fixed costs will normally have a high operating leverage. Examples of such companies include airline and automotive companies. Low operating leverage is normal for companies that are labor intensive, such as professional service companies, which have low fixed costs.

To illustrate operating leverage, assume the following data for Jones Inc. and Wilson Inc.:

	Jones Inc.	Wilson Inc.
Sales	$400,000	$400,000
Variable costs	300,000	300,000
Contribution margin	$100,000	$100,000
Fixed costs	80,000	50,000
Income from operations	$ 20,000	$ 50,000

As shown above, Jones Inc. and Wilson Inc. have the same sales, the same variable costs, and the same contribution margin. However, Jones Inc. has larger fixed costs than Wilson Inc. and, thus, a higher operating leverage. The operating leverage for each company is computed as follows:

Jones Inc.

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Income from Operations}} = \frac{\$100{,}000}{\$20{,}000} = 5$$

Wilson Inc.

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Income from Operations}} = \frac{\$100{,}000}{\$50{,}000} = 2$$

Operating leverage can be used to measure the impact of changes in sales on income from operations. Using operating leverage, the effect of changes in sales on income from operations is computed as follows:

$$\text{Percent Change in Income from Operations} = \text{Percent Change in Sales} \times \text{Operating Leverage}$$

To illustrate, assume that sales increased by 10%, or $40,000 ($400,000 × 10%), for Jones Inc. and Wilson Inc. The percent increase in income from operations for Jones Inc. and Wilson Inc. is computed below.

Jones Inc.

$$\text{Percent Change in Income from Operations} = \text{Percent Change in Sales} \times \text{Operating Leverage}$$

$$\text{Percent Change in Income from Operations} = 10\% \times 5 = 50\%$$

Wilson Inc.

$$\text{Percent Change in Income from Operations} = \text{Percent Change in Sales} \times \text{Operating Leverage}$$

$$\text{Percent Change in Income from Operations} = 10\% \times 2 = 20\%$$

As shown above, Jones Inc.'s income from operations increases by 50%, while Wilson Inc.'s income from operations increases by only 20%. The validity of this analysis is shown in the following income statements for Jones Inc. and Wilson Inc. based on the 10% increase in sales:

	Jones Inc.	Wilson Inc.
Sales	$440,000	$440,000
Variable costs	330,000	330,000
Contribution margin	$ 110,000	$ 110,000
Fixed costs	80,000	50,000
Income from operations	$ 30,000	$ 60,000

The preceding income statements indicate that Jones Inc.'s income from operations increased from $20,000 to $30,000, a 50% increase ($10,000/$20,000). In contrast, Wilson Inc.'s income from operations increased from $50,000 to $60,000, a 20% increase ($10,000/$50,000).

Because even a small increase in sales will generate a large percentage increase in income from operations, Jones Inc. might consider ways to increase sales. Such actions could include special advertising or sales promotions. In contrast, Wilson Inc. might consider ways to increase operating leverage by reducing variable costs.

The impact of a change in sales on income from operations for companies with high and low operating leverage can be summarized as follows:

Operating Leverage	Percentage Impact on Income from Operations from a Change in Sales
High	Large
Low	Small

Example Exercise 4-6 Operating Leverage 5

Tucker Company reports the following data:

Sales	$750,000
Variable costs	500,000
Contribution margin	$250,000
Fixed costs	187,500
Income from operations	$ 62,500

Determine Tucker Company's operating leverage.

Follow My Example 4-6

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Income from Operations}} = \frac{\$250{,}000}{\$62{,}500} = 4.0$$

4.0 = ($750,000 − $500,000)/($750,000 − $500,000 − $187,500) = $250,000/$62,500

For Practice: PE 4-6A, PE 4-6B

Margin of Safety

The **margin of safety** indicates the possible decrease in sales that may occur before an operating loss results. Thus, if the margin of safety is low, even a small decline in sales revenue may result in an operating loss.

The margin of safety may be expressed in the following ways:

1. Dollars of sales
2. Units of sales
3. Percent of current sales

To illustrate, assume the following data:

Sales	$250,000
Sales at the break-even point	200,000
Unit selling price	25

The margin of safety in dollars of sales is $50,000 ($250,000 − $200,000). The margin of safety in units is 2,000 units ($50,000/$25). The margin of safety expressed as a percent of current sales is 20%, as computed below.

$$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

$$= \frac{\$250{,}000 - \$200{,}000}{\$250{,}000} = \frac{\$50{,}000}{\$250{,}000} = 20\%$$

Therefore, the current sales may decline $50,000, 2,000 units, or 20% before an operating loss occurs.

Example Exercise 4-7 Margin of Safety 5

The Rachel Company has sales of $400,000, and the break-even point in sales dollars is $300,000. Determine the company's margin of safety as a percent of current sales.

Follow My Example 4-7

25% = ($400,000 − $300,000)/$400,000

For Practice: PE 4-7A, PE 4-7B

At a Glance 4

1 Classify costs as variable costs, fixed costs, or mixed costs.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Cost behavior refers to the manner in which costs change as a related activity changes. Variable costs vary in proportion to changes in the level of activity. Fixed costs remain the same in total dollar amount as the level of activity changes. Mixed costs are comprised of both fixed and variable costs.	• Describe variable costs. • Describe fixed costs. • Describe mixed costs. • Separate mixed costs using the high-low method.	**4-1**	4-1A, 4-1B

2 Compute the contribution margin, the contribution margin ratio, and the unit contribution margin.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Contribution margin is the excess of sales revenue over variable costs and can be expressed as a ratio (contribution margin ratio) or a dollar amount (unit contribution margin). The contribution margin concept is useful for business planning because it provides insight into the profit potential of the firm.	• Describe contribution margin. • Compute the contribution margin ratio. • Compute the unit contribution margin.	**4-2** **4-2**	4-2A, 4-2B 4-2A, 4-2B

3 Determine the break-even point and sales necessary to achieve a target profit.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The break-even point is the point at which a business's revenues exactly equal costs. The mathematical approach to cost-volume-profit analysis uses the unit contribution margin concept and mathematical equations to determine the break-even point and the volume necessary to achieve a target profit for a business.	• Compute the break-even point in units.	**4-3**	4-3A, 4-3B
	• Describe how changes in fixed costs affect the break-even point.		
	• Describe how changes in unit variable costs affect the break-even point.		
	• Describe how a change in the unit selling price affects the break-even point.	**4-3**	4-3A, 4-3B
	• Compute the break-even point to earn a target profit.	**4-4**	4-4A, 4-4B

4 Using a cost-volume-profit chart and a profit-volume chart, determine the break-even point and sales necessary to achieve a target profit.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Graphical methods can be used to determine the break-even point and the volume necessary to achieve a target profit. A cost-volume-profit chart focuses on the relationship among costs, sales, and operating profit or loss. The profit-volume chart focuses on profits rather than on revenues and costs.	• Describe how to construct a cost-volume-profit chart.		
	• Determine the break-even point using a cost-volume-profit chart.		
	• Describe how to construct a profit-volume chart.		
	• Determine the break-even point using a profit-volume chart.		
	• Describe factors affecting the reliability of cost-volume-profit analysis.		

5 Compute the break-even point for a company selling more than one product, the operating leverage, and the margin of safety.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Cost-volume-profit relationships can be used for analyzing (1) sales mix, (2) operating leverage, and (3) margin of safety. Sales mix computes the break-even point for a business selling more than one product. Operating leverage measures the impact of changes in sales on income from operations. The margin of safety measures the possible decrease in sales that may occur before an operating loss results.	• Compute the break-even point for more than one product.	**4-5**	4-5A, 4-5B
	• Compute operating leverage.	**4-6**	4-6A, 4-6B
	• Compute the margin of safety.	**4-7**	4-7A, 4-7B

Key Terms

activity bases (drivers) (132)
break-even point (141)
contribution margin (138)
contribution margin ratio (138)
cost behavior (132)
cost-volume-profit analysis (137)
cost-volume-profit chart (146)
fixed costs (134)
high-low method (136)
margin of safety (154)
mixed costs (134)
operating leverage (152)
profit-volume chart (148)
relevant range (132)
sales mix (151)
unit contribution margin (139)
variable costing (137)
variable costs (133)

Illustrative Problem

Wyatt Inc. expects to maintain the same inventories at the end of the year as at the beginning of the year. The estimated fixed costs for the year are $288,000, and the estimated variable costs per unit are $14. It is expected that 60,000 units will be sold at a price of $20 per unit. Maximum sales within the relevant range are 70,000 units.

Instructions

1. What is (a) the contribution margin ratio and (b) the unit contribution margin?
2. Determine the break-even point in units.
3. Construct a cost-volume-profit chart, indicating the break-even point.
4. Construct a profit-volume chart, indicating the break-even point.
5. What is the margin of safety?

Solution

1. a. $$\text{Contribution Margin Ratio} = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$$

$$\text{Contribution Margin Ratio} = \frac{(60{,}000 \text{ units} \times \$20) - (60{,}000 \text{ units} \times \$14)}{(60{,}000 \text{ units} \times \$20)}$$

$$\text{Contribution Margin Ratio} = \frac{\$1{,}200{,}000 - \$840{,}000}{\$1{,}200{,}000} = \frac{\$360{,}000}{\$1{,}200{,}000}$$

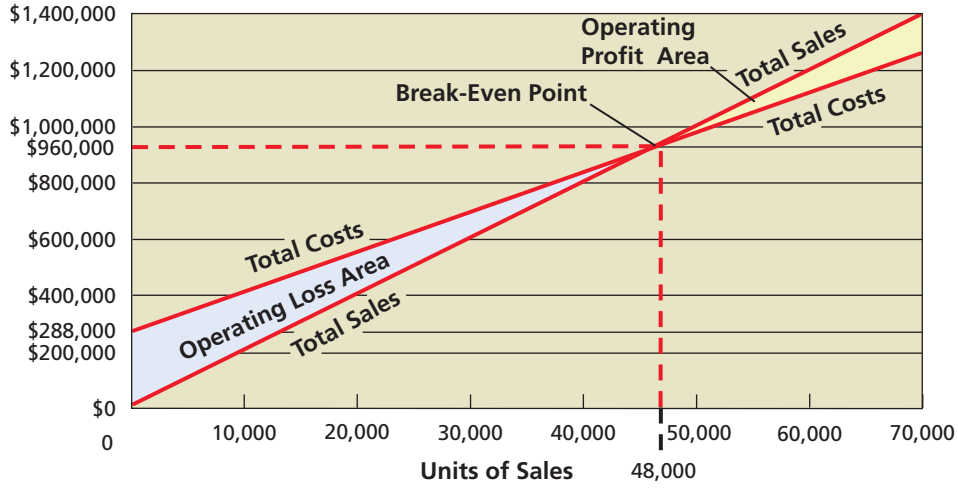
$$\text{Contribution Margin Ratio} = 30\%$$

b. $$\text{Unit Contribution Margin} = \text{Unit Selling Price} - \text{Unit Variable Costs}$$
$$\text{Unit Contribution Margin} = \$20 - \$14 = \$6$$

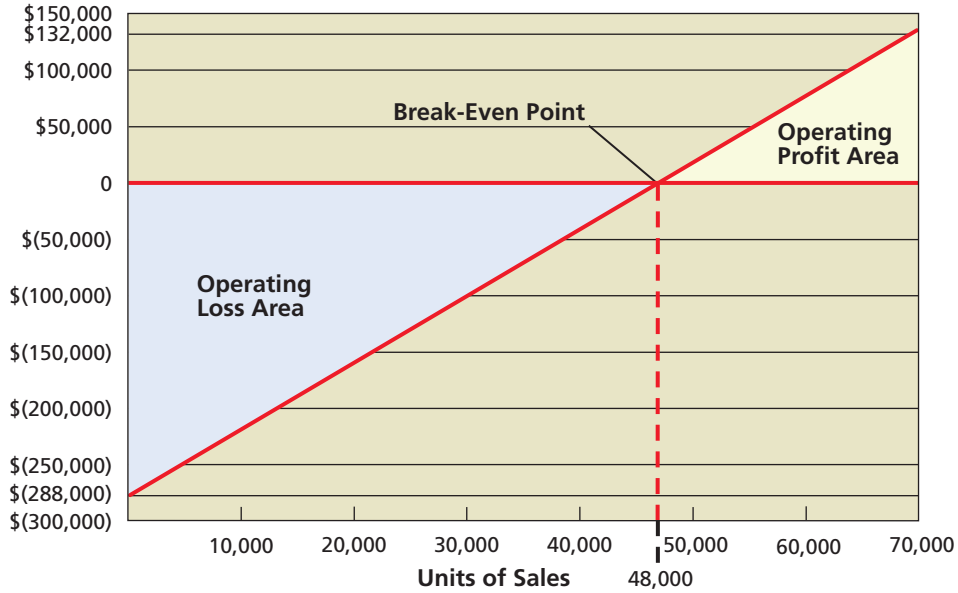
2. $$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

$$\text{Break-Even Sales (units)} = \frac{\$288{,}000}{\$6} = 48{,}000 \text{ units}$$

3. **Sales and Costs**



4. **Operating Profit (Loss)**



5. Margin of safety:

Expected sales (60,000 units × $20)	$1,200,000
Break-even point (48,000 units × $20)	960,000
Margin of safety	$ 240,000

or

$$\text{Margin of Safety (units)} = \frac{\text{Margin of Safety (dollars)}}{\text{Unit Contribution Margin}}$$

or

12,000 units ($240,000/$20)

or

$$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

$$\text{Margin of Safety} = \frac{\$240,000}{\$1,200,000} = 20\%$$

Self-Examination Questions (Answers at End of Chapter)

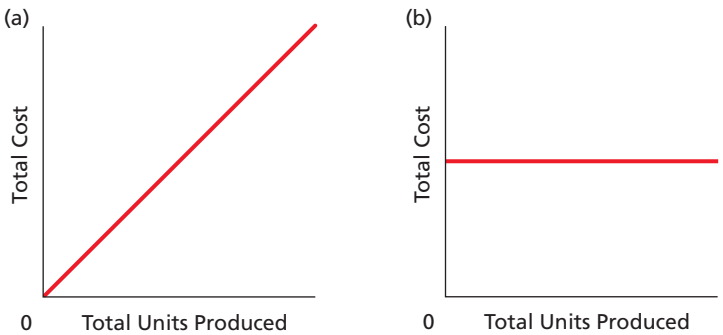
1. Which of the following statements describes variable costs?
   A. Costs that vary on a per-unit basis as the level of activity changes.
   B. Costs that vary in total in direct proportion to changes in the level of activity.
   C. Costs that remain the same in total dollar amount as the level of activity changes.
   D. Costs that vary on a per-unit basis, but remain the same in total as the level of activity changes.
2. If sales are $500,000, variable costs are $200,000, and fixed costs are $240,000, what is the contribution margin ratio?
   A. 40% C. 52%
   B. 48% D. 60%
3. If the unit selling price is $16, the unit variable cost is $12, and fixed costs are $160,000, what are the break-even sales (units)?
   A. 5,714 units C. 13,333 units
   B. 10,000 units D. 40,000 units
4. Based on the data presented in Question 3, how many units of sales would be required to realize income from operations of $20,000?
   A. 11,250 units C. 40,000 units
   B. 35,000 units D. 45,000 units
5. Based on the following operating data, what is the operating leverage?

Sales	$600,000
Variable costs	240,000
Contribution margin	$360,000
Fixed costs	160,000
Income from operations	$200,000

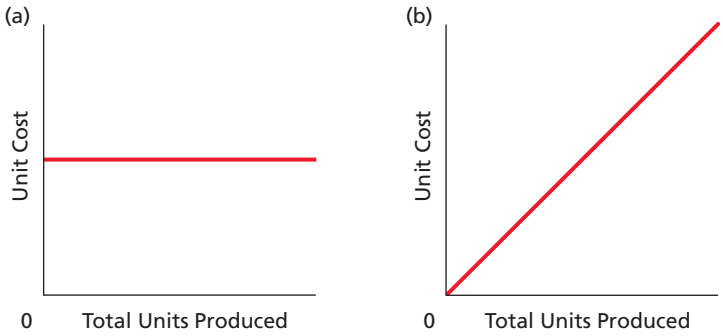
   A. 0.8 C. 1.8
   B. 1.2 D. 4.0

Eye Openers

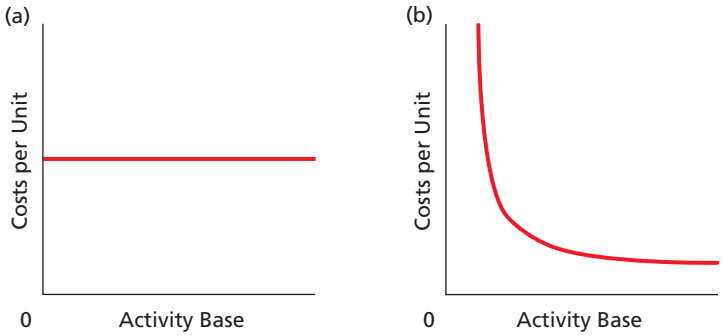
1. Describe how total variable costs and unit variable costs behave with changes in the level of activity.
2. How would each of the following costs be classified if units produced is the activity base?
   a. Direct materials costs
   b. Direct labor costs
   c. Electricity costs of $0.35 per kilowatt-hour
3. Describe the behavior of (a) total fixed costs and (b) unit fixed costs as the level of activity increases.
4. How would each of the following costs be classified if units produced is the activity base?
   a. Salary of factory supervisor ($70,000 per year)
   b. Straight-line depreciation of plant and equipment
   c. Property rent of $6,000 per month on plant and equipment
5. In cost analyses, how are mixed costs treated?
6. Which of the following graphs illustrates how total fixed costs behave with changes in total units produced?



7. Which of the following graphs illustrates how unit variable costs behave with changes in total units produced?



8. Which of the following graphs best illustrates fixed costs per unit as the activity base changes?



9. In applying the high-low method of cost estimation, how is the total fixed cost estimated?
10. If fixed costs increase, what would be the impact on the (a) contribution margin? (b) income from operations?
11. An examination of the accounting records of Clowney Company disclosed a high contribution margin ratio and production at a level below maximum capacity. Based on this information, suggest a likely means of improving income from operations. Explain.
12. If the unit cost of direct materials is decreased, what effect will this change have on the break-even point?
13. If insurance rates are increased, what effect will this change in fixed costs have on the break-even point?
14. Both Austin Company and Hill Company had the same sales, total costs, and income from operations for the current fiscal year; yet Austin Company had a lower break-even point than Hill Company. Explain the reason for this difference in break-even points.
15. The reliability of cost-volume-profit (CVP) analysis depends on several key assumptions. What are those primary assumptions?
16. How does the sales mix affect the calculation of the break-even point?
17. What does operating leverage measure, and how is it computed?

Practice Exercises

PE 4-1A
High-low method

obj. 1

EE 4-1 p. 137

The manufacturing costs of Nashbar Industries for three months of the year are provided below.

	Total Costs	Production
April	$140,000	6,000 units
May	300,000	16,000
June	380,000	18,000

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.

PE 4-1B
High-low method
obj. 1
EE 4-1 p. 137

The manufacturing costs of Sige Enterprises for the first three months of the year are provided below.

	Total Costs	Production
January	$150,000	1,500 units
February	200,000	2,500
March	180,000	2,000

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.

PE 4-2A
Contribution margin
obj. 2
EE 4-2 p. 140

Rumpza Company sells 8,000 units at $50 per unit. Variable costs are $40 per unit, and fixed costs are $20,000. Determine (a) the contribution margin ratio, (b) the unit contribution margin, and (c) income from operations.

PE 4-2B
Contribution margin
obj. 2
EE 4-2 p. 140

Carlin Company sells 14,000 units at $10 per unit. Variable costs are $9 per unit, and fixed costs are $5,000. Determine (a) the contribution margin ratio, (b) the unit contribution margin, and (c) income from operations.

PE 4-3A
Break-even point
obj. 3
EE 4-3 p. 144

Frankel Enterprises sells a product for $60 per unit. The variable cost is $40 per unit, while fixed costs are $30,000. Determine (a) the break-even point in sales units and (b) the break-even point if the selling price were increased to $65 per unit.

PE 4-3B
Break-even point
obj. 3
EE 4-3 p. 144

Grobe Inc. sells a product for $90 per unit. The variable cost is $75 per unit, while fixed costs are $45,000. Determine (a) the break-even point in sales units and (b) the break-even point if the selling price were decreased to $85 per unit.

PE 4-4A
Target profit
obj. 3
EE 4-4 p. 145

Steward Inc. sells a product for $40 per unit. The variable cost is $30 per unit, and fixed costs are $15,000. Determine (a) the break-even point in sales units and (b) the break-even point in sales units if the company desires a target profit of $15,000.

PE 4-4B
Target profit
obj. 3
EE 4-4 p. 145

Beets Company sells a product for $75 per unit. The variable cost is $65 per unit, and fixed costs are $100,000. Determine (a) the break-even point in sales units and (b) the break-even point in sales units if the company desires a target profit of $50,000.

PE 4-5A
Sales mix and break-even analysis
obj. 5
EE 4-5 p. 152

Dewi Inc. has fixed costs of $220,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products are provided below.

Product	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
A	$120	$100	$20
B	75	45	30

The sales mix for products A and B is 80% and 20%, respectively. Determine the break-even point in units of A and B.

PE 4-5B
Sales mix and break-even analysis
obj. 5
EE 4-5 p. 152

Hackworth Company has fixed costs of $150,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products are provided below.

Product	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
R	$40	$25	$15
S	60	50	10

The sales mix for products R and S is 40% and 60%, respectively. Determine the break-even point in units of R and S.

PE 4-6A
Operating leverage
obj. 5
EE 4-6 p. 154

Ruth Enterprises reports the following data:

Sales	$800,000
Variable costs	350,000
Contribution margin	$450,000
Fixed costs	225,000
Income from operations	$225,000

Determine Ruth Enterprises's operating leverage.

PE 4-6B
Operating leverage
obj. 5
EE 4-6 p. 154

Saik Co. reports the following data:

Sales	$750,000
Variable costs	300,000
Contribution margin	$450,000
Fixed costs	150,000
Income from operations	$300,000

Determine Saik Co.'s operating leverage.

PE 4-7A
Margin of safety
obj. 5
EE 4-7 p. 155

Rogan Inc. has sales of $750,000, and the break-even point in sales dollars is $675,000. Determine the company's margin of safety as a percent of current sales.

PE 4-7B
Margin of safety
obj. 5
EE 4-7 p. 155

Rejeski Company has sales of $400,000, and the break-even point in sales dollars is $240,000. Determine the company's margin of safety as a percent of current sales.

Exercises

EX 4-1
Classify costs
obj. 1

Following is a list of various costs incurred in producing toy robotic helicopters. With respect to the production and sale of these toy helicopters, classify each cost as either variable, fixed, or mixed.

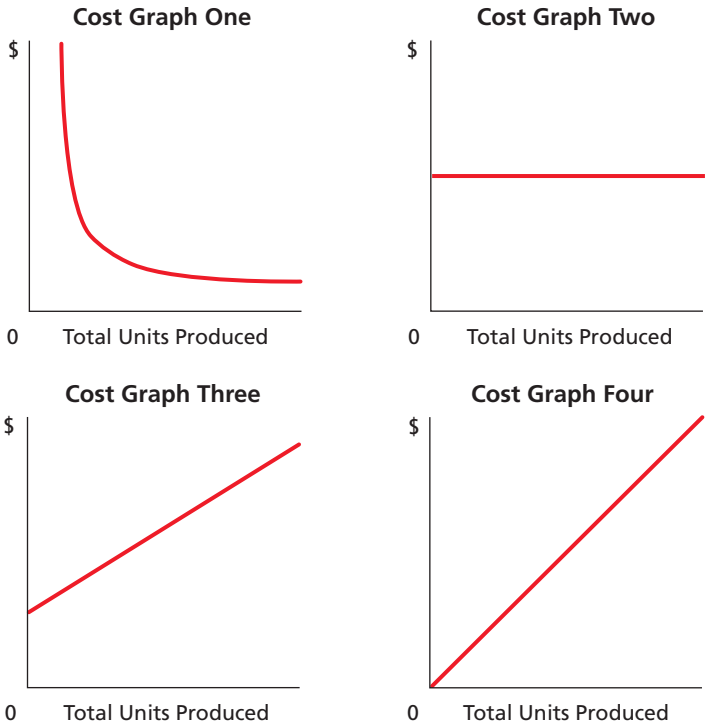
1. Oil used in manufacturing equipment
2. Hourly wages of inspectors
3. Electricity costs, $0.20 per kilowatt-hour
4. Property insurance premiums, $1,500 per month plus $0.006 for each dollar of property over $2,000,000
5. Janitorial costs, $4,000 per month
6. Pension cost, $0.80 per employee hour on the job
7. Computer chip (purchased from a vendor)
8. Hourly wages of machine operators
9. Straight-line depreciation on the production equipment
10. Metal

(continued)

11. Packaging
12. Rent on warehouse, $10,000 per month plus $10 per square foot of storage used
13. Plastic
14. Property taxes, $100,000 per year on factory building and equipment
15. Salary of plant manager

EX 4-2
Identify cost graphs
obj. 1

The following cost graphs illustrate various types of cost behavior:



For each of the following costs, identify the cost graph that best illustrates its cost behavior as the number of units produced increases.

a. Total direct materials cost
b. Electricity costs of $2,000 per month plus $0.09 per kilowatt-hour
c. Per-unit direct labor cost
d. Salary of quality control supervisor, $10,000 per month
e. Per-unit cost of straight-line depreciation on factory equipment

EX 4-3
Identify activity bases
obj. 1

For a major university, match each cost in the following table with the activity base most appropriate to it. An activity base may be used more than once, or not used at all.

Cost:	Activity Base:
1. Housing personnel wages	a. Number of financial aid applications
2. Student records office salaries	b. Number of enrolled students and alumni
3. Financial aid office salaries	c. Student credit hours
4. School supplies	d. Number of student/athletes
5. Instructor salaries	e. Number of enrollment applications
6. Admissions office salaries	f. Number of students living on campus

EX 4-4
Identify activity bases
obj. 1

From the following list of activity bases for an automobile dealership, select the base that would be most appropriate for each of these costs: (1) preparation costs (cleaning, oil, and gasoline costs) for each car received, (2) salespersons' commission of 4% of the sales price for each car sold, and (3) administrative costs for ordering cars.

a. Dollar amount of cars sold
b. Number of cars received
c. Dollar amount of cars on hand
d. Number of cars on hand
e. Dollar amount of cars ordered
f. Dollar amount of cars received
g. Number of cars ordered
h. Number of cars sold

EX 4-5
Identify fixed and variable costs

obj. 1

Intuit Inc. develops and sells software products for the personal finance market, including popular titles such as Quicken® and TurboTax®. Classify each of the following costs and expenses for this company as either variable or fixed to the number of units produced and sold:

a. Shipping expenses
b. Property taxes on general offices
c. Straight-line depreciation of computer equipment
d. Salaries of human resources personnel
e. President's salary
f. Advertising
g. Sales commissions
h. CDs
i. Packaging costs
j. Salaries of software developers
k. Wages of telephone order assistants
l. User's guides

EX 4-6
Relevant range and fixed and variable costs

obj. 1

✔ a. $0.32

Robo-Tech Inc. manufactures components for computer games within a relevant range of 200,000 to 320,000 disks per year. Within this range, the following partially completed manufacturing cost schedule has been prepared:

Components produced	200,000	250,000	320,000
Total costs:			
Total variable costs	$ 64,000	(d)	(j)
Total fixed costs	80,000	(e)	(k)
Total costs	$144,000	(f)	(l)
Cost per unit:			
Variable cost per unit	(a)	(g)	(m)
Fixed cost per unit	(b)	(h)	(n)
Total cost per unit	(c)	(i)	(o)

Complete the cost schedule, identifying each cost by the appropriate letter (a) through (o).

EX 4-7
High-low method

obj. 1

✔ a. $16.00 per unit

Shatner Inc. has decided to use the high-low method to estimate the total cost and the fixed and variable cost components of the total cost. The data for various levels of production are as follows:

Units Produced	Total Costs
7,500	$600,000
12,500	725,000
20,000	800,000

a. Determine the variable cost per unit and the fixed cost.
b. Based on part (a), estimate the total cost for 10,000 units of production.

EX 4-8
High-low method for service company

obj. 1

Blowing Rock Railroad decided to use the high-low method and operating data from the past six months to estimate the fixed and variable components of transportation costs. The activity base used by Blowing Rock Railroad is a measure of railroad operating activity, termed "gross-ton miles," which is the total number of tons multiplied by the miles moved.

✔ Fixed cost, $160,000

	Transportation Costs	Gross-Ton Miles
January	$760,000	275,000
February	850,000	310,000
March	600,000	200,000
April	810,000	300,000
May	680,000	240,000
June	875,000	325,000

Determine the variable cost per gross-ton mile and the fixed cost.

EX 4-9
Contribution margin ratio

obj. 2

✔ a. 84%

a. Bert Company budgets sales of $1,250,000, fixed costs of $450,000, and variable costs of $200,000. What is the contribution margin ratio for Bert Company?
b. If the contribution margin ratio for Ernie Company is 40%, sales were $750,000, and fixed costs were $225,000, what was the income from operations?

EX 4-10
Contribution margin and contribution margin ratio

obj. 2

✔ b. 34.9%

For a recent year, McDonald's company-owned restaurants had the following sales and expenses (in millions):

Sales	$16,083
Food and packaging	$ 5,350
Payroll	4,185
Occupancy (rent, depreciation, etc.)	4,006
General, selling, and administrative expenses	2,340
	$15,881
Income from operations	$ 202

Assume that the variable costs consist of food and packaging, payroll, and 40% of the general, selling, and administrative expenses.

a. What is McDonald's contribution margin? Round to the nearest million.
b. What is McDonald's contribution margin ratio? Round to one decimal place.
c. How much would income from operations increase if same-store sales increased by $500 million for the coming year, with no change in the contribution margin ratio or fixed costs?

EX 4-11
Break-even sales and sales to realize income from operations

obj. 3

✔ b. 21,200 units

For the current year ending March 31, Jwork Company expects fixed costs of $440,000, a unit variable cost of $50, and a unit selling price of $75.

a. Compute the anticipated break-even sales (units).
b. Compute the sales (units) required to realize income from operations of $90,000.

EX 4-12
Break-even sales

obj. 3

✔ a. 76,149,219 barrels

Anheuser-Busch Companies, Inc., reported the following operating information for a recent year (in millions):

Net sales	$15,717.1
Cost of goods sold	$10,165.0
Marketing and distribution	2,832.5
	$12,997.5
Income from operations	$ 2,719.6*

*Before special items

In addition, Anheuser-Busch sold 125 million barrels of beer during the year. Assume that variable costs were 75% of the cost of goods sold and 40% of marketing and distribution expenses. Assume that the remaining costs are fixed. For the following year, assume that Anheuser-Busch expects pricing, variable costs per barrel, and fixed costs to remain constant, except that new distribution and general office facilities are expected to increase fixed costs by $150 million.

Rounding to the nearest cent:

a. Compute the break-even sales (barrels) for the current year.
b. Compute the anticipated break-even sales (barrels) for the following year.

EX 4-13
Break-even sales
obj. 3
✔ a. 10,500 units

Currently, the unit selling price of a product is $280, the unit variable cost is $230, and the total fixed costs are $525,000. A proposal is being evaluated to increase the unit selling price to $300.

a. Compute the current break-even sales (units).
b. Compute the anticipated break-even sales (units), assuming that the unit selling price is increased and all costs remain constant.

EX 4-14
Break-even analysis
obj. 3

The Dash Club of Tampa, Florida, collected recipes from members and published a cookbook entitled *Life of the Party*. The book will sell for $25 per copy. The chairwoman of the cookbook development committee estimated that the club needed to sell 10,000 books to break even on its $90,000 investment. What is the variable cost per unit assumed in the Dash Club's analysis?

EX 4-15
Break-even analysis
obj. 3

Media outlets such as ESPN and Fox Sports often have Web sites that provide in-depth coverage of news and events. Portions of these Web sites are restricted to members who pay a monthly subscription to gain access to exclusive news and commentary. These Web sites typically offer a free trial period to introduce viewers to the Web site. Assume that during a recent fiscal year, ESPN.com spent $1,800,000 on a promotional campaign for the ESPN.com Web site that offered two free months of service for new subscribers. In addition, assume the following information:

Number of months an average new customer stays with the service (including the two free months)	25 months
Revenue per month per customer subscription	$10.00
Variable cost per month per customer subscription	$2.00

Determine the number of new customer accounts needed to break even on the cost of the promotional campaign. In forming your answer, (1) treat the cost of the promotional campaign as a fixed cost, and (2) treat the revenue less variable cost per account for the subscription period as the unit contribution margin.

EX 4-16
Break-even analysis
obj. 3


Sprint Nextel is one of the largest digital wireless service providers in the United States. In a recent year, it had approximately 41.5 million direct subscribers (accounts) that generated revenue of $40,146 million. Costs and expenses for the year were as follows (in millions):

Cost of revenue	$17,191
Selling, general, and administrative expenses	12,673
Depreciation	5,711

Assume that 75% of the cost of revenue and 35% of the selling, general, and administrative expenses are variable to the number of direct subscribers (accounts).

a. What is Sprint Nextel's break-even number of accounts, using the data and assumptions above? Round units to one decimal place (in millions).
b. How much revenue per account would be sufficient for Sprint Nextel to break even if the number of accounts remained constant?

EX 4-17
Cost-volume-profit chart
obj. 4
✔ b. $360,000

For the coming year, Paladin Inc. anticipates fixed costs of $120,000, a unit variable cost of $60, and a unit selling price of $90. The maximum sales within the relevant range are $900,000.

a. Construct a cost-volume-profit chart.
b. Estimate the break-even sales (dollars) by using the cost-volume-profit chart constructed in part (a).
c. What is the main advantage of presenting the cost-volume-profit analysis in graphic form rather than equation form?

EX 4-18
Profit-volume chart

obj. 4

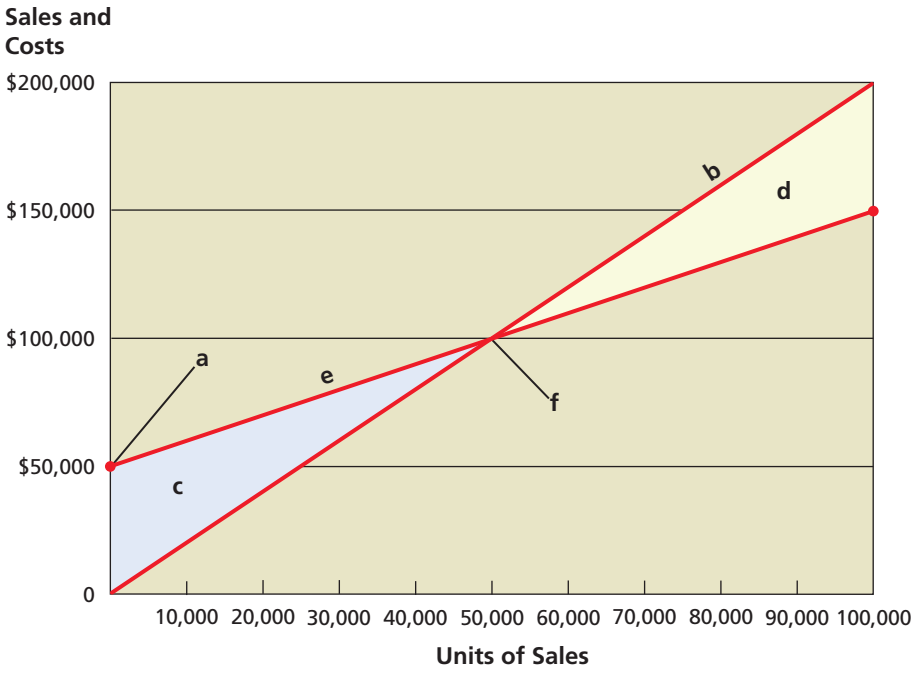
✔ b. $180,000

Using the data for Paladin Inc. in Exercise 4-17, (a) determine the maximum possible operating loss, (b) compute the maximum possible income from operations, (c) construct a profit-volume chart, and (d) estimate the break-even sales (units) by using the profit-volume chart constructed in part (c).

EX 4-19
Break-even chart

obj. 4

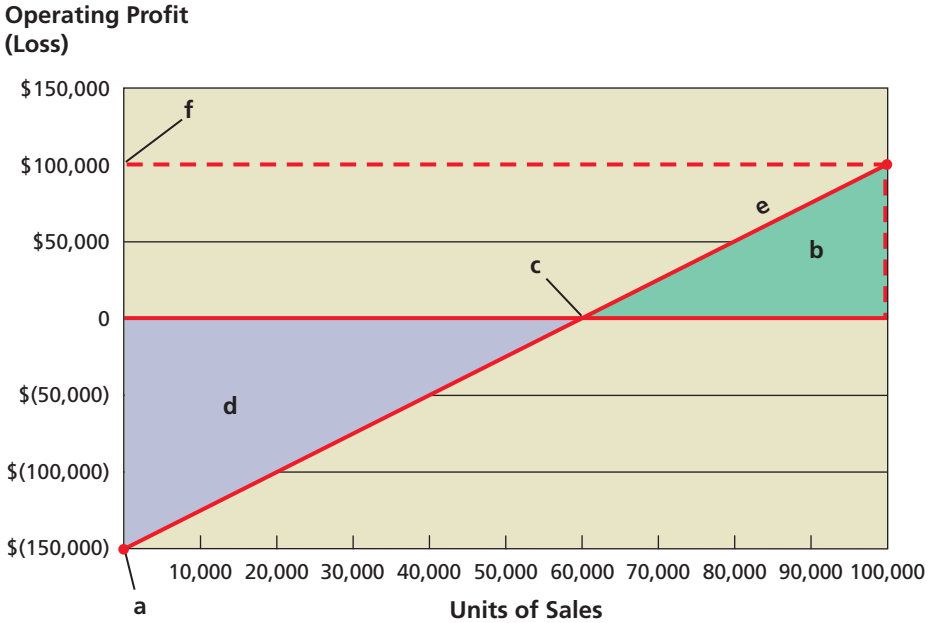
Name the following chart, and identify the items represented by the letters (a) through (f).



EX 4-20
Break-even chart

obj. 4

Name the following chart, and identify the items represented by the letters (a) through (f).



EX 4-21
Sales mix and break-even sales

obj. 5

✔ a. 10,000 units

New Wave Technology Inc. manufactures and sells two products, MP3 players and satellite radios. The fixed costs are $300,000, and the sales mix is 40% MP3 players and 60% satellite radios. The unit selling price and the unit variable cost for each product are as follows:

Products	Unit Selling Price	Unit Variable Cost
MP3 players	$ 60.00	$45.00
Satellite radios	100.00	60.00

a. Compute the break-even sales (units) for the overall product, E.
b. How many units of each product, MP3 players and satellite radios, would be sold at the break-even point?

EX 4-22
Break-even sales and sales mix for a service company

obj. 5

✔ a. 50 seats

Southwest Blue Airways provides air transportation services between Seattle and San Diego. A single Seattle to San Diego round-trip flight has the following operating statistics:

Fuel	$7,000
Flight crew salaries	5,400
Airplane depreciation	2,600
Variable cost per passenger—business class	50
Variable cost per passenger—economy class	40
Round-trip ticket price—business class	550
Round-trip ticket price—economy class	290

It is assumed that the fuel, crew salaries, and airplane depreciation are fixed, regardless of the number of seats sold for the round-trip flight.

a. Compute the break-even number of seats sold on a single round-trip flight for the overall product. Assume that the overall product is 20% business class and 80% economy class tickets.
b. How many business class and economy class seats would be sold at the break-even point?

EX 4-23
Margin of safety

obj. 5

✔ a. (2) 25%

a. If Fama Company, with a break-even point at $360,000 of sales, has actual sales of $480,000, what is the margin of safety expressed (1) in dollars and (2) as a percentage of sales?
b. If the margin of safety for Watkins Company was 25%, fixed costs were $1,200,000, and variable costs were 75% of sales, what was the amount of actual sales (dollars)? (*Hint:* Determine the break-even in sales dollars first.)

EX 4-24
Break-even and margin of safety relationships

obj. 5

At a recent staff meeting, the management of Guthold Gaming Technologies, Inc., was considering discontinuing the Evegi line of electronic games from the product line. The chief financial analyst reported the following current monthly data for the Evegi:

Units of sales	85,000
Break-even units	100,000
Margin of safety in units	7,000

For what reason would you question the validity of these data?

EX 4-25
Operating leverage

obj. 5

✔ a. Varner, 3.00

Varner Inc. and King Inc. have the following operating data:

	Varner	King
Sales	$300,000	$600,000
Variable costs	120,000	360,000
Contribution margin	$180,000	$240,000
Fixed costs	120,000	80,000
Income from operations	$ 60,000	$160,000

a. Compute the operating leverage for Varner Inc. and King Inc.
b. How much would income from operations increase for each company if the sales of each increased by 20%?
c. Why is there a difference in the increase in income from operations for the two companies? Explain.

Problem Series A

PR 4-1A
Classify costs
obj. 1

West Coast Apparel Co. manufactures a variety of clothing types for distribution to several major retail chains. The following costs are incurred in the production and sale of blue jeans:

a. Salary of production vice president
b. Property taxes on property, plant, and equipment
c. Electricity costs of $0.12 per kilowatt-hour
d. Salesperson's salary, $30,000 plus 2% of the total sales
e. Consulting fee of $100,000 paid to industry specialist for marketing advice
f. Shipping boxes used to ship orders
g. Dye
h. Thread
i. Salary of designers
j. Brass buttons
k. Janitorial supplies, $2,000 per month
l. Legal fees paid to attorneys in defense of the company in a patent infringement suit, $40,000 plus $150 per hour
m. Straight-line depreciation on sewing machines
n. Insurance premiums on property, plant, and equipment, $50,000 per year plus $4 per $20,000 of insured value over $10,000,000
o. Hourly wages of machine operators
p. Fabric
q. Rental costs of warehouse, $4,000 per month plus $3 per square foot of storage used
r. Rent on experimental equipment, $40,000 per year
s. Leather for patches identifying the brand on individual pieces of apparel
t. Supplies

Instructions

Classify the preceding costs as either fixed, variable, or mixed. Use the following tabular headings and place an "X" in the appropriate column. Identify each cost by letter in the cost column.

Cost Cost	Fixed Cost	Variable Cost	Mixed

PR 4-2A
Break-even sales under present and proposed conditions
objs. 2, 3
✔ 2 (a) $50.00

Battonkill Company, operating at full capacity, sold 112,800 units at a price of $150 per unit during 2010. Its income statement for 2010 is as follows:

Sales		$16,920,000
Cost of goods sold		6,000,000
Gross profit		$10,920,000
Expenses:		
Selling expenses	$3,000,000	
Administrative expenses	1,800,000	
Total expenses		4,800,000
Income from operations		$ 6,120,000

The division of costs between fixed and variable is as follows:

	Fixed	Variable
Cost of sales	40%	60%
Selling expenses	50%	50%
Administrative expenses	70%	30%

Management is considering a plant expansion program that will permit an increase of $1,500,000 in yearly sales. The expansion will increase fixed costs by $200,000, but will not affect the relationship between sales and variable costs.

Instructions

1. Determine for 2010 the total fixed costs and the total variable costs.
2. Determine for 2010 (a) the unit variable cost and (b) the unit contribution margin.
3. Compute the break-even sales (units) for 2010.
4. Compute the break-even sales (units) under the proposed program.
5. Determine the amount of sales (units) that would be necessary under the proposed program to realize the $6,120,000 of income from operations that was earned in 2010.
6. Determine the maximum income from operations possible with the expanded plant.
7. If the proposal is accepted and sales remain at the 2010 level, what will the income or loss from operations be for 2011?
8. Based on the data given, would you recommend accepting the proposal? Explain.

PR 4-3A
Break-even sales and cost-volume-profit chart

objs. 3, 4

✔ 1. 30,000 units

For the coming year, Tolstoy Company anticipates a unit selling price of $100, a unit variable cost of $30, and fixed costs of $2,100,000.

Instructions

1. Compute the anticipated break-even sales (units).
2. Compute the sales (units) required to realize income from operations of $350,000.
3. Construct a cost-volume-profit chart, assuming maximum sales of 50,000 units within the relevant range.
4. Determine the probable income (loss) from operations if sales total 40,000 units.

PR 4-4A
Break-even sales and cost-volume-profit chart

objs. 3, 4

✔ 1. 3,400 units

Last year, Douthett Inc. had sales of $2,400,000, based on a unit selling price of $600. The variable cost per unit was $440, and fixed costs were $544,000. The maximum sales within Douthett's relevant range are 5,000 units. Douthett is considering a proposal to spend an additional $80,000 on billboard advertising during the current year in an attempt to increase sales and utilize unused capacity.

Instructions

1. Construct a cost-volume-profit chart indicating the break-even sales for last year. Verify your answer, using the break-even equation.
2. Using the cost-volume-profit chart prepared in part (1), determine (a) the income from operations for last year and (b) the maximum income from operations that could have been realized during the year. Verify your answers arithmetically.
3. Construct a cost-volume-profit chart indicating the break-even sales for the current year, assuming that a noncancelable contract is signed for the additional billboard advertising. No changes are expected in the unit selling price or other costs. Verify your answer, using the break-even equation.
4. Using the cost-volume-profit chart prepared in part (3), determine (a) the income from operations if sales total 4,000 units and (b) the maximum income from operations that could be realized during the year. Verify your answers arithmetically.

PR 4-5A
Sales mix and break-even sales

obj. 5

✔ 1. 3,000 units

Data related to the expected sales of snowboards and skis for Winter Sports Inc. for the current year, which is typical of recent years, are as follows:

Products	Unit Selling Price	Unit Variable Cost	Sales Mix
Snowboards	$250.00	$170.00	40%
Skis	340.00	160.00	60%

The estimated fixed costs for the current year are $420,000.

Instructions

1. Determine the estimated units of sales of the overall product necessary to reach the break-even point for the current year.
2. Based on the break-even sales (units) in part (1), determine the unit sales of both snowboards and skis for the current year.
3. Assume that the sales mix was 60% snowboards and 40% skis. Compare the break-even point with that in part (1). Why is it so different?

PR 4-6A
Contribution margin, break-even sales, cost-volume-profit chart, margin of safety, and operating leverage

objs. 2, 3, 4, 5

✔ 2. 50%

Soldner Health Care Products Inc. expects to maintain the same inventories at the end of 2010 as at the beginning of the year. The total of all production costs for the year is therefore assumed to be equal to the cost of goods sold. With this in mind, the various department heads were asked to submit estimates of the costs for their departments during 2010. A summary report of these estimates is as follows:

	Estimated Fixed Cost	Estimated Variable Cost (per unit sold)
Production costs:		
Direct materials	—	$18.00
Direct labor	—	12.00
Factory overhead	$318,000	9.00
Selling expenses:		
Sales salaries and commissions	65,500	4.00
Advertising	22,500	—
Travel	5,000	—
Miscellaneous selling expense	5,500	3.50
Administrative expenses:		
Office and officers' salaries	65,000	—
Supplies	8,000	1.50
Miscellaneous administrative expense	10,500	2.00
Total	$500,000	$50.00

It is expected that 20,000 units will be sold at a price of $100 a unit. Maximum sales within the relevant range are 25,000 units.

Instructions

1. Prepare an estimated income statement for 2010.
2. What is the expected contribution margin ratio?
3. Determine the break-even sales in units.
4. Construct a cost-volume-profit chart indicating the break-even sales.
5. What is the expected margin of safety in dollars and as a percentage of sales?
6. Determine the operating leverage.

Problem Series B

PR 4-1B
Classify costs

obj. 1

New Age Furniture Company manufactures sofas for distribution to several major retail chains. The following costs are incurred in the production and sale of sofas:

a. Salary of production vice president
b. Rental costs of warehouse, $20,000 per month
c. Consulting fee of $100,000 paid to efficiency specialists
d. Janitorial supplies, $25 for each sofa produced
e. Employer's FICA taxes on controller's salary of $200,000
f. Hourly wages of sewing machine operators
g. Salary of designers
h. Foam rubber for cushion fillings
i. Straight-line depreciation on factory equipment
j. Cartons used to ship sofas
k. Legal fees paid to attorneys in defense of the company in a patent infringement suit, $20,000 plus $150 per hour
l. Property taxes on property, plant, and equipment
m. Springs
n. Electricity costs of $0.15 per kilowatt-hour
o. Sewing supplies
p. Fabric for sofa coverings
q. Salesperson's salary, $70,000 plus 5% of the selling price of each sofa sold
r. Insurance premiums on property, plant, and equipment, $20,000 per year plus $20 per $20,000 of insured value over $15,000,000

s. Rent on experimental equipment, $45 for every sofa produced
t. Wood for framing the sofas

Instructions

Classify the preceding costs as either fixed, variable, or mixed. Use the following tabular headings and place an "X" in the appropriate column. Identify each cost by letter in the Cost column.

Cost	Fixed Cost	Variable Cost	Mixed Cost

PR 4-2B

Break-even sales under present and proposed conditions

objs. 2, 3

✔ 3. 15,825 units

Gaelic Industries Inc., operating at full capacity, sold 22,350 units at a price of $150 per unit during 2010. Its income statement for 2010 is as follows:

Sales		$3,352,500
Cost of goods sold		2,200,000
Gross profit		$1,152,500
Expenses:		
Selling expenses	$250,000	
Administrative expenses	250,000	
Total expenses		500,000
Income from operations		$ 652,500

The division of costs between fixed and variable is as follows:

	Fixed	Variable
Cost of sales	60%	40%
Selling expenses	50%	50%
Administrative expenses	55%	45%

Management is considering a plant expansion program that will permit an increase of $900,000 in yearly sales. The expansion will increase fixed costs by $242,500, but will not affect the relationship between sales and variable costs.

Instructions

1. Determine for 2010 the total fixed costs and the total variable costs.
2. Determine for 2010 (a) the unit variable cost and (b) the unit contribution margin.
3. Compute the break-even sales (units) for 2010.
4. Compute the break-even sales (units) under the proposed program.
5. Determine the amount of sales (units) that would be necessary under the proposed program to realize the $652,500 of income from operations that was earned in 2010.
6. Determine the maximum income from operations possible with the expanded plant.
7. If the proposal is accepted and sales remain at the 2010 level, what will the income or loss from operations be for 2011?
8. Based on the data given, would you recommend accepting the proposal? Explain.

PR 4-3B

Break-even sales and cost-volume-profit chart

objs. 3, 4

✔ 1. 20,000 units

For the coming year, Favre Products Inc. anticipates a unit selling price of $160, a unit variable cost of $90, and fixed costs of $1,400,000.

Instructions

1. Compute the anticipated break-even sales (units).
2. Compute the sales (units) required to realize income from operations of $525,000.
3. Construct a cost-volume-profit chart, assuming maximum sales of 50,000 units within the relevant range.
4. Determine the probable income (loss) from operations if sales total 30,000 units.

PR 4-4B
Break-even sales and cost-volume-profit chart

objs. 3, 4

✔ 1. 3,250 units

Last year, Cul de sac Co. had sales of $740,000, based on a unit selling price of $200. The variable cost per unit was $120, and fixed costs were $260,000. The maximum sales within Cul de sac's relevant range are 5,000 units. Cul de sac is considering a proposal to spend an additional $30,000 on billboard advertising during the current year in an attempt to increase sales and utilize unused capacity.

Instructions

1. Construct a cost-volume-profit chart indicating the break-even sales for last year. Verify your answer, using the break-even equation.
2. Using the cost-volume-profit chart prepared in part (1), determine (a) the income from operations for last year and (b) the maximum income from operations that could have been realized during the year. Verify your answers arithmetically.
3. Construct a cost-volume-profit chart indicating the break-even sales for the current year, assuming that a noncancelable contract is signed for the additional billboard advertising. No changes are expected in the selling price or other costs. Verify your answer, using the break-even equation.
4. Using the cost-volume-profit chart prepared in part (3), determine (a) the income from operations if sales total 4,000 units and (b) the maximum income from operations that could be realized during the year. Verify your answers arithmetically.

PR 4-5B
Sales mix and break-even sales

obj. 5

✔ 1. 6,156 units

Data related to the expected sales of two types of flat panel TVs for Yan Electronics Inc. for the current year, which is typical of recent years, are as follows:

Products	Unit Selling Price	Unit Variable Cost	Sales Mix
18" Flat panel	$420.00	$300.00	75%
22" Flat panel	540.00	340.00	25%

The estimated fixed costs for the current year are $861,840.

Instructions

1. Determine the estimated units of sales of the overall product necessary to reach the break-even point for the current year.
2. Based on the break-even sales (units) in part (1), determine the unit sales of both the 18" flat panel TV and 22" flat panel TV for the current year.
3. Assume that the sales mix was 25% 18" flat panel TV and 75% 22" flat panel TV. Compare the break-even point with that in part (1). Why is it so different?

PR 4-6B
Contribution margin, break-even sales, cost-volume-profit chart, margin of safety, and operating leverage

objs. 2, 3, 4, 5

✔ 3. 15,000

Steamboat Co. expects to maintain the same inventories at the end of 2010 as at the beginning of the year. The total of all production costs for the year is therefore assumed to be equal to the cost of goods sold. With this in mind, the various department heads were asked to submit estimates of the costs for their departments during 2010. A summary report of these estimates is as follows:

	Estimated Fixed Cost	Estimated Variable Cost (per unit sold)
Production costs:		
Direct materials	—	$15.00
Direct labor	—	10.00
Factory overhead	$210,000	4.50
Selling expenses:		
Sales salaries and commissions	42,500	2.20
Advertising	14,500	—
Travel	3,500	—
Miscellaneous selling expense	2,500	1.80
Administrative expenses:		
Office and officers' salaries	70,000	—
Supplies	6,000	0.75
Miscellaneous administrative expense	11,000	1.75
Total	$360,000	$36.00

It is expected that 30,000 units will be sold at a price of $60 a unit. Maximum sales within the relevant range are 45,000 units.

Instructions

1. Prepare an estimated income statement for 2010.
2. What is the expected contribution margin ratio?
3. Determine the break-even sales in units.
4. Construct a cost-volume-profit chart indicating the break-even sales.
5. What is the expected margin of safety in dollars and as a percentage of sales?
6. Determine the operating leverage.

Special Activities

SA 4-1
Ethics and professional conduct in business

Jeff Zengel is a financial consultant to Rae Properties Inc., a real estate syndicate. Rae Properties Inc. finances and develops commercial real estate (office buildings). The completed projects are then sold as limited partnership interests to individual investors. The syndicate makes a profit on the sale of these partnership interests. Jeff provides financial information for the offering prospectus, which is a document that provides the financial and legal details of the limited partnership offerings. In one of the projects, the bank has financed the construction of a commercial office building at a rate of 8% for the first four years, after which time the rate jumps to 12% for the remaining 21 years of the mortgage. The interest costs are one of the major ongoing costs of a real estate project. Jeff has reported prominently in the prospectus that the break-even occupancy for the first four years is 60%. This is the amount of office space that must be leased to cover the interest and general upkeep costs over the first four years. The 60% break-even is very low and thus communicates a low risk to potential investors. Jeff uses the 60% break-even rate as a major marketing tool in selling the limited partnership interests. Buried in the fine print of the prospectus is additional information that would allow an astute investor to determine that the break-even occupancy will jump to 90% after the fourth year because of the contracted increase in the mortgage interest rate. Jeff believes prospective investors are adequately informed as to the risk of the investment.

Comment on the ethical considerations of this situation.

SA 4-2
Break-even sales, contribution margin

"For a student, a grade of 65 percent is nothing to write home about. But for the airline . . . [industry], filling 65 percent of the seats . . . is the difference between profit and loss.

The [economy] might be just strong enough to sustain all the carriers on a cash basis, but not strong enough to bring any significant profitability to the industry. . . . For the airlines . . ., the emphasis will be on trying to consolidate routes and raise ticket prices. . . ."

The airline industry is notorious for boom and bust cycles. Why is airline profitability very sensitive to these cycles? Do you think that during a down cycle the strategy to consolidate routes and raise ticket prices is reasonable? What would make this strategy succeed or fail? Why?

Source: Edwin McDowell, "Empty Seats, Empty Beds, Empty Pockets," *The New York Times*, January 6, 1992, p. C3.

SA 4-3
Break-even analysis

Techno Games Inc. has finished a new video game, *Mountain Bike Challenge*. Management is now considering its marketing strategies. The following information is available:

Anticipated sales price per unit	$40
Variable cost per unit*	$20
Anticipated volume	400,000
Production costs	$6,000,000
Anticipated advertising	$2,000,000

*The cost of the video game, packaging, and copying costs.

Two managers, David Hunter and Jamie Berry, had the following discussion of ways to increase the profitability of this new offering:

David: I think we need to think of some way to increase our profitability. Do you have any ideas?

Jamie: Well, I think the best strategy would be to become aggressive on price.

David: How aggressive?

Jamie: If we drop the price to $28 per unit and maintain our advertising budget at $2,000,000, I think we will generate sales of 1,500,000 units.

David: I think that's the wrong way to go. You're giving too much up on price. Instead, I think we need to follow an aggressive advertising strategy.

Jamie: How aggressive?

David: If we increase our advertising to a total of $6,000,000, we should be able to increase sales volume to 1,300,000 units without any change in price.

Jamie: I don't think that's reasonable. We'll never cover the increased advertising costs.

Which strategy is best: Do nothing? Follow the advice of Jamie Berry? Or follow David Hunter's strategy?

SA 4-4
Variable costs and activity bases in decision making

The owner of Banner-Tech, a printing company, is planning direct labor needs for the upcoming year. The owner has provided you with the following information for next year's plans:

	One Color	Two Color	Three Color	Four Color	Total
Number of banners	99	125	176	200	600

Each color on the banner must be printed one at a time. Thus, for example, a four-color banner will need to be run through the printing operation four separate times. The total production volume last year was 300 banners, as shown below.

	One Color	Two Color	Three Color	Total
Number of banners	76	103	121	300

As you can see, the four-color banner is a new product offering for the upcoming year. The owner believes that the expected 300-unit increase in volume from last year means that direct labor expenses should increase by 100% (300/300). What do you think?

SA 4-5
Variable costs and activity bases in decision making

Sales volume has been dropping at La Cross Publishing Company. During this time, however, the Shipping Department manager has been under severe financial constraints. The manager knows that most of the Shipping Department's effort is related to pulling inventory from the warehouse for each order and performing the paperwork. The paperwork involves preparing shipping documents for each order. Thus, the pulling and paperwork effort associated with each sales order is essentially the same, regardless of the size of the order. The Shipping Department manager has discussed the financial situation with senior management. Senior management has responded by pointing out that sales volume has been dropping, so that the amount of work in the Shipping Department should be dropping. Thus, senior management told the Shipping Department manager that costs should be decreasing in the department.

The Shipping Department manager prepared the following information:

Month	Sales Volume	Number of Customer Orders	Sales Volume per Order
January	$168,000	700	240
February	165,600	720	230
March	160,600	730	220
April	150,000	750	200
May	149,150	785	190
June	148,000	800	185
July	147,600	820	180
August	147,000	840	175

Given this information, how would you respond to senior management?

SA 4-6
Break-even analysis

Group Project

Break-even analysis is one of the most fundamental tools for managing any kind of business unit. Consider the management of your school. In a group, brainstorm some applications of break-even analysis at your school. Identify three areas where break-even analysis might be used. For each area, identify the revenues, variable costs, and fixed costs that would be used in the calculation.

Answers to Self-Examination Questions

1. **B** Variable costs vary in total in direct proportion to changes in the level of activity (answer B). Costs that vary on a per-unit basis as the level of activity changes (answer A) or remain constant in total dollar amount as the level of activity changes (answer C), or both (answer D), are fixed costs.
2. **D** The contribution margin ratio indicates the percentage of each sales dollar available to cover the fixed costs and provide income from operations and is determined as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$$

$$\text{Contribution Margin Ratio} = \frac{\$500{,}000 - \$200{,}000}{\$500{,}000} = 60\%$$

3. **D** The break-even sales of 40,000 units (answer D) is computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

$$\text{Break-Even Sales (units)} = \frac{\$160{,}000}{\$4} = 40{,}000 \text{ units}$$

4. **D** Sales of 45,000 units are required to realize income from operations of $20,000, computed as follows:

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

$$\text{Sales (units)} = \frac{\$160{,}000 + \$20{,}000}{\$4} = 45{,}000 \text{ units}$$

5. **C** The operating leverage is 1.8, computed as follows:

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Income from Operations}}$$

$$\text{Operating Leverage} = \frac{\$360{,}000}{\$200{,}000} = 1.8$$

CHAPTER 5

Variable Costing for Management Analysis

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ADOBE SYSTEMS, INC.

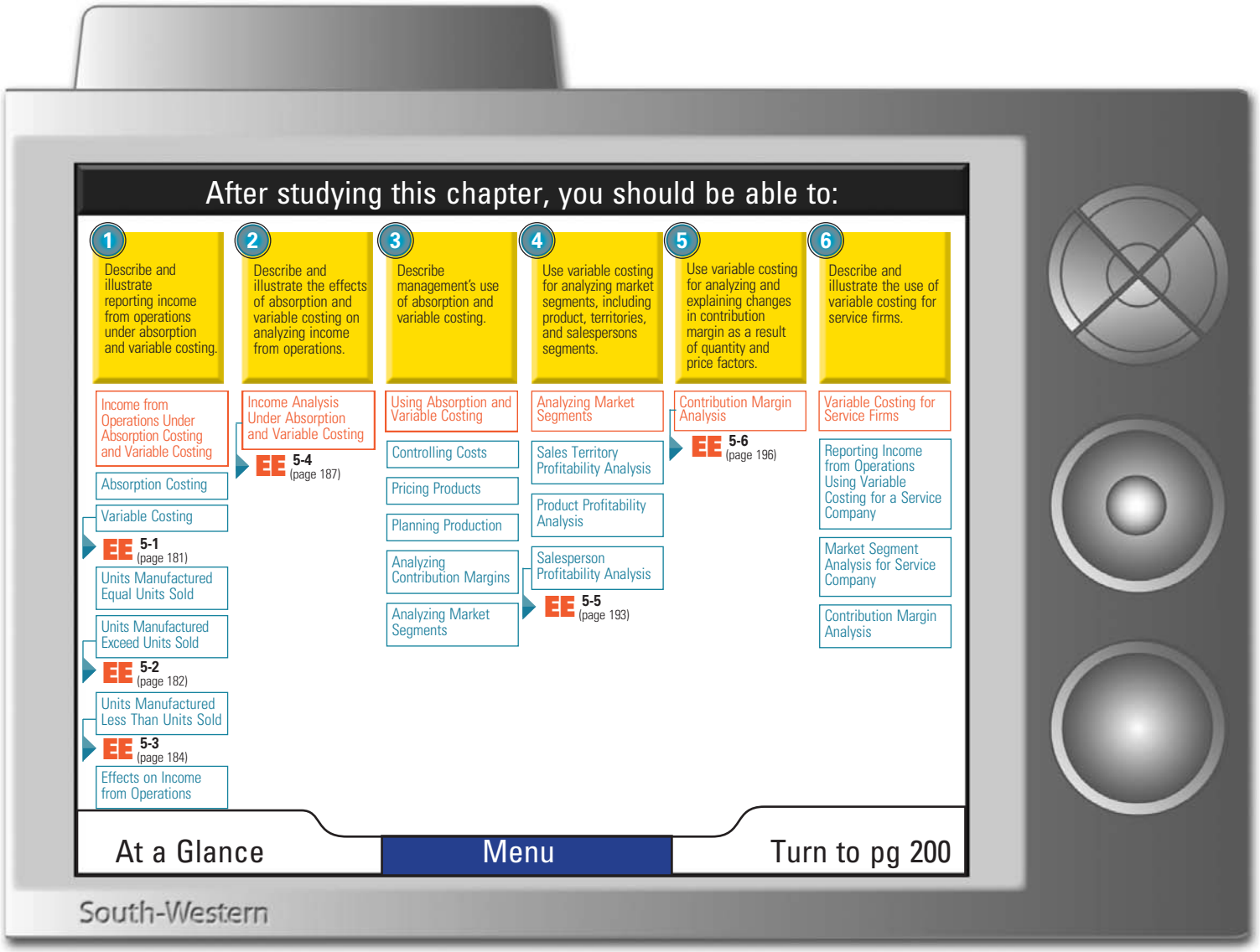
Assume that you are interested in obtaining a temporary job during the summer and that you have three different job options. How would you evaluate these options? Naturally, there are many things to consider, including how much you could earn from each job.

Determining how much you could earn from each job may not be as simple as comparing the rates of pay per hour. For example, a job as an office clerk at a local company pays $7 per hour. A job delivering pizza pays $10 per hour (including estimated tips), although you must use your own transportation. Another job working in a store located in a beach resort over 500 miles away from your home pays $8 per hour. All three jobs offer work for 40 hours per week for the whole summer. If these options were ranked according to their pay per hour, the pizza delivery job would be the most attractive. However, the costs associated with each job must also be evaluated. For example, the office job may require that you pay for downtown parking and purchase office clothes. The pizza delivery job will require you to pay for gas and maintenance for your car. The resort job will require you to move to the resort city and incur additional living costs. Only by considering the costs for each job will you be able to determine which job will provide you with the most income.

Just as you should evaluate the relative income of various choices, a business also evaluates the income earned from its choices. Important choices include the products offered and the geographical regions to be served.

A company will often evaluate the profitability of products and regions. For example, Adobe Systems Inc., one of the largest software companies in the world, determines the income earned from its various product lines, such as Acrobat®, Photoshop®, Premier®, and Dreamweaver® software. Adobe uses this information to establish product line pricing, as well as sales, support, and development effort. Likewise, Adobe evaluates the income earned in the geographic regions it serves, such as the United States, Europe, and Asia. Again, such information aids management in managing revenue and expenses within the regions.

In this chapter, how businesses measure profitability using absorption costing and variable costing is discussed. After illustrating and comparing these concepts, how businesses use them for controlling costs, pricing products, planning production, analyzing market segments, and analyzing contribution margins is described and illustrated.



1 Describe and illustrate reporting income from operations under absorption and variable costing.

Income from Operations Under Absorption Costing and Variable Costing

Income from operations is one of the most important items reported by a company. Depending on the decision-making needs of management, income from operations can be determined using absorption or variable costing.

Absorption Costing

Absorption costing is required under generally accepted accounting principles for financial statements distributed to external users. Under absorption costing, the cost of goods manufactured includes direct materials, direct labor, and factory overhead costs. Both fixed and variable factory costs are included as part of factory overhead. In the financial statements, these costs are included in cost of goods sold (income statement) and inventory (balance sheet).

The reporting of income from operations under absorption costing is as follows:

Sales	$XXX
Cost of goods sold	XXX
Gross profit	$XXX
Selling and administrative expenses	XXX
Income from operations	$XXX

The income statements illustrated in the preceding chapters of this text have used absorption costing.

Variable Costing

For internal use in decision making, managers often use variable costing. Under **variable costing**, sometimes called *direct costing*, the cost of goods manufactured includes only variable manufacturing costs. Thus, the cost of goods manufactured consists of the following:

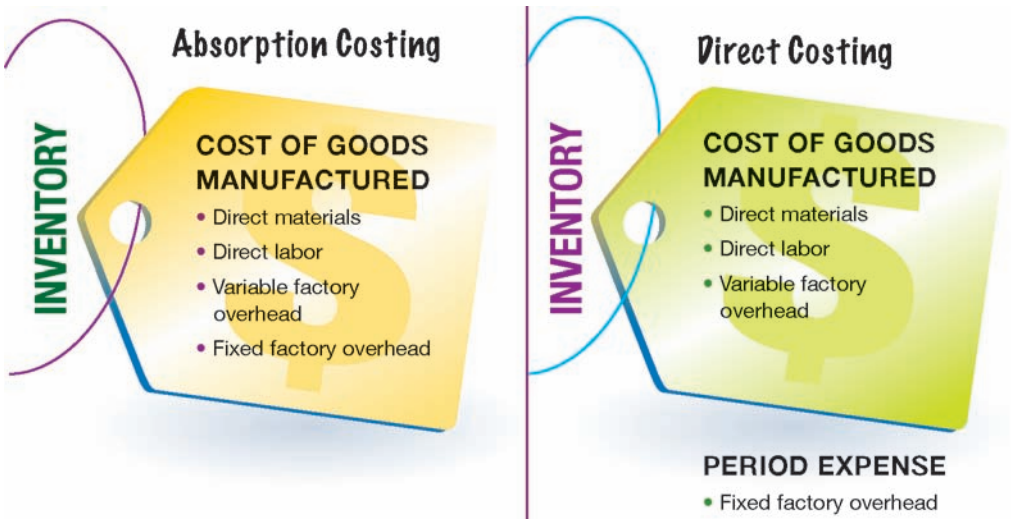
1. Direct materials
2. Direct labor
3. *Variable* factory overhead

Under variable costing, *fixed* factory overhead costs are not a part of the cost of goods manufactured. Instead, fixed factory overhead costs are treated as a period expense.

The reporting of income from operations under variable costing is as follows:

Sales		$XXX
Variable cost of goods sold		XXX
Manufacturing margin		$XXX
Variable selling and administrative expenses		XXX
Contribution margin		$XXX
Fixed costs:		
Fixed manufacturing costs	$XXX	
Fixed selling and administrative expenses	XXX	XXX
Income from operations		$XXX

Manufacturing margin is sales less variable cost of goods sold. **Variable cost of goods sold** consists of direct materials, direct labor, and variable factory overhead for the units sold. **Contribution margin** is manufacturing margin less variable selling and administrative expenses. Subtracting fixed costs from contribution margin yields income from operations.



To illustrate variable costing and absorption costing, assume that 15,000 units are manufactured and sold at a price of $50. The related costs and expenses are as follows:

	Number of Units	Unit Cost	Total Cost
Manufacturing costs:			
Variable	15,000	$25	$375,000
Fixed	15,000	10	150,000
Total		$35	$525,000
Selling and administrative expenses:			
Variable	15,000	$5	$ 75,000
Fixed	15,000	—	50,000
Total			$125,000

Exhibit 1 illustrates the reporting of income from operations under absorption costing prepared from the above data. The computations are shown in parentheses.

Exhibit 1

Absorption Costing Income Statement

Sales (15,000 × $50)	$750,000
Cost of goods sold (15,000 × $35)	525,000
Gross profit	$225,000
Selling and administrative expenses ($75,000 + $50,000)	125,000
Income from operations	$100,000

Absorption costing does not distinguish between variable and fixed costs. All manufacturing costs are included in the cost of goods sold. Deducting cost of goods sold of $525,000 from sales of $750,000 yields gross profit of $225,000. Deducting selling and administrative expenses of $125,000 from gross profit yields income from operations of $100,000.

Exhibit 2 shows the reporting of income from operations under variable costing prepared from the same data. The computations are shown in parentheses.

Exhibit 2

Variable Costing Income Statement

Sales (15,000 × $50)		$750,000
Variable cost of goods sold (15,000 × $25)		375,000
Manufacturing margin		$375,000
Variable selling and administrative expenses (15,000 × $5)		75,000
Contribution margin		$300,000
Fixed costs:		
Fixed manufacturing costs	$150,000	
Fixed selling and administrative expenses	50,000	200,000
Income from operations		$100,000

The variable costing income statement includes only variable manufacturing costs in the cost of goods sold.

Variable costing income reports variable costs separately from fixed costs. Deducting the variable cost of goods sold of $375,000 from sales of $750,000 yields manufacturing margin of $375,000. Deducting variable selling and administrative expenses of $75,000 from manufacturing margin yields contribution margin of $300,000. Deducting fixed costs of $200,000 from contribution margin yields income from operations of $100,000.

The contribution margin reported in Exhibit 2 is the same as that used in Chapter 4. That is, contribution margin is sales less variable costs and expenses. The only difference is that Exhibit 2 reports manufacturing margin before deducting variable selling and administrative expenses.

Example Exercise 5-1 Variable Costing 1

Leone Company has the following information for March:

Sales	$450,000
Variable cost of goods sold	220,000
Fixed manufacturing costs	80,000
Variable selling and administrative expenses	50,000
Fixed selling and administrative expenses	35,000

Determine (a) the manufacturing margin, (b) the contribution margin, and (c) income from operations for Leone Company for the month of March.

Follow My Example 5-1

a. $230,000 ($450,000 – $220,000)
b. $180,000 ($230,000 – $50,000)
c. $65,000 ($180,000 – $80,000 – $35,000)

For Practice: PE 5-1A, PE 5-1B

Different regions of the world emphasize different approaches to reporting income. For example, Scandinavian companies have a strong variable costing tradition, while German cost accountants have developed some of the most advanced absorption costing practices in the world.

Units Manufactured Equal Units Sold

In Exhibits 1 and 2, 15,000 units were manufactured and sold. Both variable and absorption costing reported the same income from operations of $100,000. Thus, when the number of units manufactured equals the number of units sold, income from operations will be the same under both methods.

Units Manufactured Exceed Units Sold

When units manufactured exceed the units sold, the variable costing income from operations will be *less* than it is for the absorption costing. To illustrate, assume that in the preceding example only 12,000 units of the 15,000 units manufactured were sold.

Exhibit 3 shows the reporting of income from operations under absorption and variable costing.

Exhibit 3

Units Manufactured Exceed Units Sold

Absorption Costing Income Statement

Sales (12,000 × $50)		$600,000
Cost of goods sold:		
Cost of goods manufactured (15,000 × $35)	$525,000	
Less ending inventory (3,000 × $35)	105,000	
Cost of goods sold		420,000
Gross profit		$180,000
Selling and administrative expenses [(12,000 × $5) + $50,000]		110,000
Income from operations		$ 70,000

Exhibit 3
(concluded)

Variable Costing Income Statement

Sales (12,000 × $50)		$600,000
Variable cost of goods sold:		
Variable cost of goods manufactured (15,000 × $25)	$375,000	
Less ending inventory (3,000 × $25)	75,000	
Variable cost of goods sold		300,000
Manufacturing margin		$300,000
Variable selling and administrative expenses (12,000 × $5)		60,000
Contribution margin		$240,000
Fixed costs:		
Fixed manufacturing costs	$150,000	
Fixed selling and administrative expenses	50,000	200,000
Income from operations		$ 40,000

Exhibit 3 shows a $30,000 difference in income from operations ($70,000 – $40,000). This difference is due to the fixed manufacturing costs. All of the $150,000 of fixed manufacturing costs is included as a period expense in the variable costing statement. However, the 3,000 units of ending inventory in the absorption costing statement includes $30,000 (3,000 units × $10) of fixed manufacturing costs. By including the $30,000 in inventory, it is excluded from cost of goods sold. Thus, the absorption costing income from operations is $30,000 higher than the income from operations for variable costing.

Example Exercise 5-2 Variable Costing—Production Exceeds Sales 1

Fixed manufacturing costs are $40 per unit, and variable manufacturing costs are $120 per unit. Production was 125,000 units, while sales were 120,000 units. Determine (a) whether variable costing income from operations is less than or greater than absorption costing income from operations, and (b) the difference in variable costing and absorption costing income from operations.

Follow My Example 5-2

a. Variable costing income from operations is less than absorption costing income from operations.
b. $200,000 ($40 per unit × 5,000 units)

For Practice: PE 5-2A, PE 5-2B

Units Manufactured Less Than Units Sold

When the units manufactured are less than the number of units sold, the variable costing income from operations will be *greater* than that of absorption costing. To illustrate, assume that beginning inventory, units manufactured, and units sold were as follows:

Beginning inventory	5,000 units
Units manufactured during current period	10,000 units
Units sold during the current period at $50 per unit	15,000 units

The manufacturing costs and selling and administrative expenses are as follows:

	Number of Units	Unit Cost	Total Cost
Beginning inventory (5,000 units):			
Manufacturing costs:			
Variable	5,000	$25	$125,000
Fixed	5,000	10	50,000
Total		$35	$175,000
Current period (10,000 units):			
Manufacturing costs:			
Variable	10,000	$25	$250,000
Fixed	10,000	15	150,000
Total		$40	$400,000
Selling and administrative expenses:			
Variable	15,000	$ 5	$ 75,000
Fixed	15,000	—	50,000
Total			$125,000

Exhibit 4 shows the reporting of income from operations under absorption and variable costing based on the preceding data.

Exhibit 4

Units Manufactured Are Less Than Units Sold

Absorption Costing Income Statement

Sales (15,000 × $50)		$750,000
Cost of goods sold:		
Beginning inventory (5,000 × $35)	$175,000	
Cost of goods manufactured (10,000 × $40)	400,000	
Cost of goods sold		575,000
Gross profit		$175,000
Selling and administrative expenses ($75,000 + $50,000)		125,000
Income from operations		$ 50,000

Variable Costing Income Statement

Sales (15,000 × $50)		$750,000
Variable cost of goods sold:		
Beginning inventory (5,000 × $25)	$125,000	
Variable cost of goods manufactured (10,000 × $25)	250,000	
Variable cost of goods sold		375,000
Manufacturing margin		$375,000
Variable selling and administrative expenses (15,000 × $5)		75,000
Contribution margin		$300,000
Fixed costs:		
Fixed manufacturing costs	$150,000	
Fixed selling and administrative expenses	50,000	200,000
Income from operations		$100,000

Exhibit 4 shows a $50,000 difference in income from operations ($100,000 – $50,000). This difference is due to the fixed manufacturing costs. The beginning inventory under absorption costing includes $50,000 (5,000 units × $10) of fixed manufacturing costs

incurred in the preceding period. By being included in the beginning inventory, this $50,000 is included in the cost of goods sold for the current period. Under variable costing, this $50,000 was included as an expense in an income statement of a prior period. Thus, the variable costing income from operations is $50,000 higher than the income from operations for absorption costing.

Example Exercise 5-3 Variable Costing—Sales Exceed Production

1

The beginning inventory is 6,000 units. All of the units were manufactured during the period and 6,000 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are $60 per unit, and variable manufacturing costs are $300 per unit. Determine (a) whether variable costing income from operations is less than or greater than absorption costing income from operations, and (b) the difference in variable costing and absorption costing income from operations.

Follow My Example 5-3

a. Variable costing income from operations is greater than absorption costing income from operations.
b. $360,000 ($60 per unit × 6,000 units)

For Practice: PE 5-3A, PE 5-3B

Effects on Income from Operations

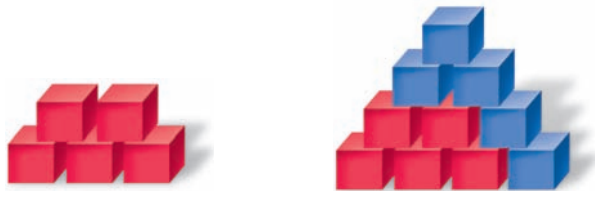
The preceding examples illustrate the effects on income from operations of using absorption and variable costing. These effects are summarized below.

IF **Units Manufactured** = **Units Sold**

THEN **Absorption Costing Income from Operations** = **Variable Costing Income from Operations**

IF **Units Manufactured** > **Units Sold**

THEN **Absorption Costing Income from Operations** > **Variable Costing Income from Operations**



IF **Units Manufactured** < **Units Sold**

THEN **Absorption Costing Income from Operations** < **Variable Costing Income from Operations**

2 Describe and illustrate the effects of absorption and variable costing on analyzing income from operations.

Income Analysis Under Absorption and Variable Costing

Whenever the units manufactured differ from the units sold, finished goods inventory is affected. When the units manufactured are greater than the units sold, finished goods inventory increases. Under absorption costing, a portion of this increase is related to the allocation of fixed manufacturing overhead to ending inventory. As a result, increases or decreases in income from operations can be due to changes in inventory levels. In analyzing income from operations, such increases and decreases could be misinterpreted as operating efficiencies or inefficiencies.

To illustrate, assume that Frand Manufacturing Company has no beginning inventory and sales are estimated to be 20,000 units at $75 per unit. Also, assume that sales will not change if more than 20,000 units are manufactured.

The management of Frand Manufacturing Company is evaluating whether to manufacture 20,000 units (Proposal 1) or 25,000 units (Proposal 2). The costs and expenses related to each proposal are shown below.

Proposal 1: 20,000 Units to Be Manufactured and Sold

	Number of Units	Unit Cost	Total Cost
Manufacturing costs:			
Variable	20,000	$35	$ 700,000
Fixed	20,000	20*	400,000
Total		$55	$1,100,000
Selling and administrative expenses:			
Variable	20,000	$ 5	$ 100,000
Fixed	20,000	—	100,000
Total			$ 200,000

*$400,000/20,000 units

Proposal 2: 25,000 Units to Be Manufactured and 20,000 Units to Be Sold

	Number of Units	Unit Cost	Total Cost
Manufacturing costs:			
Variable	25,000	$35	$ 875,000
Fixed	25,000	16*	400,000
Total		$51	$1,275,000
Selling and administrative expenses:			
Variable	20,000	$ 5	$ 100,000
Fixed	20,000	—	100,000
Total			$ 200,000

*$400,000/25,000 units

The absorption costing income statements for each proposal are shown in Exhibit 5.

Exhibit 5 shows that if Frand manufactures 25,000 units, sells 20,000 units, and adds 5,000 units to finished goods inventory (Proposal 2), income from operations will be $280,000. In contrast, if Frand manufactures and sells 20,000 units (Proposal 1), income from operations will be $200,000. In other words, Frand can increase income from operations by $80,000 ($280,000 – $200,000) by simply increasing finished goods inventory by 5,000 units.

The $80,000 increase in income from operations under Proposal 2 is caused by the allocation of the fixed manufacturing costs of $400,000 over a greater number of units manufactured. Specifically, an increase in production from 20,000 units to 25,000 units means that the fixed manufacturing cost per unit decreases from $20 ($400,000/20,000 units) to $16 ($400,000/25,000 units). Thus, the cost of goods sold when 25,000 units are manufactured is $4 per unit less, or $80,000 less in total (20,000 units sold × $4). Since the cost of goods sold is less, income from operations is $80,000 more when 25,000 units rather than 20,000 units are manufactured.

Exhibit 5

Absorption Costing Income Statements for Two Production Levels

Frand Manufacturing Company
Absorption Costing Income Statements

	Proposal 1 20,000 Units Manufactured	Proposal 2 25,000 Units Manufactured
Sales (20,000 units × $75)	$1,500,000	$1,500,000
Cost of goods sold:		
Cost of goods manufactured:		
(20,000 units × $55)	$1,100,000	
(25,000 units × $51)		$1,275,000
Less ending inventory:		
(5,000 units × $51)		255,000
Cost of goods sold	$1,100,000	$1,020,000
Gross profit	$ 400,000	$ 480,000
Selling and administrative expenses		
($100,000 + $100,000)	200,000	200,000
Income from operations	$ 200,000	$ 280,000

Managers should be careful in analyzing income from operations under absorption costing when finished goods inventory changes. As shown above, increases in income from operations may be created by simply increasing finished goods inventory. Thus, managers could misinterpret such increases (or decreases) in income from operations as due to changes in sales volume, prices, or costs.

Under variable costing, income from operations is $200,000, regardless of whether 20,000 units or 25,000 units are manufactured. This is because no fixed manufacturing costs are allocated to the units manufactured. Instead, all fixed manufacturing costs are treated as a period expense.

To illustrate, Exhibit 6 shows the variable costing income statements for Frand Manufacturing Company for the production of 20,000 units, 25,000 units, and 30,000 units. In each case, the income from operations is $200,000.

Integrity, Objectivity, and Ethics in Business

TAKING AN "ABSORPTION HIT"

Aligning production to demand is a critical decision in business. Managers must not allow the temporary benefits of excess production through higher absorption of fixed costs to guide their decisions. Likewise, if demand falls, production should be dropped and inventory liquidated to match the new demand level, even though earnings will be penalized. The following interchange provides an example of an appropriate response to lowered demand for H.J. Heinz Company:

Analyst's question: *Could you talk for a moment about manufacturing costs during the quarter? You had highlighted that they were up and that gross margins at Heinz USA were down. Why was that the case?*

Heinz executive's response: *Yeah. The manufacturing costs were somewhat up . . . as we improve our inventory position, obviously you've got less inventory to spread your fixed costs over, so you'll take what accountants would call an absorption hit as we reduce costs. And that will be something that as we pull down inventory over the years, that will be an additional P&L cost hurdle that we need to overcome.*

Management operating with integrity will seek the tangible benefits of reducing inventory, even though there may be an adverse impact on published financial statements caused by absorption costing.

Exhibit 6

Variable Costing Income Statements for Three Production Levels

Frand Manufacturing Company
Variable Costing Income Statements

	20,000 Units Manufactured	25,000 Units Manufactured	30,000 Units Manufactured
Sales (20,000 units × $75)	$1,500,000	$1,500,000	$1,500,000
Variable cost of goods sold:			
Variable cost of goods manufactured:			
(20,000 units × $35)	$ 700,000		
(25,000 units × $35)		$ 875,000	
(30,000 units × $35)			$1,050,000
Less ending inventory:			
(0 units × $35)	0		
(5,000 units × $35)		175,000	
(10,000 units × $35)			350,000
Variable cost of goods sold	$ 700,000	$ 700,000	$ 700,000
Manufacturing margin	$ 800,000	$ 800,000	$ 800,000
Variable selling and administrative expenses	100,000	100,000	100,000
Contribution margin	$ 700,000	$ 700,000	$ 700,000
Fixed costs:			
Fixed manufacturing costs	$ 400,000	$ 400,000	$ 400,000
Fixed selling and administrative expenses	100,000	100,000	100,000
Total fixed costs	$ 500,000	$ 500,000	$ 500,000
Income from operations	$ 200,000	$ 200,000	$ 200,000

As shown above, absorption costing may encourage managers to produce inventory. This is because producing inventory absorbs fixed manufacturing costs, which increases income from operations. However, producing inventory leads to higher handling, storage, financing, and obsolescence costs. For this reason, many accountants believe that variable costing should be used by management for evaluating operating performance.

Example Exercise 5-4 Analyzing Income Under Absorption and Variable Costing

2

Variable manufacturing costs are $100 per unit, and fixed manufacturing costs are $50,000. Sales are estimated to be 4,000 units.

a. How much would absorption costing income from operations differ between a plan to produce 4,000 units and a plan to produce 5,000 units?
b. How much would variable costing income from operations differ between the two production plans?

Follow My Example 5-4

a. $10,000 greater in producing 5,000 units. 4,000 units × ($12.50[1] – $10.00[2]), or [1,000 units × ($50,000/5,000 units)].
b. There would be no difference in variable costing income from operations between the two plans.

[1]$50,000/4,000 units
[2]$50,000/5,000 units

For Practice: PE 5-4A, PE 5-4B

3 Describe management's use of absorption and variable costing.

Using Absorption and Variable Costing

Each decision-making situation should be carefully analyzed in deciding whether absorption or variable costing reporting would be more useful. As a basis for discussion, the use of absorption and variable costing in the following decision-making situations is described:

1. Controlling costs
2. Pricing products
3. Planning production
4. Analyzing contribution margins
5. Analyzing market segments

The role of accounting reports in these decision-making situations is shown in Exhibit 7.

Exhibit 7

Accounting Reports and Management Decisions

Controlling Costs

All costs are controllable in the long run by someone within a business. However, not all costs are controllable at the same level of management. For example, plant supervisors control the use of direct materials in their departments. They have no control, though, over insurance costs related to the property, plant, and equipment.

For a level of management, **controllable costs** are costs that can be influenced (increased or decreased) by management at that level. **Noncontrollable costs** are costs that another level of management controls. This distinction is useful for reporting costs to those responsible for their control.

Variable manufacturing costs are controlled by operating management. In contrast, fixed manufacturing overhead costs such as the salaries of production supervisors are normally controlled at a higher level of management. Likewise, control of the variable and

Major hotel chains, such as Marriott, Hilton, and Hyatt, often provide "weekend getaway" packages, which provide discounts for weekend stays in their city hotels. As long as the weekend rates exceed the variable costs, the "weekend getaway" pricing will contribute to the hotel's short-run profitability.

fixed operating expenses usually involves different levels of management. Since fixed costs and expenses are reported separately under variable costing, variable costing reports are normally more useful than absorption costing reports for controlling costs.

Pricing Products

Many factors enter into determining the selling price of a product. However, the cost of making the product is significant in all pricing decisions.

In the short run, fixed costs cannot be avoided. Thus, the selling price of a product should at least be equal to the variable costs of making and selling it. Any price above this minimum selling price contributes to covering fixed costs and generating income. Since variable costing reports variable and fixed costs and expenses separately, it is often more useful than absorption costing for setting short-run prices.

In the long run, a company must set its selling price high enough to cover all costs and expenses (variable and fixed) and generate income. Since absorption costing includes fixed and variable costs in the cost of manufacturing a product, absorption costing is often more useful than variable costing for setting long-term prices.

Planning Production

In the short run, planning production is limited to existing capacity. In many cases, operating decisions must be made quickly before opportunities are lost.

To illustrate, a company with seasonal demand for its products may have an opportunity to obtain an off-season order that will not interfere with its current production schedule. The relevant factors for such a short-run decision are the additional revenues and the additional variable costs associated with the order. If the revenues from the order exceed the related variable costs, the order will increase contribution margin and, thus, increase the company's income from operations. Since variable costing reports contribution margin, it is often more useful than absorption costing in such cases.

In the long run, planning production can consider expanding existing capacity. Thus, when analyzing and evaluating long-run sales and operating decisions, absorption costing, which considers fixed and variable costs, is often more useful.

Analyzing Contribution Margins

For planning and control purposes, managers often compare planned and actual contribution margins. For example, an increase in the price of fuel could have a significant impact on the planned contribution margins of an airline. The use of variable costing as a basis for such analyses is described and illustrated later in this chapter.

Analyzing Market Segments

Market analysis determines the profit contributed by the market segments of a company. A **market segment** is a portion of a company that can be analyzed using sales, costs, and expenses to determine its profitability. Examples of market segments include sales territories, products, salespersons, and customers. Variable costing as an aid in decision making regarding market segments is discussed next.

Analyzing Market Segments

4 Use variable costing for analyzing market segments, including product, territories, and salespersons segments.

Companies can report income for internal decision making using either absorption or variable costing. Absorption costing is often used for long-term analysis of market segments. This type of analysis is illustrated in Chapter 11, "Cost Allocation and Activity-Based Costing." Variable costing is often used for short-term analysis of market segments. In this section, segment profitability reporting using variable costing is described and illustrated.

Most companies prepare variable costing reports for each product. These reports are often used for product pricing and deciding whether to discontinue a product. In addition, variable costing reports may be prepared for geographic areas, customers,

Borders Group Inc. evaluates the profitability of its Internet and retail store distribution channels.

distribution channels, or salespersons. A distribution channel is the method for selling a product to a customer.

To illustrate analysis of market segments using variable costing, the following data for the month ending March 31, 2010, for Camelot Fragrance Company are used:

Camelot Fragrance Company
Sales and Production Data
For the Month Ended March 31, 2010

	Northern Territory	Southern Territory	Total
Sales:			
Gwenevere	$60,000	$30,000	$ 90,000
Lancelot	20,000	50,000	70,000
Total territory sales	$80,000	$80,000	$160,000
Variable production costs:			
Gwenevere (12% of sales)	$ 7,200	$ 3,600	$ 10,800
Lancelot (12% of sales)	2,400	6,000	8,400
Total variable production cost by territory	$ 9,600	$ 9,600	$ 19,200
Promotion costs:			
Gwenevere (variable at 30% of sales)	$18,000	$ 9,000	$ 27,000
Lancelot (variable at 20% of sales)	4,000	10,000	14,000
Total promotion cost by territory	$22,000	$19,000	$ 41,000
Sales commissions:			
Gwenevere (variable at 20% of sales)	$12,000	$ 6,000	$ 18,000
Lancelot (variable at 10% of sales)	2,000	5,000	7,000
Total sales commissions by territory	$14,000	$11,000	$ 25,000

McDonald's Corporation evaluates the profitability of its geographic segments. For example, it compares the profitability of its restaurants in the United States with those in Asia and Europe.

Camelot Fragrance Company manufactures and sells the Gwenevere perfume for women and the Lancelot cologne for men. To simplify, no inventories are assumed to exist at the beginning or end of March.

Sales Territory Profitability Analysis

An income statement presenting the contribution margin by sales territories is often used in evaluating past performance and in directing future sales efforts. Sales territory profitability analysis may lead management to do the following:

1. Reduce costs in lower-profit sales territories
2. Increase sales efforts in higher-profit territories

To illustrate sales territory profitability analysis, Exhibit 8 shows the contribution margin for the Northern and Southern territories of Camelot Fragrance Company. As Exhibit 8 indicates, the Northern Territory is generating $34,400 of contribution margin, while the Southern Territory is generating $40,400 of contribution margin.

In addition to the contribution margin, the contribution margin ratio for each territory is shown in Exhibit 8. The contribution margin ratio is computed as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

Exhibit 8 indicates that the Northern Territory has a contribution margin ratio of 43% ($34,400/$80,000). In contrast, the Southern Territory has a contribution margin ratio of 50.5% ($40,400/$80,000).

The difference in profit of the Northern and Southern territories is due to the difference in sales mix between the territories. **Sales mix**, sometimes referred to as *product mix*, is the relative amount of sales among the various products. The sales mix is

Exhibit 8

Contribution Margin by Sales Territory Report

Camelot Fragrance Company
Contribution Margin by Sales Territory
For the Month Ended March 31, 2010

	Northern Territory		Southern Territory	
Sales		$80,000		$80,000
Variable cost of goods sold		9,600		9,600
Manufacturing margin		$70,400		$70,400
Variable selling expenses:				
Promotion costs	$22,000		$19,000	
Sales commissions	14,000	36,000	11,000	30,000
Contribution margin		$34,400		$40,400
Contribution margin ratio		43%		50.5%

The Coca-Cola Company earns over 75% of its total corporate profits outside of the United States. As a result, Coca-Cola management continues to expand operations and sales efforts around the world.

computed by dividing the sales of each product by the total sales of each territory. The sales mix of the Northern and Southern territories is as follows:

	Northern Territory		Southern Territory	
Product	**Sales**	**Sales Mix**	**Sales**	**Sales Mix**
Gwenevere	$60,000	75%	$30,000	37.5%
Lancelot	20,000	25	50,000	62.5
Total	$80,000	100%	$80,000	100.0%

As shown above, 62.5% of the Southern Territory's sales are sales of Lancelot. Since the Southern Territory's contribution margin ($40,400) is higher (as shown in Exhibit 8) than that of the Northern Territory ($34,400), Lancelot must be more profitable than Gwenevere. To verify this, product profitability analysis is performed.

Rite-Aid Corporation recently reported that its gross margins increased as a result of a shift in sales mix from prescription toward generic drug sales.

Product Profitability Analysis

A company should focus its sales efforts on products that will provide the maximum total contribution margin. In doing so, product profitability analysis is often used by management in making decisions regarding product sales and promotional efforts.

To illustrate product profitability analysis, Exhibit 9 shows the contribution margin by product for Camelot Fragrance Company.

Exhibit 9

Contribution Margin by Product Line Report

Camelot Fragrance Company
Contribution Margin by Product Line
For the Month Ended March 31, 2010

	Gwenevere		Lancelot	
Sales		$90,000		$70,000
Variable cost of goods sold		10,800		8,400
Manufacturing margin		$79,200		$61,600
Variable selling expenses:				
Promotion costs	$27,000		$14,000	
Sales commissions	18,000	45,000	7,000	21,000
Contribution margin		$34,200		$40,600
Contribution margin ratio		38%		58%

Exhibit 9 indicates that Lancelot's contribution margin ratio (58%) is greater than Gwenevere's (38%). Lancelot's higher contribution margin ratio is a result of its lower

promotion and sales commissions costs. Thus, management should consider the following:

1. Emphasizing Lancelot in its marketing plans
2. Reducing Gwenevere's promotion and sales commissions costs
3. Increasing the price of Gwenevere

Salesperson Profitability Analysis

A salesperson profitability report is useful in evaluating sales performance. Such a report normally includes total sales, variable cost of goods sold, variable selling expenses, contribution margin, and contribution margin ratio for each salesperson.

Exhibit 10 illustrates such a salesperson profitability report for three salespersons in the Northern Territory of Camelot Fragrance Company.

Exhibit 10

Contribution Margin by Salesperson Report

Camelot Fragrance Company
Contribution Margin by Salesperson—Northern Territory
For the Month Ended March 31, 2010

	Inez Rodriguez	Tom Ginger	Beth Williams	Northern Territory—Total
Sales	$20,000	$20,000	$40,000	$80,000
Variable cost of goods sold	2,400	2,400	4,800	9,600
Manufacturing margin	$17,600	$17,600	$35,200	$70,400
Variable selling expenses:				
Promotion costs	$ 5,000	$ 5,000	$12,000	$22,000
Sales commissions	3,000	3,000	8,000	14,000
	$ 8,000	$ 8,000	$20,000	$36,000
Contribution margin	$ 9,600	$ 9,600	$15,200	$34,400
Contribution margin ratio	48%	48%	38%	43%
Sales mix (% Lancelot sales)	50%	50%	0	25%

Exhibit 10 indicates that Beth Williams produced the greatest contribution margin ($15,200), but had the lowest contribution margin ratio (38%). Beth sold $40,000 of product, which is twice as much product as the other two salespersons. However, Beth sold only Gwenevere, which has the lowest contribution margin ratio (from Exhibit 9). The other two salespersons sold equal amounts of Gwenevere and Lancelot. As a result, Inez Rodriguez and Tom Ginger had higher contribution margin ratios because they sold more Lancelot. The Northern Territory manager could use this report to encourage Inez and Tom to sell more total product, while encouraging Beth to sell more Lancelot.

Other factors should also be considered in evaluating salespersons' performance. For example, sales growth rates, years of experience, customer service, territory size, and actual performance compared to budgeted performance may also be important.

Example Exercise 5-5 Contribution Margin by Segment

4

The following data are for Moss Creek Apparel:

	East	West
Sales volume (units):		
Shirts	6,000	5,000
Shorts	4,000	8,000
Sales price:		
Shirts	$12	$13
Shorts	$16	$18
Variable cost per unit:		
Shirts	$7	$7
Shorts	$10	$10

Determine the contribution margin for (a) Shorts and (b) the West Region.

Follow My Example 5-5

a. $88,000 [4,000 units × ($16 – $10)] + [8,000 units × ($18 – $10)]
b. $94,000 [5,000 units × ($13 – $7)] + [8,000 units × ($18 – $10)]

For Practice: PE 5-5A, PE 5-5B

Business Connection

MCDONALD'S CORPORATION CONTRIBUTION MARGIN BY STORE

McDonald's Corporation is the largest restaurant company in the world, representing 2.5% of the restaurants and 7.3% of the sales of all restaurants in the United States. McDonald's annual report identifies revenues and costs for its company-owned restaurants separately from its franchised restaurants. Assume that the food, paper, payroll, and benefit costs are variable and that occupancy and other operating expenses are fixed. A contribution margin and income from operations can be constructed for the company-owned restaurants as follows:

McDonald's Corporation
Company-Owned Restaurant Contribution Margin and Income from Operations (estimated)
For the Year Ended December 31, 2007 (in millions)

Sales		$16,611
Variable restaurant expenses:		
Food and paper	$5,487.4	
Payroll and employee benefits	4,331.6	
Total variable restaurant operating costs		9,819
Contribution margin		$ 6,792
Occupancy and other operating expenses		3,923
Income from operations		$ 2,869

The annual report also indicates that McDonald's has 10,872 company-owned restaurants. Dividing the numbers above by 10,872 yields the contribution margin and income from operations *per restaurant* as follows:

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Sales	$1,527,870
Variable restaurant expenses	903,146
Contribution margin	$ 624,724
Occupancy and other operating expenses	360,808
Income from operations	$ 263,916

In addition, McDonald's segments this information by its major operating regions, such as the United States, Europe, Latin America, Canada, and Asia. McDonald's can use this information for pricing products; evaluating the sensitivity of store profitability to changes in sales volume, prices, and costs; analyzing profitability by geographic segments; and evaluating the contribution of the company-owned stores to overall corporate profitability.

5 Use variable costing for analyzing and explaining changes in contribution margin as a result of quantity and price factors.

Contribution Margin Analysis

Managers often use contribution margin in planning and controlling operations. In doing so, managers use contribution margin analysis. **Contribution margin analysis** focuses on explaining the differences between planned and actual contribution margins.

Contribution margin is defined as sales less variable costs. Thus, a difference between the planned and actual contribution margin may be caused by an increase or a decrease in:

1. Sales
2. Variable costs

An increase or a decrease in sales or variable costs may in turn be due to an increase or a decrease in the:

1. Number of units sold
2. Unit sales price or unit cost

The effects of the preceding factors on sales or variable costs may be stated as follows:

1. **Quantity factor:** The effect of a difference in the number of units sold, assuming no change in unit sales price or unit cost. The *sales quantity factor* and the *variable cost quantity factor* are computed as follows:

   Sales Quantity Factor = (Actual Units Sold − Planned Units of Sales) × Planned Sales Price

   Variable Cost Quantity Factor = (Planned Units of Sales − Actual Units Sold) × Planned Unit Cost

   The preceding factors are computed so that a positive amount increases contribution margin and a negative amount decreases contribution margin.

2. **Unit price factor** or unit cost factor: The effect of a difference in unit sales price or unit cost on the number of units sold. The *unit price factor* and *unit cost factor* are computed as follows:

   Unit Price Factor = (Actual Selling Price per Unit − Planned Selling Price per Unit) × Actual Units Sold

   Unit Cost Factor = (Planned Cost per Unit − Actual Cost per Unit) × Actual Units Sold

   The preceding factors are computed so that a positive amount increases contribution margin and a negative amount decreases contribution margin.

The effects of the preceding factors on contribution margin are summarized in Exhibit 11.

To illustrate, the following data for the year ended December 31, 2010 for Noble Inc., which sells a single product, are used. [1]

	Actual	Planned
Sales	$937,500	$800,000
Less: Variable cost of goods sold	$425,000	$350,000
Variable selling and administrative expenses	162,500	125,000
Total	$587,500	$475,000
Contribution margin	$350,000	$325,000
Number of units sold	125,000	100,000
Per unit:		
Sales price	$7.50	$8.00
Variable cost of goods sold	3.40	3.50
Variable selling and administrative expenses	1.30	1.25

[1] To simplify, it is assumed that Noble Inc. sells a single product. The analysis would be more complex, but the principles would be the same if more than one product were sold.

Exhibit 11

Contribution Margin Analysis

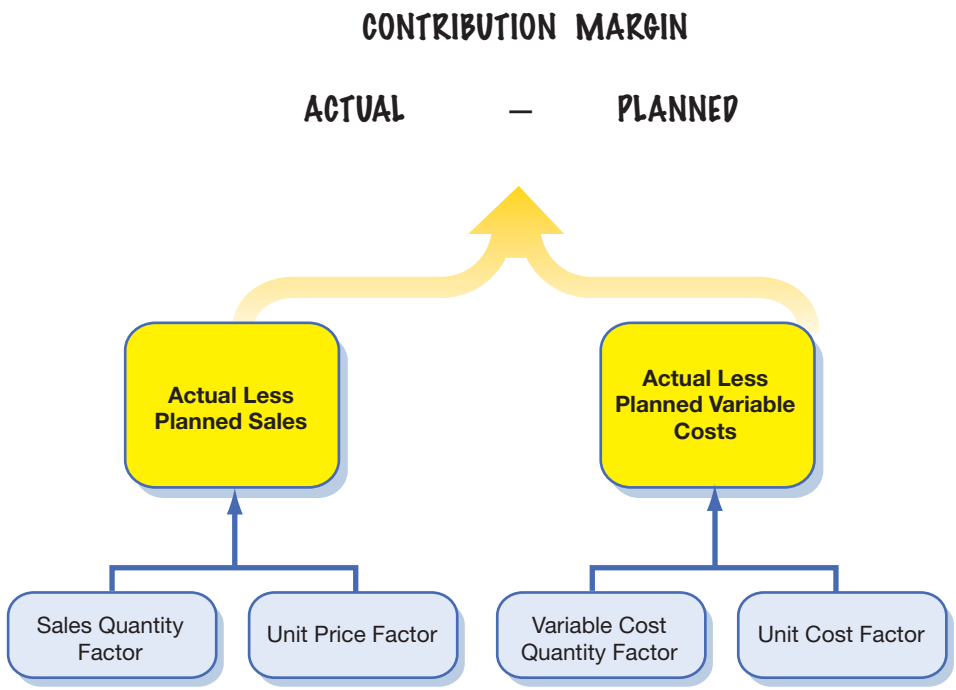


Exhibit 12 shows the contribution margin analysis report for Noble Inc. for the year ended December 31, 2010.

Exhibit 12

Contribution Margin Analysis Report

Noble Inc.
Contribution Margin Analysis
For the Year Ended December 31, 2010

Planned contribution margin		$325,000
Effect of changes in sales:		
Sales quantity factor (125,000 units – 100,000 units) × $8.00	$200,000	
Unit price factor ($7.50 – $8.00) × 125,000 units	–62,500	
Total effect of changes in sales		137,500
Effect of changes in variable cost of goods sold:		
Variable cost quantity factor (100,000 units – 125,000 units) × $3.50	–$87,500	
Unit cost factor ($3.50 – $3.40) × 125,000 units	12,500	
Total effect of changes in variable cost of goods sold		–75,000
Effect of changes in selling and administrative expenses:		
Variable cost quantity factor (100,000 units – 125,000 units) × $1.25	–$31,250	
Unit cost factor ($1.25 – $1.30) × 125,000 units	–6,250	
Total effect of changes in selling and administrative expenses		–37,500
Actual contribution margin		$350,000

Exhibit 12 indicates that the favorable difference of $25,000 ($350,000 – $325,000) between the actual and planned contribution margins was due in large part to an increase in the quantity sold (sales quantity factor) of $200,000. This $200,000 increase was partially offset by a decrease in the unit sales price (unit price factor) of ($62,500) and an increase in the amount of variable costs of $112,500 ($75,000 + $37,500).

The contribution margin analysis reports are useful to management in evaluating past performance and in planning future operations. For example, the impact of the $0.50 reduction in the unit sales price by Noble Inc. on the number of units sold and on the total sales for the year is useful information in determining whether further price reductions might be desirable.

The contribution margin analysis report also highlights the impact of changes in unit variable costs and expenses. For example, the $0.05 increase in the unit variable selling and administrative expenses might be a result of increased advertising expenditures. If so, the increase in the number of units sold in 2010 could be attributed to both the $0.50 price reduction and the increased advertising.

Example Exercise 5-6 Contribution Margin Analysis 5

The actual price for a product was $48 per unit, while the planned price was $40 per unit. The volume increased by 5,000 units to 60,000 actual total units. Determine (a) the quantity factor and (b) the price factor for sales.

Follow My Example 5-6

a. $200,000 increase in sales (5,000 units × $40 per unit)
b. $480,000 increase in sales [($48 – $40) × 60,000 units]

For Practice: PE 5-6A, PE 5-6B

6 Describe and illustrate the use of variable costing for service firms.

Variable Costing for Service Firms

Variable costing and the use of variable costing for manufacturing firms have been discussed earlier in this chapter. Service companies also use variable costing, contribution margin analysis, and segment analysis.

Reporting Income from Operations Using Variable Costing for a Service Company

Unlike a manufacturing company, a service company does not make or sell a product. Thus, service companies do not have inventory. Since service companies have no inventory, they do not use absorption costing to allocate fixed costs. In addition, variable costing reports of service companies do not report a manufacturing margin.

To illustrate variable costing for a service company, Blue Skies Airlines Inc., which operates as a small commercial airline, is used. The variable and fixed costs of Blue Skies are shown in Exhibit 13.

Exhibit 13

Costs of Blue Skies Airlines Inc.

Cost	Amount	Cost Behavior	Activity Base
Depreciation expense	$3,600,000	Fixed	
Food and beverage service expense	444,000	Variable	Number of passengers
Fuel expense	4,080,000	Variable	Number of miles flown
Rental expense	800,000	Fixed	
Selling expense	3,256,000	Variable	Number of passengers
Wages expense	6,120,000	Variable	Number of miles flown

As discussed in the prior chapter, a cost is classified as a fixed or variable cost according to how it changes relative to an activity base. A common activity for a manufacturing firm is the number of units produced. In contrast, most service companies use several activity bases.

To illustrate, Blue Skies Airlines uses the activity base *number of passengers* for food and beverage service and selling expenses. Blue Skies uses *number of miles flown* for fuel and wage expenses.

The variable costing income statement for Blue Skies, assuming revenue of $19,238,000, is shown in Exhibit 14.

Exhibit 14

Variable Costing Income Statement

Blue Skies Airlines Inc.
Variable Costing Income Statement
For the Month Ended April 30, 2010

Revenue		$19,238,000
Variable costs:		
Fuel expense	$4,080,000	
Wages expense	6,120,000	
Food and beverage service expense	444,000	
Selling expense	3,256,000	
Total variable costs		13,900,000
Contribution margin		$ 5,338,000
Fixed costs:		
Depreciation expense	$3,600,000	
Rental expense	800,000	
Total fixed costs		4,400,000
Income from operations		$ 938,000

Unlike a manufacturing company, Exhibit 14 does not report cost of goods sold, inventory, or manufacturing margin. However, as shown in Exhibit 14, contribution margin is reported separately from income from operations.

Market Segment Analysis for Service Company

A contribution margin report for service companies can be used to analyze and evaluate market segments. Typical segments for various service companies are shown below.

Service Industry	Market Segments
Electric power	Regions, customer types (industrial, consumer)
Banking	Customer types (commercial, retail), products (loans, savings accounts)
Airlines	Products (passengers, cargo), routes
Railroads	Products (commodity type), routes
Hotels	Hotel properties
Telecommunications	Customer type (commercial, retail), service type (voice, data)
Health care	Procedure, payment type (Medicare, insured)

To illustrate, a contribution margin report segmented by route is used for Blue Skies Airlines. In preparing the report, the following data for April 2010 are used:

	Chicago/Atlanta	Atlanta/LA	LA/Chicago
Average ticket price per passenger	$400	$1,075	$805
Total passengers served	16,000	7,000	6,600
Total miles flown	56,000	88,000	60,000

The variable costs per unit are as follows:

Fuel	$ 20 per mile
Wages	30 per mile
Food and beverage service	15 per passenger
Selling	110 per passenger

A contribution margin report for Blue Skies Airlines is shown in Exhibit 15. The report is segmented by the routes (city pairs) flown.

Exhibit 15

Contribution Margin by Segment Report—Service Firm

Blue Skies Airlines Inc.
Contribution Margin by Route
For the Month Ended April 30, 2010

	Chicago/ Atlanta	Atlanta/ Los Angeles	Los Angeles/ Chicago	Total
Revenue				
(Ticket price × No. of passengers)	$ 6,400,000	$ 7,525,000	$ 5,313,000	$19,238,000
Aircraft fuel				
($20 × No. of miles flown)	(1,120,000)	(1,760,000)	(1,200,000)	(4,080,000)
Wages and benefits				
($30 × No. of miles flown)	(1,680,000)	(2,640,000)	(1,800,000)	(6,120,000)
Food and beverage service				
($15 × No. of passengers)	(240,000)	(105,000)	(99,000)	(444,000)
Selling expenses				
($110 × No. of passengers)	(1,760,000)	(770,000)	(726,000)	(3,256,000)
Contribution margin	$ 1,600,000	$ 2,250,000	$ 1,488,000	$ 5,338,000
Contribution margin ratio* (rounded)	25%	30%	28%	28%

*Contribution margin/revenue

Exhibit 15 indicates that the Chicago/Atlanta route has the lowest contribution margin ratio of 25%. In contrast, the Atlanta/Los Angeles route has the highest contribution margin ratio of 30%.

Contribution Margin Analysis

Blue Skies Airlines Inc. is also used to illustrate contribution margin analysis. Specifically, assume that Blue Skies decides to try to improve the contribution margin of its Chicago/Atlanta route during May by decreasing ticket prices. Thus, Blue Skies decreases the ticket price from $400 to $380 beginning May 1. As a result, the number of tickets sold (passengers) increased from 16,000 to 20,000. However, the cost per mile also increased during May from $20 to $22 due to increasing fuel prices.

The actual and planned results for the Chicago/Atlanta route during May are shown on the next page. The planned amounts are based on the April results without considering the price change or cost per mile increase. The highlighted numbers indicate changes during May.

	Chicago/Atlanta Route	
	Actual, May	Planned, May
Revenue	$7,600,000	$6,400,000
Less variable expenses:		
Aircraft fuel	$1,232,000	$1,120,000
Wages and benefits	1,680,000	1,680,000
Food and beverage service	300,000	240,000
Selling expenses and commissions	2,200,000	1,760,000
Total	$5,412,000	$4,800,000
Contribution margin	$2,188,000	$1,600,000
Contribution margin ratio	29%	25%
Number of miles flown	56,000	56,000
Number of passengers flown	20,000	16,000
Per unit:		
Ticket price	$380	$400
Fuel expense	22	20
Wages expense	30	30
Food and beverage service expense	15	15
Selling expense	110	110

Using the preceding data, a contribution margin analysis report can be prepared for the Chicago/Atlanta route for May as shown in Exhibit 16. Since the planned and actual wages and benefits expense are the same ($1,680,000), its quantity and unit cost factors are not included in Exhibit 16.

Exhibit 16

Contribution Margin Analysis Report—Service Company

Blue Skies Airlines Inc.
Contribution Margin Analysis
Chicago/Atlanta Route
For the Month Ended May 31, 2010

Planned contribution margin		$1,600,000
Effect of changes in revenue:		
Revenue quantity factor (20,000 pass. – 16,000 pass.) × $400	$ 1,600,000	
Unit price factor ($380 – $400) × 20,000 passengers	–400,000	
Total effect of changes in revenue		1,200,000
Effect of changes in fuel cost:		
Variable cost quantity factor (56,000 miles – 56,000 miles) × $20	$ 0	
Unit cost factor ($20 – $22) × 56,000 miles	–112,000	
Total effect of changes in fuel costs		–112,000
Effect of changes in food and beverage expenses:		
Variable cost quantity factor (16,000 pass. – 20,000 pass.) × $15	– $ 60,000	
Unit cost factor ($15 – $15) × 20,000 passengers	0	
Total effect of changes in food and beverage expenses		–60,000
Effect of changes in selling and commission expenses:		
Variable cost quantity factor (16,000 pass. – 20,000 pass.) × $110	–$ 440,000	
Unit cost factor ($110 – $110) × 20,000 passengers	0	
Total effect of changes in selling and administrative expenses		–440,000
Actual contribution margin		$2,188,000

Exhibit 16 indicates that the price decrease generated an additional $1,600,000 in revenue. This consists of $1,200,000 from an increased number of passengers (revenue quantity factor) and a $400,000 revenue reduction from the decrease in ticket price (unit price factor).

The increased fuel costs (by $2 per mile) reduced the contribution margin by $112,000 (unit cost factor). The increased number of passengers also increased the food and beverage service costs by $60,000 and the selling costs by $440,000 (variable cost quantity factors). The net increase in contribution margin is $588,000 ($2,188,000 – $1,600,000).

At a Glance 5

1 Describe and illustrate reporting income from operations under absorption and variable costing.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Under absorption costing, direct materials, direct labor, and factory overhead become part of the cost of goods manufactured. Under variable costing, the cost of goods manufactured is composed of only variable costs—the direct materials, direct labor, and only those factory overhead costs that vary with the rate of production. The fixed factory overhead costs do not become a part of the cost of goods manufactured but are considered an expense of the period.	• Describe the difference between absorption and variable costing.		
Deducting the variable cost of goods sold from sales in the variable costing income statement yields the manufacturing margin. Deducting the variable selling and administrative expenses from the manufacturing margin yields the contribution margin. Deducting the fixed costs from the contribution margin yields the income from operations.	• Prepare a variable costing income statement for a manufacturer.	**5-1**	5-1A, 5-1B
	• Evaluate the difference between the variable and absorption costing income statements when production exceeds sales.	**5-2**	5-2A, 5-2B
	• Evaluate the difference between the variable and absorption costing income statements when sales exceed production.	**5-3**	5-3A, 5-3B

2 Describe and illustrate the effects of absorption and variable costing on analyzing income from operations.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Management should be aware of the effects of changes in inventory levels on income from operations reported under variable costing and absorption costing. If absorption costing is used, managers could misinterpret increases or decreases in income from operations due to changes in inventory levels to be the result of operating efficiencies or inefficiencies.	• Determine absorption costing and variable costing income under different planned levels of production for a given sales level.	**5-4**	5-4A, 5-4B

3 Describe management's use of absorption and variable costing.

Key Points

Variable costing is especially useful at the operating level of management because the amount of variable manufacturing costs are controllable at this level. The fixed factory overhead costs are ordinarily controllable by a higher level of management.

In the short run, variable costing may be useful in establishing the selling price of a product. This price should be at least equal to the variable costs of making and selling the product. In the long run, however, absorption costing is useful in establishing selling prices because all costs must be covered and a reasonable amount of operating income must be earned.

Key Learning Outcomes

- Describe the management's use of variable and absorption costing for controlling costs, pricing products, planning production, analyzing contribution margins, and analyzing market segments.

Example Exercises	Practice Exercises

4 Use variable costing for analyzing market segments, including product, territories, and salespersons segments.

Key Points

Variable costing can support management decision making in analyzing and evaluating market segments, such as territories, products, salespersons, and customers. Contribution margin reports by segment can be used by managers to support price decisions, evaluate cost changes, and plan volume changes.

Key Learning Outcomes

- Describe management's uses of contribution margin reports by segment.
- Prepare a contribution margin report by sales territory.
- Prepare a contribution margin report by product.
- Prepare a contribution margin report by salesperson.

Example Exercises	Practice Exercises
5-5	5-5A, 5-5B

5 Use variable costing for analyzing and explaining changes in contribution margin as a result of quantity and price factors.

Key Points

Contribution margin analysis is the systematic examination of differences between planned and actual contribution margins. These differences can be caused by an increase/decrease in the amount of sales or variable costs, which can be caused by changes in the amount of units sold, unit sales price, or unit cost.

Key Learning Outcomes

- Prepare a contribution margin analysis identifying changes between actual and planned contribution margin by price/cost and quantity factors.

Example Exercises	Practice Exercises
5-6	5-6A, 5-6B

6 Describe and illustrate the use of variable costing for service firms.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Service firms will not have inventories, manufacturing margin, or cost of goods sold. Service firms can prepare variable costing income statements and contribution margin reports for market segments. In addition, service firms can use contribution margin analysis to plan and control operations.	• Prepare a variable costing income statement for a service firm. • Prepare contribution margin reports by market segments for a service firm. • Prepare a contribution margin analysis for a service firm.		

Key Terms

absorption costing (178)
contribution margin (179)
contribution margin analysis (194)
controllable costs (188)
manufacturing margin (179)
market segment (189)
noncontrollable cost (188)
quantity factor (194)
sales mix (190)
unit price (cost) factor (194)
variable cost of goods sold (179)
variable costing (179)

Illustrative Problem

During the current period, McLaughlin Company sold 60,000 units of product at $30 per unit. At the beginning of the period, there were 10,000 units in inventory and McLaughlin Company manufactured 50,000 units during the period. The manufacturing costs and selling and administrative expenses were as follows:

	Total Cost	Number of Units	Unit Cost
Beginning inventory:			
Direct materials	$ 67,000	10,000	$ 6.70
Direct labor	155,000	10,000	15.50
Variable factory overhead	18,000	10,000	1.80
Fixed factory overhead	20,000	10,000	2.00
Total	$ 260,000		$26.00
Current period costs:			
Direct materials	$ 350,000	50,000	$ 7.00
Direct labor	810,000	50,000	16.20
Variable factory overhead	90,000	50,000	1.80
Fixed factory overhead	100,000	50,000	2.00
Total	$1,350,000		$27.00
Selling and administrative expenses:			
Variable	$ 65,000		
Fixed	45,000		
Total	$ 110,000		

Instructions

1. Prepare an income statement based on the absorption costing concept.
2. Prepare an income statement based on the variable costing concept.
3. Give the reason for the difference in the amount of income from operations in parts (1) and (2).

Solution

1.

Absorption Costing Income Statement

Sales (60,000 × $30)		$1,800,000
Cost of goods sold:		
Beginning inventory (10,000 × $26)	$ 260,000	
Cost of goods manufactured (50,000 × $27)	1,350,000	
Cost of goods sold		1,610,000
Gross profit		$ 190,000
Selling and administrative expenses ($65,000 + $45,000)		110,000
Income from operations		$ 80,000

2.

Variable Costing Income Statement

Sales (60,000 × $30)		$1,800,000
Variable cost of goods sold:		
Beginning inventory (10,000 × $24)	$ 240,000	
Variable cost of goods manufactured (50,000 × $25)	1,250,000	
Variable cost of goods sold		1,490,000
Manufacturing margin		$ 310,000
Variable selling and administrative expenses		65,000
Contribution margin		$ 245,000
Fixed costs:		
Fixed manufacturing costs	$ 100,000	
Fixed selling and administrative expenses	45,000	145,000
Income from operations		$ 100,000

3. The difference of $20,000 ($100,000 – $80,000) in the amount of income from operations is attributable to the different treatment of the fixed manufacturing costs. The beginning inventory in the absorption costing income statement includes $20,000 (10,000 units × $2) of fixed manufacturing costs incurred in the preceding period. This $20,000 was included as an expense in a variable costing income statement of a prior period. Therefore, none of it is included as an expense in the current period variable costing income statement.

Self-Examination Questions (Answers at End of Chapter)

1. Sales were $750,000, the variable cost of goods sold was $400,000, the variable selling and administrative expenses were $90,000, and fixed costs were $200,000. The contribution margin was:
   A. $60,000.
   B. $260,000.
   C. $350,000.
   D. none of the above.

2. During a year in which the number of units manufactured exceeded the number of units sold, the income from operations reported under the absorption costing concept would be:
   A. larger than the income from operations reported under the variable costing concept.
   B. smaller than the income from operations reported under the variable costing concept.
   C. the same as the income from operations reported under the variable costing concept.
   D. none of the above.

3. The beginning inventory consists of 6,000 units, all of which are sold during the period. The beginning inventory fixed costs are $20 per unit, and variable costs are $90 per unit. What is the difference in income from operations between variable and absorption costing?
   A. Variable costing income from operations is $540,000 less than under absorption costing.
   B. Variable costing income from operations is $660,000 greater than under absorption costing.
   C. Variable costing income from operations is $120,000 less than under absorption costing.
   D. Variable costing income from operations is $120,000 greater than under absorption costing.

4. Variable costs are $70 per unit and fixed costs are $150,000. Sales are estimated to be 10,000 units. How much would absorption costing income from operations differ between a plan to produce 10,000 units and 12,000 units?
   A. $150,000 greater for 12,000 units
   B. $150,000 less for 12,000 units
   C. $25,000 greater for 12,000 units
   D. $25,000 less for 12,000 units

5. If actual sales totaled $800,000 for the current year (80,000 units at $10 each) and planned sales were $765,000 (85,000 units at $9 each), the difference between actual and planned sales due to the sales quantity factor is:
   A. a $50,000 increase.
   B. a $35,000 increase.
   C. a $45,000 decrease.
   D. none of the above.

Eye Openers

1. What types of costs are customarily included in the cost of manufactured products under (a) the absorption costing concept and (b) the variable costing concept?
2. Which type of manufacturing cost (direct materials, direct labor, variable factory overhead, fixed factory overhead) is included in the cost of goods manufactured under the absorption costing concept but is excluded from the cost of goods manufactured under the variable costing concept?
3. Which of the following costs would be included in the cost of a manufactured product according to the variable costing concept: (a) rent on factory building, (b) direct materials, (c) property taxes on factory building, (d) electricity purchased to operate factory equipment, (e) salary of factory supervisor, (f) depreciation on factory building, (g) direct labor?
4. In the following equations, based on the variable costing income statement, identify the items designated by X:
   a. Net sales – X = manufacturing margin
   b. Manufacturing margin – X = contribution margin
   c. Contribution margin – X = income from operations
5. In the variable costing income statement, how are the fixed manufacturing costs reported and how are the fixed selling and administrative expenses reported?

6. If the quantity of the ending inventory is larger than that of the beginning inventory, will the amount of income from operations determined by absorption costing be more than or less than the amount determined by variable costing? Explain.
7. Since all costs of operating a business are controllable, what is the significance of the term *noncontrollable cost*?
8. Discuss how financial data prepared on the basis of variable costing can assist management in the development of short-run pricing policies.
9. How might management analyze sales territory profitability?
10. Why might management analyze product profitability?
11. Explain why rewarding sales personnel on the basis of total sales might not be in the best interests of a business whose goal is to maximize profits.
12. Discuss the two factors affecting both sales and variable costs to which a change in contribution margin can be attributed.
13. How is the quantity factor for an increase or a decrease in the amount of sales computed in using contribution margin analysis?
14. How is the unit cost factor for an increase or a decrease in the amount of variable cost of goods sold computed in using contribution margin analysis?
15. Provide examples of market segments for an entertainment company, such as The Walt Disney Co.

Practice Exercises

PE 5-1A
Variable costing

obj. 1

EE 5-1 p. 181

Scofield Company has the following information for March:

Sales	$240,000
Variable cost of goods sold	86,400
Fixed manufacturing costs	57,600
Variable selling and administrative expenses	19,200
Fixed selling and administrative expenses	14,400

Determine (a) the manufacturing margin, (b) the contribution margin, and (c) income from operations for Scofield Company for the month of March.

PE 5-1B
Variable costing

obj. 1

EE 5-1 p. 181

McCoy Company has the following information for July:

Sales	$560,000
Variable cost of goods sold	291,200
Fixed manufacturing costs	50,400
Variable selling and administrative expenses	145,600
Fixed selling and administrative expenses	33,600

Determine (a) the manufacturing margin, (b) the contribution margin, and (c) income from operations for McCoy Company for the month of July.

PE 5-2A
Variable costing—production exceeds sales

obj. 1

EE 5-2 p. 182

Fixed manufacturing costs are $30 per unit, and variable manufacturing costs are $55 per unit. Production was 160,000 units, while sales were 144,000 units. Determine (a) whether variable costing income from operations is less than or greater than absorption costing income from operations, and (b) the difference in variable costing and absorption costing income from operations.

PE 5-2B
Variable costing—production exceeds sales
obj. 1
EE 5-2 p. 182

Fixed manufacturing costs are $18 per unit, and variable manufacturing costs are $42 per unit. Production was 28,000 units, while sales were 21,000 units. Determine (a) whether variable costing income from operations is less than or greater than absorption costing income from operations, and (b) the difference in variable costing and absorption costing income from operations.

PE 5-3A
Variable costing—sales exceed production
obj. 1
EE 5-3 p. 184

The beginning inventory is 12,000 units. All of the units were manufactured during the period and 4,000 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are $15.40 per unit, and variable manufacturing costs are $44 per unit. Determine (a) whether variable costing income from operations is less than or greater than absorption costing income from operations, and (b) the difference in variable costing and absorption costing income from operations.

PE 5-3B
Variable costing—sales exceed production
obj. 1
EE 5-3 p. 184

The beginning inventory is 40,000 units. All of the units were manufactured during the period and 22,000 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are $5.80 per unit, and variable manufacturing costs are $12.00 per unit. Determine (a) whether variable costing income from operations is less than or greater than absorption costing income from operations, and (b) the difference in variable costing and absorption costing income from operations.

PE 5-4A
Analyzing income under absorption and variable costing
obj. 2
EE 5-4 p. 187

Variable manufacturing costs are $22 per unit, and fixed manufacturing costs are $110,000. Sales are estimated to be 20,000 units.

a. How much would absorption costing income from operations differ between a plan to produce 20,000 units and a plan to produce 25,000 units?
b. How much would variable costing income from operations differ between the two production plans?

PE 5-4B
Analyzing income under absorption and variable costing
obj. 2
EE 5-4 p. 187

Variable manufacturing costs are $35 per unit, and fixed manufacturing costs are $42,000. Sales are estimated to be 3,000 units.

a. How much would absorption costing income from operations differ between a plan to produce 3,000 units and a plan to produce 4,000 units?
b. How much would variable costing income from operations differ between the two production plans?

PE 5-5A
Contribution margin by segment
obj. 4
EE 5-5 p. 193

The following information is for Cool Wave Skateboards, Inc.:

	East	West
Sales Volume (units):		
Big Kahuna	12,500	16,500
Easy Rider	28,000	35,000
Sales Price:		
Big Kahuna	$120	$125
Easy Rider	$140	$150
Variable Cost per unit:		
Big Kahuna	$62	$62
Easy Rider	$65	$65

Determine the contribution margin for (a) Big Kahuna Skateboards and (b) East Region.

PE 5-5B
Contribution margin by segment

obj. 4

EE 5-5 p. 193

The following information is for Raspberry Games, Inc.:

	North	South
Sales Volume (units):		
Xenon	7,500	9,500
Flash	10,000	12,500
Sales Price:		
Xenon	$175	$165
Flash	$182	$180
Variable Cost per unit:		
Xenon	$84	$84
Flash	$90	$90

Determine the contribution margin for (a) Flash hand-held video games and (b) South Region.

PE 5-6A
Contribution margin analysis

obj. 5

EE 5-6 p. 196

The actual price for a product was $28 per unit, while the planned price was $25 per unit. The volume decreased by 20,000 units to 410,000 actual total units. Determine (a) the sales quantity factor and (b) the unit price factor for sales.

PE 5-6B
Contribution margin analysis

obj. 5

EE 5-6 p. 196

The actual variable cost of goods sold for a product was $140 per unit, while the planned variable cost of goods sold was $136 per unit. The volume increased by 2,400 units to 14,000 actual total units. Determine (a) the variable cost quantity factor and (b) the unit cost factor for variable cost of goods sold.

Exercises

EX 5-1
Inventory valuation under absorption costing and variable costing

obj. 1

✔ b. Inventory, $294,840

At the end of the first year of operations, 5,200 units remained in the finished goods inventory. The unit manufacturing costs during the year were as follows:

Direct materials	$35.00
Direct labor	16.80
Fixed factory overhead	5.60
Variable factory overhead	4.90

Determine the cost of the finished goods inventory reported on the balance sheet under (a) the absorption costing concept and (b) the variable costing concept.

EX 5-2
Income statements under absorption costing and variable costing

obj. 1

✔ a. Income from operations, $191,200

Digital Edge Inc. assembles and sells MP3 players. The company began operations on May 1, 2010, and operated at 100% of capacity during the first month. The following data summarize the results for May:

Sales (14,000 units)		$1,820,000
Production costs (18,000 units):		
Direct materials	$865,800	
Direct labor	421,200	
Variable factory overhead	210,600	
Fixed factory overhead	140,400	1,638,000
Selling and administrative expenses:		
Variable selling and administrative expenses	$254,800	
Fixed selling and administrative expenses	100,000	354,800

a. Prepare an income statement according to the absorption costing concept.
b. Prepare an income statement according to the variable costing concept.
c. What is the reason for the difference in the amount of income from operations reported in (a) and (b)?

EX 5-3
Income statements under absorption costing and variable costing

obj. 1

✔ b. Income from operations, $930,400

Rugged Gear Inc. manufactures and sells men's athletic clothes. The company began operations on July 1, 2010, and operated at 100% of capacity (44,000 units) during the first month, creating an ending inventory of 4,000 units. During August, the company produced 40,000 garments during the month but sold 44,000 units at $110 per unit. The August manufacturing costs and selling and administrative expenses were as follows:

	Number of Units	Unit Cost	Total Cost
Manufacturing costs in August beginning inventory:			
Variable	4,000	$44.00	$ 176,000
Fixed	4,000	16.00	64,000
Total		$60.00	$ 240,000
August manufacturing costs:			
Variable	40,000	$44.00	$1,760,000
Fixed	40,000	17.60	704,000
Total		$61.60	$2,464,000
Selling and administrative expenses:			
Variable ($20.90 per unit sold)			$ 919,600
Fixed			350,000
Total			$1,269,600

a. Prepare an income statement according to the absorption costing concept for August.
b. Prepare an income statement according to the variable costing concept for August.
c. What is the reason for the difference in the amount of income from operations reported in (a) and (b)?

EX 5-4
Cost of goods manufactured, using variable costing and absorption costing

obj. 1

✔ b. Unit cost of goods manufactured, $16,800

On June 30, the end of the first year of operations, Reinemund Equipment Company manufactured 2,200 units and sold 1,900 units. The following income statement was prepared, based on the variable costing concept:

Reinemund Equipment Company
Variable Costing Income Statement
For the Year Ended June 30, 2011

Sales		$45,600,000
Variable cost of goods sold:		
Variable cost of goods manufactured	$25,344,000	
Less inventory, July 31	3,456,000	
Variable cost of goods sold		21,888,000
Manufacturing margin		$23,712,000
Variable selling and administrative expenses		5,472,000
Contribution margin		$18,240,000
Fixed costs:		
Fixed manufacturing costs	$11,616,000	
Fixed selling and administrative expenses	3,648,000	15,264,000
Income from operations		$ 2,976,000

Determine the unit cost of goods manufactured, based on (a) the variable costing concept and (b) the absorption costing concept.

EX 5-5
Variable costing income statement

obj. 1

✔ Income from operations, $12,250

On June 30, the end of the first month of operations, Volker Energy Company prepared the following income statement, based on the absorption costing concept:

Volker Energy Company
Absorption Costing Income Statement
For the Month Ended June 30, 2011

Sales (4,800 units)		$134,400
Cost of goods sold:		
Cost of goods manufactured (5,600 units)	$112,000	
Less inventory, June 30 (800 units)	16,000	
Cost of goods sold		96,000
Gross profit		$ 38,400
Selling and administrative expenses		22,550
Income from operations		$ 15,850

If the fixed manufacturing costs were $25,200 and the variable selling and administrative expenses were $11,400, prepare an income statement according to the variable costing concept.

EX 5-6
Absorption costing income statement

obj. 1

✔ Income from operations, $114,960

On May 31, the end of the first month of operations, Trendwest Office Equipment Company prepared the following income statement, based on the variable costing concept:

Trendwest Office Equipment Company
Variable Costing Income Statement
For the Month Ended May 31, 2010

Sales (12,000 units)		$648,000
Variable cost of goods sold:		
Variable cost of goods manufactured	$311,040	
Less inventory, May 31 (2,400 units)	51,840	
Variable cost of goods sold		259,200
Manufacturing margin		$388,800
Variable selling and administrative expenses		168,000
Contribution margin		$220,800
Fixed costs:		
Fixed manufacturing costs	$64,800	
Fixed selling and administrative expenses	51,840	116,640
Income from operations		$104,160

Prepare an income statement under absorption costing.

EX 5-7
Variable costing income statement

obj. 1

✔ a. Income from operations, $15,450

The following data were adapted from a recent income statement of Procter & Gamble Company:

	(in millions)
Net sales	$76,476
Operating costs:	
Cost of products sold	$36,686
Marketing, administrative, and other expenses	24,340
Total operating costs	$61,026
Income from operations	$15,450

Assume that the variable amount of each category of operating costs is as follows:

	(in millions)
Cost of products sold	$20,500
Marketing, administrative, and other expenses	9,700

a. Based on the above data, prepare a variable costing income statement for Procter & Gamble Company, assuming that the company maintained constant inventory levels during the period.
b. If Procter & Gamble reduced its inventories during the period, what impact would that have on the income from operations determined under absorption costing?

EX 5-8
Estimated income statements, using absorption and variable costing

objs. 1, 2

✔ a. 1. Income from operations, $50,300 (18,000 units)

Prior to the first month of operations ending April 30, 2011, Powell Industries Inc. estimated the following operating results:

Sales (18,000 × $62.00)	$1,116,000
Manufacturing costs (18,000 units):	
Direct materials	684,000
Direct labor	162,000
Variable factory overhead	75,600
Fixed factory overhead	90,000
Fixed selling and administrative expenses	24,500
Variable selling and administrative expenses	29,600

The company is evaluating a proposal to manufacture 20,000 units instead 18,000 units, thus creating an ending inventory of 2,000 units. Manufacturing the additional units will not change sales, unit variable factory overhead costs, total fixed factory overhead cost, or total selling and administrative expenses.

a. Prepare an estimated income statement, comparing operating results if 18,000 and 20,000 units are manufactured in (1) the absorption costing format and (2) the variable costing format.
b. What is the reason for the difference in income from operations reported for the two levels of production by the absorption costing income statement?

EX 5-9
Variable and absorption costing

obj. 1

✔ a. Contribution margin, $6,312

Whirlpool Corporation had the following abbreviated income statement for a recent year:

	(in millions)
Net sales	$19,408
Cost of goods sold	16,517
Selling administrative, and other expenses	1,736
Total expenses	$18,253
Income from operations	$ 1,155

Assume that there were $4,250 million fixed manufacturing costs and $1,000 million fixed selling, administrative, and other costs for the year.

The finished goods inventories at the beginning and end of the year from the balance sheet were as follows:

January 1	$2,350 million
December 31	$2,660 million

Assume that 30% of the beginning and ending inventory consists of fixed costs. Assume work in process and materials inventory were unchanged during the period.

a. Prepare an income statement according to the variable costing concept for Whirlpool Corporation for the recent year.
b. Explain the difference between the amount of income from operations reported under the absorption costing and variable costing concepts.

EX 5-10
Variable and absorption costing—three products

objs. 2, 3

East Coast Footwear Company manufactures and sells three types of shoes. The income statements prepared under the absorption costing method for the three shoes are as follows:

East Coast Footwear Company
Product Income Statements—Absorption Costing
For the Year Ended December 31, 2010

	Athletic Shoes	Casual Shoes	Work Shoes
Revenues	$464,000	$392,000	$336,000
Cost of goods sold	240,000	192,000	224,000
Gross profit	$224,000	$200,000	$112,000
Selling and administrative expenses	192,000	144,000	188,000
Income from operations	$ 32,000	$ 56,000	$ (76,000)

In addition, you have determined the following information with respect to allocated fixed costs:

	Athletic Shoes	Casual Shoes	Work Shoes
Fixed costs:			
Cost of goods sold	$72,000	$52,000	$48,000
Selling and administrative expenses	56,000	48,000	48,000

These fixed costs are used to support all three product lines. In addition, you have determined that the inventory is negligible.

The management of the company has deemed the profit performance of the work shoe line as unacceptable. As a result, it has decided to eliminate the work shoe line. Management does not expect to be able to increase sales in the other two lines. However, as a result of eliminating the work shoe line, management expects the profits of the company to increase by $76,000.

a. Do you agree with management's decision and conclusions?
b. Prepare a variable costing income statement for the three products.
c. Use the report in (b) to determine the profit impact of eliminating the work shoe line, assuming no other changes.

EX 5-11
Change in sales mix and contribution margin

obj. 4

Airwave Audio Company manufactures Model DL headphones and Model XL headphones and is operating at less than full capacity. Market research indicates that 24,800 additional Model DL and 27,500 additional Model XL could be sold. The income from operations by unit of product is as follows:

	Model DL Headphone	Model XL Headphone
Sales price	$35.00	$56.00
Variable cost of goods sold	19.60	31.40
Manufacturing margin	$15.40	$24.60
Variable selling and administrative expenses	7.00	11.20
Contribution margin	$ 8.40	$13.40
Fixed manufacturing costs	3.20	5.10
Income from operations	$ 5.20	$ 8.30

Prepare an analysis indicating the increase or decrease in total profitability if 24,800 additional Model DL and 27,500 additional Model XL are produced and sold, assuming that there is sufficient capacity for the additional production.

EX 5-12
Product profitability analysis

obj. 4

✔ a. 2WD contribution margin, $1,267,200

Outdoor Sports Vehicles Inc. manufactures and sells two styles of ATVs, 4-wheel drive (4WD) and 2-wheel drive (2WD), from a single manufacturing facility. The manufacturing facility operates at 100% of capacity. The following per unit information is available for the two products:

	4WD	2WD
Sales price	$5,760	$3,600
Variable cost of goods sold	3,600	2,400
Manufacturing margin	$2,160	$1,200
Variable selling expenses	1,080	624
Contribution margin	$1,080	$ 576
Fixed expenses	510	230
Income from operations	$ 570	$ 346

In addition, the following unit volume information for the period is as follows:

	4WD	2WD
Sales unit volume	3,000	2,200

a. Prepare a contribution margin by product report. Calculate the contribution margin ratio for each product as a whole percent, rounded to two decimal places.

(*continued*)

b. What advice would you give to the management of Outdoor Sports Vehicles Inc. regarding the relative profitability of the two products?

EX 5-13
Territory and product profitability analysis

obj. 4

✔ a. Northern California contribution margin, $297,000

ScooterSport Inc. manufactures and sells two styles of scooter, Mountain Cat and City Dawg. These scooters are sold in two regions, the Colorado and Northern California. Information about the two scooters is as follows:

	Mountain Cat	City Dawg
Sales price	$250	$150
Variable cost of goods sold per unit	92	75
Manufacturing margin per unit	$158	$ 75
Variable selling expense per unit	104	30
Contribution margin per unit	$ 54	$ 45

The sales unit volume for the territories and products for the period is as follows:

	Colorado	Northern California
Mountain Cat	6,000	3,000
City Dawg	0	3,000

a. Prepare a contribution margin by sales territory report. Calculate the contribution margin ratio for each territory as a whole percent, rounded to two decimal places.

b. What advice would you give to the management of ScooterSport Inc. regarding the relative profitability of the two territories?

EX 5-14
Sales territory and salesperson profitability analysis

obj. 4

✔ a. Scott W. contribution margin, $168,000

Scottish Industries, Inc. manufactures and sells a variety of commercial vehicles to manufactures in the East and West regions. There are two salespersons assigned to each territory. Higher commission rates go to the most experienced salespersons. The following sales statistics are available for each salesperson:

	East		West	
	Ozzie S.	Scott W.	Bob B.	Mellisa C.
Average per unit:				
Sales price	$40,000	$35,000	$45,000	$32,500
Variable cost of goods sold	24,000	14,000	27,000	13,000
Commission rate	8%	12%	12%	8%
Units sold	12	10	10	16
Manufacturing margin ratio	40%	60%	40%	60%

a. 1. Prepare a contribution margin by salesperson report. Calculate the contribution margin ratio for each salesperson.
2. Interpret the report.

b. 1. Prepare a contribution margin by territory report. Calculate the contribution margin for each territory as a whole percent, rounded to one decimal place.
2. Interpret the report.

EX 5-15
Segment profitability analysis

obj. 4

✔ a. North America contribution margin, $2,499.85

Provided below are the marketing segment sales for Caterpillar, Inc., for a recent year.

Caterpillar, Inc.
Machinery and Engines Marketing Segment Sales
(in millions)

	Asia	Europe/Africa/ Middle East (EAME)	Latin America	Power Systems	North America	Electric Power
Sales	$3,396	$7,516	$3,530	$4,966	$9,571	$3,190

The Power Systems and Electric Power segments design, manufacture, and market engines. The geographic segments sell Caterpillar equipment to their respective regions.

Assume the following information:

	Asia/ Pacific	Europe/Africa/ Middle East (EAME)	Latin America	Power Systems	North America	Electric Power
Variable cost of goods sold as a percent of sales	48%	55%	50%	50%	55%	55%
Dealer commissions as a percent of sales	9%	11%	8%	6%	10%	5%
Variable promotion expenses (in millions)	$460	$800	$350	$780	$850	$400

a. Use the sales information and the additional assumed information to prepare a contribution margin by segment report. Round to two decimal places. In addition, calculate the contribution margin ratio for each segment as a whole percent, rounded to one decimal place.

b. Prepare a table showing the manufacturing margin, dealer commissions, and variable promotion expenses as a percent of sales for each segment. Round whole percents to one decimal place.

c. Use the information in (a) and (b) to interpret the segment performance.

EX 5-16
Segment contribution margin analysis

objs. 4, 6

✔ a. Filmed entertainment, $7,769.0, 70%

The operating revenues of the five largest business segments for Time Warner, Inc., for a recent year are shown below. Each segment includes a number of businesses, examples of which are indicated in parentheses.

Time Warner, Inc. Segment Revenues (in millions)	
AOL	$ 5,161
Cable (TWC, Inc.)	15,940
Filmed Entertainment (Warner Bros.)	11,099
Networks (CNN, HBO, WB)	9,354
Publishing (*Time*, *People*, *Sports Illustrated*)	4,928

Assume that the variable costs as a percent of sales for each segment are as follows:

AOL	18%
Cable	18%
Filmed Entertainment	30%
Networks	25%
Publishing	70%

a. Determine the contribution margin (round to whole millions) and contribution margin ratio (round to whole percents) for each segment from the above information.

b. Why is the contribution margin ratio for the Publishing segment smaller than for the other segments?

c. Does your answer to (b) mean that the other segments are more profitable businesses than the Publishing segment?

EX 5-17
Contribution margin analysis—sales

obj. 4

Bay Area Sound, Inc. sells computer speakers. Management decided early in the year to reduce the price of the speakers in order to increase sales volume. As a result, for the year ended December 31, 2011, the sales increased by $19,000 from the planned level of $989,000. The following information is available from the accounting records for the year ended December 31, 2011:

	Actual	Planned	Increase or (Decrease)
Sales	$1,008,000	$989,000	$19,000
Number of units sold	24,000	21,500	2,500
Sales price	$42.00	$46.00	$(4.00)
Variable cost per unit	$7.00	$7.00	0

(*continued*)

a. Prepare an analysis of the sales quantity and unit price factors.
b. Did the price decrease generate sufficient volume to result in a net increase in contribution margin if the actual variable cost per unit was $7, as planned?

EX 5-18
Contribution margin analysis—sales

obj. 4

✔ Sales quantity factor, $(211,200)

The following data for Ergonomic Products Inc. are available:

For the Year Ended December 31, 2010	Actual	Planned	Difference—Increase or (Decrease)
Sales	$6,496,000	$6,336,000	$160,000
Less:			
Variable cost of goods sold	$3,410,400	$3,336,000	$ 74,400
Variable selling and administrative expenses	672,800	744,000	(71,200)
Total variable costs	$4,083,200	$4,080,000	$ 3,200
Contribution margin	$2,412,800	$2,256,000	$156,800
Number of units sold	23,200	24,000	
Per unit:			
Sales price	$280.00	$264.00	
Variable cost of goods sold	147.00	139.00	
Variable selling and administrative expenses	29.00	31.00	

Prepare an analysis of the sales quantity and unit price factors.

EX 5-19
Contribution margin analysis—variable costs

obj. 4

✔ Variable cost quantity factor, $111,200

Based on the data in Exercise 5-18, prepare a contribution analysis of the variable costs for Ergonomic Products Inc. for the year ended December 31, 2010.

EX 5-20
Variable costing income statement—service company

objs. 4, 6

Eastern Railroad Company transports commodities among three routes (city-pairs): Atlanta/Baltimore, Baltimore/Pittsburgh, and Pittsburgh/Atlanta. Significant costs, their cost behavior, and activity rates for May 2010 are as follows:

Cost	Amount	Cost Behavior	Activity Rate
Labor costs for loading and unloading railcars	$141,440	Variable	$42.50 per railcar
Fuel costs	385,280	Variable	11.20 per train-mile
Train crew labor costs	220,160	Variable	6.40 per train-mile
Switchyard labor costs	96,512	Variable	29.00 per railcar
Track and equipment depreciation	180,000	Fixed	
Maintenance	120,000	Fixed	

Operating statistics from the management information system reveal the following for May:

	Atlanta/Baltimore	Baltimore/Pittsburgh	Pittsburgh/Atlanta	Total
Number of train-miles	12,080	9,520	12,800	34,400
Number of railcars	384	1,904	1,040	3,328
Revenue per railcar	$512	$256	$408	

a. Prepare a contribution margin by route report for Eastern Railroad Company for the month of May. Calculate the contribution margin ratio in whole percents, rounded to one decimal place.
b. Evaluate the route performance of the railroad using the report in (a).

EX 5-21
Contribution margin reporting and analysis—service company

objs. 5, 6

The management of Eastern Railroad Company introduced in Exercise 5-20 improved the profitability of the Atlanta/Baltimore route in June by reducing the price of a railcar from $512 to $464. This price reduction increased the demand for rail services. Thus, the number of railcars increased by 256 railcars to a total of 640 railcars. This was accomplished by increasing the size of each train but not the number of trains. Thus, the number of train-miles was unchanged. All the activity rates remained unchanged.

a. Prepare a contribution margin report for the Atlanta/Baltimore route for June. Calculate the contribution margin ratio in percentage terms to one decimal place.
b. Prepare a contribution margin analysis to evaluate management's actions in June. Assume that the June planned quantity, price, and unit cost was the same as May.

EX 5-22
Variable costing income statement and contribution margin analysis—service company

objs. 5, 6

The actual and planned data for Open University for the Fall term 2010 were as follows:

	Actual	Planned
Enrollment	7,520	6,880
Tuition per credit hour	$200	$224
Credit hours	100,800	72,000
Registration, records, and marketing cost per enrolled student	$464	$464
Instructional costs per credit hour	$106	$100
Depreciation on classrooms and equipment	$1,376,000	$1,376,000

Registration, records, and marketing costs vary by the number of enrolled students, while instructional costs vary by the number of credit hours. Depreciation is a fixed cost.

a. Prepare a variable costing income statement showing the contribution margin and income from operations for the Fall 2010 term.
b. Prepare a contribution margin analysis report comparing planned with actual performance for the Fall 2010 term.

Problems Series A

PR 5-1A
Absorption and variable costing income statements

objs. 1, 2

✔ 2. Income from operations, $135,250

During the first month of operations ended May 31, 2010, Dorm Room Appliance Company manufactured 10,300 microwaves, of which 9,700 were sold. Operating data for the month are summarized as follows:

Sales		$1,455,000
Manufacturing costs:		
Direct materials	$721,000	
Direct labor	216,300	
Variable manufacturing cost	185,400	
Fixed manufacturing cost	92,700	1,215,400
Selling and administrative expenses:		
Variable	$116,400	
Fixed	53,350	169,750

Instructions

1. Prepare an income statement based on the absorption costing concept.
2. Prepare an income statement based on the variable costing concept.
3. Explain the reason for the difference in the amount of income from operations reported in (1) and (2).

PR 5-2A
Income statements under absorption costing and variable costing

objs. 1, 2

The demand for solvent, one of numerous products manufactured by Mathews Industries Inc., has dropped sharply because of recent competition from a similar product. The company's chemists are currently completing tests of various new formulas, and it is anticipated that the manufacture of a superior product can be started on May 1, one month hence. No changes will be needed in the present production facilities to manufacture the new product because only the mixture of the various materials will be changed.

✔ 2. Contribution margin, $36,000

The controller has been asked by the president of the company for advice on whether to continue production during April or to suspend the manufacture of solvent until May 1. The controller has assembled the following pertinent data:

Mathews Industries Inc.
Income Statement—Solvent
For the Month Ended March 31, 2011

Sales (2,500 units)	$175,000
Cost of goods sold	156,500
Gross profit	$ 18,500
Selling and administrative expenses	36,600
Loss from operations	$ (18,100)

The production costs and selling and administrative expenses, based on production of 2,500 units in March, are as follows:

Direct materials	$27.30 per unit
Direct labor	9.50 per unit
Variable manufacturing cost	9.00 per unit
Variable selling and administrative expenses	5.00 per unit
Fixed manufacturing cost	42,000 for March
Fixed selling and administrative expenses	24,100 for March

Sales for April are expected to drop about 25% below those of the preceding month. No significant changes are anticipated in the fixed costs or variable costs per unit. No extra costs will be incurred in discontinuing operations in the portion of the plant associated with solvent. The inventory of solvent at the beginning and end of April is expected to be inconsequential.

Instructions

1. Prepare an estimated income statement in absorption costing form for April for solvent, assuming that production continues during the month. Round amounts to two decimals.
2. Prepare an estimated income statement in variable costing form for April for solvent, assuming that production continues during the month. Round amounts to two decimals.
3. What would be the estimated loss in income from operations if the solvent production were temporarily suspended for April?
4. What advice should the controller give to management?

PR 5-3A
Absorption and variable costing income statements for two months and analysis

objs. 1, 2

✔ 1. b. Income from operations, $15,528

During the first month of operations ended May 31, 2011, The Water Bottle Company produced 33,600 designer water bottles, of which 31,200 were sold. Operating data for the month are summarized as follows:

Sales		$287,040
Manufacturing costs:		
Direct materials	$174,720	
Direct labor	47,040	
Variable manufacturing cost	21,840	
Fixed manufacturing cost	20,160	263,760
Selling and administrative expenses:		
Variable	$ 13,728	
Fixed	9,984	23,712

During June, The Water Bottle Company produced 28,800 designer water bottles and sold 31,200 shirts. Operating data for June are summarized as follows:

Sales		$287,040
Manufacturing costs:		
Direct materials	$149,760	
Direct labor	40,320	
Variable manufacturing cost	18,720	
Fixed manufacturing cost	20,160	228,960
Selling and administrative expenses:		
Variable	$ 13,728	
Fixed	9,984	23,712

Instructions

1. Using the absorption costing concept, prepare income statements for (a) May and (b) June.
2. Using the variable costing concept, prepare income statements for (a) May and (b) June.
3. a. Explain the reason for the differences in the amount of income from operations in (1) and (2) for May.
   b. Explain the reason for the differences in the amount of income from operations in (1) and (2) for June.
4. Based on your answers to (1) and (2), did The Water Bottle Company operate more profitably in May or in June? Explain.

PR 5-4A
Salespersons' report and analysis

obj. 4

✔ 1. Patel contribution margin ratio, 32%

Cook Instruments Company employs seven salespersons to sell and distribute its product throughout the state. Data taken from reports received from the salespersons during the year ended December 31, 2010, are as follows:

Salesperson	Total Sales	Variable Cost of Goods Sold	Variable Selling Expenses
Best	$470,000	$263,200	$84,600
Edgeton	472,000	264,320	94,400
Harrison	382,500	198,900	61,200
Leonard	425,000	153,000	76,500
Morant	440,000	220,000	72,600
Moore	580,000	203,000	84,100
Patel	416,000	208,000	74,880

Instructions

1. Prepare a table indicating contribution margin, variable cost of goods sold as a percent of sales, variable selling expenses as a percent of sales, and contribution margin ratio by salesperson. Round whole percents to a single digit.
2. Which salesperson generated the highest contribution margin ratio for the year and why?
3. Briefly list factors other than contribution margin that should be considered in evaluating the performance of salespersons.

PR 5-5A
Segment variable costing income statement and effect on income of change in operations

obj. 4

✔ 1. Income from operations, $120,000

Mountain Outerwear Company manufactures three sizes of extreme weather coats—small (S), medium (M), and large (L). The income statement has consistently indicated a net loss for the M size, and management is considering three proposals: (1) continue Size M, (2) discontinue Size M and reduce total output accordingly, or (3) discontinue Size M and conduct an advertising campaign to expand the sales of Size S so that the entire plant capacity can continue to be used.

If Proposal 2 is selected and Size M is discontinued and production curtailed, the annual fixed production costs and fixed operating expenses could be reduced by $64,000 and $44,800, respectively. If Proposal 3 is selected, it is anticipated that an additional annual expenditure of $48,000 for the rental of additional warehouse space would yield an increase of 130% in Size S sales volume. It is also assumed that the increased production of Size S would utilize the plant facilities released by the discontinuance of Size M.

The sales and costs have been relatively stable over the past few years, and they are expected to remain so for the foreseeable future. The income statement for the past year ended June 30, 2010, is as follows:

	Size			
	S	M	L	Total
Sales	$928,000	$1,024,000	$1,328,000	$3,280,000
Cost of goods sold:				
Variable costs	$416,000	$ 496,000	$ 608,000	$1,520,000
Fixed costs	104,000	192,000	240,000	536,000
Total cost of goods sold	$520,000	$ 688,000	$ 848,000	$2,056,000
Gross profit	$408,000	$ 336,000	$ 480,000	$1,224,000
Less operating expenses:				
Variable expenses	$184,000	$ 216,000	$ 272,000	$ 672,000
Fixed expenses	128,000	144,000	160,000	432,000
Total operating expenses	$312,000	$ 360,000	$ 432,000	$1,104,000
Income from operations	$ 96,000	$ (24,000)	$ 48,000	$ 120,000

Instructions

1. Prepare an income statement for the past year in the variable costing format. Use the following headings:

	Size		
S	M	L	Total

Data for each style should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin, as reported in the "Total" column, to determine income from operations.

2. Based on the income statement prepared in (1) and the other data presented, determine the amount by which total annual income from operations would be reduced below its present level if Proposal 2 is accepted.
3. Prepare an income statement in the variable costing format, indicating the projected annual income from operations if Proposal 3 is accepted. Use the following headings:

	Size	
S	L	Total

Data for each style should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin as reported in the "Total" column. For purposes of this problem, the expenditure of $48,000 for the rental of additional warehouse space can be added to the fixed operating expenses.

4. By how much would total annual income increase above its present level if Proposal 3 is accepted? Explain.

PR 5-6A
Contribution margin analysis

obj. 5

1. Sales quantity factor, $(180,000)

Baucom Industries Inc. manufactures only one product. For the year ended December 31, 2010, the contribution margin increased by $36,000 from the planned level of $720,000. The president of Baucom Industries Inc. has expressed some concern about such a small increase and has requested a follow-up report.

The following data have been gathered from the accounting records for the year ended December 31, 2010:

	Actual	Planned	Difference—Increase (Decrease)
Sales	$1,470,000	$1,440,000	$ 30,000
Less:			
Variable cost of goods sold	$ 560,000	$ 592,000	$(32,000)
Variable selling and administrative expenses	154,000	128,000	26,000
Total	$ 714,000	$ 720,000	$ (6,000)
Contribution margin	$ 756,000	$ 720,000	$ 36,000
Number of units sold	14,000	16,000	
Per unit:			
Sales price	$105.00	$90.00	
Variable cost of goods sold	40.00	37.00	
Variable selling and administrative expenses	11.00	8.00	

Instructions

1. Prepare a contribution margin analysis report for the year ended December 31, 2010.
2. At a meeting of the board of directors on January 30, 2011, the president, after reviewing the contribution margin analysis report, made the following comment:

It looks as if the price increase of $15.00 had the effect of decreasing sales volume. However, this was a favorable tradeoff. The variable cost of goods sold was less than planned. Apparently, we are efficiently managing our variable cost of goods sold. However, the variable selling and administrative expenses appear out of control. Let's look into these expenses and get them under control! Also, let's consider increasing the sales price to $120 and continue this favorable tradeoff between higher price and lower volume.

Do you agree with the president's comment? Explain.

Problems Series B

PR 5-1B
Absorption and variable costing income statements

objs. 1, 2

✔ 2. Contribution margin, $606,000

During the first month of operations ended September 30, 2010, Hercules Video Inc. manufactured 2,160 computer monitors, of which 2,000 were sold. Operating data for the month are summarized as follows:

Sales		$1,900,000
Manufacturing costs:		
Direct materials	$756,000	
Direct labor	324,000	
Variable manufacturing cost	120,960	
Fixed manufacturing cost	226,800	1,427,760
Selling and administrative expenses:		
Variable	$182,000	
Fixed	84,000	266,000

Instructions

1. Prepare an income statement based on the absorption costing concept.
2. Prepare an income statement based on the variable costing concept.
3. Explain the reason for the difference in the amount of income from operations reported in (1) and (2).

PR 5-2B
Income statements under absorption costing and variable costing

objs. 1, 2

✔ 2. Contribution margin, $137,200

The demand for shampoo, one of numerous products manufactured by Hardin Hair Care Products Inc., has dropped sharply because of recent competition from a similar product. The company's chemists are currently completing tests of various new formulas, and it is anticipated that the manufacture of a superior product can be started on March 1, one month hence. No changes will be needed in the present production facilities to manufacture the new product because only the mixture of the various materials will be changed.

The controller has been asked by the president of the company for advice on whether to continue production during February or to suspend the manufacture of shampoo until March 1. The controller has assembled the following pertinent data:

Hardin Hair Care Products Inc.
Income Statement—Shampoo
For the Month Ended January 31, 2010

Sales (245,000 units)	$10,780,000
Cost of goods sold	10,062,000
Gross profit	$ 718,000
Selling and administrative expenses	1,522,000
Loss from operations	$ (804,000)

The production costs and selling and administrative expenses, based on production of 245,000 units in January, are as follows:

Direct materials	$ 8.00 per unit
Direct labor	10.00 per unit
Variable manufacturing cost	19.60 per unit
Variable selling and administrative expenses	5.60 per unit
Fixed manufacturing cost	850,000 for January
Fixed selling and administrative expenses	150,000 for January

Sales for February are expected to drop about 30% below those of the preceding month. No significant changes are anticipated in the fixed costs or variable costs per unit. No extra costs will be incurred in discontinuing operations in the portion of the plant associated with shampoo. The inventory of shampoo at the beginning and end of February is expected to be inconsequential.

Instructions

1. Prepare an estimated income statement in absorption costing form for February for shampoo, assuming that production continues during the month.
2. Prepare an estimated income statement in variable costing form for February for shampoo, assuming that production continues during the month.
3. What would be the estimated loss in income from operations if the shampoo production were temporarily suspended for February?
4. What advice should the controller give to management?

PR 5-3B
Absorption and variable costing income statements for two months and analysis

objs. 1, 2

✔ 2. a. Manufacturing margin, $42,240

During the first month of operations ended July 31, 2010, Tri-State Bakers Inc. baked 7,000 cakes, of which 6,400 were sold. Operating data for the month are summarized as follows:

Sales		$128,000
Baking costs:		
Direct materials	$53,900	
Direct labor	25,900	
Variable manufacturing cost	14,000	
Fixed manufacturing cost	18,200	112,000
Selling and administrative expenses:		
Variable	$14,080	
Fixed	6,400	20,480

During August, Tri-State Bakers Inc. baked 5,800 cakes and sold 6,400 cakes. Operating data for August are summarized as follows:

Sales		$128,000
Baking costs:		
Direct materials	$44,660	
Direct labor	21,460	
Variable manufacturing cost	11,600	
Fixed manufacturing cost	18,200	95,920
Selling and administrative expenses:		
Variable	$14,080	
Fixed	6,400	20,480

Instructions

1. Using the absorption costing concept, prepare income statements for (a) July and (b) August.
2. Using the variable costing concept, prepare income statements for (a) July and (b) August.
3. a. Explain the reason for the differences in the amount of income from operations in (1) and (2) for July.

b. Explain the reason for the differences in the amount of income from operations in (1) and (2) for August.

4. Based on your answers to (1) and (2), did Tri-State Bakers Inc. operate more profitably in July or in August? Explain.

PR 5-4B
Salespersons' report and analysis

obj. 4

✔ 1. Morgan contribution margin ratio, 42.5%

Schmidt Equipment Inc. employs seven salespersons to sell and distribute its product throughout the state. Data taken from reports received from the salespersons during the year ended June 30, 2010, are as follows:

Salesperson	Total Sales	Variable Cost of Goods Sold	Variable Selling Expenses
Applegate	$290,000	$118,900	$49,300
Cullinan	380,000	138,700	53,200
Mathews	410,000	172,200	77,900
Morgan	390,000	150,150	74,100
Ribisl	350,000	131,250	77,000
Wellman	392,000	148,960	58,800
Zick	384,000	153,600	69,120

Instructions

1. Prepare a table indicating contribution margin, variable cost of goods sold as a percent of sales, variable selling expenses as a percent of sales, and contribution margin ratio by salesperson (round whole percent to one digit after decimal point).
2. Which salesperson generated the highest contribution margin ratio for the year and why?
3. Briefly list factors other than contribution margin that should be considered in evaluating the performance of salespersons.

PR 5-5B
Variable costing income statement and effect on income of change in operations

obj. 4

✔ 3. Income from operations, $164,500

Workplace Concepts, Inc. manufactures three sizes of industrial work benches—small (S), medium (M), and large (L). The income statement has consistently indicated a net loss for the M size, and management is considering three proposals: (1) continue Size M, (2) discontinue Size M and reduce total output accordingly, or (3) discontinue Size M and conduct an advertising campaign to expand the sales of Size S so that the entire plant capacity can continue to be used.

If Proposal 2 is selected and Size M is discontinued and production curtailed, the annual fixed production costs and fixed operating expenses could be reduced by $210,000 and $42,000, respectively. If Proposal 3 is selected, it is anticipated that an additional annual expenditure of $126,000 for the salary of an assistant brand manager (classified as a fixed operating expense) would yield an increase of 130% in Size S sales volume. It is also assumed that the increased production of Size S would utilize the plant facilities released by the discontinuance of Size M.

The sales and costs have been relatively stable over the past few years, and they are expected to remain so for the foreseeable future. The income statement for the past year ended January 31, 2011, is as follows:

	Size			
	S	M	L	Total
Sales	$1,470,000	$1,610,000	$1,400,000	$4,480,000
Cost of goods sold:				
Variable costs	$ 798,000	$1,064,000	$ 840,000	$2,702,000
Fixed costs	357,000	427,000	371,000	1,155,000
Total cost of goods sold	$1,155,000	$1,491,000	$1,211,000	$3,857,000
Gross profit	$ 315,000	$ 119,000	$ 189,000	$ 623,000

(*continued*)

	Size			
	S	M	L	Total
Less operating expenses:				
Variable expenses	$ 175,000	$ 161,000	$ 126,000	$ 462,000
Fixed expenses	47,600	63,000	21,000	131,600
Total operating expenses	$ 222,600	$ 224,000	$ 147,000	$ 593,600
Income from operations	$ 92,400	$ (105,000)	$ 42,000	$ 29,400

Instructions

1. Prepare an income statement for the past year in the variable costing format. Use the following headings:

Size			
S	M	L	Total

Data for each style should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin, as reported in the "Total" column, to determine income from operations.

2. Based on the income statement prepared in (1) and the other data presented above, determine the amount by which total annual income from operations would be reduced below its present level if Proposal 2 is accepted.
3. Prepare an income statement in the variable costing format, indicating the projected annual income from operations if Proposal 3 is accepted. Use the following headings:

Size		
S	L	Total

Data for each style should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin as reported in the "Total" column. For purposes of this problem, the additional expenditure of $126,000 for the assistant brand manager's salary can be added to the fixed operating expenses.

4. By how much would total annual income increase above its present level if Proposal 3 is accepted? Explain.

PR 5-6B
Contribution margin analysis

obj. 5

✔ 1. Sales quantity factor, $(138,000)

Lesso Company manufactures only one product. For the year ended December 31, 2010, the contribution margin decreased by $56,000 from the planned level of $240,000. The president of Lesso Company has expressed some concern about this decrease and has requested a follow-up report.

The following data have been gathered from the accounting records for the year ended December 31, 2010:

	Actual	Planned	Difference—Increase or (Decrease)
Sales	$1,012,000	$920,000	$ 92,000
Less:			
Variable cost of goods sold	$ 460,000	$440,000	$ 20,000
Variable selling and administrative expenses	368,000	240,000	128,000
Total	$ 828,000	$680,000	$148,000
Contribution margin	$ 184,000	$240,000	$ (56,000)
Number of units sold	23,000	20,000	
Per unit:			
Sales price	$44.00	$46.00	
Variable cost of goods sold	20.00	22.00	
Variable selling and administrative expenses	16.00	12.00	

Instructions

1. Prepare a contribution margin analysis report for the year ended December 31, 2010.

2. At a meeting of the board of directors on January 30, 2011, the president, after reviewing the contribution margin analysis report, made the following comment:

"It looks as if the price decrease of $2.00 had the effect of increasing sales. However, we lost control over the variable cost of goods sold and variable selling and administrative expenses. Let's look into these expenses and get them under control! Also, let's consider decreasing the sales price to $40 to increase sales further."

Do you agree with the president's comment? Explain.

Special Activities

SA 5-1
Ethics and professional conduct in business

The Outdoor Division of Rugged Inc. uses absorption costing for profit reporting. The general manager of the Outdoor Division is concerned about meeting the income objectives of the division. At the beginning of the reporting period, the division had an adequate supply of inventory. The general manager has decided to increase production of goods in the plant in order to allocate fixed manufacturing cost over a greater number of units. Unfortunately, the increased production cannot be sold and will increase the inventory. However, the impact on earnings will be positive because the lower cost per unit will be matched against sales. The general manager has come to Bill Clark, the controller, to determine exactly how much additional production is required in order to increase net income enough to meet the division's profit objectives. Clark analyzes the data and determines that the inventory will need to be increased by 30% in order to absorb enough fixed costs and meet the income objective. Clark reports this information to the division manager.

Discuss whether Clark is acting in an ethical manner.

SA 5-2
Inventories under absorption costing

Circle-D manufactures control panels for the electronics industry and has just completed its first year of operations. The following discussion took place between the controller, Sam Smooth, and the company president, Suzanne Jax:

Suzanne: I've been looking over our first year's performance by quarters. Our earnings have been increasing each quarter, even though our sales have been flat and our prices and costs have not changed. Why is this?

Sam: Our actual sales have stayed even throughout the year, but we've been increasing the utilization of our factory every quarter. By keeping our factory utilization high, we will keep our costs down by allocating the fixed plant costs over a greater number of units. Naturally, this causes our cost per unit to be lower than it would be otherwise.

Suzanne: Yes, but what good is this if we have been unable to sell everything that we make? Our inventory is also increasing.

Sam: This is true. However, our unit costs are lower because of the additional production. When these lower costs are matched against sales, it has a positive impact on our earnings.

Suzanne: Are you saying that we are able to create additional earnings merely by building inventory? Can this be true?

Sam: Well, I've never thought about it quite that way . . . but I guess so.

Suzanne: And another thing. What will happen if we begin to reduce our production in order to liquidate the inventory? Don't tell me our earnings will go down even though our production effort drops!

Sam: Well . . .

Suzanne: There must be a better way. I'd like our quarterly income statements to reflect what's really going on. I don't want our income reports to reward building inventory and penalize reducing inventory.

Sam: I'm not sure what I can do—we have to follow generally accepted accounting principles.

1. Why does reporting income under generally accepted accounting principles "reward" building inventory and "penalize" reducing inventory?
2. What advice would you give to Sam in responding to Suzanne's concern about the present method of profit reporting?

SA 5-3
Segmented contribution margin analysis

Dodd Inc. manufactures and sells devices used in cardiovascular surgery. The company has two salespersons, Warner and Queen.

A contribution margin by salesperson report was prepared as follows:

Dodd Inc.
Contribution Margin by Salesperson

	Warner	Queen
Sales	$220,000	$250,000
Variable cost of goods sold	88,000	150,000
Manufacturing margin	$132,000	$100,000
Variable promotion expenses	$ 61,600	$ 20,000
Variable sales commission expenses	26,400	30,000
	$ 88,000	$ 50,000
Contribution margin	$ 44,000	$ 50,000
Manufacturing margin as a percent of sales (manufacturing margin ratio)	60%	40%
Contribution margin ratio	20%	20%

Interpret the report, and provide recommendations to the two salespersons for improving profitability.

SA 5-4
Margin analysis

Wolfson Equipment Inc. manufactures and sells kitchen cooking products throughout the state. The company employs four salespersons. The following contribution margin by salesperson analysis was prepared:

Wolfson Equipment Inc.
Contribution Margin Analysis by Salesperson

	Burnap	Hendricks	Mikan	Stanford
Sales	$130,000	$150,000	$140,000	$100,000
Variable cost of goods sold	45,500	75,000	70,000	50,000
Manufacturhg margin	$ 84,500	$ 75,000	$ 70,000	$ 50,000
Variable selling expenses				
Commissions	$ 5,200	$ 6,000	$ 5,600	$ 4,000
Promotion expenses	40,300	42,000	39,200	28,000
Total variable selling expenses	$ 45,500	$ 48,000	$ 44,800	$ 32,000
Contribution margin	$ 39,000	$ 27,000	$ 25,200	$ 18,000

1. Calculate the manufacturing margin as a percent of sales and the contribution margin ratio for each salesperson.
2. Explain the results of the analysis.

SA 5-5
Contribution margin analysis

DeLong Industrial Supply Company sells artistic supplies to retailers in three different states—North Carolina, South Carolina, and Georgia. The following profit analysis by state was prepared by the company:

	North Carolina	South Carolina	Georgia
Revenue	$600,000	$525,000	$630,000
Cost of goods sold	300,000	285,000	300,000
Gross profit	$300,000	$240,000	$330,000
Selling expenses	195,000	180,000	225,000
Income from operations	$105,000	$ 60,000	$105,000

The following fixed costs have also been provided:

	North Carolina	South Carolina	Georgia
Fixed manufacturing costs	$60,000	$120,000	$67,500
Fixed selling expenses	45,000	72,000	60,600

In addition, assume that inventories have been negligible.

Management believes it could increase state sales by 25%, without increasing any of the fixed costs, by spending an additional $22,500 per state on advertising.

1. Prepare a contribution margin by state report for DeLong Industrial Supply Company.
2. Determine how much state operating profit will be generated for an additional $22,500 per state on advertising.
3. Which state will provide the greatest profit return for a $22,500 increase in advertising? Why?

SA 5-6
Absorption costing

Group Project

Tribeck Company is a family-owned business in which you own 20% of the common stock and your brothers and sisters own the remaining shares. The employment contract of Tribeck's new president, Jake Goll, stipulates a base salary of $160,000 per year plus 10% of income from operations in excess of $800,000. Goll uses the absorption costing method of reporting income from operations, which has averaged approximately $1,100,000 for the past several years.

Sales for 2010, Goll's first year as president of Tribeck Company, are estimated at 500,000 units at a selling price of $120 per unit. To maximize the use of Tribeck's productive capacity, Goll has decided to manufacture 60,000 units, rather than the 50,000 units of estimated sales. The beginning inventory at January 1, 2010, is insignificant in amount, and the manufacturing costs and selling and administrative expenses for the production of 50,000 and 60,000 units are as follows:

50,000 Units to Be Manufactured

	Number of Units	Unit Cost	Total Cost
Manufacturing costs:			
Variable	50,000	$56	$2,800,000
Fixed	50,000	12	600,000
Total		$68	$3,400,000
Selling and administrative expenses:			
Variable	$1,200,000		
Fixed	400,000		
Total	$1,600,000		

60,000 Units to Be Manufactured

	Number of Units	Unit Cost	Total Cost
Manufacturing costs:			
Variable	60,000	$56	$3,360,000
Fixed	60,000	10	600,000
Total		$66	$3,960,000
Selling and administrative expenses:			
Variable	$1,200,000		
Fixed	400,000		
Total	$1,600,000		

1. In one group, prepare an absorption costing income statement for the year ending December 31, 2010, based on sales of 50,000 units and the manufacture of 50,000 units. In the other group, conduct the same analysis, assuming production of 60,000 units.
2. Explain the difference in the income from operations reported in (1).
3. Compute Goll's total salary for the year 2010, based on sales of 50,000 units and the manufacture of 50,000 units (Group 1) and 60,000 units (Group 2). Compare your answers.

4. In addition to maximizing the use of Tribeck Company's productive capacity, why might Goll wish to manufacture 60,000 units rather than 50,000 units?
5. Can you suggest an alternative way in which Goll's salary could be determined, using a base salary of $160,000 and 10% of income from operations in excess of $800,000, so that the salary could not be increased by simply manufacturing more units?

Answers to Self-Examination Questions

1. **B** The contribution margin of $260,000 (answer B) is determined by deducting all of the variable costs ($400,000 + $90,000) from sales ($750,000).

2. **A** In a period in which the number of units manufactured exceeds the number of units sold, the income from operations reported under the absorption costing concept is larger than the income from operations reported under the variable costing concept (answer A). This is because a portion of the fixed manufacturing costs are deferred when the absorption costing concept is used. This deferment has the effect of excluding a portion of the fixed manufacturing costs from the current cost of goods sold.

3. **D** (6,000 units × $20 per unit). Answer A incorrectly calculates the difference in income from operations using the variable cost per unit, while Answer B incorrectly calculates the difference in income from operations using the total cost per unit. Answer C is incorrect because variable costing income from operations will be greater than absorption costing income from operations when units manufactured is less than units sold.

4. **C** [2,000 units × ($150,000/12,000 units)]. Answers A and B incorrectly calculate the difference in income from operations using variable cost per unit. When production exceeds sales, absorption costing will include fixed costs in the ending inventory, which causes cost of goods sold to decline and income from operations to increase. Thus, income from operations would not decline (answer D) for a production level of 12,000 units.

5. **C** A difference between planned and actual sales can be attributed to a unit price factor. The $45,000 decrease (answer C) attributed to the quantity factor is determined as follows:

Decrease in number of units sold	5,000
Planned unit sales price	× $9
Quantity factor—decrease	$45,000

The unit price factor can be determined as follows:

Increase in unit sales price	$1
Actual number of units sold	× 80,000
Price factor—increase	$80,000

The increase of $80,000 attributed to the price factor less the decrease of $45,000 attributed to the quantity factor accounts for the $35,000 increase in total sales.

CHAPTER 6

Budgeting

THE NORTH FACE

You may have financial goals for your life. To achieve these goals, it is necessary to plan for future expenses. For example, you may consider taking a part-time job to save money for school expenses for the coming school year. How much money would you need to earn and save in order to pay these expenses? One way to find an answer to this question would be to prepare a budget. A budget would show an estimate of your expenses associated with school, such as tuition, fees, and books. In addition, you would have expenses for day-to-day living, such as rent, food, and clothing. You might also have expenses for travel and entertainment. Once the school year begins, you can use the budget as a tool for guiding your spending priorities during the year.

The budget is used in businesses in much the same way as it can be used in personal life. For example, The North Face sponsors mountain climbing expeditions throughout the year for professional and amateur climbers. These events require budgeting to plan trip expenses, much like you might use a budget to plan a vacation.

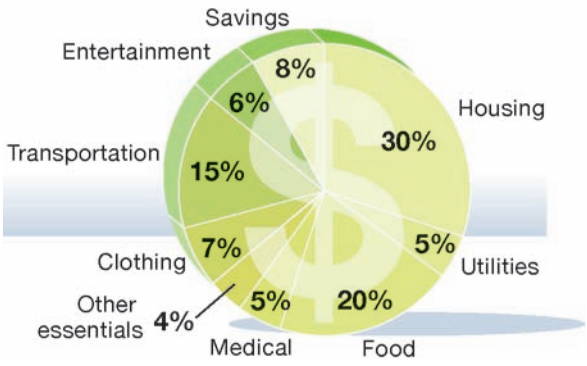
Budgeting is also used by The North Face to plan the manufacturing costs associated with its outdoor clothing and equipment production. For example, budgets would be used to determine the number of coats to be produced, number of people to be employed, and amount of material to be purchased. The budget provides the company with a "game plan" for the year. In this chapter, you will see how budgets can be used for financial planning and control.

1 Describe budgeting, its objectives, and its impact on human behavior.

Nature and Objectives of Budgeting

Budgets play an important role for organizations of all sizes and forms. For example, budgets are used in managing the operations of government agencies, churches, hospitals, and other nonprofit organizations. Individuals and families also use budgeting in managing their financial affairs. This chapter describes and illustrates budgeting for a manufacturing company.

The chart below shows the estimated portion of your total monthly income that should be budgeted for various living expenses according to the Consumer Credit Counseling Service.



Objectives of Budgeting

Budgeting involves (1) establishing specific goals, (2) executing plans to achieve the goals, and (3) periodically comparing actual results with the goals. In doing so, budgeting affects the following managerial functions:

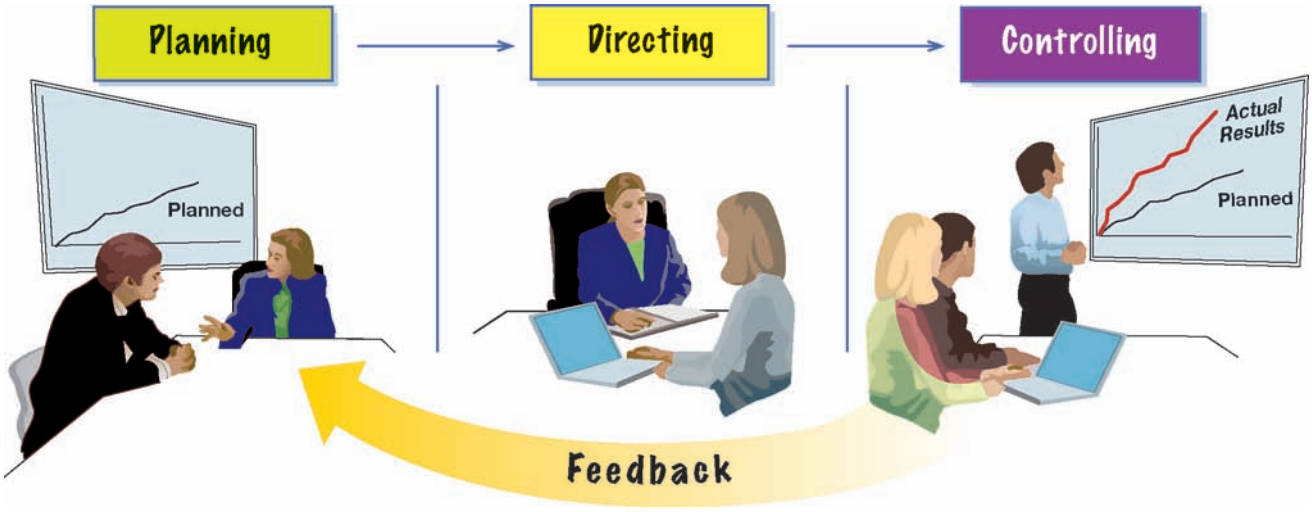
1. Planning
2. Directing
3. Controlling

The relationships of these activities are illustrated in Exhibit 1.

Planning involves setting goals as a guide for making decisions. Budgeting supports the planning process by requiring all departments and other organizational units to establish their goals for the future. These goals help motivate employees. In addition, the budgeting process often identifies areas where operations can be improved or inefficiencies eliminated.

Exhibit 1

Planning, Directing, and Controlling



A budget is like a road map. It charts a future course for a company in financial terms and, thus, aids the company in navigating through the year to reach its destination.

Directing involves decisions and actions to achieve budgeted goals. Budgeting aids in coordinating management's decisions and actions to achieve the company's budgeted goals. A budgetary unit of a company is called a **responsibility center**. Each responsibility center is led by a manager who has the authority and responsibility for achieving the center's budgeted goals.

Controlling involves comparing actual performance against the budgeted goals. Such comparisons provide feedback to managers and employees about their performance. If necessary, responsibility centers can use such feedback to adjust their activities in the future.

Human Behavior and Budgeting

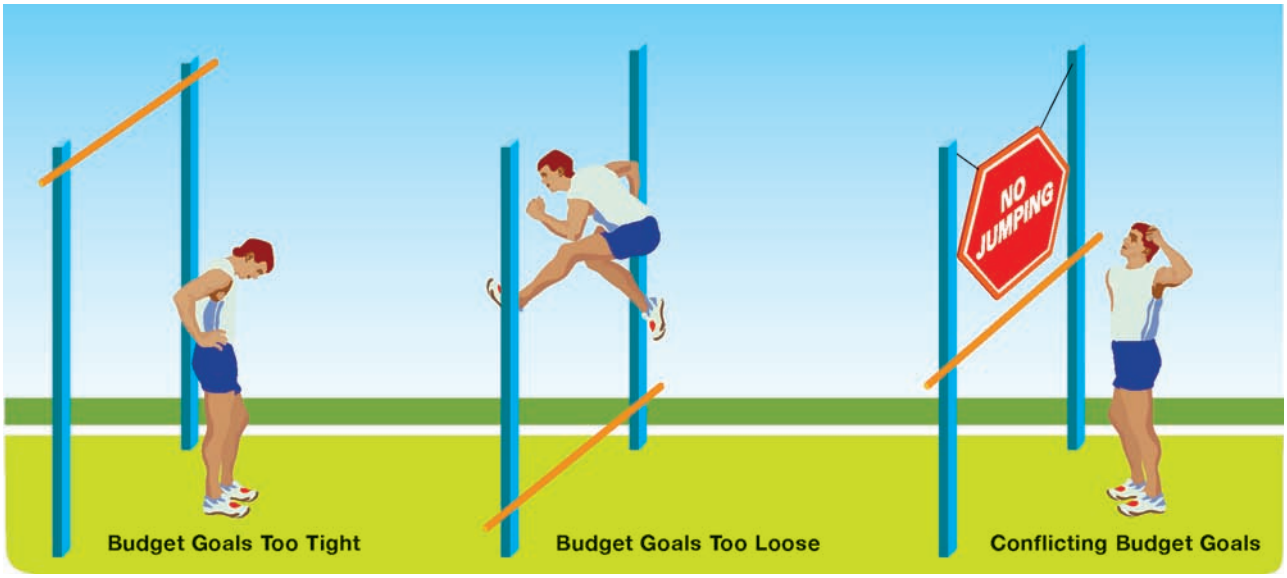
Human behavior problems can arise in the budgeting process in the following situations:

1. Budgeted goals are set too tight, which are very hard or impossible to achieve
2. Budgeted goals are set too loose, which are very easy to achieve
3. Budgeted goals conflict with the objectives of the company and employees

These behavior problems are illustrated in Exhibit 2.

Exhibit 2

Human Behavior Problems in Budgeting



Setting Budget Goals Too Tightly Employees and managers may become discouraged if budgeted goals are set too high. That is, if budgeted goals are viewed as unrealistic or unachievable, the budget may have a negative effect on the ability of the company to achieve its goals.

Reasonable, attainable goals are more likely to motivate employees and managers. For this reason, it is important that employees and managers be involved in the budgeting process. Involving employees in the budgeting process provides employees with a sense of control and, thus, more of a commitment in meeting budgeted goals. Finally, involving employees and managers also encourages cooperation across departments and responsibility centers. Such cooperation increases awareness of each department's importance to the overall goals of the company.

Setting Budget Goals Too Loosely Although it is desirable to establish attainable goals, it is undesirable to plan lower goals than may be possible. Such budget "padding" is termed **budgetary slack**. Managers may plan slack in the budget in order to provide a "cushion" for unexpected events or improve the appearance of operations. Budgetary slack can be reduced by properly training employees and managers in the importance of realistic, attainable budgets.

Slack budgets may cause a "spend it or lose it" mentality. This often occurs at the end of the budget period when actual spending is less than the budget. Employees and managers may spend the remaining budget on unnecessary purchases in order to avoid having their budget reduced for the next period.

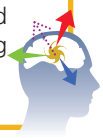
Setting Conflicting Budget Goals **Goal conflict** occurs when the employees' or managers' self-interest differs from the company's objectives or goals. Goal conflict may also occur among responsibility centers such as departments.

To illustrate, assume that the sales department manager is given an increased sales goal and as a result accepts customers who are poor credit risks. This, in turn, causes bad debt expense to increase and profitability to decline. Likewise, a manufacturing department manager may be told to reduce costs. As a result, the manufacturing department manager might use lower-cost direct materials, which are also of lower quality. As a result, customer complaints and returns might increase significantly, which would adversely affect the company's profitability.

Integrity, Objectivity, and Ethics in Business

BUDGET GAMES

The budgeting system is designed to plan and control a business. However, it is common for the budget to be "gamed" by its participants. For example, managers may pad their budgets with excess resources. In this way, the managers have additional resources for unexpected events during the period. If the budget is being used to establish the incentive plan, then sales managers have incentives to understate the sales potential of a territory in order to ensure hitting their quotas. Other times, managers engage in "land grabbing," which occurs when they overstate the sales potential of a territory in order to guarantee access to resources. If managers believe that unspent resources will not roll over to future periods, then they may be encouraged to "spend it or lose it," causing wasteful expenditures. These types of problems can be partially overcome by separating the budget into planning and incentive components. This is why many organizations have two budget processes, one for resource planning and another, more challenging budget, for motivating managers.



2 Describe the basic elements of the budget process, the two major types of budgeting, and the use of computers in budgeting.

Budgeting Systems

Budgeting systems vary among companies and industries. For example, the budget system used by Ford Motor Company differs from that used by Delta Air Lines. However, the basic budgeting concepts discussed in this section apply to all types of businesses and organizations.

The budgetary period for operating activities normally includes the fiscal year of a company. A year is short enough that future operations can be estimated fairly accurately, yet long enough that the future can be viewed in a broad context. However, for control purposes, annual budgets are usually subdivided into shorter time periods, such as quarters of the year, months, or weeks.

Western Digital Corporation, a computer hard drive manufacturer, introduced a new Web-based B&P (budget and planning) system to perform a continuous rolling budget. According to the financial executives at the company, "We're never [again] comparing results to old operating plans that were set months ago."

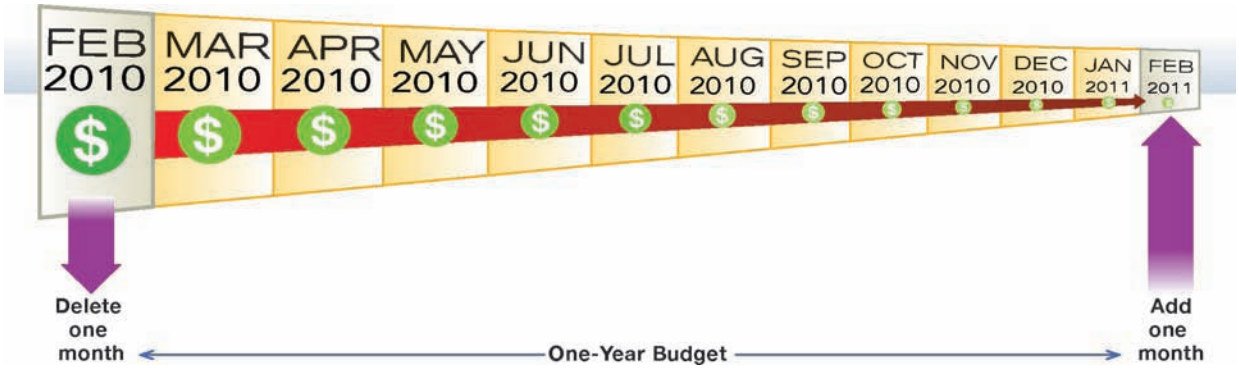
A variation of fiscal-year budgeting, called **continuous budgeting**, maintains a 12-month projection into the future. The 12-month budget is continually revised by replacing the data for the month just ended with the budget data for the same month in the next year. A continuous budget is illustrated in Exhibit 3.

Developing an annual budget usually begins several months prior to the end of the current year. This responsibility is normally assigned to a budget committee. Such a committee often consists of the budget director, the controller, the treasurer, the production manager, and the sales manager. The budget process is monitored and summarized by the Accounting Department, which reports to the committee.

There are several methods of developing budget estimates. One method, termed **zero-based budgeting**, requires managers to estimate sales, production, and other operating

Exhibit 3

Continuous Budgeting



data as though operations are being started for the first time. This approach has the benefit of taking a fresh view of operations each year. A more common approach is to start with last year's budget and revise it for actual results and expected changes for the coming year. Two major budgets using this approach are the static budget and the flexible budget.

Static Budget

A **static budget** shows the expected results of a responsibility center for only one activity level. Once the budget has been determined, it is not changed, even if the activity changes. Static budgeting is used by many service companies and for some functions of manufacturing companies, such as purchasing, engineering, and accounting.

To illustrate, the static budget for the Assembly Department of Colter Manufacturing Company is shown in Exhibit 4.

Exhibit 4

Static Budget

	A	B
1	Colter Manufacturing Company	
2	Assembly Department Budget	
3	For the Year Ending July 31, 2010	
4	**Direct labor**	**$40,000**
5	**Electric power**	**5,000**
6	**Supervisor salaries**	**15,000**
7	**Total department costs**	**$60,000**
8		

A disadvantage of static budgets is that they do not adjust for changes in activity levels. For example, assume that the Assembly Department of Colter Manufacturing spent $70,800 for the year ended July 31, 2010. Thus, the Assembly Department spent $10,800 ($70,800 − $60,000), or 18% ($10,800/$60,000) more than budgeted. Is this good news or bad news?

The first reaction is that this is bad news and the Assembly Department was inefficient in spending more than budgeted. However, assume that the Assembly Department's budget was based on plans to assemble 8,000 units during the year. If 10,000 units were actually assembled, the additional $10,800 spent in excess of budget might be good news. That is, the Assembly Department assembled 25% (2,000 units/8,000 units) more than planned for only 18% more cost.

Flexible Budget

Flexible budgets show expected results for several activity levels.

Unlike static budgets, **flexible budgets** show the expected results of a responsibility center for several activity levels. A flexible budget is, in effect, a series of static budgets for different levels of activity.

To illustrate, a flexible budget for the Assembly Department of Colter Manufacturing Company is shown in Exhibit 5.

Business Connection

BUILD VERSUS HARVEST

Budgeting systems are not "one size fits all" solutions but must adapt to the underlying business conditions. For example, a business can adopt either a build strategy or a harvest strategy. A *build* strategy is one where the business is designing, launching, and growing new products and markets. Build strategies often require short-term profit sacrifice in order to grow market share. Apple Computer, Inc.'s iPhone® is an example of a product managed under a build strategy. A *harvest* strategy is often employed for business units with mature products enjoying high market share in low-growth industries. H.J. Heinz Company's Ketchup® and P&G's *Ivory* soap are examples of such products. A build strategy often has greater uncertainty, unpredictability, and change than a harvest strategy. The difference between these strategies implies different budgeting approaches.

The build strategy should employ a budget approach that is flexible to the uncertainty of the business. Thus, budgets should adapt to changing conditions by allowing periodic revisions and flexible targets. The budget serves as a short-term planning tool to guide management in executing an uncertain and evolving product market strategy.

In a harvest strategy, the business is often much more stable and is managed to maximize profitability and cash flow. Because cost control is much more important in this strategy, the budget is used to restrict the actions of managers.

Exhibit 5

Flexible Budget

	A	B	C	D
1	Colter Manufacturing Company			
2	Assembly Department Budget			
3	For the Year Ending July 31, 2010			
4		Level 1	Level 2	Level 3
5	**Units of production**	**8,000**	**9,000**	**10,000**
6	**Variable cost:**			
7	**Direct labor ($5 per unit)**	**$40,000**	**$45,000**	**$50,000**
8	**Electric power ($0.50 per unit)**	**4,000**	**4,500**	**5,000**
9	**Total variable cost**	**$44,000**	**$49,500**	**$55,000**
10	**Fixed cost:**			
11	**Electric power**	**$ 1,000**	**$ 1,000**	**$ 1,000**
12	**Supervisor salaries**	**15,000**	**15,000**	**15,000**
13	**Total fixed cost**	**$16,000**	**$16,000**	**$16,000**
14	**Total department costs**	**$60,000**	**$65,500**	**$71,000**

Step 1 (row 5)

Step 2 (rows 6–12)

Step 3 (row 14)

A flexible budget is constructed as follows:

Step 1. Identify the relevant activity levels. The relevant levels of activity could be expressed in units, machine hours, direct labor hours, or some other activity base. In Exhibit 5, the levels of activity are 8,000, 9,000, and 10,000 units of production.

Step 2. Identify the fixed and variable cost components of the costs being budgeted. In Exhibit 5, the electric power cost is separated into its fixed cost ($1,000 per year) and variable cost ($0.50 per unit). The direct labor is a variable cost, and the supervisor salaries are all fixed costs.

Step 3. Prepare the budget for each activity level by multiplying the variable cost per unit by the activity level and then adding the monthly fixed cost.

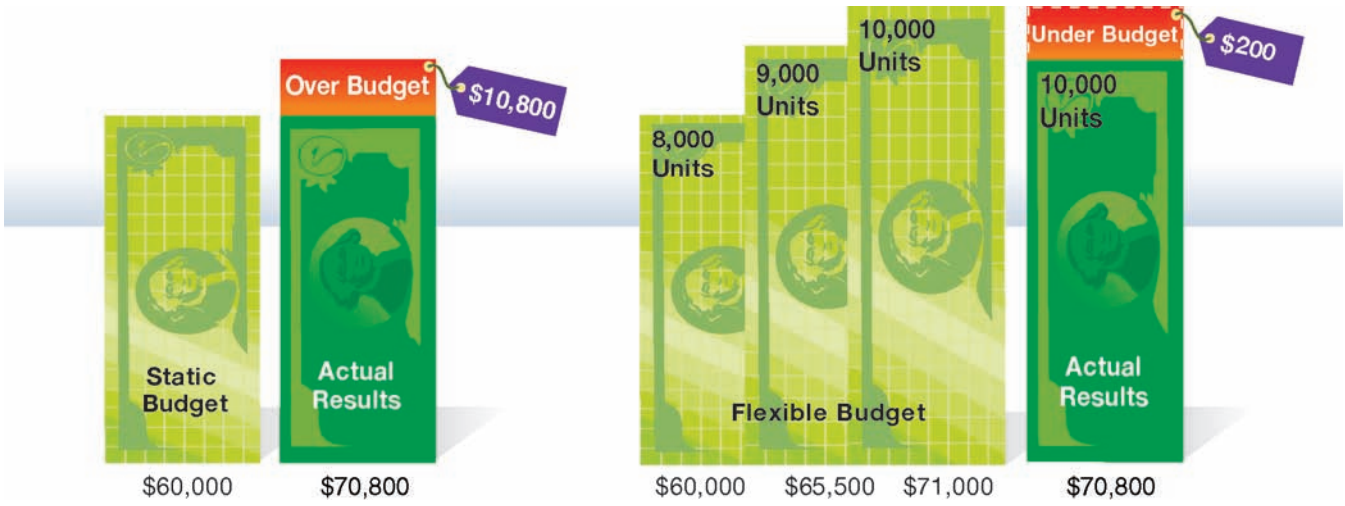
Many hospitals use flexible budgeting to plan the number of nurses for patient floors. These budgets use a measure termed "relative value units," which is a measure of nursing effort. The more patients and the more severe their illnesses, the higher the total relative value units, and thus the higher the staffing budget.

With a flexible budget, actual costs can be compared to the budgeted costs for actual activity. To illustrate, assume that the Assembly Department spent $70,800 to produce 10,000 units. Exhibit 5 indicates that the Assembly Department was *under* budget by $200 ($71,000 − $70,800).

Under the static budget in Exhibit 4, the Assembly Department was $10,800 *over* budget. This comparison is illustrated in Exhibit 6.

Exhibit 6

Static and Flexible Budgets



The flexible budget for the Assembly Department is much more accurate and useful than the static budget. This is because the flexible budget adjusts for changes in the level of activity.

Example Exercise 6-1 Flexible Budgeting 2

At the beginning of the period, the Assembly Department budgeted direct labor of $45,000 and supervisor salaries of $30,000 for 5,000 hours of production. The department actually completed 6,000 hours of production. Determine the budget for the department, assuming that it uses flexible budgeting.

Follow My Example 6-1

Variable cost:	
Direct labor (6,000 hours × $9* per hour)	$54,000
Fixed cost:	
Supervisor salaries	30,000
Total department costs	$84,000

*$45,000/5,000 hours

For Practice: PE 6-1A, PE 6-1B

Computerized Budgeting Systems

One survey reported that 67% of the companies relied on spreadsheets for budgeting and planning.

Source: Tim Reason, "Budgeting in the Real World," *CFO Magazine*, July 1, 2005.

In developing budgets, companies use a variety of computerized approaches. Two of the most popular computerized approaches use:

1. Spreadsheet software such as Microsoft Excel
2. Integrated budget and planning (B&P) software systems

Integrated computerized budget and planning systems speed up and reduce the cost of preparing the budget. This is especially true when large quantities of data need to be processed.

B&P software systems are also useful in continuous budgeting. For example, the latest B&P systems use the Web (Intranet) to link thousands of employees together during

Fujitsu, a Japanese technology company, used B&P to reduce its budgeting process from 6–8 weeks down to 10–15 days.

the budget process. Employees can input budget data onto Web pages that are integrated and summarized throughout the company. In this way, a company can quickly and consistently integrate top-level strategies and goals to lower-level operational goals. These latest B&P software systems are moving companies closer to the real-time budget, wherein the budget is being "rolled" every day.[1]

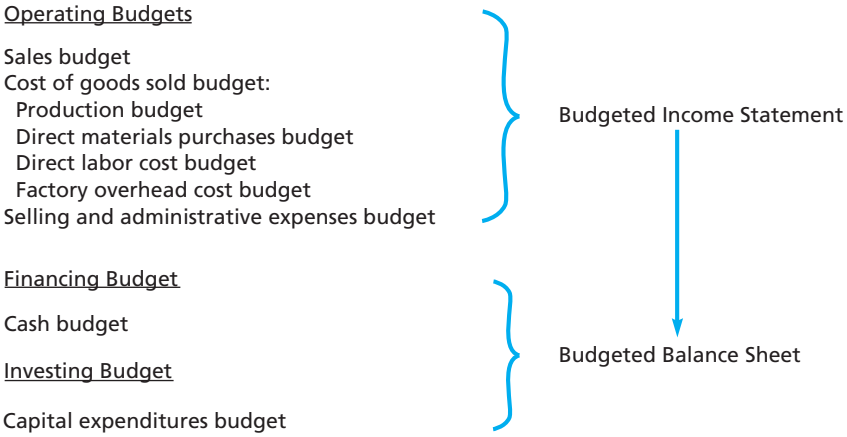
Companies may also use computer simulation models to analyze the impact of various assumptions and operating alternatives on the budget. For example, the budget can be revised to show the impact of a proposed change in indirect labor wage rates. Likewise, the budgetary effect of a proposed product line can be determined.

Master Budget

3 Describe the master budget for a manufacturing company.

The **master budget** is an integrated set of operating, investing, and financing budgets for a period of time. Most companies prepare the master budget on a yearly basis.

For a manufacturing company, the master budget consists of the following integrated budgets:



As shown above, the master budget is an integrated set of budgets that tie together a company's operating, financing, and investing activities into an integrated plan for the coming year.

The master budget begins with preparing the operating budgets, which form the budgeted income statement. The income statement budgets are normally prepared in the following order beginning with the sales budget:

1. Sales budget
2. Production budget
3. Direct materials purchases budget
4. Direct labor cost budget
5. Factory overhead cost budget
6. Cost of goods sold budget
7. Selling and administrative expenses budget
8. Budgeted income statement

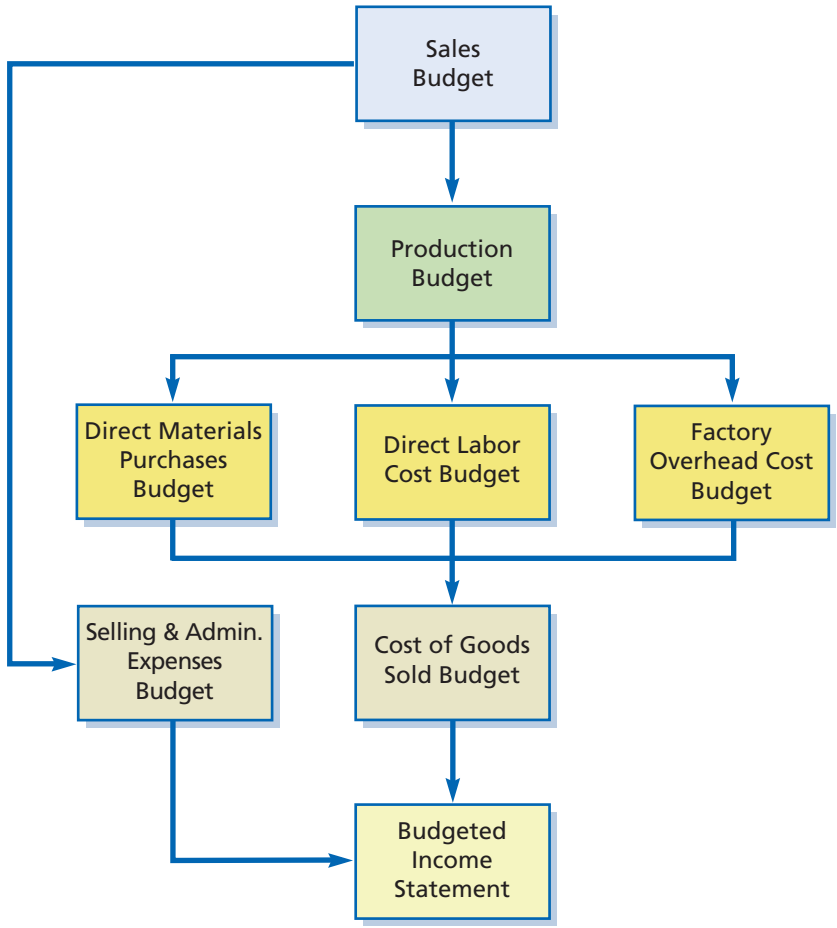
After the budgeted income statement is prepared, the budgeted balance sheet is prepared. Two major budgets comprising the budgeted balance sheet are the cash budget and the capital expenditures budget.

1 Janet Kersnar, "Rolling Along," *CFO Europe*, September 14, 2004.

Exhibit 7 shows the relationships among the income statement budgets.

Exhibit 7

Income Statement Budgets



4 Prepare the basic income statement budgets for a manufacturing company.

Income Statement Budgets

The integrated budgets that support the income statement budget are described and illustrated in this section. Elite Accessories Inc., a small manufacturing company, is used as a basis for illustration.

Sales Budget

The **sales budget** begins by estimating the quantity of sales. As a starting point, the prior year's sales quantities are often used. These sales quantities are then revised for such factors as the following:

1. Backlog of unfilled sales orders from the prior period
2. Planned advertising and promotion
3. Productive capacity
4. Projected pricing changes
5. Findings of market research studies
6. Expected industry and general economic conditions

Once sales quantities are estimated, the expected sales revenue can be determined by multiplying the volume by the expected unit sales price.

To illustrate, Elite Accessories Inc. manufactures wallets and handbags that are sold in two regions, the East and West Regions. Elite Accessories estimates the following sales quantities and prices for 2010:

	East Region	West Region	Unit Selling Price
Wallets	287,000	241,000	$12
Handbags	156,400	123,600	25

Exhibit 8 illustrates the sales budget for Elite Accessories based on the preceding data.

Exhibit 8

Sales Budget

	A	B	C	D
1	Elite Accessories Inc.			
2	Sales Budget			
3	For the Year Ending December 31, 2010			
4		Unit Sales	Unit Selling	
5	Product and Region	Volume	Price	Total Sales
6	**Wallet:**	**287,000**	**$12.00**	**$ 3,444,000**
7	**East**	**241,000**	**12.00**	**2,892,000**
8	**West**	**528,000**		**$ 6,336,000**
9	**Total**			
10				
11	**Handbag:**			
12	**East**	**156,400**	**$25.00**	**$ 3,910,000**
13	**West**	**123,600**	**25.00**	**3,090,000**
14	**Total**	**280,000**		**$ 7,000,000**
15				
16	**Total revenue from sales**			**$13,336,000**

Production Budget

The production budget should be integrated with the sales budget to ensure that production and sales are kept in balance during the year. The **production budget** estimates the number of units to be manufactured to meet budgeted sales and desired inventory levels.

The budgeted units to be produced are determined as follows:

Expected units to be sold	XXX units
Plus desired units in ending inventory	+ XXX
Less estimated units in beginning inventory	− XXX
Total units to be produced	XXX units

Elite Accessories Inc. expects the following inventories of wallets and handbags:

	Estimated Inventory January 1, 2010	Desired Inventory December 31, 2010
Wallets	88,000	80,000
Handbags	48,000	60,000

Exhibit 9 illustrates the production budget for Elite Accessories Inc.

Exhibit 9

Production Budget

	A	B	C
1	Elite Accessories Inc.		
2	Production Budget		
3	For the Year Ending December 31, 2010		
4		Units	
5		Wallet	Handbag
6	**Expected units to be sold (from Exhibit 8)**	**528,000**	**280,000**
7	**Plus desired ending inventory, December 31, 2010**	**80,000**	**60,000**
8	**Total**	**608,000**	**340,000**
9	**Less estimated beginning inventory, January 1, 2010**	**88,000**	**48,000**
10	**Total units to be produced**	**520,000**	**292,000**

Example Exercise 6-2 Production Budget 4

Landon Awards Co. projected sales of 45,000 brass plaques for 2010. The estimated January 1, 2010, inventory is 3,000 units, and the desired December 31, 2010, inventory is 5,000 units. What is the budgeted production (in units) for 2010?

Follow My Example 6-2

Expected units to be sold	45,000
Plus desired ending inventory, December 31, 2010	5,000
Total	50,000
Less estimated beginning inventory, January 1, 2010	3,000
Total units to be produced	47,000

For Practice: PE 6-2A, PE 6-2B

Direct Materials Purchases Budget

The direct materials purchases budget should be integrated with the production budget to ensure that production is not interrupted during the year. The **direct materials purchases budget** estimates the quantities of direct materials to be purchased to support budgeted production and desired inventory levels.

The direct materials to be purchased are determined as follows:

Materials required for production	XXX
Plus desired ending materials inventory	+ XXX
Less estimated beginning materials inventory	− XXX
Direct materials to be purchased	XXX

Elite Accessories Inc. uses leather and lining in producing wallets and handbags. The quantity of direct materials expected to be used for each unit of product is as follows:

Wallet	Handbag
Leather: 0.30 sq. yd. per unit	Leather: 1.25 sq. yds. per unit
Lining: 0.10 sq. yd. per unit	Lining: 0.50 sq. yd. per unit

Elite Accessories Inc. expects the following direct materials inventories of leather and lining:

	Estimated Direct Materials Inventory January 1, 2010	Desired Direct Materials Inventory December 31, 2010
Leather	18,000 sq. yds.	20,000 sq. yds.
Lining	15,000 sq. yds.	12,000 sq. yds.

The estimated price per square yard of leather and lining during 2010 is shown below.

	Price per Square Yard
Leather	$4.50
Lining	1.20

Exhibit 10 illustrates the direct materials purchases budget for Elite Accessories Inc.

Exhibit 10

Direct Materials Purchases Budget

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Direct Materials Purchases Budget				
3	For the Year Ending December 31, 2010				
4			Direct Materials		
5			Leather	Lining	Total
6	Square yards required for production:				
7	Wallet (Note A)		156,000	52,000	
8	Handbag (Note B)		365,000	146,000	
9	Plus desired inventory, December 31, 2010		20,000	12,000	
10	Total		541,000	210,000	
11	Less estimated inventory, January 1, 2010		18,000	15,000	
12	Total square yards to be purchased		523,000	195,000	
13	Unit price (per square yard)		× $4.50	× $1.20	
14	Total direct materials to be purchased		$2,353,500	$234,000	$2,587,500
15					
16	Note A:	Leather: 520,000 units × 0.30 sq. yd. per unit = 156,000 sq. yds.			
17		Lining: 520,000 units × 0.10 sq. yd. per unit = 52,000 sq. yds.			
18					
19	Note B:	Leather: 292,000 units × 1.25 sq. yds. per unit = 365,000 sq. yds.			
20		Lining: 292,000 units × 0.50 sq. yd. per unit = 146,000 sq. yds.			

The timing of the direct materials purchases should be coordinated between the purchasing and production departments so that production is not interrupted.

Example Exercise 6-3 Direct Materials Purchases Budget 4

Landon Awards Co. budgeted production of 47,000 brass plaques in 2010. Brass sheet is required to produce a brass plaque. Assume 96 square inches of brass sheet are required for each brass plaque. The estimated January 1, 2010, brass sheet inventory is 240,000 square inches. The desired December 31, 2010, brass sheet inventory is 200,000 square inches. If brass sheet costs $0.12 per square inch, determine the direct materials purchases budget for 2010.

Follow My Example 6-3

Square inches required for production:	
Brass sheet (47,000 × 96 sq. in.)	4,512,000
Plus desired ending inventory, December 31, 2010	200,000
Total	4,712,000
Less estimated beginning inventory, January 1, 2010	240,000
Total square inches to be purchased	4,472,000
Unit price (per square inch)	× $0.12
Total direct materials to be purchased	$ 536,640

For Practice: PE 6-3A, PE 6-3B

Direct Labor Cost Budget

The **direct labor cost budget** estimates the direct labor hours and related cost needed to support budgeted production.

Elite Accessories Inc. estimates that the following direct labor hours are needed to produce a wallet and handbag:

Wallet	Handbag
Cutting Department: 0.10 hr. per unit	Cutting Department: 0.15 hr. per unit
Sewing Department: 0.25 hr. per unit	Sewing Department: 0.40 hr. per unit

The estimated direct labor hourly rates for the Cutting and Sewing departments during 2010 are shown below.

	Hourly Rate
Cutting Department	$12
Sewing Department	15

Exhibit 11 illustrates the direct labor cost budget for Elite Accessories Inc.

Exhibit 11

Direct Labor Cost Budget

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Direct Labor Cost Budget				
3	For the Year Ending December 31, 2010				
4			Cutting	Sewing	Total
5	Hours required for production:				
6	Wallet (Note A)		52,000	130,000	
7	Handbag (Note B)		43,800	116,800	
8	Total		95,800	246,800	
9	Hourly rate		× $12.00	× $15.00	
10	Total direct labor cost		$1,149,600	$3,702,000	$4,851,600
11					
12	Note A:	Cutting Department: 520,000 units × 0.10 hr. per unit = 52,000 hrs.			
13		Sewing Department: 520,000 units × 0.25 hr. per unit = 130,000 hrs.			
14					
15	Note B:	Cutting Department: 292,000 units × 0.15 hr. per unit = 43,800 hrs.			
16		Sewing Department: 292,000 units × 0.40 hr. per unit = 116,800 hrs.			

As shown in Exhibit 11, for Elite Accessories Inc. to produce 520,000 wallets, 52,000 hours (520,000 units × 0.10 hr. per unit) of labor are required in the Cutting Department. Likewise, to produce 292,000 handbags, 43,800 hours (292,000 units × 0.15 hour per unit) of labor are required in the Cutting Department. Thus, the estimated total direct labor cost for the Cutting Department is $1,149,600 [(52,000 hrs. + 43,800 hrs.) × $12 per hr.). In a similar manner, the direct labor hours and cost for the Sewing Department are determined.

The direct labor needs should be coordinated between the production and personnel departments so that there will be enough labor available for production.

Example Exercise 6-4 Direct Labor Cost Budget 4

Landon Awards Co. budgeted production of 47,000 brass plaques in 2010. Each plaque requires engraving. Assume that 12 minutes are required to engrave each plaque. If engraving labor costs $11.00 per hour, determine the direct labor cost budget for 2010.

Follow My Example 6-4

Hours required for engraving:	
Brass plaque (47,000 × 12 min.)	564,000 min.
Convert minutes to hours	÷ 60 min.
Engraving hours	9,400 hrs.
Hourly rate	× $11.00
Total direct labor cost	$103,400

For Practice: PE 6-4A, PE 6-4B

Factory Overhead Cost Budget

The **factory overhead cost budget** estimates the cost for each item of factory overhead needed to support budgeted production.

Exhibit 12 illustrates the factory overhead cost budget for Elite Accessories Inc.

Exhibit 12

Factory Overhead Cost Budget

	A	B
1	Elite Accessories Inc.	
2	Factory Overhead Cost Budget	
3	For the Year Ending December 31, 2010	
4	Indirect factory wages	$ 732,800
5	Supervisor salaries	360,000
6	Power and light	306,000
7	Depreciation of plant and equipment	288,000
8	Indirect materials	182,800
9	Maintenance	140,280
10	Insurance and property taxes	79,200
11	Total factory overhead cost	$2,089,080

The factory overhead cost budget shown in Exhibit 12 may be supported by departmental schedules. Such schedules normally separate factory overhead costs into fixed and variable costs to better enable department managers to monitor and evaluate costs during the year.

The factory overhead cost budget should be integrated with the production budget to ensure that production is not interrupted during the year.

Cost of Goods Sold Budget

The **cost of goods sold budget** is prepared by integrating the following budgets:

1. Direct materials purchases budget (Exhibit 10)
2. Direct labor cost budget (Exhibit 11)
3. Factory overhead cost budget (Exhibit 12)

In addition, the estimated and desired inventories for direct materials, work in process, and finished goods must be integrated into the cost of goods sold budget.

Elite Accessories Inc. expects the following direct materials, work in process, and finished goods inventories:

	Estimated Inventory Jan. 1, 2010	Desired Inventory Dec. 31, 2010
Direct materials:		
Leather	$ 81,000 (18,000 sq. yds. × $4.50)	$ 90,000 (20,000 sq. yds. × $4.50)
Lining	18,000 (15,000 sq. yds. × $1.20)	14,400 (12,000 sq. yds. × $1.20)
Total direct materials	$ 99,000	$ 104,400
Work in process:	$ 214,400	$ 220,000
Finished goods:	$1,095,600	$1,565,000

Exhibit 13 illustrates the cost of goods sold budget for Elite Accessories Inc. It indicates that total manufacturing costs of $9,522,780 are budgeted to be incurred in 2010. Of this total, $2,582,100 is budgeted for direct materials, $4,851,600 is budgeted for direct labor, and $2,089,080 is budgeted for factory overhead. After considering work in process inventories, the total budgeted cost of goods manufactured and transferred to finished goods during 2010 is $9,517,180. Based on expected sales, the budgeted cost of goods sold is $9,047,780.

Exhibit 13

Cost of Goods Sold Budget

	A	B	C	D	E	F
1	Elite Accessories Inc.					
2	Cost of Goods Sold Budget					
3	For the Year Ending December 31, 2010					
4	Finished goods inventory, January 1, 2010					$ 1,095,600
5	Work in process inventory, January 1, 2010				$ 214,400	
6	Direct materials:					
7	Direct materials inventory,					
8	January 1, 2010			$ 99,000		
9	Direct materials purchases (from Exhibit 10)			2,587,500		
10	Cost of direct materials available for use			$2,686,500		
11	Less direct materials inventory,					
12	December 31, 2010			104,400		
13	Cost of direct materials placed in production			$2,582,100		
14	Direct labor (from Exhibit 11)			4,851,600		
15	Factory overhead (from Exhibit 12)			2,089,080		
16	Total manufacturing costs				9,522,780	
17	Total work in process during period				$9,737,180	
18	Less work in process inventory,					
19	December 31, 2010				220,000	
20	Cost of goods manufactured					9,517,180
21	Cost of finished goods available for sale					$10,612,780
22	Less finished goods inventory,					
23	December 31, 2010					1,565,000
24	Cost of goods sold					$ 9,047,780
25						

Direct materials purchases budget

Direct labor cost budget

Factory overhead cost budget

Example Exercise 6-5 Cost of Goods Sold Budget

4

Prepare a cost of goods sold budget for Landon Awards Co. using the information in Example Exercises 6-3 and 6-4. Assume the estimated inventories on January 1, 2010, for finished goods and work in process were $54,000 and $47,000, respectively. Also assume the desired inventories on December 31, 2010, for finished goods and work in process were $50,000 and $49,000, respectively. Factory overhead was budgeted for $126,000.

Follow My Example 6-5

Finished goods inventory, January 1, 2010			$ 54,000
Work in process inventory, January 1, 2010		$ 47,000	
Direct materials:			
Direct materials inventory, January 1, 2010 (240,000 × $0.12, from EE 6-3)	$ 28,800		
Direct materials purchases (from EE 6-3)	536,640		
Cost of direct materials available for use	$565,440		
Less direct materials inventory, December 31, 2010 (200,000 × $0.12, from EE 6-3)	24,000		
Cost of direct materials placed in production	$541,440		
Direct labor (from EE 6-4)	103,400		
Factory overhead	126,000		
Total manufacturing costs		770,840	
Total work in process during period		$817,840	
Less work in process inventory, December 31, 2010		49,000	
Cost of goods manufactured			768,840
Cost of finished goods available for sale			$822,840
Less finished goods inventory, December 31, 2010			50,000
Cost of goods sold			$772,840

For Practice: PE 6-5A, PE 6-5B

Selling and Administrative Expenses Budget

The sales budget is often used as the starting point for the selling and administrative expenses budget. For example, a budgeted increase in sales may require more advertising expenses.

Exhibit 14 illustrates the selling and administrative expenses budget for Elite Accessories Inc.

Exhibit 14

Selling and Administrative Expenses Budget

	A	B	C
1	Elite Accessories Inc.		
2	Selling and Administrative Expenses Budget		
3	For the Year Ending December 31, 2010		
4	Selling expenses:		
5	Sales salaries expense	$715,000	
6	Advertising expense	360,000	
7	Travel expense	115,000	
8	Total selling expenses		$1,190,000
9	Administrative expenses:		
10	Officers' salaries expense	$360,000	
11	Office salaries expense	258,000	
12	Office rent expense	34,500	
13	Office supplies expense	17,500	
14	Miscellaneous administrative expenses	25,000	
15	Total administrative expenses		695,000
16	Total selling and administrative expenses		$1,885,000

The selling and administrative expenses budget shown in Exhibit 14 is normally supported by departmental schedules. For example, an advertising expense schedule for the Marketing Department could include the advertising media to be used (newspaper, direct mail, television), quantities (column inches, number of pieces, minutes), the cost per unit, and related costs per unit.

Budgeted Income Statement

The budgeted income statement is prepared by integrating the following budgets:

1. Sales budget (Exhibit 8)
2. Cost of goods sold budget (Exhibit 13)
3. Selling and administrative expenses budget (Exhibit 14)

In addition, estimates of other income, other expense, and income tax are also integrated into the budgeted income statement.

Exhibit 15 illustrates the budgeted income statement for Elite Accessories Inc. This budget summarizes the budgeted operating activities of the company. In doing so, the budgeted income statement allows management to assess the effects of estimated sales, costs, and expenses on profits for the year.

Balance Sheet Budgets

5 Prepare balance sheet budgets for a manufacturing company.

While the income statement budgets reflect the operating activities of the company, the balance sheet budgets reflect the financing and investing activities. In this section, the following balance sheet budgets are described and illustrated:

1. Cash budget (financing activity)
2. Capital expenditures budget (investing activity)

Exhibit 15

Budgeted Income Statement

	A	B	C
1	Elite Accessories Inc.		
2	Budgeted Income Statement		
3	For the Year Ending December 31, 2010		
4	Revenue from sales (from Exhibit 8)		$13,336,000
5	Cost of goods sold (from Exhibit 13)		9,047,780
6			
7	Gross profit		$ 4,288,220
8	Selling and administrative expenses:		
9	Selling expenses (from Exhibit 14)	$1,190,000	
10			
11	Administrative expenses (from Exhibit 14)	695,000	
12	Total selling and administrative expenses		1,885,000
13	Income from operations		$ 2,403,220
14	Other income:		
15	Interest revenue	$ 98,000	
16	Other expenses:		
17	Interest expense	90,000	8,000
18	Income before income tax		$ 2,411,220
19	Income tax		600,000
20	Net income		$ 1,811,220

Sales budget

Cost of goods sold budget

Selling and administrative expenses budget

Cash Budget

The **cash budget** estimates the expected receipts (inflows) and payments (outflows) of cash for a period of time. The cash budget is integrated with the various operating budgets. In addition, the capital expenditures budget, dividends, and equity or long-term debt financing plans of the company affect the cash budget.

The cash budget presents the expected receipts and payments of cash for a period of time.

To illustrate, a monthly cash budget for January, February, and March 2010 for Elite Accessories Inc. is prepared. The preparation of the cash budget begins by estimating cash receipts.

Estimated Cash Receipts

The primary source of estimated cash receipts is from cash sales and collections on account. In addition, cash receipts may be obtained from plans to issue equity or debt financing as well as other sources such as interest revenue.

To estimate cash receipts from cash sales and collections on account, a *schedule of collections from sales* is prepared. To illustrate, the following data for Elite Accessories Inc. are used:

	January	February	March
Sales:			
Budgeted sales	$1,080,000	$1,240,000	$970,000
Percent of cash sales	10%	10%	10%
Accounts receivable, January 1, 2010	$370,000		
Receipts from sales on account:			
From prior month's sales on account	40%		
From current month's sales on account	60		
	100%		

Using the preceding data, the schedule of collections from sales is prepared, as shown in Exhibit 16. Cash sales are determined by multiplying the percent of cash sales by the monthly budgeted sales. The cash receipts from sales on account are determined by adding the cash received from the prior month's sales on account (40%) and the cash received from the current month's sales on account (60%). To simplify, it is assumed that all accounts receivable are collected.

Exhibit 16

Schedule of Collections from Sales

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Schedule of Collections from Sales				
3	For the Three Months Ending March 31, 2010				
4			January	February	March
5	Receipts from cash sales:				
6	Cash sales (10% × current month's sales—				
7	Note A)		$108,000	$ 124,000	$ 97,000
8					
9	Receipts from sales on account:				
10	Collections from prior month's sales (40% of				
11	previous month's credit sales—Note B)		$370,000	$ 388,800	$446,400
12	Collections from current month's sales (60%				
13	of current month's credit sales—Note C)		583,200	669,600	523,800
14	Total receipts from sales on account		$953,200	$1,058,400	$970,200
15					
16	Note A:	$108,000 = $1,080,000 × 10%			
17		$124,000 = $1,240,000 × 10%			
18		$ 97,000 = $ 970,000 × 10%			
19					
20	Note B:	$370,000, given as January 1, 2010, Accounts Receivable balance			
21		$388,800 = $1,080,000 × 90% × 40%			
22		$446,400 = $1,240,000 × 90% × 40%			
23					
24	Note C:	$583,200 = $1,080,000 × 90% × 60%			
25		$669,600 = $1,240,000 × 90% × 60%			
26		$523,800 = $ 970,000 × 90% × 60%			

Estimated Cash Payments Estimated cash payments must be budgeted for operating costs and expenses such as manufacturing costs, selling expenses, and administrative expenses. In addition, estimated cash payments may be planned for capital expenditures, dividends, interest payments, or long-term debt payments.

To estimate cash payments for manufacturing costs, a *schedule of payments for manufacturing costs* is prepared. To illustrate, the following data for Elite Accessories Inc. are used:

	January	February	March
Manufacturing Costs:			
Budgeted manufacturing costs	$840,000	$780,000	$812,000
Depreciation on machines included in manufacturing costs	24,000	24,000	24,000
Accounts Payable:			
Accounts payable, January 1, 1010	$190,000		
Payments of manufacturing costs on account:			
From prior month's manufacturing costs . . .	25%		
From current month's manufacturing costs . . .	75		
	100%		

Using the preceding data, the schedule of payments for manufacturing costs is prepared, as shown in Exhibit 17. The cash payments are determined by adding the cash paid on costs incurred from the prior month (25%) to the cash paid on costs incurred in the current month (75%). The $24,000 of depreciation is excluded from all computations, since depreciation does not require a cash payment.

Exhibit 17

Schedule of Payments for Manufacturing Costs

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Schedule of Payments for Manufacturing Costs				
3	For the Three Months Ending March 31, 2010				
4			January	February	March
5	Payments of prior month's manufacturing costs				
6	{[25% × previous month's manufacturing costs				
7	(less depreciation)]—Note A}		$190,000	$204,000	$189,000
8	Payments of current month's manufacturing costs				
9	{[75% × current month's manufacturing costs				
10	(less depreciation)]—Note B}		612,000	567,000	591,000
11	Total payments		$802,000	$771,000	$780,000
12					
13	Note A:	$190,000, given as January 1, 2010, Accounts Payable balance			
14		$204,000 = ($840,000 − $24,000) × 25%			
15		$189,000 = ($780,000 − $24,000) × 25%			
16					
17	Note B:	$612,000 = ($840,000 − $24,000) × 75%			
18		$567,000 = ($780,000 − $24,000) × 75%			
19		$591,000 = ($812,000 − $24,000) × 75%			

Completing the Cash Budget Assume the additional data for Elite Accessories Inc. shown below.

Cash balance on January 1, 2010	$280,000
Quarterly taxes paid on March 31, 2010	150,000
Quarterly interest expense paid on January 10, 2010	22,500
Quarterly interest revenue received on March 21, 2010	24,500
Sewing equipment purchased in February 2010	274,000
Selling and administrative expenses (paid in month incurred):	

January	February	March
$160,000	$165,000	$145,000

Using the preceding data, the *cash budget* is prepared, as shown in Exhibit 18.

Exhibit 18

Cash Budget

	A	B	C	D
1	Elite Accessories Inc.			
2	Cash Budget			
3	For the Three Months Ending March 31, 2010			
4		January	February	March
5	Estimated cash receipts from:			
6	Cash sales (from Exhibit 16)	$ 108,000	$ 124,000	$ 97,000
7	Collections of accounts receivable			
8	(from Exhibit 16)	953,200	1,058,400	970,200
9	Interest revenue			24,500
10	Total cash receipts	$1,061,200	$1,182,400	$1,091,700
11	Estimated cash payments for:			
12	Manufacturing costs (from Exhibit 17)	$ 802,000	$ 771,000	$ 780,000
13	Selling and administrative expenses	160,000	165,000	145,000
14	Capital additions		274,000	
15	Interest expense	22,500		
16	Income taxes			150,000
17	Total cash payments	$ 984,500	$1,210,000	$1,075,000
18	Cash increase (decrease)	$ 76,700	$ (27,600)	$ 16,700
19	Cash balance at beginning of month	280,000	356,700	329,100
20	Cash balance at end of month	$ 356,700	$ 329,100	$ 345,800
21	Minimum cash balance	340,000	340,000	340,000
22	Excess (deficiency)	$ 16,700	$ (10,900)	$ 5,800

Schedule of collections from sales

Schedule of cash payments for manufacturing costs

As shown in Exhibit 18, Elite Accessories Inc. has estimated that a *minimum cash balance* of $340,000 is required at the end of each month to support its operations. This minimum cash balance is compared to the estimated ending cash balance for each month. In this way, any expected cash excess or deficiency is determined.

Exhibit 18 indicates that Elite Accessories expects a cash excess at the end of January of $16,700. This excess could be invested in temporary income-producing securities such as U.S. Treasury bills or notes. In contrast, the estimated cash deficiency at the end of February of $10,900 might require Elite Accessories to borrow cash from its bank.

Example Exercise 6-6 Cash Budget 5

Landon Awards Co. collects 25% of its sales on account in the month of the sale and 75% in the month following the sale. If sales on account are budgeted to be $100,000 for March and $126,000 for April, what are the budgeted cash receipts from sales on account for April?

Follow My Example 6-6

	April
Collections from March sales (75% × $100,000)	$ 75,000
Collections from April sales (25% × $126,000)	31,500
Total receipts from sales on account	$106,500

For Practice: PE 6-6A, PE 6-6B

Capital Expenditures Budget

The **capital expenditures budget** summarizes plans for acquiring fixed assets. Such expenditures are necessary as machinery and other fixed assets wear out or become obsolete. In addition, purchasing additional fixed assets may be necessary to meet increasing demand for the company's product.

To illustrate, a five-year capital expenditures budget for Elite Accessories Inc. is shown in Exhibit 19.

Exhibit 19

Capital Expenditures Budget

	A	B	C	D	E	F
1	Elite Accessories Inc.					
2	Capital Expenditures Budget					
3	For the Five Years Ending December 31, 2014					
4	Item	2010	2011	2012	2013	2014
5	**Machinery—Cutting Department**	**$400,000**			**$280,000**	**$360,000**
6	**Machinery—Sewing Department**	**274,000**	**$260,000**	**$560,000**	**200,000**	
7	**Office equipment**		**90,000**			**60,000**
8	**Total**	**$674,000**	**$350,000**	**$560,000**	**$480,000**	**$420,000**

As shown in Exhibit 19, capital expenditures budgets are often prepared for five to ten years into the future. This is necessary since fixed assets often must be ordered years in advance. Likewise, it could take years to construct new buildings or other production facilities.

The capital expenditures budget should be integrated with the operating and financing budgets. For example, depreciation of new manufacturing equipment affects

the factory overhead cost budget. The plans for financing the capital expenditures also affect the cash budget.

Budgeted Balance Sheet

The budgeted balance sheet is prepared based on the operating, financing, and investing budgets of the master budget. The budgeted balance sheet is dated as of the end of the budget period and is similar to a normal balance sheet except that estimated amounts are used. For this reason, a budgeted balance sheet for Elite Accessories Inc. is not illustrated.

At a Glance 6

1 Describe budgeting, its objectives, and its impact on human behavior.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Budgeting involves (1) establishing plans (planning), (2) directing operations (directing), and (3) evaluating performance (controlling). In addition, budgets should be established to avoid human behavior problems.	• Describe the planning, directing, controlling, and feedback elements of the budget process. • Describe the behavioral issues associated with tight goals, loose goals, and goal conflict.		

2 Describe the basic elements of the budget process, the two major types of budgeting, and the use of computers in budgeting.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The budget process is often initiated by the budget committee. The budget estimates received by the committee should be carefully studied, analyzed, revised, and integrated. The static and flexible budgets are two major budgeting approaches. Computers can be used to make the budget process more efficient and organizationally integrated.	• Describe a static budget and explain when it might be used. • Describe and prepare a flexible budget and explain when it might be used. • Describe the role of computers in the budget process.	**6-1**	6-1A, 6-1B

3 Describe the master budget for a manufacturing company.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The master budget consists of the budgeted income statement and budgeted balance sheet.	• Illustrate the connection between the major income statement and balance sheet budgets.		

4 Prepare the basic income statement budgets for a manufacturing company.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The basic income statement budgets are the sales budget, production budget, direct materials purchases budget, direct labor cost budget, factory overhead cost budget, cost of goods sold budget, and selling and administrative expenses budget.	• Prepare a sales budget.		
	• Prepare a production budget.	6-2	6-2A, 6-2B
	• Prepare a direct materials purchases budget.	6-3	6-3A, 6-3B
	• Prepare a direct labor cost budget.	6-4	6-4A, 6-4B
	• Prepare a factory overhead cost budget.		
	• Prepare a cost of goods sold budget.	6-5	6-5A, 6-5B
	• Prepare a selling and administrative expenses budget.		

5 Prepare balance sheet budgets for a manufacturing company.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The cash budget and capital expenditures budget can be used in preparing the budgeted balance sheet.	• Prepare cash receipts and cash payments budgets.	6-6	6-6A, 6-6B
	• Prepare a capital expenditures budget.		

Key Terms

budget (228)
budgetary slack (230)
capital expenditures budget (247)
cash budget (244)
continuous budgeting (231)
cost of goods sold budget (241)
direct labor cost budget (239)
direct materials purchases budget (238)
factory overhead cost budget (240)
flexible budget (232)
goal conflict (230)
master budget (235)
production budget (237)
responsibility center (229)
sales budget (236)
static budget (232)
zero-based budgeting (231)

Illustrative Problem

Selected information concerning sales and production for Cabot Co. for July 2010 are summarized as follows:

a. Estimated sales:

Product K: 40,000 units at $30.00 per unit
Product L: 20,000 units at $65.00 per unit

b. Estimated inventories, July 1, 2010:

Material A:	4,000 lbs.	Product K:	3,000 units at $17 per unit	$ 51,000
Material B:	3,500 lbs.	Product L:	2,700 units at $35 per unit	94,500
		Total		$145,500

There were no work in process inventories estimated for July 1, 2010.

c. Desired inventories at July 31, 2010:

Material A:	3,000 lbs.	Product K:	2,500 units at $17 per unit	$ 42,500
Material B:	2,500 lbs.	Product L:	2,000 units at $35 per unit	70,000
		Total		$112,500

There were no work in process inventories desired for July 31, 2010.

d. Direct materials used in production:

	Product K	Product L
Material A:	0.7 lb. per unit	3.5 lbs. per unit
Material B:	1.2 lbs. per unit	1.8 lbs. per unit

e. Unit costs for direct materials:

Material A: $4.00 per lb.
Material B: $2.00 per lb.

f. Direct labor requirements:

	Department 1	Department 2
Product K	0.4 hr. per unit	0.15 hr. per unit
Product L	0.6 hr. per unit	0.25 hr. per unit

g.

	Department 1	Department 2
Direct labor rate	$12.00 per hr.	$16.00 per hr.

h. Estimated factory overhead costs for July:

Indirect factory wages	$200,000
Depreciation of plant and equipment	40,000
Power and light	25,000
Indirect materials	34,000
Total	$299,000

Instructions

1. Prepare a sales budget for July.
2. Prepare a production budget for July.
3. Prepare a direct materials purchases budget for July.
4. Prepare a direct labor cost budget for July.
5. Prepare a cost of goods sold budget for July.

Solution

1.

	A	B	C	D
1	Cabot Co.			
2	Sales Budget			
3	For the Month Ending July 31, 2010			
4	Product	Unit Sales Volume	Unit Selling Price	Total Sales
5	**Product K**	**40,000**	**$30.00**	**$1,200,000**
6	**Product L**	**20,000**	**65.00**	**1,300,000**
7	**Total revenue from sales**			**$2,500,000**

2.

	A	B	C
1	Cabot Co.		
2	Production Budget		
3	For the Month Ending July 31, 2010		
4		Units	
5		Product K	Product L
6	**Sales**	**40,000**	**20,000**
7	**Plus desired inventories at July 31, 2010**	**2,500**	**2,000**
8	**Total**	**42,500**	**22,000**
9	**Less estimated inventories, July 1, 2010**	**3,000**	**2,700**
10	**Total production**	**39,500**	**19,300**

3.

	A	B	C	D	E	F	G
1	Cabot Co.						
2	Direct Materials Purchases Budget						
3	For the Month Ending July 31, 2010						
4			Direct Materials				
5			Material A		Material B		Total
6	**Units required for production:**						
7	**Product K (39,500 × lbs. per unit)**		**27,650**	**lbs.***	**47,400**	**lbs.***	
8	**Product L (19,300 × lbs. per unit)**		**67,550**	**	**34,740**	**	
9	**Plus desired units of inventory,**						
10	**July 31, 2010**		**3,000**		**2,500**		
11	**Total**		**98,200**	**lbs.**	**84,640**	**lbs.**	
12	**Less estimated units of inventory,**						
13	**July 1, 2010**		**4,000**		**3,500**		
14	**Total units to be purchased**		**94,200**	**lbs.**	**81,140**	**lbs.**	
15	**Unit price**		**× $4.00**		**× $2.00**		
16	**Total direct materials purchases**		**$376,800**		**$162,280**		**$539,080**
17							
18	*27,650 = 39,500 × 0.7	47,400 = 39,500 × 1.2					
19	**67,550 = 19,300 × 3.5	34,740 = 19,300 × 1.8					

4.

	A	B	C	D	E	F	G
1	Cabot Co.						
2	Direct Labor Cost Budget						
3	For the Month Ending July 31, 2010						
4			Department 1		Department 2		Total
5	**Hours required for production:**						
6	**Product K (39,500 × hrs. per unit)**		**15,800**	*	**5,925**	*	
7	**Product L (19,300 × hrs. per unit)**		**11,580**	**	**4,825**	**	
8	**Total**		**27,380**		**10,750**		
9	**Hourly rate**		**×$12.00**		**×$16.00**		
10	**Total direct labor cost**		**$328,560**		**$172,000**		**$500,560**
11							
12	*15,800 = 39,500 × 0.4	5,925 = 39,500 × 0.15					
13	**11,580 = 19,300 × 0.6	4,825 = 19,300 × 0.25					

5.

	A	B	C	D
1	Cabot Co.			
2	Cost of Goods Sold Budget			
3	For the Month Ending July 31, 2010			
4	Finished goods inventory, July 1, 2010			$ 145,500
5	Direct materials:			
6	Direct materials inventory, July 1, 2010—(Note A)		$ 23,000	
7	Direct materials purchases		539,080	
8	Cost of direct materials available for use		$562,080	
9	Less direct materials inventory, July 31, 2010—(Note B)		17,000	
10	Cost of direct materials placed in production		$545,080	
11	Direct labor		500,560	
12	Factory overhead		299,000	
13	Cost of goods manufactured			1,344,640
14	Cost of finished goods available for sale			$1,490,140
15	Less finished goods inventory, July 31, 2010			112,500
16	Cost of goods sold			$1,377,640
17				
18	Note A:			
19	Material A 4,000 lbs. at $4.00 per lb.	$16,000		
20	Material B 3,500 lbs. at $2.00 per lb.	7,000		
21	Direct materials inventory, July 1, 2010	$23,000		
22				
23	Note B:			
24	Material A 3,000 lbs. at $4.00 per lb.	$12,000		
25	Material B 2,500 lbs. at $2.00 per lb.	5,000		
26	Direct materials inventory, July 31, 2010	$17,000		

Self-Examination Questions (Answers at End of Chapter)

1. A tight budget may create:
   A. budgetary slack.
   B. discouragement.
   C. a flexible budget.
   D. a "spend it or lose it" mentality.
2. The first step of the budget process is:
   A. plan. C. control.
   B. direct. D. feedback.
3. Static budgets are often used by:
   A. production departments.
   B. administrative departments.
   C. responsibility centers.
   D. capital projects.
4. The total estimated sales for the coming year is 250,000 units. The estimated inventory at the beginning of the year is 22,500 units, and the desired inventory at the end of the year is 30,000 units. The total production indicated in the production budget is:
   A. 242,500 units. C. 280,000 units.
   B. 257,500 units. D. 302,500 units.
5. Dixon Company expects $650,000 of credit sales in March and $800,000 of credit sales in April. Dixon historically collects 70% of its sales in the month of sale and 30% in the following month. How much cash does Dixon expect to collect in April?
   A. $800,000 C. $755,000
   B. $560,000 D. $1,015,000

Eye Openers

1. What are the three major objectives of budgeting?
2. What is the manager's role in a responsibility center?
3. Briefly describe the type of human behavior problems that might arise if budget goals are set too tightly.

4. Give an example of budgetary slack.
5. What behavioral problems are associated with setting a budget too loosely?
6. What behavioral problems are associated with establishing conflicting goals within the budget?
7. When would a company use zero-based budgeting?
8. Under what circumstances would a static budget be appropriate?
9. How do computerized budgeting systems aid firms in the budgeting process?
10. What is the first step in preparing a master budget?
11. Why should the production requirements set forth in the production budget be carefully coordinated with the sales budget?
12. Why should the timing of direct materials purchases be closely coordinated with the production budget?
13. In preparing the budget for the cost of goods sold, what are the three budgets from which data on relevant estimates of quantities and costs are combined with data on estimated inventories?
14. a. Discuss the purpose of the cash budget.
    b. If the cash for the first quarter of the fiscal year indicates excess cash at the end of each of the first two months, how might the excess cash be used?
15. How does a schedule of collections from sales assist in preparing the cash budget?
16. Give an example of how the capital expenditures budget affects other operating budgets.

Practice Exercises

PE 6-1A
Flexible budgeting
obj. 2
EE 6-1 p. 234

At the beginning of the period, the Fabricating Department budgeted direct labor of $22,500 and equipment depreciation of $7,000 for 900 hours of production. The department actually completed 750 hours of production. Determine the budget for the department, assuming that it uses flexible budgeting.

PE 6-1B
Flexible budgeting
obj. 2
EE 6-1 p. 234

At the beginning of the period, the Assembly Department budgeted direct labor of $186,000 and property tax of $15,000 for 12,000 hours of production. The department actually completed 13,400 hours of production. Determine the budget for the department, assuming that it uses flexible budgeting.

PE 6-2A
Production budget
obj. 4
EE 6-2 p. 238

Soft Glow Candle Co. projected sales of 78,000 candles for 2010. The estimated January 1, 2010, inventory is 3,600 units, and the desired December 31, 2010, inventory is 4,500 units. What is the budgeted production (in units) for 2010?

PE 6-2B
Production budget
obj. 4
EE 6-2 p. 238

Day Timer Publishers Inc. projected sales of 205,000 schedule planners for 2010. The estimated January 1, 2010, inventory is 18,500 units, and the desired December 31, 2010, inventory is 15,000 units. What is the budgeted production (in units) for 2010?

PE 6-3A
Direct materials purchases budget
obj. 4
EE 6-3 p. 239

Soft Glow Candle Co. budgeted production of 78,900 candles in 2010. Wax is required to produce a candle. Assume 8 ounces (one half of a pound) of wax is required for each candle. The estimated January 1, 2010, wax inventory is 2,000 pounds. The desired December 31, 2010, wax inventory is 2,400 pounds. If candle wax costs $3.20 per pound, determine the direct materials purchases budget for 2010.

PE 6-3B
Direct materials purchases budget
obj. 4
EE 6-3 p. 239

Day Timer Publishers Inc. budgeted production of 201,500 schedule planners in 2010. Paper is required to produce a planner. Assume 80 square feet of paper are required for each planner. The estimated January 1, 2010, paper inventory is 250,000 square feet. The desired December 31, 2010, paper inventory is 210,000 square feet. If paper costs $0.10 per square foot, determine the direct materials purchases budget for 2010.

PE 6-4A
Direct labor cost budget
obj. 4
EE 6-4 p. 240

Soft Glow Candle Co. budgeted production of 78,900 candles in 2010. Each candle requires molding. Assume that 15 minutes are required to mold each candle. If molding labor costs $16.00 per hour, determine the direct labor cost budget for 2010.

PE 6-4B
Direct labor cost budget
obj. 4
EE 6-4 p. 240

Day Timer Publishers Inc. budgeted production of 201,500 schedule planners in 2010. Each planner requires assembly. Assume that 12 minutes are required to assemble each planner. If assembly labor costs $14 per hour, determine the direct labor cost budget for 2010.

PE 6-5A
Cost of goods sold budget
obj. 4
EE 6-5 p. 242

Prepare a cost of goods sold budget for Soft Glow Candle Co. using the information in Practice Exercises 6-3A and 6-4A. Assume the estimated inventories on January 1, 2010, for finished goods and work in process were $12,000 and $4,000, respectively. Also assume the desired inventories on December 31, 2010, for finished goods and work in process were $11,200 and $5,000, respectively. Factory overhead was budgeted at $108,000.

PE 6-5B
Cost of goods sold budget
obj. 4
EE 6-5 p. 242

Prepare a cost of goods sold budget for Day Timer Publishers Inc. using the information in Practice Exercises 6-3B and 6-4B. Assume the estimated inventories on January 1, 2010, for finished goods and work in process were $39,000 and $18,000, respectively. Also assume the desired inventories on December 31, 2010, for finished goods and work in process were $43,000 and $15,000, respectively. Factory overhead was budgeted at $240,000.

PE 6-6A
Cash budget
obj. 5
EE 6-6 p. 247

Soft Glow Candle Co. pays 20% of its purchases on account in the month of the purchase and 80% in the month following the purchase. If purchases are budgeted to be $15,000 for October and $17,000 for November, what are the budgeted cash payments for purchases on account for November?

PE 6-6B
Cash budget
obj. 5
EE 6-6 p. 247

Day Timer Publishers Inc. collects 25% of its sales on account in the month of the sale and 75% in the month following the sale. If sales on account are budgeted to be $390,000 for April and $360,000 for May, what are the budgeted cash receipts from sales on account for May?

Exercises

EX 6-1
Personal cash budget
objs. 2, 5

✔ a. December 31 cash balance, $3,500

At the beginning of the 2010 school year, Britney Logan decided to prepare a cash budget for the months of September, October, November, and December. The budget must plan for enough cash on December 31 to pay the spring semester tuition, which is the same as the fall tuition. The following information relates to the budget:

Cash balance, September 1 (from a summer job)	$7,000
Purchase season football tickets in September	100
Additional entertainment for each month	250
Pay fall semester tuition on September 3	3,800
Pay rent at the beginning of each month	350
Pay for food each month	200
Pay apartment deposit on September 2 (to be returned Dec. 15)	500
Part-time job earnings each month (net of taxes)	900

a. Prepare a cash budget for September, October, November, and December.
b. Are the four monthly budgets that are presented prepared as static budgets or flexible budgets?
c. What are the budget implications for Britney Logan?

EX 6-2
Flexible budget for selling and administrative expenses

objs. 2, 4

✔ Total selling and administrative expenses at $125,000 sales, $66,350

Agent Blaze uses flexible budgets that are based on the following data:

Sales commissions	8% of sales
Advertising expense	21% of sales
Miscellaneous selling expense	$2,250 plus 3% of sales
Office salaries expense	$15,000 per month
Office supplies expense	4% of sales
Miscellaneous administrative expense	$1,600 per month plus 2% of sales

Prepare a flexible selling and administrative expenses budget for January 2010 for sales volumes of $100,000, $125,000, and $150,000. (Use Exhibit 5 as a model.)

EX 6-3
Static budget vs. flexible budget

objs. 2, 4

✔ b. Excess of actual over budget for March, ($53,000)

The production supervisor of the Machining Department for Nell Company agreed to the following monthly static budget for the upcoming year:

Nell Company
Machining Department
Monthly Production Budget

Wages	$540,000
Utilities	36,000
Depreciation	60,000
Total	$636,000

The actual amount spent and the actual units produced in the first three months of 2010 in the Machining Department were as follows:

	Amount Spent	Units Produced
January	$600,000	110,000
February	570,000	100,000
March	545,000	90,000

The Machining Department supervisor has been very pleased with this performance, since actual expenditures have been less than the monthly budget. However, the plant manager believes that the budget should not remain fixed for every month but should "flex" or adjust to the volume of work that is produced in the Machining Department. Additional budget information for the Machining Department is as follows:

Wages per hour	$18.00
Utility cost per direct labor hour	$1.20
Direct labor hours per unit	0.25
Planned unit production	120,000

a. Prepare a flexible budget for the actual units produced for January, February, and March in the Machining Department. Assume depreciation is a fixed cost.
b. Compare the flexible budget with the actual expenditures for the first three months. What does this comparison suggest?

EX 6-4
Flexible budget for Fabrication Department

obj. 2

✔ Total department cost at 12,000 units, $1,029,000

Steelcase Inc. is one of the largest manufacturers of office furniture in the United States. In Grand Rapids, Michigan, it produces filing cabinets in two departments: Fabrication and Trim Assembly. Assume the following information for the Fabrication Department:

Steel per filing cabinet	45 pounds
Direct labor per filing cabinet	20 minutes
Supervisor salaries	$140,000 per month
Depreciation	$22,000 per month
Direct labor rate	$21 per hour
Steel cost	$1.45 per pound

Prepare a flexible budget for 12,000, 15,000, and 18,000 filing cabinets for the month of October 2010, similar to Exhibit 5, assuming that inventories are not significant.

EX 6-5
Production budget

obj. 4

✔ Small scale budgeted production, 51,600 units

Accu-Weight, Inc. produces a small and large version of its popular electronic scale. The anticipated unit sales for the scales by sales region are as follows:

	Small Scale	Large Scale
North Region unit sales	25,000	34,000
South Region unit sales	27,000	32,500
Total	52,000	66,500

The finished goods inventory estimated for May 1, 2011, for the small and large scale models is 1,500 and 2,300 units, respectively. The desired finished goods inventory for May 31, 2011, for the small and large scale models is 1,100 and 2,500 units, respectively.

Prepare a production budget for the small and large scales for the month ended May 31, 2011.

EX 6-6
Sales and production budgets

obj. 4

✔ b. Model DL total production, 7,985 units

Harmony Audio Company manufactures two models of speakers, DL and XL. Based on the following production and sales data for September 2009, prepare (a) a sales budget and (b) a production budget.

	DL	XL
Estimated inventory (units), September 1	240	60
Desired inventory (units), September 30	275	52
Expected sales volume (units):		
East Region	3,700	3,250
West Region	4,250	3,700
Unit sales price	$125	$195

EX 6-7
Professional fees earned budget

obj. 4

✔ Total professional fees earned, $10,153,500

Roberts and Chou, CPAs, offer three types of services to clients: auditing, tax, and small business accounting. Based on experience and projected growth, the following billable hours have been estimated for the year ending December 31, 2010:

	Billable Hours
Audit Department:	
Staff	32,400
Partners	4,800
Tax Department:	
Staff	24,800
Partners	3,100
Small Business Accounting Department:	
Staff	4,500
Partners	630

The average billing rate for staff is $130 per hour, and the average billing rate for partners is $250 per hour. Prepare a professional fees earned budget for Roberts and Chou, CPAs, for the year ending December 31, 2010, using the following column headings and showing the estimated professional fees by type of service rendered:

Billable Hours	Hourly Rate	Total Revenue

EX 6-8
Professional labor cost budget

obj. 4

✔ Staff total labor cost, $1,851,000

Based on the data in Exercise 6-7 and assuming that the average compensation per hour for staff is $30 and for partners is $125, prepare a professional labor cost budget for Roberts and Chou, CPAs, for the year ending December 31, 2010. Use the following column headings:

Staff	Partners

EX 6-9
Direct materials purchases budget

obj. 4

✔ Total cheese purchases, $123,163

Marino's Frozen Pizza Inc. has determined from its production budget the following estimated production volumes for 12" and 16" frozen pizzas for April 2010:

	Units	
	12" Pizza	16" Pizza
Budgeted production volume	15,100	22,700

There are three direct materials used in producing the two types of pizza. The quantities of direct materials expected to be used for each pizza are as follows:

	12" Pizza	16" Pizza
Direct materials:		
Dough	0.90 lb. per unit	1.50 lbs. per unit
Tomato	0.60	1.00
Cheese	0.75	1.25

In addition, Marino's has determined the following information about each material:

	Dough	Tomato	Cheese
Estimated inventory, April 1, 2010	580 lbs.	205 lbs.	325 lbs.
Desired inventory, April 30, 2010	610 lbs.	200 lbs.	355 lbs.
Price per pound	$1.20	$2.60	$3.10

Prepare April's direct materials purchases budget for Marino's Frozen Pizza Inc.

EX 6-10
Direct materials purchases budget

obj. 4

✔ Concentrate budgeted purchases, $107,600

Coca-Cola Enterprises is the largest bottler of Coca-Cola® in North America. The company purchases Coke® and Sprite® concentrate from The Coca-Cola Company, dilutes and mixes the concentrate with carbonated water, and then fills the blended beverage into cans or plastic two-liter bottles. Assume that the estimated production for Coke and Sprite two-liter bottles at the Dallas, Texas, bottling plant are as follows for the month of March:

Coke	214,000 two-liter bottles
Sprite	163,000 two-liter bottles

In addition, assume that the concentrate costs $80 per pound for both Coke and Sprite and is used at a rate of 0.2 pound per 100 liters of carbonated water in blending Coke and 0.15 pound per 100 liters of carbonated water in blending Sprite. Assume that two-liter bottles cost $0.08 per bottle and carbonated water costs $0.06 per liter.

Prepare a direct materials purchases budget for March 2010, assuming no changes between beginning and ending inventories for all three materials.

EX 6-11
Direct materials purchases budget

obj. 4

✔ Total steel belt purchases, $1,344,000

Anticipated sales for Sure Grip Tire Company were 42,000 passenger car tires and 15,000 truck tires. There were no anticipated beginning or ending finished goods inventories for either product. Rubber and steel belts are used in producing passenger car and truck tires according to the following table:

	Passenger Car	Truck
Rubber	30 lbs. per unit	70 lbs. per unit
Steel belts	4 lbs. per unit	10 lbs. per unit

The purchase prices of rubber and steel are $3.20 and $4.20 per pound, respectively. The desired ending inventories of rubber and steel belts are 40,000 and 10,000 pounds,

respectively. The estimated beginning inventories for rubber and steel belts are 46,000 and 8,000 pounds, respectively.

Prepare a direct materials purchases budget for Sure Grip Tire Company for the year ended December 31, 2010.

EX 6-12
Direct labor cost budget

obj. 4

✔ Total direct labor cost, Assembly, $208,860

Hammer Racket Company manufactures two types of tennis rackets, the Junior and Pro Striker models. The production budget for October for the two rackets is as follows:

	Junior	Pro Striker
Production budget	7,600 units	22,100 units

Both rackets are produced in two departments, Forming and Assembly. The direct labor hours required for each racket are estimated as follows:

	Forming Department	Assembly Department
Junior	0.25 hour per unit	0.40 hour per unit
Pro Striker	0.35 hour per unit	0.65 hour per unit

The direct labor rate for each department is as follows:

Forming Department	$16.00 per hour
Assembly Department	$12.00 per hour

Prepare the direct labor cost budget for October 2010.

EX 6-13
Direct labor budget—service business

obj. 4

✔ Average weekday total, $1,712

Sleep-EZ Suites, Inc., operates a downtown hotel property that has 250 rooms. On average, 72% of Sleep-EZ Suites' rooms are occupied on weekdays, and 48% are occupied during the weekend. The manager has asked you to develop a direct labor budget for the housekeeping and restaurant staff for weekdays and weekends. You have determined that the housekeeping staff requires 40 minutes to clean each occupied room. The housekeeping staff is paid $10 per hour. The restaurant has five full-time staff (eight-hour day) on duty, regardless of occupancy. However, for every 60 occupied rooms, an additional person is brought in to work in the restaurant for the eight-hour day. The restaurant staff is paid $8 per hour.

Determine the estimated housekeeping, restaurant, and total direct labor cost for an average weekday and weekend day. Format the budget in two columns, labeled as weekday and weekend day.

EX 6-14
Production and direct labor cost budgets

obj. 4


✔ a. Total production of 501 Jeans, 54,000

Levi Strauss & Co. manufactures slacks and jeans under a variety of brand names, such as Dockers® and 501 Jeans®. Slacks and jeans are assembled by a variety of different sewing operations. Assume that the sales budget for Dockers and 501 Jeans shows estimated sales of 24,700 and 53,600 pairs, respectively, for January 2010. The finished goods inventory is assumed as follows:

	Dockers	501 Jeans
January 1 estimated inventory	1,110	1,490
January 31 desired inventory	410	1,890

Assume the following direct labor data per 10 pairs of Dockers and 501 Jeans for four different sewing operations:

	Direct Labor per 10 Pairs	
	Dockers	501 Jeans
Inseam	18 minutes	12 minutes
Outerseam	22	15
Pockets	7	9
Zipper	10	6
Total	57 minutes	42 minutes

a. Prepare a production budget for January. Prepare the budget in two columns: Dockers® and 501 Jeans®.

(*continued*)

b. Prepare the January direct labor cost budget for the four sewing operations, assuming a $12.50 wage per hour for the inseam and outerseam sewing operations and a $16 wage per hour for the pocket and zipper sewing operations. Prepare the direct labor cost budget in four columns: inseam, outerseam, pockets, and zipper.

EX 6-15
Factory overhead cost budget

obj. 4

✔ Total variable factory overhead costs, $264,000

Venus Candy Company budgeted the following costs for anticipated production for September 2010:

Advertising expenses	$275,000	Production supervisor wages	$132,000
Manufacturing supplies	15,000	Production control salaries	35,000
Power and light	44,000	Executive officer salaries	280,000
Sales commissions	300,000	Materials management salaries	38,000
Factory insurance	26,000	Factory depreciation	21,000

Prepare a factory overhead cost budget, separating variable and fixed costs. Assume that factory insurance and depreciation are the only factory fixed costs.

EX 6-16
Cost of goods sold budget

obj. 4

✔ Cost of goods sold, $2,334,000

Delaware Chemical Company uses oil to produce two types of plastic products, P1 and P2. Delaware budgeted 25,000 barrels of oil for purchase in September for $72 per barrel. Direct labor budgeted in the chemical process was $210,000 for September. Factory overhead was budgeted at $325,000 during September. The inventories on September 1 were estimated to be:

Oil	$14,600
P1	9,800
P2	8,600
Work in process	12,100

The desired inventories on September 30 were:

Oil	$16,100
P1	9,100
P2	7,900
Work in process	13,000

Use the preceding information to prepare a cost of goods sold budget for September 2011.

EX 6-17
Cost of goods sold budget

obj. 4

✔ Cost of goods sold, $425,420

The controller of Swiss Ceramics Inc. wishes to prepare a cost of goods sold budget for June. The controller assembled the following information for constructing the cost of goods sold budget:

Direct materials:	**Enamel**	**Paint**	**Porcelain**	**Total**
Total direct materials purchases budgeted for June	$33,840	$5,340	$118,980	$158,160
Estimated inventory, June 1, 2010	1,150	2,800	4,330	8,280
Desired inventory, June 30, 2010	2,400	2,050	6,000	10,450

Direct labor cost:	**Kiln Department**	**Decorating Department**	**Total**
Total direct labor cost budgeted for June	$41,600	$142,400	$184,000

Finished goods inventories:	**Dish**	**Bowl**	**Figurine**	**Total**
Estimated inventory, June 1, 2010	$4,060	$2,970	$2,470	$ 9,500
Desired inventory, June 30, 2010	3,350	4,150	3,590	11,090

Work in process inventories:	
Estimated inventory, June 1, 2010	$ 2,800
Desired inventory, June 30, 2010	1,880
Budgeted factory overhead costs for June:	
Indirect factory wages	$64,900
Depreciation of plant and equipment	12,600
Power and light	4,900
Indirect materials	3,700
Total	$86,100

Use the preceding information to prepare a cost of goods sold budget for June 2010.

EX 6-18
Schedule of cash collections of accounts receivable

obj. 5

✔ Total cash collected in July, $520,350

Pet Joy Wholesale Inc., a pet wholesale supplier, was organized on May 1, 2010. Projected sales for each of the first three months of operations are as follows:

May	$360,000
June	450,000
July	600,000

The company expects to sell 10% of its merchandise for cash. Of sales on account, 50% are expected to be collected in the month of the sale, 35% in the month following the sale, and the remainder in the second month following the sale.

Prepare a schedule indicating cash collections from sales for May, June, and July.

EX 6-19
Schedule of cash collections of accounts receivable

obj. 5

✔ Total cash collected in August, $300,000

Office Mate Supplies Inc. has "cash and carry" customers and credit customers. Office Mate estimates that 25% of monthly sales are to cash customers, while the remaining sales are to credit customers. Of the credit customers, 20% pay their accounts in the month of sale, while the remaining 80% pay their accounts in the month following the month of sale. Projected sales for the first three months of 2010 are as follows:

August	$250,000
September	290,000
October	270,000

The Accounts Receivable balance on July 31, 2010, was $200,000.

Prepare a schedule of cash collections from sales for August, September, and October.

EX 6-20
Schedule of cash payments

obj. 5

✔ Total cash payments in August, $79,440

Excel Learning Systems Inc. was organized on May 31, 2010. Projected selling and administrative expenses for each of the first three months of operations are as follows:

June	$117,400
July	110,500
August	100,400

Depreciation, insurance, and property taxes represent $25,000 of the estimated monthly expenses. The annual insurance premium was paid on May 31, and property taxes for the year will be paid in December. Sixty percent of the remainder of the expenses are expected to be paid in the month in which they are incurred, with the balance to be paid in the following month.

Prepare a schedule indicating cash payments for selling and administrative expenses for June, July, and August.

EX 6-21
Schedule of cash payments

obj. 5

✔ Total cash payments in September, $123,300

Rejuvenation Physical Therapy Inc. is planning its cash payments for operations for the third quarter (July–September), 2011. The Accrued Expenses Payable balance on July 1 is $24,000. The budgeted expenses for the next three months are as follows:

	July	August	September
Salaries	$ 58,200	$ 63,500	$ 74,500
Utilities	5,300	5,600	7,100
Other operating expenses	48,500	52,700	58,200
Total	$112,000	$121,800	$139,800

Other operating expenses include $10,500 of monthly depreciation expense and $600 of monthly insurance expense that was prepaid for the year on March 1 of the current year. Of the remaining expenses, 70% are paid in the month in which they are incurred, with the remainder paid in the following month. The Accrued Expenses Payable balance on July 1 relates to the expenses incurred in June.

Prepare a schedule of cash payments for operations for July, August, and September.

EX 6-22
Capital expenditures budget

obj. 5

✔ Total capital expenditures in 2010, $7,000,000

On January 1, 2010, the controller of Gardeneer Tools Inc. is planning capital expenditures for the years 2010–2013. The following interviews helped the controller collect the necessary information for the capital expenditures budget:

Director of Facilities: A construction contract was signed in late 2009 for the construction of a new factory building at a contract cost of $13,000,000. The construction is scheduled to begin in 2010 and be completed in 2011.

Vice President of Manufacturing: Once the new factory building is finished, we plan to purchase $1.7 million in equipment in late 2011. I expect that an additional $200,000 will be needed early in the following year (2012) to test and install the equipment before we can begin production. If sales continue to grow, I expect we'll need to invest another million in equipment in 2013.

Vice President of Marketing: We have really been growing lately. I wouldn't be surprised if we need to expand the size of our new factory building in 2013 by at least 40%. Fortunately, we expect inflation to have minimal impact on construction costs over the next four years. Additionally, I would expect the cost of the expansion to be proportional to the size of the expansion.

Director of Information Systems: We need to upgrade our information systems to wireless network technology. It doesn't make sense to do this until after the new factory building is completed and producing product. During 2012, once the factory is up and running, we should equip the whole facility with wireless technology. I think it would cost us $1,600,000 today to install the technology. However, prices have been dropping by 25% per year, so it should be less expensive at a later date.

President: I am excited about our long-term prospects. My only short-term concern is financing the $7,000,000 of construction costs on the portion of the new factory building scheduled to be completed in 2010.

Use the interview information above to prepare a capital expenditures budget for Gardeneer Tools Inc. for the years 2010–2013.

Problems Series A

PR 6-1A
Forecast sales volume and sales budget

obj. 4

✔ 3. Total revenue from sales, $34,374,630

Guardian Devices Inc. prepared the following sales budget for the current year:

Guardian Devices Inc.
Sales Budget
For the Year Ending December 31, 2010

Product and Area	Unit Sales Volume	Unit Selling Price	Total Sales
Home Alert System:			
United States	24,300	$250	$ 6,075,000
Europe	6,700	250	1,675,000
Asia	5,900	250	1,475,000
Total	36,900		$ 9,225,000
Business Alert System:			
United States	14,900	$900	$13,410,000
Europe	6,400	900	5,760,000
Asia	4,200	900	3,780,000
Total	25,500		$22,950,000
Total revenue from sales			$32,175,000

At the end of December 2010, the following unit sales data were reported for the year:

	Unit Sales	
	Home Alert System	Business Alert System
United States	25,272	15,645
Europe	6,834	6,336
Asia	5,723	4,326

For the year ending December 31, 2011, unit sales are expected to follow the patterns established during the year ending December 31, 2010. The unit selling price for the Home Alert System is expected to increase to $270, and the unit selling price for the Business Alert System is expected to be decreased to $880, effective January 1, 2011.

Instructions

1. Compute the increase or decrease of actual unit sales for the year ended December 31, 2010, over budget. Place your answers in a columnar table with the following format:

	Unit Sales, Year Ended 2010		Increase (Decrease) Actual Over Budget	
	Budget	Actual Sales	Amount	Percent
Home Alert System:				
United States				
Europe				
Asia				
Business Alert System:				
United States				
Europe				
Asia				

2. Assuming that the trend of sales indicated in part (1) is to continue in 2011, compute the unit sales volume to be used for preparing the sales budget for the year ending December 31, 2011. Place your answers in a columnar table similar to that in part (1) above but with the following column heads. Round budgeted units to the nearest unit.

2010 Actual Units	Percentage Increase (Decrease)	2011 Budgeted Units (rounded)

3. Prepare a sales budget for the year ending December 31, 2011.

PR 6-2A
Sales, production, direct materials purchases, and direct labor cost budgets

obj. 4

✔ 3. Total direct materials purchases, $7,721,394

The budget director of Regal Furniture Company requests estimates of sales, production, and other operating data from the various administrative units every month. Selected information concerning sales and production for August 2010 is summarized as follows:

a. Estimated sales of King and Prince chairs for August by sales territory:

Northern Domestic:	
King	5,500 units at $750 per unit
Prince	6,900 units at $520 per unit
Southern Domestic:	
King	3,200 units at $690 per unit
Prince	4,000 units at $580 per unit
International:	
King	1,450 units at $780 per unit
Prince	900 units at $600 per unit

b. Estimated inventories at August 1:

Direct materials:		Finished products:	
Fabric	4,500 sq. yds.	King	950 units
Wood	6,000 lineal ft.	Prince	280 units
Filler	2,800 cu. ft.		
Springs	6,700 units		

c. Desired inventories at August 31:

Direct materials:		Finished products:	
Fabric	4,300 sq. yds.	King	800 units
Wood	6,200 lineal ft.	Prince	400 units
Filler	3,100 cu. ft.		
Springs	7,500 units		

d. Direct materials used in production:

In manufacture of King:	
Fabric	5.0 sq. yds. per unit of product
Wood	35 lineal ft. per unit of product
Filler	3.8 cu. ft. per unit of product
Springs	14 units per unit of product

In manufacture of Prince:

Fabric	3.5 sq. yds. per unit of product
Wood	25 lineal ft. per unit of product
Filler	3.2 cu. ft. per unit of product
Springs	10 units per unit of product

e. Anticipated purchase price for direct materials:

Fabric	$12.00 per sq. yd.	Filler	$3.50 per cu. ft.
Wood	8.00 per lineal ft.	Springs	4.50 per unit

f. Direct labor requirements:

King:	
Framing Department	2.5 hrs. at $12 per hr.
Cutting Department	1.5 hrs. at $11 per hr.
Upholstery Department	2.4 hrs. at $14 per hr.
Prince:	
Framing Department	1.8 hrs. at $12 per hr.
Cutting Department	0.5 hrs. at $11 per hr.
Upholstery Department	2.0 hrs. at $14 per hr.

Instructions

1. Prepare a sales budget for August.
2. Prepare a production budget for August.
3. Prepare a direct materials purchases budget for August.
4. Prepare a direct labor cost budget for August.

PR 6-3A
Budgeted income statement and supporting budgets

obj. 4

✔ 4. Total direct labor cost in Assembly Dept., $85,605

The budget director of Heads Up Athletic Co., with the assistance of the controller, treasurer, production manager, and sales manager, has gathered the following data for use in developing the budgeted income statement for January 2010:

a. Estimated sales for January:

Batting helmet	3,700 units at $70 per unit
Football helmet	7,200 units at $142 per unit

b. Estimated inventories at January 1:

Direct materials:		Finished products:	
Plastic	800 lbs.	Batting helmet	310 units at $33 per unit
Foam lining	520 lbs.	Football helmet	420 units at $57 per unit

c. Desired inventories at January 31:

Direct materials:		Finished products:	
Plastic	1,240 lbs.	Batting helmet	290 units at $34 per unit
Foam lining	450 lbs.	Football helmet	520 units at $58 per unit

d. Direct materials used in production:

In manufacture of batting helmet:	
Plastic	1.20 lbs. per unit of product
Foam lining	0.50 lb. per unit of product
In manufacture of football helmet:	
Plastic	2.80 lbs. per unit of product
Foam lining	1.40 lbs. per unit of product

e. Anticipated cost of purchases and beginning and ending inventory of direct materials:

Plastic	$7.50 per lb.
Foam lining	$5.00 per lb.

f. Direct labor requirements:

Batting helmet:	
Molding Department	0.20 hr. at $15 per hr.
Assembly Department	0.50 hr. at $13 per hr.
Football helmet:	
Molding Department	0.30 hr. at $15 per hr.
Assembly Department	0.65 hr. at $13 per hr.

g. Estimated factory overhead costs for January:

Indirect factory wages	$115,000	Power and light	$18,000
Depreciation of plant and equipment	32,000	Insurance and property tax	8,700

h. Estimated operating expenses for January:

Sales salaries expense	$275,300
Advertising expense	139,500
Office salaries expense	83,100
Depreciation expense—office equipment	5,800
Telephone expense—selling	3,200
Telephone expense—administrative	900
Travel expense—selling	46,200
Office supplies expense	4,900
Miscellaneous administrative expense	5,200

i. Estimated other income and expense for January:

Interest revenue	$14,500
Interest expense	17,400

j. Estimated tax rate: 30%

Instructions

1. Prepare a sales budget for January.
2. Prepare a production budget for January.
3. Prepare a direct materials purchases budget for January.
4. Prepare a direct labor cost budget for January.
5. Prepare a factory overhead cost budget for January.
6. Prepare a cost of goods sold budget for January. Work in process at the beginning of January is estimated to be $12,500, and work in process at the end of January is desired to be $13,500.
7. Prepare a selling and administrative expenses budget for January.
8. Prepare a budgeted income statement for January.

PR 6-4A
Cash budget

obj. 5

✔ 1. August deficiency, $21,100

The controller of Dash Shoes Inc. instructs you to prepare a monthly cash budget for the next three months. You are presented with the following budget information:

	June	July	August
Sales	$120,000	$150,000	$200,000
Manufacturing costs	50,000	65,000	72,000
Selling and administrative expenses	35,000	40,000	45,000
Capital expenditures	—	—	48,000

The company expects to sell about 10% of its merchandise for cash. Of sales on account, 60% are expected to be collected in full in the month following the sale and the remainder the following month. Depreciation, insurance, and property tax expense represent $8,000 of the estimated monthly manufacturing costs. The annual insurance premium is paid in February, and the annual property taxes are paid in November. Of the remainder of the manufacturing costs, 80% are expected to be paid in the month in which they are incurred and the balance in the following month.

Current assets as of June 1 include cash of $45,000, marketable securities of $65,000, and accounts receivable of $143,400 ($105,000 from May sales and $38,400 from April sales). Sales on account in April and May were $96,000 and $105,000, respectively. Current liabilities as of June 1 include a $60,000, 12%, 90-day note payable due August 20 and $8,000 of accounts payable incurred in May for manufacturing costs. All selling and administrative expenses are paid in cash in the period they are incurred. It is expected that $3,500 in dividends will be received in June. An estimated income tax payment of $18,000 will be made in July. Dash Shoes' regular quarterly dividend of $8,000 is expected to be declared in July and paid in August. Management desires to maintain a minimum cash balance of $35,000.

Instructions

1. Prepare a monthly cash budget and supporting schedules for June, July, and August 2010.
2. On the basis of the cash budget prepared in part (1), what recommendation should be made to the controller?

PR 6-5A
Budgeted income statement and balance sheet

objs. 4, 5

✔ 1. Budgeted net income, $613,700

As a preliminary to requesting budget estimates of sales, costs, and expenses for the fiscal year beginning January 1, 2011, the following tentative trial balance as of December 31, 2010, is prepared by the Accounting Department of Webster Publishing Co.:

Cash	$ 118,600	
Accounts Receivable	232,400	
Finished Goods	148,900	
Work in Process	32,700	
Materials	52,500	
Prepaid Expenses	4,000	
Plant and Equipment	580,000	
Accumulated Depreciation—Plant and Equipment		$ 251,000
Accounts Payable		182,500
Common Stock, $15 par		450,000
Retained Earnings		285,600
	$1,169,100	$1,169,100

Factory output and sales for 2011 are expected to total 32,000 units of product, which are to be sold at $100 per unit. The quantities and costs of the inventories at December 31, 2011, are expected to remain unchanged from the balances at the beginning of the year.

Budget estimates of manufacturing costs and operating expenses for the year are summarized as follows:

	Estimated Costs and Expenses	
	Fixed (Total for Year)	Variable (Per Unit Sold)
Cost of goods manufactured and sold:		
Direct materials	—	$25.00
Direct labor	—	7.80
Factory overhead:		
Depreciation of plant and equipment	$ 32,000	—
Other factory overhead	10,000	4.50
Selling expenses:		
Sales salaries and commissions	115,000	12.80
Advertising	112,400	—
Miscellaneous selling expense	8,400	2.00
Administrative expenses:		
Office and officers salaries	75,400	6.25
Supplies	3,900	1.00
Miscellaneous administrative expense	2,000	1.50

Balances of accounts receivable, prepaid expenses, and accounts payable at the end of the year are not expected to differ significantly from the beginning balances. Federal income tax of $280,000 on 2011 taxable income will be paid during 2011. Regular quarterly cash dividends of $1.50 a share are expected to be declared and paid in March, June, September, and December on 30,000 shares of common stock outstanding. It is anticipated that fixed assets will be purchased for $170,000 cash in May.

Instructions

1. Prepare a budgeted income statement for 2011.
2. Prepare a budgeted balance sheet as of December 31, 2011, with supporting calculations.

Problems Series B

PR 6-1B
Forecast sales volume and sales budget

obj. 4

✔ 3. Total revenue from sales, $2,447,424

Van Gogh Frame Company prepared the following sales budget for the current year:

Van Gogh Frame Company
Sales Budget
For the Year Ending December 31, 2010

Product and Area	Unit Sales Volume	Unit Selling Price	Total Sales
8" × 10" Frame:			
East	28,000	$15.00	$ 420,000
Central	24,000	15.00	360,000
West	32,500	15.00	487,500
Total	84,500		$1,267,500
12" × 16" Frame:			
East	15,000	$25.00	$ 375,000
Central	9,500	25.00	237,500
West	14,000	25.00	350,000
Total	38,500		$ 962,500
Total revenue from sales			$2,230,000

At the end of December 2010, the following unit sales data were reported for the year:

	Unit Sales	
	8" × 10" Frame	12" × 16" Frame
East	29,680	15,300
Central	23,040	9,405
West	33,150	14,700

For the year ending December 31, 2011, unit sales are expected to follow the patterns established during the year ending December 31, 2010. The unit selling price for the 8" × 10" frame is expected to increase to $16, and the unit selling price for the 12" × 16" frame is expected to increase to $26, effective January 1, 2011.

Instructions

1. Compute the increase or decrease of actual unit sales for the year ended December 31, 2010, over budget. Place your answers in a columnar table with the following format:

	Unit Sales, Year Ended 2010		Increase (Decrease) Actual Over Budget	
	Budget	Actual Sales	Amount	Percent
8" × 10" Frame:				
East				
Central				
West				
12" × 16" Frame:				
East				
Central				
West				

2. Assuming that the trend of sales indicated in part (1) is to continue in 2011, compute the unit sales volume to be used for preparing the sales budget for the year ending December 31, 2011. Place your answers in a columnar table similar to that in part (1) above but with the following column heads. Round budgeted units to the nearest unit.

2010 Actual Units	Percentage Increase (Decrease)	2011 Budgeted Units (rounded)

3. Prepare a sales budget for the year ending December 31, 2011.

PR 6-2B
Sales, production, direct materials purchases, and direct labor cost budgets

obj. 4

✔ 3. Total direct materials purchases, $10,383,800

The budget director of Outdoor Gourmet Grill Company requests estimates of sales, production, and other operating data from the various administrative units every month. Selected information concerning sales and production for July 2010 is summarized as follows:

a. Estimated sales for July by sales territory:

Maine:	
Backyard Chef	5,000 units at $750 per unit
Master Chef	1,800 units at $1,500 per unit
Vermont:	
Backyard Chef	4,200 units at $800 per unit
Master Chef	1,600 units at $1,600 per unit
New Hampshire:	
Backyard Chef	4,600 units at $850 per unit
Master Chef	1,900 units at $1,700 per unit

b. Estimated inventories at July 1:

Direct materials:		Finished products:	
Grates	1,000 units	Backyard Chef	1,400 units
Stainless steel	1,800 lbs.	Master Chef	600 units
Burner subassemblies	500 units		
Shelves	300 units		

c. Desired inventories at July 31:

Direct materials:		Finished products:	
Grates	800 units	Backyard Chef	1,600 units
Stainless steel	2,100 lbs.	Master Chef	500 units
Burner subassemblies	550 units		
Shelves	350 units		

d. Direct materials used in production:

In manufacture of Backyard Chef:	
Grates	3 units per unit of product
Stainless steel	20 lbs. per unit of product
Burner subassemblies	2 units per unit of product
Shelves	5 units per unit of product
In manufacture of Master Chef:	
Grates	6 units per unit of product
Stainless steel	45 lbs. per unit of product
Burner subassemblies	4 units per unit of product
Shelves	6 units per unit of product

e. Anticipated purchase price for direct materials:

Grates	$20 per unit	Burner subassemblies	$105 per unit
Stainless steel	$6 per lb.	Shelves	$7 per unit

f. Direct labor requirements:

Backyard Chef:	
Stamping Department	0.60 hr. at $18 per hr.
Forming Department	0.80 hr. at $14 per hr.
Assembly Department	1.50 hr. at $12 per hr.
Master Chef:	
Stamping Department	0.80 hr. at $18 per hr.
Forming Department	1.50 hr. at $14 per hr.
Assembly Department	2.50 hr. at $12 per hr.

Instructions

1. Prepare a sales budget for July.
2. Prepare a production budget for July.
3. Prepare a direct materials purchases budget for July.
4. Prepare a direct labor cost budget for July.

PR 6-3B
Budgeted income statement and supporting budgets

obj. 4

✔ 4. Total direct labor cost in Fabrication Dept., $226,200

The budget director of Feathered Friends Inc., with the assistance of the controller, treasurer, production manager, and sales manager, has gathered the following data for use in developing the budgeted income statement for December 2010:

a. Estimated sales for December:

Bird House	32,500 units at $50 per unit
Bird Feeder	21,300 units at $85 per unit

b. Estimated inventories at December 1:

Direct materials:		Finished products:	
Wood	2,400 ft.	Bird House	3,100 units at $26 per unit
Plastic	3,600 lbs.	Bird Feeder	1,900 units at $40 per unit

c. Desired inventories at December 31:

Direct materials:		Finished products:	
Wood	2,900 ft.	Bird House	3,600 units at $27 per unit
Plastic	3,400 lbs.	Bird Feeder	1,800 units at $41 per unit

d. Direct materials used in production:

In manufacture of Bird House:		In manufacture of Bird Feeder:	
Wood	0.80 ft. per unit of product	Wood	1.20 ft. per unit of product
Plastic	0.50 lb. per unit of product	Plastic	0.75 lb. per unit of product

e. Anticipated cost of purchases and beginning and ending inventory of direct materials:

Wood	$6.00 per ft.	Plastic	$0.80 per lb.

f. Direct labor requirements:

Bird House:	
Fabrication Department	0.20 hr. at $15 per hr.
Assembly Department	0.30 hr. at $11 per hr.
Bird Feeder:	
Fabrication Department	0.40 hr. at $15 per hr.
Assembly Department	0.35 hr. at $11 per hr.

g. Estimated factory overhead costs for December:

Indirect factory wages	$750,000	Power and light	$47,000
Depreciation of plant and equipment	185,000	Insurance and property tax	15,400

h. Estimated operating expenses for December:

Sales salaries expense	$645,000
Advertising expense	149,700
Office salaries expense	211,100
Depreciation expense—office equipment	5,200
Telephone expense—selling	4,800
Telephone expense—administrative	1,500
Travel expense—selling	41,200
Office supplies expense	3,500
Miscellaneous administrative expense	5,000

i. Estimated other income and expense for December:

Interest revenue	$16,900
Interest expense	11,600

j. Estimated tax rate: 35%

Instructions

1. Prepare a sales budget for December.
2. Prepare a production budget for December.
3. Prepare a direct materials purchases budget for December.
4. Prepare a direct labor cost budget for December.
5. Prepare a factory overhead cost budget for December.
6. Prepare a cost of goods sold budget for December. Work in process at the beginning of December is estimated to be $27,000, and work in process at the end of December is estimated to be $32,400.

(*continued*)

7. Prepare a selling and administrative expenses budget for December.
8. Prepare a budgeted income statement for December.

PR 6-4B
Cash budget

obj. 5

✔ 1. May deficiency, $30,340

The controller of Sedona Housewares Inc. instructs you to prepare a monthly cash budget for the next three months. You are presented with the following budget information:

	March	April	May
Sales	$650,000	$732,000	$850,000
Manufacturing costs	350,000	370,000	430,000
Selling and administrative expenses	175,000	225,000	245,000
Capital expenditures			160,000

The company expects to sell about 10% of its merchandise for cash. Of sales on account, 70% are expected to be collected in full in the month following the sale and the remainder the following month. Depreciation, insurance, and property tax expense represent $25,000 of the estimated monthly manufacturing costs. The annual insurance premium is paid in July, and the annual property taxes are paid in November. Of the remainder of the manufacturing costs, 80% are expected to be paid in the month in which they are incurred and the balance in the following month.

Current assets as of March 1 include cash of $30,000, marketable securities of $105,000, and accounts receivable of $750,000 ($600,000 from February sales and $150,000 from January sales). Sales on account for January and February were $500,000 and $600,000, respectively. Current liabilities as of March 1 include a $120,000, 15%, 90-day note payable due May 20 and $60,000 of accounts payable incurred in February for manufacturing costs. All selling and administrative expenses are paid in cash in the period they are incurred. It is expected that $1,800 in dividends will be received in March. An estimated income tax payment of $46,000 will be made in April. Sedona's regular quarterly dividend of $12,000 is expected to be declared in April and paid in May. Management desires to maintain a minimum cash balance of $40,000.

Instructions

1. Prepare a monthly cash budget and supporting schedules for March, April, and May.
2. On the basis of the cash budget prepared in part (1), what recommendation should be made to the controller?

PR 6-5B
Budgeted income statement and balance sheet

objs. 4, 5

✔ 1. Budgeted net income, $222,050

As a preliminary to requesting budget estimates of sales, costs, and expenses for the fiscal year beginning January 1, 2011, the following tentative trial balance as of December 31, 2010, is prepared by the Accounting Department of Spring Garden Soap Co.:

Cash	$100,000	
Accounts Receivable	112,300	
Finished Goods	76,700	
Work in Process	24,300	
Materials	54,100	
Prepaid Expenses	3,400	
Plant and Equipment	375,000	
Accumulated Depreciation—Plant and Equipment		$140,400
Accounts Payable		59,000
Common Stock, $10 par		190,000
Retained Earnings		356,400
	$745,800	$745,800

Factory output and sales for 2011 are expected to total 225,000 units of product, which are to be sold at $5.20 per unit. The quantities and costs of the inventories at December 31, 2011, are expected to remain unchanged from the balances at the beginning of the year.

Budget estimates of manufacturing costs and operating expenses for the year are summarized as follows:

	Estimated Costs and Expenses	
	Fixed (Total for Year)	Variable (Per Unit Sold)
Cost of goods manufactured and sold:		
Direct materials	—	$0.90
Direct labor	—	0.55
Factory overhead:		
Depreciation of plant and equipment	$48,000	—
Other factory overhead	8,000	0.35
Selling expenses:		
Sales salaries and commissions	42,000	0.40
Advertising	60,000	—
Miscellaneous selling expense	5,000	0.20
Administrative expenses:		
Office and officers salaries	69,200	0.15
Supplies	4,000	0.08
Miscellaneous administrative expense	3,000	0.12

Balances of accounts receivable, prepaid expenses, and accounts payable at the end of the year are not expected to differ significantly from the beginning balances. Federal income tax of $90,000 on 2011 taxable income will be paid during 2011. Regular quarterly cash dividends of $1.00 a share are expected to be declared and paid in March, June, September, and December on 19,000 shares of common stock outstanding. It is anticipated that fixed assets will be purchased for $75,000 cash in May.

Instructions

1. Prepare a budgeted income statement for 2011.
2. Prepare a budgeted balance sheet as of December 31, 2011, with supporting calculations.

Special Activities

SA 6-1
Ethics and professional conduct in business

The director of marketing for Eclipse Computer Co., Lori Keller, had the following discussion with the company controller, Deon Johnson, on July 26 of the current year:

Lori: Deon, it looks like I'm going to spend much less than indicated on my July budget.

Deon: I'm glad to hear it.

Lori: Well, I'm not so sure it's good news. I'm concerned that the president will see that I'm under budget and reduce my budget in the future. The only reason that I look good is that we've delayed an advertising campaign. Once the campaign hits in September, I'm sure my actual expenditures will go up. You see, we are also having our sales convention in September. Having the advertising campaign and the convention at the same time is going to kill my September numbers.

Deon: I don't think that's anything to worry about. We all expect some variation in actual spending month to month. What's really important is staying within the budgeted targets for the year. Does that look as if it's going to be a problem?

Lori: I don't think so, but just the same, I'd like to be on the safe side.

Deon: What do you mean?

Lori: Well, this is what I'd like to do. I want to pay the convention-related costs in advance this month. I'll pay the hotel for room and convention space and purchase the airline tickets in advance. In this way, I can charge all these expenditures to July's budget. This would cause my actual expenses to come close to budget for July. Moreover, when the big advertising campaign hits in September, I won't have to worry about expenditures for the convention on my September budget as well. The convention costs will already be paid. Thus, my September expenses should be pretty close to budget.

Deon: I can't tell you when to make your convention purchases, but I'm not too sure that it should be expensed on July's budget.

Lori: What's the problem? It looks like "no harm, no foul" to me. I can't see that there's anything wrong with this—it's just smart management.

How should Deon Johnson respond to Lori Keller's request to expense the advanced payments for convention-related costs against July's budget?

SA 6-2
Evaluating budgeting systems

Children's Hospital of the King's Daughters Health System in Norfolk, Virginia, introduced a new budgeting method that allowed the hospital's annual plan to be updated for changes in operating plans. For example, if the budget was based on 400 patient-days (number of patients × number of days in the hospital) and the actual count rose to 450 patient-days, the variable costs of staffing, lab work, and medication costs could be adjusted to reflect this change. The budget manager stated, "I work with hospital directors to turn data into meaningful information and effect change before the month ends."

a. What budgeting methods are being used under the new approach?
b. Why are these methods superior to the former approaches?

SA 6-3
Service company static decision making

A bank manager of First Union Bank Inc. uses the managerial accounting system to track the costs of operating the various departments within the bank. The departments include Cash Management, Trust, Commercial Loans, Mortgage Loans, Operations, Credit Card, and Branch Services. The budget and actual results for the Operations Department are as follows:

Resources	Budget	Actual
Salaries	$200,000	$200,000
Benefits	30,000	30,000
Supplies	45,000	42,000
Travel	20,000	30,000
Training	25,000	35,000
Overtime	25,000	20,000
Total	$345,000	$357,000
Excess of actual over budget	$ 12,000	

a. What information is provided by the budget? Specifically, what questions can the bank manager ask of the Operations Department manager?
b. What information does the budget fail to provide? Specifically, could the budget information be presented differently to provide even more insight for the bank manager?

SA 6-4
Objectives of the master budget

Domino's Pizza L.L.C. operates pizza delivery and carryout restaurants. The annual report describes its business as follows:

We offer a focused menu of high-quality, value-priced pizza with three types of crust (Hand-Tossed, Thin Crust, and Deep Dish), along with buffalo wings, bread sticks, cheesy bread, CinnaStix®, and Coca-Cola® products. Our hand-tossed pizza is made from fresh dough produced in our regional distribution centers. We prepare every pizza using real cheese, pizza sauce made from fresh tomatoes, and a choice of high-quality meat and vegetable toppings in generous portions. Our focused menu and use of premium ingredients enable us to consistently and efficiently produce the highest-quality pizza.

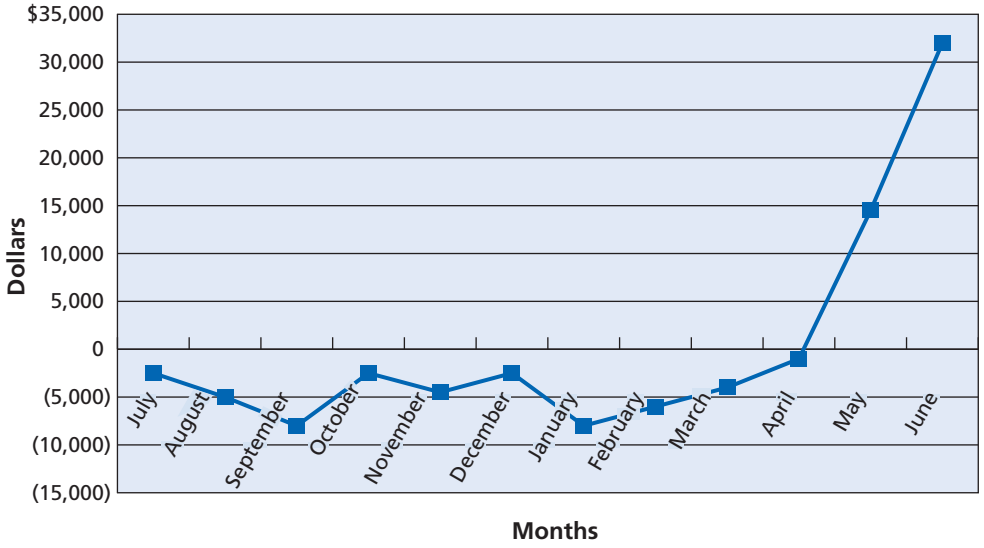
Over the 41 years since our founding, we have developed a simple, cost-efficient model. We offer a limited menu, our stores are designed for delivery and carry-out, and we do not generally offer dine-in service. As a result, our stores require relatively small, lower-rent locations and limited capital expenditures.

How would a master budget support planning, directing, and control for Domino's?

SA 6-5
Integrity and evaluating budgeting systems

The city of Western Heights has an annual budget cycle that begins on July 1 and ends on June 30. At the beginning of each budget year, an annual budget is established for each department. The annual budget is divided by 12 months to provide a constant monthly static budget. On June 30, all unspent budgeted monies for the budget year from the various city departments must be "returned" to the general fund. Thus, if department heads fail to use their budget by year-end, they will lose it. A budget

analyst prepared a chart of the difference between the monthly actual and budgeted amounts for the recent fiscal year. The chart was as follows:



a. Interpret the chart.
b. Suggest an improvement in the budget system.

SA 6-6
Budget for a state government

Group Project
Internet Project

In a group, find the home page of the state in which you presently live. The home page will be of the form *statename.gov*. At the home page site, search for annual budget information.

1. What are the budgeted sources of revenue and their percentage breakdown?
2. What are the major categories of budgeted expenditures (or appropriations) and their percentage breakdown?
3. Is the projected budget in balance?

Answers to Self-Examination Questions

1. **B** Individuals can be discouraged with budgets that appear too tight or unobtainable. Flexible budgeting (answer C) provides a series of budgets for varying rates of activity and thereby builds into the budgeting system the effect of fluctuations in the level of activity. Budgetary slack (answer A) comes from a loose budget, not a tight budget. A "spend it or lose it" mentality (answer D) is often associated with loose budgets.
2. **A** The first step of the budget process is to develop a plan. Once plans are established, management may direct actions (answer B). The results of actions can be controlled (answer C) by comparing them to the plan. This feedback (answer D) can be used by management to change plans or redirect actions.
3. **B** Administrative departments (answer B), such as Purchasing or Human Resources, will often use static budgeting. Production departments (answer A) frequently use flexible budgets. Responsibility centers (answer C) can use either static or flexible budgeting. Capital expenditures budgets are used to plan capital projects (answer D).
4. **B** The total production indicated in the production budget is 257,500 units (answer B), which is computed as follows:

Sales	250,000 units
Plus desired ending inventory	30,000 units
Total	280,000 units
Less estimated beginning inventory	22,500 units
Total production	257,500 units

5. **C** Dixon expects to collect 70% of April sales ($560,000) plus 30% of the March sales ($195,000) in April, for a total of $755,000 (answer C). Answer A is 100% of April sales. Answer B is 70% of April sales. Answer D adds 70% of both March and April sales.

CHAPTER 7

Performance Evaluation Using Variances from Standard Costs

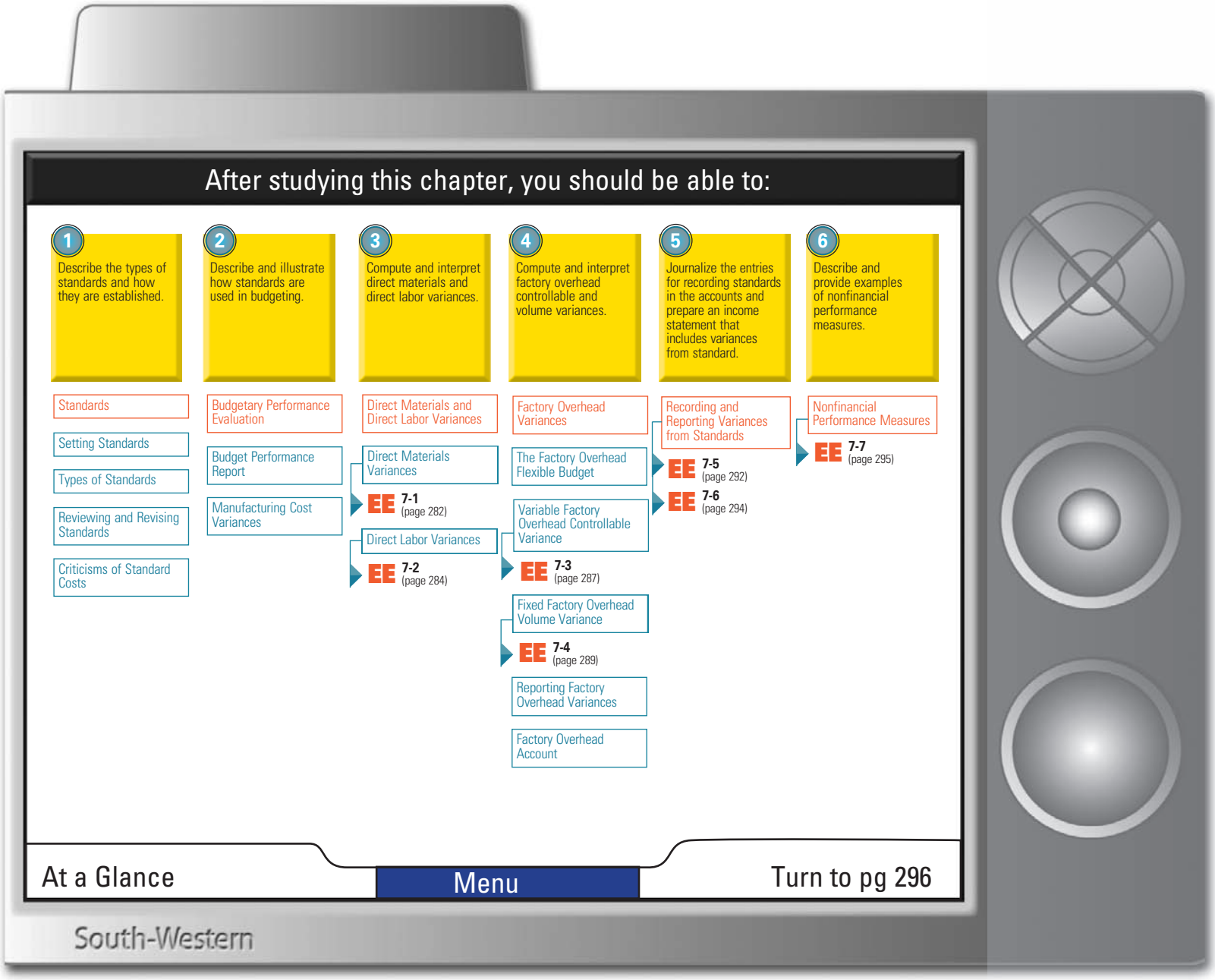
BMW GROUP—MINI COOPER

When you play a sport, you are evaluated with respect to how well you perform compared to a standard or to a competitor. In bowling, for example, your score is compared to a perfect score of 300 or to the scores of your competitors. In this class, you are compared to performance standards. These standards are often described in terms of letter grades, which provide a measure of how well you achieved the class objectives. On your job, you are also evaluated according to performance standards.

Just as your class performance is evaluated, managers are evaluated according to goals and plans. For example, BMW Group uses manufacturing standards at its automobile assembly plants to guide performance. The Mini Cooper, a BMW Group car, is manufactured in a modern facility in Oxford, England. There are a number of performance targets used in this plant. For example, the bodyshell is welded by over 250 robots so as to be two to three times stiffer than rival cars. In addition, the bodyshell dimensions are tested to the accuracy of the width of a human hair. Such performance standards are not surprising given the automotive racing background of John W. Cooper, the designer of the original Mini Cooper.

If you want to take an online tour of the Oxford plant to see how a Mini Cooper is manufactured, go to **http://www.mini.com/com/en/manufacturing.**

Performance is often measured as the difference between actual results and planned results. In this chapter, we will discuss and illustrate the ways in which business performance is evaluated.



1 Describe the types of standards and how they are established.

Standards

Standards are performance goals. Manufacturing companies normally use **standard cost** for each of the three following product costs:

1. Direct materials
2. Direct labor
3. Factory overhead

Accounting systems that use standards for product costs are called **standard cost systems**. Standard cost systems enable management to determine the following:

1. How much a product *should* cost (standard cost)
2. How much it does cost (actual cost)

Drivers for United Parcel Service (UPS) are expected to drive a standard distance per day. Salespersons for The Limited are expected to meet sales standards.

When actual costs are compared with standard costs, the exceptions or cost variances are reported. This reporting by the *principle of exceptions* allows management to focus on correcting the cost variances.

Standards may be integrated into computerized manufacturing operations so that variances are automatically detected and reported and operations are adjusted during manufacturing.

Setting Standards

The standard-setting process normally requires the joint efforts of accountants, engineers, and other management personnel. The accountant converts the results of judgments and process studies into dollars and cents. Engineers with the aid of operation managers identify the materials, labor, and machine requirements needed to produce the product. For example, engineers estimate direct materials by studying the product specifications and estimating normal spoilage. Time and motion studies may be used to determine the direct labor required for each manufacturing operation. Engineering studies may also be used to determine standards for factory overhead, such as the amount of power needed to operate machinery.

Setting standards often begins with analyzing past operations. However, caution must be used when relying on past cost data. For example, inefficiencies may be contained within past costs. In addition, changes in technology, machinery, or production methods may make past costs irrelevant for future operations.

Types of Standards

Standards imply an acceptable level of production efficiency. One of the major objectives in setting standards is to motivate employees to achieve efficient operations.

Kaizen costing uses ideal standards to motivate changes and improvement. *Kaizen* is a Japanese term meaning "continuous improvement."

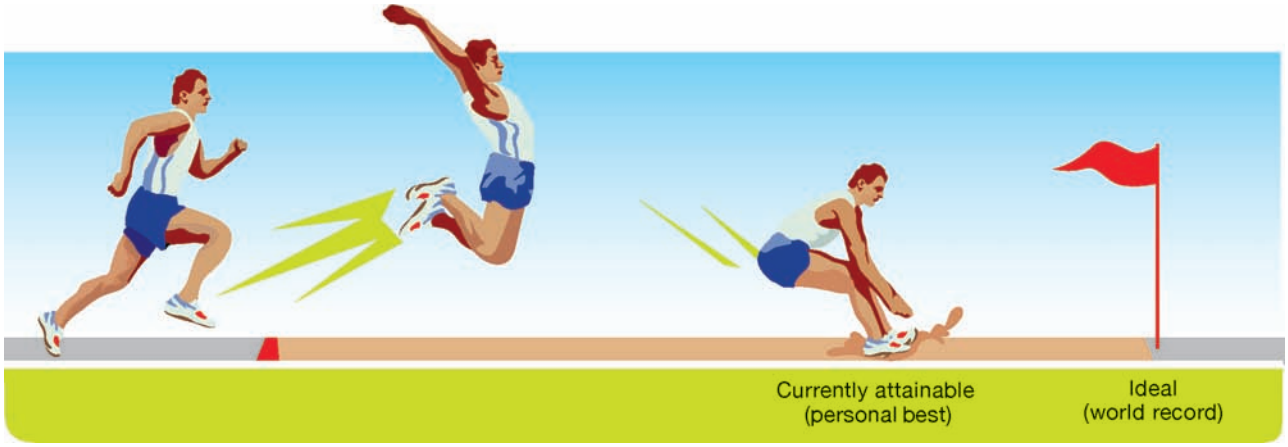
Tight, unrealistic standards may have a negative impact on performance. This is because employees may become frustrated with an inability to meet the standards and may give up trying to do their best. Standards that can be achieved only under perfect operating conditions, such as no idle time, no machine breakdowns, and no materials spoilage, are called **ideal standards** or *theoretical standards*.

Standards that are too loose might not motivate employees to perform at their best. This is because the standard level of performance can be reached too easily. As a result, operating performance may be lower than what could be achieved.

Currently attainable standards, sometimes called *normal standards*, are standards that can be attained with reasonable effort. Such standards, which are used by most companies, allow for normal production difficulties and mistakes. For example, currently attainable standards allow for normal materials spoilage and machine breakdowns. When reasonable standards are used, employees focus more on cost and are more likely to put forth their best efforts.

An example from the game of golf illustrates the distinction between ideal and normal standards. In golf, "par" is an ideal standard for most players. Each player's USGA (United States Golf Association) handicap is the player's normal standard. The motivation of average players is to beat their handicaps because beating par is unrealistic for most players.

The difference between currently attainable and ideal standards is illustrated below.



Aluminum beverage cans were redesigned to taper slightly at the top of the can, which reduces the amount of aluminum required per can. As a result, beverage can manufacturers reduced the standard amount of aluminum per can.

Reviewing and Revising Standards

Standard costs should be periodically reviewed to ensure that they reflect current operating conditions. Standards should not be revised, however, just because they differ from actual costs. For example, the direct labor standard would not be revised just because employees are unable to meet properly set standards. On the other hand, standards should be revised when prices, product designs, labor rates, or manufacturing methods change.

Criticisms of Standard Costs

Some criticisms of using standard costs for performance evaluation include the following:

1. Standards limit operating improvements by discouraging improvement beyond the standard.
2. Standards are too difficult to maintain in a dynamic manufacturing environment, resulting in "stale standards."
3. Standards can cause employees to lose sight of the larger objectives of the organization by focusing only on efficiency improvement.
4. Standards can cause employees to unduly focus on their own operations to the possible harm of other operations that rely on them.

Regardless of these criticisms, standards are widely used. In addition, standard costs are only one part of the performance evaluation system used by most companies. As discussed in this chapter, other nonfinancial performance measures are often used to supplement standard costs, with the result that many of the preceding criticisms are overcome.

Business Connection

MAKING THE GRADE IN THE REAL WORLD—THE 360-DEGREE REVIEW

When you leave school and take your first job, you will likely be subject to an employee evaluation and feedback. These reviews provide feedback on performance that is often very detailed, providing insights to strengths and weaknesses that often go beyond mere grades.

One feedback trend is the 360-degree review. As stated by the human resources consulting firm Towers Perrin, the 360-degree review "is a huge wave that's just hitting—not only here, but all over the world." In a 360-degree review, six to twelve evaluators who encircle an employee's sphere of influence, such as superiors, peers, and subordinates, are selected to fill out anonymous questionnaires. These questionnaires rate the employee on various criteria including the ability to work in groups, form a consensus, make timely decisions, motivate employees, and achieve objectives. The results are summarized and used to identify and strengthen weaknesses.

For example, one individual at Intel Corporation was very vocal during team meetings. In the 360-degree review, the manager thought this behavior was "refreshing." However, the employee's peers thought the vocal behavior monopolized conversations. Thus, what the manager viewed as a positive, the peer group viewed as a negative. The 360-degree review provided valuable information to both the manager and the employee to adjust behavior. Without the 360-degree feedback, the manager might have been blind to the group's reaction to the vocal behavior and reinforced behavior that was actually harmful to the group.

Sources: Llana DeBare, "360-Degrees of Evaluation: More Companies Turning to Full-Circle Job Reviews," *San Francisco Chronicle*, May 5, 1997; Francie Dalton, "Using 360 Degree Feedback Mechanisms," *Occupational Health and Safety*, Vol. 74, Issue 7, 2005.

Integrity, Objectivity, and Ethics in Business

COMPANY REPUTATION: THE BEST OF THE BEST

Harris Interactive annually ranks American corporations in terms of reputation. The ranking is based on how respondents rate corporations on 20 attributes in six major areas. The six areas are emotional appeal, products and services, financial performance, workplace environment, social responsibility, and vision and leadership. What are the five highest ranked companies in its 2006 survey? The five highest (best) ranked companies were Microsoft, Johnson & Johnson, 3M, Google, and The Coca-Cola Company.

Source: Harris Interactive, February 1, 2007.

2 Describe and illustrate how standards are used in budgeting.

Budgetary Performance Evaluation

As discussed in Chapter 6, the master budget assists a company in planning, directing, and controlling performance. The control function, or budgetary performance evaluation, compares the actual performance against the budget.

To illustrate, Western Rider Inc., a manufacturer of blue jeans, uses standard costs in its budgets. The standards for direct materials, direct labor, and factory overhead are separated into the following two components:

1. Standard price
2. Standard quantity

The standard cost per unit for direct materials, direct labor, and factory overhead is computed as follows:

$$\text{Standard Cost per Unit} = \text{Standard Price} \times \text{Standard Quantity}$$

Western Rider's standard costs per unit for its XL jeans are shown in Exhibit 1.

Exhibit 1

Standard Cost for XL Jeans

Manufacturing Costs	Standard Price	×	Standard Quantity per Pair	=	Standard Cost per Pair of XL Jeans
Direct materials	$5.00 per sq. yd.		1.5 sq. yds.		$ 7.50
Direct labor	$9.00 per hr.		0.80 hr. per pair		7.20
Factory overhead	$6.00 per hr.		0.80 hr. per pair		4.80
Total standard cost per pair					$19.50

As shown in Exhibit 1, the standard cost per pair of XL jeans is $19.50, which consists of $7.50 for direct materials, $7.20 for direct labor, and $4.80 for factory overhead.

The standard price and standard quantity are separated for each product cost. For example, Exhibit 1 indicates that for each pair of XL jeans, the standard price for direct materials is $5.00 per square yard and the standard quantity is 1.5 square yards. The standard price and quantity are separated because the department responsible for their control is normally different. For example, the direct materials price per square yard is controlled by the Purchasing Department, and the direct materials quantity per pair is controlled by the Production Department.

As illustrated in Chapter 6, the master budget is prepared based on planned sales and production. The budgeted costs for materials purchases, direct labor, and factory overhead are determined by multiplying their standard costs per unit by the planned level of production. Budgeted (standard) costs are then compared to actual costs during the year for control purposes.

Budget Performance Report

The report that summarizes actual costs, standard costs, and the differences for the units produced is called a **budget performance report**. To illustrate, assume that Western Rider produced the following pairs of jeans during June:

XL jeans produced and sold	5,000 pairs
Actual costs incurred in June:	
Direct materials	$ 40,150
Direct labor	38,500
Factory overhead	22,400
Total costs incurred	$101,050

Favorable cost variance:
Actual cost < Standard cost at actual volumes

Unfavorable cost variance:
Actual cost > Standard cost at actual volumes

Exhibit 2 illustrates the budget performance report for June for Western Rider Inc. The report summarizes the actual costs, standard costs, and the differences for each product cost. The differences between actual and standard costs are called **cost variances**. A **favorable cost variance** occurs when the actual cost is less than the standard cost. An **unfavorable cost variance** occurs when the actual cost exceeds the standard cost.

Exhibit 2

Budget Performance Report

Western Rider Inc.
Budget Performance Report
For the Month Ended June 30, 2010

Manufacturing Costs	Actual Costs	Standard Cost at Actual Volume (5,000 pairs of XL jeans)*	Cost Variance—(Favorable) Unfavorable
Direct materials	$ 40,150	$37,500	$2,650
Direct labor	38,500	36,000	2,500
Factory overhead	22,400	24,000	(1,600)
Total manufacturing costs	$101,050	$97,500	$3,550

*5,000 pairs × $7.50 per pair = $37,500
5,000 pairs × $7.20 per pair = $36,000
5,000 pairs × $4.80 per pair = $24,000

The budget performance report shown in Exhibit 2 is based on the actual units produced in June of 5,000 XL jeans. Even though 6,000 XL jeans might have been *planned* for production, the budget performance report is based on *actual* production.

Manufacturing Cost Variances

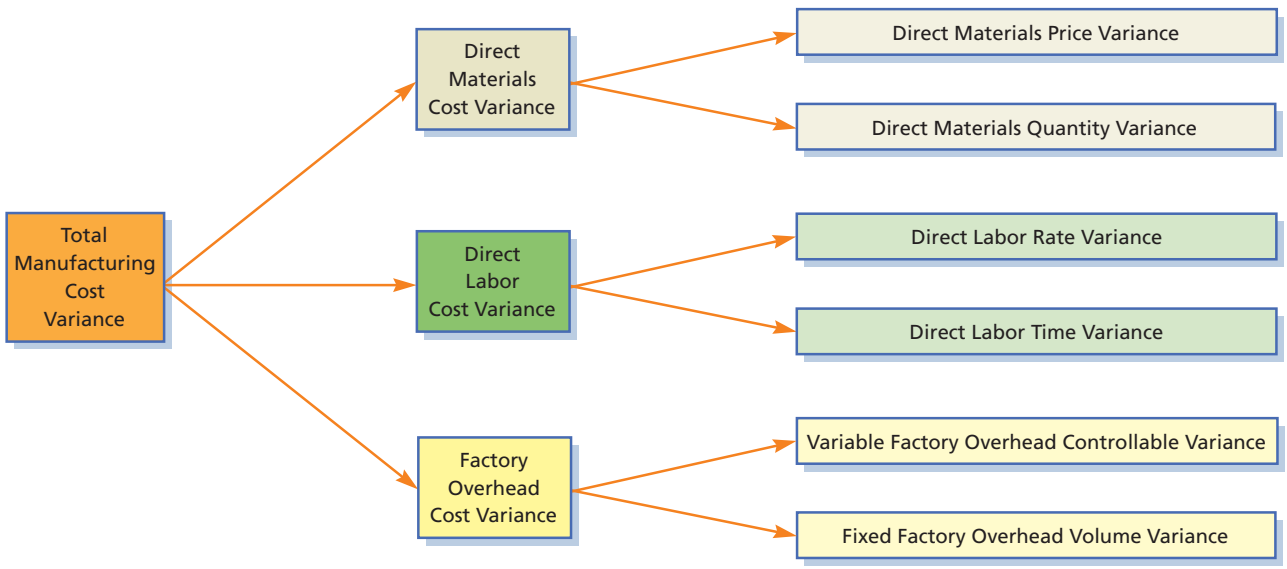
The **total manufacturing cost variance** is the difference between total standard costs and total actual cost for the units produced. As shown in Exhibit 2, the total manufacturing cost unfavorable variance and the variance for each product cost are as follows:

	Cost Variance (Favorable) Unfavorable
Direct materials	$ 2,650
Direct labor	2,500
Factory overhead	(1,600)
Total manufacturing variance	$ 3,550

For control purposes, each product cost variance is separated into two additional variances as shown in Exhibit 3.

Exhibit 3

Manufacturing Cost Variances



The total direct materials variance is separated into a *price* and *quantity* variance. This is because standard and actual direct materials costs are computed as follows:

Actual Direct Materials Cost	=	Actual Price	×	Actual Quantity
−Standard Direct Materials Cost	=	−Standard Price	×	−Standard Quantity
Direct Materials Cost Variance	=	Price Difference	×	Quantity Difference

Thus, the actual and standard direct materials costs may differ because of either a price difference (variance) or a quantity difference (variance).

Likewise, the total direct labor variance is separated into a *rate* and a *time* variance. This is because standard and actual direct labor costs are computed as follows:

Actual Direct Labor Cost	=	Actual Rate	×	Actual Time
−Standard Direct Labor Cost	=	−Standard Rate	×	−Standard Time
Direct Labor Cost Variance	=	Rate Difference	×	Time Difference

Therefore, the actual and standard direct labor costs may differ because of either a rate difference (variance) or a time difference (variance).

The total factory overhead variance is separated into a *controllable* and *volume* variance. Because factory overhead has fixed and variable cost elements, it is more complex to analyze than direct materials and direct labor, which are variable costs. The controllable variance is similar to a price or rate variance, and the volume variance is similar to the quantity or time variance.

In the next sections, the price and quantity variances for direct materials, the rate and time variances for direct labor, and the controllable and volume variances for factory overhead are further described and illustrated.

3 Compute and interpret direct materials and direct labor variances.

Direct Materials and Direct Labor Variances

As indicated in the prior section, the total direct materials and direct labor variances are separated into the following variances for analysis and control purposes:

Total Direct Materials Cost Variance → { Direct Materials Price Variance; Direct Materials Quantity Variance }

Total Direct Labor Cost Variance → { Direct Labor Rate Variance; Direct Labor Time Variance }

As a basis for illustration, the variances for Western Rider Inc.'s June operations shown in Exhibit 2 are used.

Direct Materials Variances

During June, Western Rider reported an unfavorable total direct materials cost variance of $2,650 for the production of 5,000 XL style jeans, as shown in Exhibit 2. This variance was based on the following actual and standard costs:

Actual costs	$40,150
Standard costs	37,500
Total direct materials cost variance	$ 2,650

The actual costs incurred of $40,150 consist of the following:

Actual Direct Materials Cost = Actual Price × Actual Quantity
Actual Direct Materials Cost = ($5.50 per sq. yd.) × (7,300 sq. yds.)
Actual Direct Materials Cost = $40,150

The standard costs of $37,500 consist of the following:

Standard Direct Materials Cost = Standard Price × Standard Quantity
Standard Direct Materials Cost = ($5.00 per sq. yd.) × (7,500 sq. yds.)
Standard Direct Materials Cost = $37,500

The standard price of $5.00 per square yard is taken from Exhibit 1. In addition, Exhibit 1 indicates that 1.5 square yards is the standard for producing one pair of XL jeans. Thus, 7,500 (5,000 × 1.5) square yards is the standard for producing 5,000 pairs of XL jeans.

Comparing the actual and standard cost computations shown above indicates that the total direct materials unfavorable cost variance of $2,650 is caused by the following:

1. A price per square yard of $0.50 ($5.50 − $5.00) more than standard
2. A quantity usage of 200 square yards (7,300 sq. yds. − 7,500 sq. yds.) less than standard

The impact of these differences from standard is reported and analyzed as a direct materials *price* variance and direct materials *quantity* variance.

Direct Materials Price Variance The **direct materials price variance** is computed as follows:

$$\text{Direct Materials Price Variance} = (\text{Actual Price} - \text{Standard Price}) \times \text{Actual Quantity}$$

If the actual price per unit exceeds the standard price per unit, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual price per unit is less than the standard price per unit, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

Most restaurants use standards to control the amount of food served to customers. For example, Darden Restaurants, Inc., the operator of the Red Lobster chain, establishes standards for the number of shrimp, scallops, or clams on a seafood plate.

To illustrate, the direct materials price variance for Western Rider Inc. is computed as follows:[1]

$$\text{Direct Materials Price Variance} = (\text{Actual Price} - \text{Standard Price}) \times \text{Actual Quantity}$$
$$\text{Direct Materials Price Variance} = (\$5.50 - \$5.00) \times 7{,}300 \text{ sq. yds.}$$
$$\text{Direct Materials Price Variance} = \$3{,}650 \text{ Unfavorable Variance}$$

As shown above, Western Rider has an unfavorable direct materials price variance of $3,650 for June.

Direct Materials Quantity Variance The **direct materials quantity variance** is computed as follows:

$$\text{Direct Materials Quantity Variance} = (\text{Actual Quantity} - \text{Standard Quantity}) \times \text{Standard Price}$$

If the actual quantity for the units produced exceeds the standard quantity, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual quantity for the units produced is less than the standard quantity, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct materials quantity variance for Western Rider Inc. is computed as follows:

$$\text{Direct Materials Quantity Variance} = (\text{Actual Quantity} - \text{Standard Quantity}) \times \text{Standard Price}$$
$$\text{Direct Materials Quantity Variance} = (7{,}300 \text{ sq. yds.} - 7{,}500 \text{ sq. yds.}) \times \$5.00$$
$$\text{Direct Materials Quantity Variance} = -\$1{,}000 \text{ Favorable Variance}$$

As shown above, Western Rider has a favorable direct materials quantity variance of $1,000 for June.

Direct Materials Variance Relationships The relationship among the *total* direct materials cost variance, the direct materials *price* variance, and the direct materials *quantity* variance is shown in Exhibit 4.

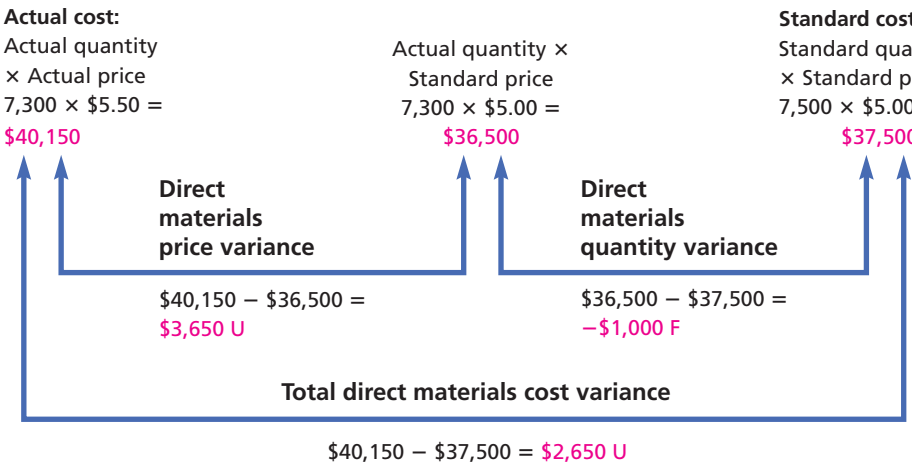
Reporting Direct Materials Variances The direct materials quantity variances should be reported to the manager responsible for the variance. For example, an unfavorable quantity variance might be caused by either of the following:

1. Equipment that has not been properly maintained
2. Low-quality (inferior) direct materials

1 To simplify, it is assumed that there is no change in the beginning and ending materials inventories. Thus, the amount of materials budgeted for production equals the amount purchased.

Exhibit 4

Direct Materials Variance Relationships



The price of a pound of copper has doubled since 2005.

In the first case, the operating department responsible for maintaining the equipment should be held responsible for the variance. In the second case, the Purchasing Department should be held responsible.

Not all variances are controllable. For example, an unfavorable materials price variance might be due to market-wide price increases. In this case, there is nothing the Purchasing Department might have done to avoid the unfavorable variance. On the other hand, if materials of the same quality could have been purchased from another supplier at the standard price, the variance was controllable.

Example Exercise 7-1 Direct Materials Variances 3

Tip Top Corp. produces a product that requires six standard pounds per unit. The standard price is $4.50 per pound. If 3,000 units required 18,500 pounds, which were purchased at $4.35 per pound, what is the direct materials (a) price variance, (b) quantity variance, and (c) cost variance?

Follow My Example 7-1

a. Direct materials price variance (favorable) −$2,775 [($4.35 − $4.50) × 18,500 pounds]
b. Direct materials quantity variance (unfavorable) $2,250 [(18,500 pounds − 18,000 pounds*) × $4.50]
c. Direct materials cost variance (favorable) −$525 [($2,775) + $2,250] or [($4.35 × 18,500 pounds − ($4.50 × 18,000 pounds)] = $80,475 − $81,000

*3,000 units × 6 pounds

For Practice: PE 7-1A, PE 7-1B

The Internal Revenue Service publishes a time standard for completing a tax return. The average 1040EZ return is expected to require 8.3 hours to prepare.

Direct Labor Variances

During June, Western Rider reported an unfavorable total direct labor cost variance of $2,500 for the production of 5,000 XL style jeans, as shown in Exhibit 2. This variance was based on the following actual and standard costs:

Actual costs	$38,500
Standard costs	36,000
Total direct labor cost variance	$ 2,500

The actual costs incurred of $38,500 consist of the following:

Actual Direct Labor Cost = Actual Rate per Hour × Actual Time
Actual Direct Labor Cost = ($10.00 per hr.) × (3,850 hrs.)
Actual Direct Labor Cost = $38,500

The standard costs of $36,000 consist of the following:

Standard Direct Labor Cost = Standard Rate per Hour × Standard Time
Standard Direct Labor Cost = ($9.00 per hr.) × (4,000 hrs.)
Standard Direct Labor Cost = $36,000

The standard rate of $9.00 per direct labor hour is taken from Exhibit 1. In addition, Exhibit 1 indicates that 0.80 hour is the standard time required for producing one pair of XL jeans. Thus, 4,000 (5,000 × 0.80) direct labor hours is the standard for producing 5,000 pairs of XL jeans.

Comparing the actual and standard cost computations shown above indicates that the total direct labor unfavorable cost variance of $2,500 is caused by the following:

1. A rate of $1.00 per hour ($10.00 − $9.00) more than standard
2. A quantity of 150 hours (4,000 hrs. − 3,850 hrs.) less than standard

The impact of these differences from standard is reported and analyzed as a direct labor *rate* variance and a direct labor *time* variance.

Direct Labor Rate Variance

The **direct labor rate variance** is computed as follows:

Direct Labor Rate Variance = (Actual Rate per Hour − Standard Rate per Hour) × Actual Hours

If the actual rate per hour exceeds the standard rate per hour, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual rate per hour is less than the standard rate per hour, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct labor rate variance for Western Rider Inc. is computed as follows:

Direct Labor Rate Variance = (Actual Rate per Hour − Standard Rate per Hour) × Actual Hours
Direct Labor Rate Variance = ($10.00 − $9.00) × 3,850 hours
Direct Labor Rate Variance = $3,850 Unfavorable Variance

As shown above, Western Rider has an unfavorable direct labor rate variance of $3,850 for June.

Direct Labor Time Variance

The **direct labor time variance** is computed as follows:

Direct Labor Time Variance = (Actual Direct Labor Hours − Standard Direct Labor Hours) × Standard Rate per Hour

If the actual direct labor hours for the units produced exceeds the standard direct labor hours, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual direct labor hours for the units produced is less than the standard direct labor hours, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct labor time variance for Western Rider Inc. is computed as follows:

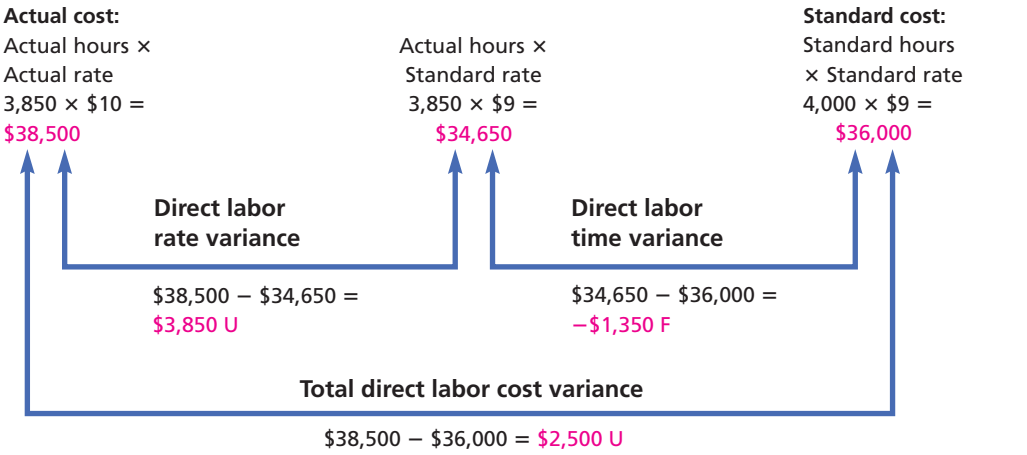
Direct Labor Time Variance = (Actual Direct Labor Hours − Standard Direct Labor Hours) × Standard Rate per Hour
Direct Labor Time Variance = (3,850 hours − 4,000 direct labor hours) × $9.00
Direct Labor Time Variance = − $1,350 Favorable Variance

As shown above, Western Rider has a favorable direct labor time variance of $1,350 for June.

Direct Labor Variance Relationships The relationship among the *total* direct labor cost variance, the direct labor *rate* variance, and the direct labor *time* variance is shown in Exhibit 5.

Exhibit 5

Direct Labor Variance Relationships



Reporting Direct Labor Variances Production supervisors are normally responsible for controlling direct labor cost. For example, an investigation could reveal the following causes for unfavorable rate and time variances:

1. An unfavorable rate variance may be caused by the improper scheduling and use of employees. In such cases, skilled, highly paid employees may be used in jobs that are normally performed by unskilled, lower-paid employees. In this case, the unfavorable rate variance should be reported to the managers who schedule work assignments.
2. An unfavorable time variance may be caused by a shortage of skilled employees. In such cases, there may be an abnormally high turnover rate among skilled employees. In this case, production supervisors with high turnover rates should be questioned as to why their employees are quitting.

Hospitals use time standards, termed *standard treatment protocols*, to evaluate the efficiency of performing hospital procedures.

Direct Labor Standards for Nonmanufacturing Activities Direct labor time standards can also be developed for use in administrative, selling, and service activities. This is most appropriate when the activity involves a repetitive task that produces a common output. In these cases, the use of standards is similar to that for a manufactured product.

To illustrate, standards could be developed for customer service personnel who process sales orders. A standard time for processing a sales order (the output) could be developed. The variance between the actual and the standard time could then be used to control sales order processing costs. Similar standards could be developed for computer help desk operators, nurses, and insurance application processors.

When labor-related activities are not repetitive, direct labor time standards are less commonly used. This often occurs when the time spent to perform the activity is not directly related to a unit of output. For example, the time spent by a senior executive or the work of a research and development scientist is not easily related to a measurable output. In these cases, the costs and expenses are normally controlled using static budgets.

Example Exercise 7-2 Direct Labor Variances 3

Tip Top Corp. produces a product that requires 2.5 standard hours per unit at a standard hourly rate of $12 per hour. If 3,000 units required 7,420 hours at an hourly rate of $12.30 per hour, what is the direct labor (a) rate variance, (b) time variance, and (c) cost variance?

(continued)

Follow My Example 7-2

a.	Direct labor rate variance (unfavorable)	$2,226 [($12.30 − $12.00) × 7,420 hours]
b.	Direct labor time variance (favorable)	−$960 [(7,420 hours − 7,500 hours*) × $12.00]
c.	Direct labor cost variance (unfavorable)	$1,266 [$2,226 + ($960)] or [($12.30 × 7,420 hours) − ($12.00 × 7,500 hours)] = $91,266 − $90,000

*3,000 units × 2.5 hours

For Practice: PE 7-2A, PE 7-2B

4 Compute and interpret factory overhead controllable and volume variances.

Factory Overhead Variances

Factory overhead costs are analyzed differently from direct labor and direct materials costs. This is because factory overhead costs have fixed and variable cost elements. For example, indirect materials and factory supplies normally behave as a variable cost as units produced changes. In contrast, straight-line plant depreciation on factory machinery is a fixed cost.

Factory overhead costs are budgeted and controlled by separating factory overhead into fixed and variable costs. Doing so allows the preparation of flexible budgets and analysis of factory overhead controllable and volume variances.

The Factory Overhead Flexible Budget

The preparation of a flexible budget was described and illustrated in Chapter 6. Exhibit 6 illustrates a flexible factory overhead budget for Western Rider Inc. for June 2010.

Exhibit 6

Factory Overhead Cost Budget Indicating Standard Factory Overhead Rate

	A	B	C	D	E
1	Western Rider Inc.				
2	Factory Overhead Cost Budget				
3	For the Month Ending June 30, 2010				
4	Percent of normal capacity	80%	90%	100%	110%
5	Units produced	5,000	5,625	6,250	6,875
6	Direct labor hours (0.80 hr. per unit)	4,000	4,500	5,000	5,500
7	Budgeted factory overhead:				
8	Variable costs:				
9	Indirect factory wages	$ 8,000	$ 9,000	$10,000	$11,000
10	Power and light	4,000	4,500	5,000	5,500
11	Indirect materials	2,400	2,700	3,000	3,300
12	Total variable cost	$14,400	$16,200	$18,000	$19,800
13	Fixed costs:				
14	Supervisory salaries	$ 5,500	$ 5,500	$ 5,500	$ 5,500
15	Depreciation of plant				
16	and equipment	4,500	4,500	4,500	4,500
17	Insurance and property taxes	2,000	2,000	2,000	2,000
18	Total fixed cost	$12,000	$12,000	$12,000	$12,000
19	Total factory overhead cost	$26,400	$28,200	$30,000	$31,800
20					
21	Factory overhead rate per direct labor hour, $30,000/5,000 hours = $6.00				
22					

Exhibit 6 indicates that the budgeted factory overhead rate for Western Rider is $6.00, as computed below.

$$\text{Factory Overhead Rate} = \frac{\text{Budgeted Factory Overhead at Normal Capacity}}{\text{Normal Productive Capacity}}$$

$$\text{Factory Overhead Rate} = \frac{\$30,000}{5,000 \text{ direct labor hrs.}} = \$6.00 \text{ per direct labor hr.}$$

The normal productive capacity is expressed in terms of an activity base such as direct labor hours, direct labor cost, or machine hours. For Western Rider, 100% of normal capacity is 5,000 direct labor hours. The budgeted factory overhead cost at 100% of normal capacity is $30,000, which consists of variable overhead of $18,000 and fixed overhead of $12,000.

For analysis purposes, the budgeted factory overhead rate is subdivided into a variable factory overhead rate and a fixed factory overhead rate. For Western Rider, the variable overhead rate is $3.60 per direct labor hour, and the fixed overhead rate is $2.40 per direct labor hour, as computed below.

$$\text{Variable Factory Overhead Rate} = \frac{\text{Budgeted Fixed Overhead at Normal Capacity}}{\text{Normal Productive Capacity}}$$

$$\text{Variable Factory Overhead Rate} = \frac{\$18{,}000}{5{,}000 \text{ direct labor hrs.}} = \$3.60 \text{ per direct labor hr.}$$

$$\text{Fixed Factory Overhead Rate} = \frac{\text{Budgeted Variable Overhead at Normal Capacity}}{\text{Normal Productive Capacity}}$$

$$\text{Fixed Factory Overhead Rate} = \frac{\$12{,}000}{5{,}000 \text{ direct labor hrs.}} = \$2.40 \text{ per direct labor hr.}$$

To summarize, the budgeted factory overhead rates for Western Rider Inc. are as follows:

Variable factory overhead rate	$3.60
Fixed factory overhead rate	2.40
Total factory overhead rate	$6.00

As mentioned earlier, factory overhead variances can be separated into a controllable variance and a volume variance as discussed in the next sections.

Variable Factory Overhead Controllable Variance

The variable factory overhead **controllable variance** is the difference between the actual variable overhead costs and the budgeted variable overhead for actual production. It is computed as shown below.

$$\text{Variable Factory Overhead Controllable Variance} = \text{Actual Variable Factory Overhead} - \text{Budgeted Variable Factory Overhead}$$

If the actual variable overhead is less than the budgeted variable overhead, the variance is favorable. If the actual variable overhead exceeds the budgeted variable overhead, the variance is unfavorable.

The **budgeted variable factory overhead** is the standard variable overhead for the *actual* units produced. It is computed as follows:

$$\text{Budgeted Variable Factory Overhead} = \text{Standard Hours for Actual Units Produced} \times \text{Variable Factory Overhead Rate}$$

To illustrate, the budgeted variable overhead for Western Rider for June is $14,400, as computed below.

$$\text{Budgeted Variable Factory Overhead} = \text{Standard Hours for Actual Units Produced} \times \text{Variable Factory Overhead Rate}$$
$$\text{Budgeted Variable Factory Overhead} = 4{,}000 \text{ direct labor hrs.} \times \$3.60$$
$$\text{Budgeted Variable Factory Overhead} = \$14{,}400$$

The preceding computation is based on the fact that Western Rider produced 5,000 XL jeans, which requires a standard of 4,000 (5,000 × 0.8 hr.) direct labor hours. The variable factory overhead rate of $3.60 was computed earlier. Thus, the budgeted variable factory overhead is $14,400 (4,000 direct labor hrs. × $3.60).

During June, assume that Western Rider incurred the following actual factory overhead costs:

	Actual Costs in June
Variable factory overhead	$10,400
Fixed factory overhead	12,000
Total actual factory overhead	$22,400

Based on the actual variable factory overhead incurred in June, the variable factory overhead controllable variance is a $4,000 favorable variance, as computed below.

$$\text{Variable Factory Overhead Controllable Variance} = \text{Actual Variable Factory Overhead} - \text{Budgeted Variable Factory Overhead}$$

$$\text{Variable Factory Overhead Controllable Variance} = \$10{,}400 - \$14{,}400$$

$$\text{Variable Factory Overhead Controllable Variance} = -\$4{,}000 \text{ Favorable Variance}$$

The variable factory overhead controllable variance indicates the ability to keep the factory overhead costs within the budget limits. Since variable factory overhead costs are normally controllable at the department level, responsibility for controlling this variance usually rests with department supervisors.

Example Exercise 7-3 Factory Overhead Controllable Variance 4

Tip Top Corp. produced 3,000 units of product that required 2.5 standard hours per unit. The standard variable overhead cost per unit is $2.20 per hour. The actual variable factory overhead was $16,850. Determine the variable factory overhead controllable variance.

Follow My Example 7-3

Variable Factory Overhead Controllable Variance = Actual Variable Factory Overhead − Budgeted Variable Factory Overhead
Variable Factory Overhead Controllable Variance = $16,850 − [(3,000 units × 2.5 hrs.) × $2.20]
Variable Factory Overhead Controllable Variance = $16,850 − $16,500
Variable Factory Overhead Controllable Variance = $350 Unfavorable Variance

For Practice: PE 7-3A, PE 7-3B

Fixed Factory Overhead Volume Variance

Western Rider's budgeted factory overhead is based on a 100% normal capacity of 5,000 direct labor hours, as shown in Exhibit 6. This is the expected capacity that management believes will be used under normal business conditions. Exhibit 6 indicates that the 5,000 direct labor hours is less than the total available capacity of 110%, which is 5,500 direct labor hours.

The fixed factory overhead **volume variance** is the difference between the budgeted fixed overhead at 100% of normal capacity and the standard fixed overhead for the actual units produced. It is computed as follows:

$$\text{Fixed Factory Overhead Volume Variance} = \left(\text{Standard Hours for 100\% of Normal Capacity} - \text{Standard Hours for Actual Units Produced}\right) \times \text{Fixed Factory Overhead Rate}$$

The volume variance measures the use of fixed overhead resources (plant and equipment). The interpretation of an unfavorable and a favorable fixed factory overhead volume variance is as follows:

1. *Unfavorable* fixed factory overhead variance. The actual units produced is *less than* 100% of normal capacity; thus, the company used its fixed overhead resources (plant and equipment) less than would be expected under normal operating conditions.

2. *Favorable* fixed factory overhead variance. The actual units produced is *more than* 100% of normal capacity; thus, the company used its fixed overhead resources (plant and equipment) more than would be expected under normal operating conditions.

To illustrate, the volume variance for Western Rider is a $2,400 unfavorable variance, as computed below.

$$\text{Fixed Factory Overhead Volume Variance} = \left(\text{Standard Hours for 100\% of Normal Capacity} - \text{Standard Hours for Actual Units Produced}\right) \times \text{Fixed Factory Overhead Rate}$$

$$\text{Fixed Factory Overhead Volume Variance} = \left(\text{5,000 direct labor hrs.} - \text{4,000 direct labor hrs.}\right) \times \$2.40$$

$$\text{Fixed Factory Overhead Volume Variance} = \$2{,}400 \text{ Unfavorable Variance}$$

Since Western Rider produced 5,000 XL jeans during June, the standard for the actual units produced is 4,000 (5,000 × 0.80) direct labor hours. This is 1,000 hours less than the 5,000 standard hours of normal capacity. The fixed overhead rate of $2.40 was computed earlier. Thus, the unfavorable fixed factory overhead volume variance is $2,400 (1,000 direct labor hrs. × $2.40).

Exhibit 7 illustrates graphically the fixed factory overhead volume variance for Western Rider Inc. The budgeted fixed overhead does not change and is $12,000 at all levels of production. At 100% of normal capacity (5,000 direct labor hours), the standard fixed overhead line intersects the budgeted fixed costs line. For production levels *more than* 100% of normal capacity (5,000 direct labor hours), the volume variance is *favorable*. For production levels *less than* 100% of normal capacity (5,000 direct labor hours), the volume variance is *unfavorable*.

Exhibit 7

Graph of Fixed Overhead Volume Variance

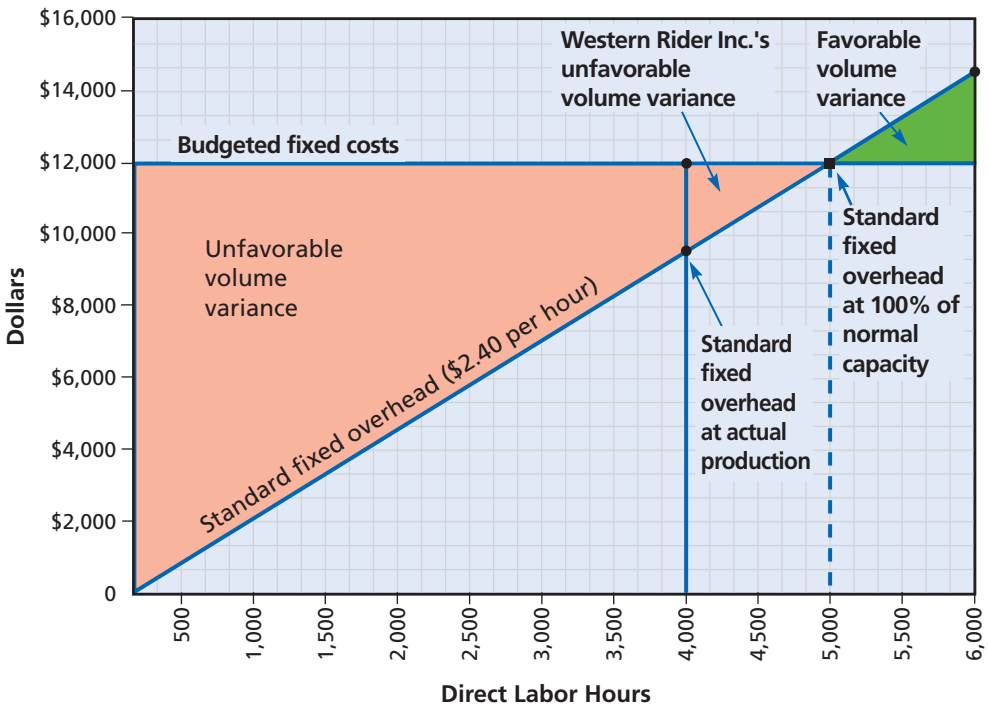


Exhibit 7 indicates that Western Rider's volume variance is unfavorable in June because the actual production is 4,000 direct labor hours, or 80% of normal volume. The unfavorable volume variance of $2,400 can be viewed as the cost of the unused capacity (1,000 direct labor hours).

An unfavorable volume variance may be due to factors such as the following:

1. Failure to maintain an even flow of work
2. Machine breakdowns
3. Work stoppages caused by lack of materials or skilled labor
4. Lack of enough sales orders to keep the factory operating at normal capacity

A paper company ran paper machines above normal volume in order to create favorable volume variances. This created a six-months' supply of excess paper inventory that had to be stored in public warehouses, thus, incurring significant storage costs.

Management should determine the causes of the unfavorable variance and consider taking corrective action. For example, a volume variance caused by an uneven flow of work could be remedied by changing operating procedures. Lack of sales orders may be corrected through increased advertising.

Favorable volume variances may not always be desirable. For example, in an attempt to create a favorable volume variance, manufacturing managers might run the factory above the normal capacity. This is favorable when the additional production can be sold. However, if the additional production cannot be sold, it must be stored as inventory, which would incur storage costs. In this case, a favorable volume variance may actually reduce company profits.

Example Exercise 7-4 Factory Overhead Volume Variance 4

Tip Top Corp. produced 3,000 units of product that required 2.5 standard hours per unit. The standard fixed overhead cost per unit is $0.90 per hour at 8,000 hours, which is 100% of normal capacity. Determine the fixed factory overhead volume variance.

Follow My Example 7-4

Fixed Factory Overhead Volume Variance = (Standard Hours for 100% of Normal Capacity − Standard Hours for Actual Units Produced) × Fixed Factory Overhead Rate
Fixed Factory Overhead Volume Variance = [8,000 hrs. − (3,000 units × 2.5 hrs.)] × $0.90
Fixed Factory Overhead Volume Variance = [8,000 hrs. − 7,500 hrs.] × $0.90
Fixed Factory Overhead Volume Variance = $450 Unfavorable Variance

For Practice: PE 7-4A, PE 7-4B

Reporting Factory Overhead Variances

The total factory overhead cost variance can also be determined as the sum of the factory overhead controllable and volume variances, as shown below for Western Rider Inc.

Variable factory overhead controllable variance	–$4,000 Favorable Variance
Fixed factory overhead volume variance	2,400 Unfavorable Variance
Total factory overhead cost variance	–$1,600 Favorable Variance

A **factory overhead cost variance report** is useful to management in controlling factory overhead costs. Budgeted and actual costs for variable and fixed factory overhead along with the related controllable and volume variances are reported by each cost element.

Exhibit 8 illustrates a factory overhead cost variance report for Western Rider Inc. for June.

Factory Overhead Account

To illustrate, the applied factory overhead for Western Rider for the 5,000 XL jeans produced in June is $24,000, as computed below.

$$\text{Applied Factory Overhead} = \begin{matrix}\text{Standard Hours for Actual} \\ \text{Units Produced}\end{matrix} \times \begin{matrix}\text{Total Factory} \\ \text{Overhead Rate}\end{matrix}$$

Applied Factory Overhead = (5,000 jeans × 0.80 direct labor hr. per pair of jeans) × $6.00
Applied Factory Overhead = 4,000 direct labor hrs. × $6.00 = $24,000

Exhibit 8

Factory Overhead Cost Variance Report

	A	B	C	D	E
1	Western Rider Inc.				
2	Factory Overhead Cost Variance Report				
3	For the Month Ending June 30, 2010				
4	**Productive capacity for the month (100% of normal)**	**5,000 hours**			
5	**Actual production for the month**	**4,000 hours**			
6					
7		Budget			
8		(at Actual		Variances	
9		Production)	Actual	Favorable	Unfavorable
10	**Variable factory overhead costs:**				
11	**Indirect factory wages**	**$ 8,000**	**$ 5,100**	**$2,900**	
12	**Power and light**	**4,000**	**4,200**		**$ 200**
13	**Indirect materials**	**2,400**	**1,100**	**1,300**	
14	**Total variable factory**				
15	**overhead cost**	**$14,400**	**$10,400**		
16	**Fixed factory overhead costs:**				
17	**Supervisory salaries**	**$ 5,500**	**$ 5,500**		
18	**Depreciation of plant and**				
19	**equipment**	**4,500**	**4,500**		
20	**Insurance and property taxes**	**2,000**	**2,000**		
21	**Total fixed factory**				
22	**overhead cost**	**$12,000**	**$12,000**		
23	**Total factory overhead cost**	**$26,400**	**$22,400**		
24	**Total controllable variances**			**$4,200**	**$ 200**
25					
26					
27	**Net controllable variance—favorable**				**$4,000**
28	**Volume variance—unfavorable:**				
29	**Capacity not used at the standard rate for fixed**				
30	**factory overhead—1,000 × $2.40**				**2,400**
31	**Total factory overhead cost variance—favorable**				**$1,600**
32					

The total actual factory overhead for Western Rider, as shown in Exhibit 8, was $22,400. Thus, the total factory overhead cost variance for Western Rider for June is a $1,600 favorable variance, as computed below.

$$\text{Total Factory Overhead Cost Variance} = \text{Actual Factory Overhead} - \text{Applied Factory Overhead}$$

$$\text{Total Factory Overhead Cost Variance} = \$22{,}400 - \$24{,}000 = -\$1{,}600 \text{ Favorable Variance}$$

At the end of the period, the factory overhead account normally has a balance. A debit balance in Factory Overhead represents underapplied overhead. Underapplied overhead occurs when actual factory overhead costs exceed the applied factory overhead. A credit balance in Factory Overhead represents overapplied overhead. Overapplied overhead occurs when actual factory overhead costs are less than the applied factory overhead.

The difference between the actual factory overhead and the applied factory overhead is the total factory overhead cost variance. Thus, underapplied and overapplied factory overhead account balances represent the following total factory overhead cost variances:

1. *Underapplied* Factory Overhead = *Unfavorable* Total Factory Overhead Cost Variance
2. *Overapplied* Factory Overhead = *Favorable* Total Factory Overhead Cost Variance

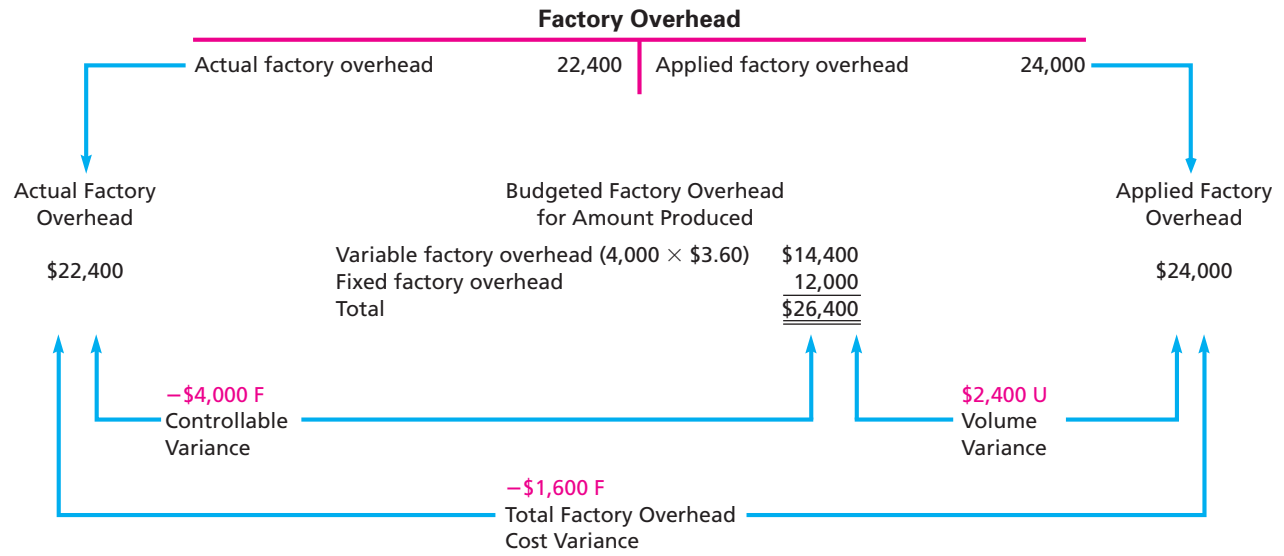
The factory overhead account for Western Rider Inc. for the month ending June 30, 2010, is shown below.

Factory Overhead

Actual factory overhead ($10,400 + $12,000)	22,400		24,000 Applied factory overhead (4,000 hrs. × $6.00 per hr.)
		Bal., June 30	1,600 Overapplied factory overhead

The $1,600 overapplied factory overhead account balance shown above and the total factory cost variance shown in Exhibit 8 are the same.

The variable factory overhead controllable variance and the volume variance can be computed by comparing the factory overhead account with the budgeted total overhead for the actual level produced, as shown below.



The controllable and volume variances are determined as follows:

1. The difference between the actual overhead incurred and the budgeted overhead is the *controllable* variance.
2. The difference between the applied overhead and the budgeted overhead is the *volume* variance.

If the actual factory overhead exceeds (is less than) the budgeted factory overhead, the controllable variance is unfavorable (favorable). In contrast, if the applied factory overhead is less than (exceeds) the budgeted factory overhead, the volume variance is unfavorable (favorable).

For many of the individual factory overhead costs, quantity and price variances can be computed similar to that for direct materials and direct labor. For example, the indirect factory labor cost variance may include both time and rate variances. Likewise, the indirect materials cost variance may include both a quantity variance and a price variance. Such variances are illustrated in advanced textbooks.

5 Journalize the entries for recording standards in the accounts and prepare an income statement that includes variances from standard.

Recording and Reporting Variances from Standards

Standard costs may be used as a management tool to control costs separately from the accounts in the general ledger. However, many companies include standard costs in their accounts. One method for doing so records standard costs and variances at the same time the actual product costs are recorded.

To illustrate, assume that Western Rider Inc. purchased, on account, the 7,300 square yards of blue denim used at $5.50 per square yard. The standard price for direct materials is $5.00 per square yard. The entry to record the purchase and the unfavorable direct materials price variance is as follows:

Materials (7,300 sq. yds. × $5.00)			36,500	
Direct Materials Price Variance			3,650	
Accounts Payable (7,300 sq. yds. × $5.50)				40,150

The materials account is debited for the *actual quantity* purchased at the *standard price*, $36,500 (7,300 square yards × $5.00). Accounts Payable is credited for the $40,150 actual cost and the amount due the supplier. The difference of $3,650 is the unfavorable direct materials price variance [($5.50 − $5.00) × 7,300 sq. yds.]. It is recorded by debiting *Direct Materials Price Variance*. If the variance had been favorable, Direct Materials Price Variance would have been credited for the variance.

A debit balance in the direct materials price variance account represents an unfavorable variance. Likewise, a credit balance in the direct materials price variance account represents a favorable variance.

The direct materials quantity variance is recorded in a similar manner. For example, Western Rider Inc. used 7,300 square yards of blue denim to produce 5,000 pairs of XL jeans. The standard quantity of denim for the 5,000 jeans produced is 7,500 square yards. The entry to record the materials used is as follows:

Work in Process (7,500 sq. yds. × $5.00)			37,500	
Direct Materials Quantity Variance				1,000
Materials (7,300 sq. yds. × $5.00)				36,500

Work in Process is debited for $37,500, which is the standard cost of the direct materials required to produce 5,000 XL jeans (7,500 sq. yds. × $5.00). Materials is credited for $36,500, which is the actual quantity of materials used at the standard price (7,300 sq. yds. × $5.00). The difference of $1,000 is the favorable direct materials quantity variance [(7,300 sq. yds. − 7,500 sq. yds.) × $5.00]. It is recorded by crediting *Direct Materials Quantity Variance*. If the variance had been unfavorable, Direct Materials Quantity Variance would have been debited for the variance.

A debit balance in the direct materials quantity variance account represents an unfavorable variance. Likewise, a credit balance in the direct materials quantity variance account represents a favorable variance.

Example Exercise 7-5 Standard Cost Journal Entries 5

Tip Top Corp. produced 3,000 units that require six standard pounds per unit at the $4.50 standard price per pound. The company actually used 18,500 pounds in production. Journalize the entry to record the standard direct materials used in production.

Follow My Example 7-5

Work in Process (18,000* pounds × $4.50)	81,000	
Direct Materials Quantity Variance [(18,500 pounds − 18,000 pounds) × $4.50]	2,250	
Materials (18,500 pounds × $4.50)		83,250

*3,000 units × 6 pounds per unit = 18,000 standard pounds for units produced

For Practice: PE 7-5A, PE 7-5B

The journal entries to record the standard costs and variances for *direct labor* are similar to those for direct materials. These entries are summarized below.

1. Work in Process is debited for the standard cost of direct labor.
2. Wages Payable is credited for the actual direct labor cost incurred.
3. Direct Labor Rate Variance is debited for an unfavorable variance and credited for a favorable variance.
4. Direct Labor Time Variance is debited for an unfavorable variance and credited for a favorable variance.

As illustrated in the prior section, the factory overhead account already incorporates standard costs and variances into its journal entries. That is, Factory Overhead is debited for actual factory overhead and credited for applied (standard) factory overhead. The ending balance of factory overhead (overapplied or underapplied) is the total factory overhead cost variance. By comparing the actual factory overhead with the budgeted factory overhead, the controllable variance can be determined. By comparing the budgeted factory overhead with the applied factory overhead, the volume variance can be determined.

When goods are completed, Finished Goods is debited and Work in Process is credited for the standard cost of the product transferred.

At the end of the period, the balances of each of the variance accounts indicate the net favorable or unfavorable variance for the period. These variances may be reported in an income statement prepared for management's use.

Exhibit 9 is an example of an income statement for Western Rider Inc. that includes variances. In Exhibit 9, a sales price of $28 per pair of jeans, selling expenses of $14,500, and administrative expenses of $11,225 are assumed.

Exhibit 9

Variances from Standards in Income Statement

Western Rider Inc.
Income Statement
For the Month Ended June 30, 2010

Sales			$140,000[1]
Cost of goods sold—at standard			97,500[2]
Gross profit—at standard			$ 42,500
	Favorable	**Unfavorable**	
Less variances from standard cost:			
Direct materials price		$ 3,650	
Direct materials quantity	$1,000		
Direct labor rate		3,850	
Direct labor time	1,350		
Factory overhead controllable	4,000		
Factory overhead volume		2,400	3,550
Gross profit			$ 38,950
Operating expenses:			
Selling expenses		$14,500	
Administrative expenses		11,225	25,725
Income before income tax			$ 13,225

[1] 5,000 × $28
[2] $37,500 + $36,000 + $24,000 (from Exhibit 2), or 5,000 × $19.50 (from Exhibit 1)

The income statement shown in Exhibit 9 is for internal use by management. That is, variances are not reported to external users. Thus, the variances shown in Exhibit 9 must be transferred to other accounts in preparing an income statement for external users.

In preparing an income statement for external users, the balances of the variance accounts are normally transferred to Cost of Goods Sold. However, if the variances are significant or if many of products manufactured are still in inventory, the variances should be allocated to Work in Process, Finished Goods, and Cost of Goods Sold. Such an allocation, in effect, converts these account balances from standard cost to actual cost.

Example Exercise 7-6 Income Statement with Variances

5

Prepare an income statement for the year ended December 31, 2010, through gross profit for Tip Top Corp. using the variance data in Example Exercises 7-1 through 7-4. Assume Tip Top sold 3,000 units at $100 per unit.

Follow My Example 7-6

TIP TOP CORP.
INCOME STATEMENT THROUGH GROSS PROFIT
For the Year Ended December 31, 2010

	Favorable	Unfavorable	
Sales (3,000 units × $100)			$300,000
Cost of goods sold—at standard			194,250*
Gross profit—at standard			$105,750
Less variances from standard cost:			
Direct materials price (EE7-1)	$2,775		
Direct materials quantity (EE7-1)		$2,250	
Direct labor rate (EE7-2)		2,226	
Direct labor time (EE7-2)	960		
Factory overhead controllable (EE7-3)		350	
Factory overhead volume (EE7-4)		450	1,541
Gross profit—actual			$104,209

*Direct materials (3,000 units × 6 lbs. × $4.50)	$ 81,000
Direct labor (3,000 units × 2.5 hrs. × $12.00)	90,000
Factory overhead [3,000 units × 2.5 hrs. × ($2.20 + $0.90)]	23,250
Cost of goods sold at standard	$194,250

For Practice: PE 7-6A, PE 7-6B

6 Describe and provide examples of nonfinancial performance measures.

Nonfinancial Performance Measures

Many companies supplement standard costs and variances from standards with nonfinancial performance measures. A **nonfinancial performance measure** expresses performance in a measure other than dollars. For example, airlines use on-time performance, percent of bags lost, and number of customer complaints as nonfinancial performance measures. Such measures are often used to evaluate the time, quality, or quantity of a business activity.

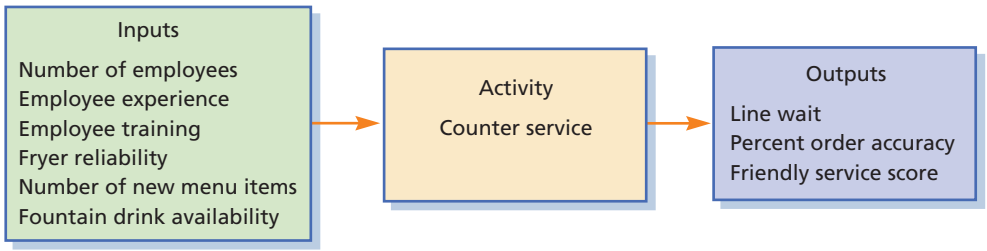
Using financial and nonfinancial performance measures aids managers and employees in considering multiple performance objectives. Such measures often bring additional perspectives, such as quality of work, to evaluating performance. Some examples of nonfinancial performance measures include the following:

In one company, machine operators were evaluated by a labor time standard (how fast they worked). This resulted in poor-quality products, which led the company to supplement its labor time standard with a product quality standard.

Nonfinancial Performance Measures
Inventory turnover
Percent on-time delivery
Elapsed time between a customer order and product delivery
Customer preference rankings compared to competitors
Response time to a service call
Time to develop new products
Employee satisfaction
Number of customer complaints

Nonfinancial measures are often linked to either the inputs or outputs of an activity or process. A **process** is a sequence of activities for performing a task. The relationship between an activity or a process and its inputs and outputs is shown below.

To illustrate, the counter service activity of a fast-food restaurant is used. The following inputs/outputs could be identified for providing customer service:



The customer service outputs of the counter service activity include the following:

1. Line wait for the customer
2. Percent order accuracy in serving the customer
3. Friendly service experience for the customer

Some of the inputs that impact the customer service outputs include the following:

1. Number of employees
2. Employee experience
3. Employee training
4. Fryer (and other cooking equipment) reliability
5. Number of new menu items
6. Fountain drink availability

A fast-food restaurant can develop a set of linked nonfinancial performance measures across inputs and outputs. The output measures tell management how the activity is performing, such as keeping the line wait to a minimum. The input measures are used to improve the output measures. For example, if the customer line wait is too long, then improving employee training or hiring more employees could improve the output (decrease customer line wait).

Example Exercise 7-7 Activity Inputs and Outputs

6

The following are inputs and outputs to the baggage claim process of an airline:

Baggage handler training
Time customers wait for returned baggage
Maintenance of baggage handling equipment
Number of baggage handlers
Number of damaged bags
On-time flight performance

Identify whether each is an input or output to the baggage claim process.

Follow My Example 7-7

Baggage handler training	Input
Time customers wait for returned baggage	Output
Maintenance of baggage handling equipment	Input
Number of baggage handlers	Input
Number of damaged bags	Output
On-time flight performance	Input

For Practice: PE 7-7A, PE 7-7B

1 Describe the types of standards and how they are established.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Standards represent performance benchmarks that can be compared to actual results in evaluating performance. Standards are established so that they are neither too high nor too low, but are attainable.	• Define *ideal* and *normal standards* and explain how they are used in setting standards. • Describe some of the criticisms of the use of standards.		

2 Describe and illustrate how standards are used in budgeting.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Budgets are prepared by multiplying the standard cost per unit by the planned production. To measure performance, the standard cost per unit is multiplied by the actual number of units produced, and the actual results are compared with the standard cost at actual volumes (cost variance).	• Compute the standard cost per unit of production for materials, labor, and factory overhead. • Compute the direct materials, direct labor, and factory overhead cost variances. • Prepare a budget performance report.		

3 Compute and interpret direct materials and direct labor variances.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The direct materials cost variance can be separated into direct materials price and quantity variances. The direct labor cost variance can be separated into direct labor rate and time variances.	• Compute and interpret direct materials price and quantity variances. • Compute and interpret direct labor rate and time variances. • Describe and illustrate how time standards are used in nonmanufacturing settings.	**7-1** **7-2**	7-1A, 7-1B 7-2A, 7-2B

4 Compute and interpret factory overhead controllable and volume variances.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The factory overhead cost variance can be separated into a variable factory overhead controllable variance and a fixed factory overhead volume variance.	• Prepare a factory overhead flexible budget. • Compute and interpret the variable factory overhead controllable variance. • Compute and interpret the fixed factory overhead volume variance. • Prepare a factory overhead cost variance report. • Evaluate factory overhead variances using a T account.	**7-3** **7-4**	7-3A, 7-3B 7-4A, 7-4B

(continued)

5 Journalize the entries for recording standards in the accounts and prepare an income statement that includes variances from standard.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Standard costs and variances can be recorded in the accounts at the same time the manufacturing costs are recorded in the accounts. Work in Process is debited at standard. Under a standard cost system, the cost of goods sold will be reported at standard cost. Manufacturing variances can be disclosed on the income statement to adjust the gross profit at standard to the actual gross profit.	• Journalize the entries to record the purchase and use of direct materials at standard, recording favorable or unfavorable variances.	**7-5**	7-5A, 7-5B
	• Prepare an income statement, disclosing favorable and unfavorable direct materials, direct labor, and factory overhead variances.	**7-6**	7-6A, 7-6B

Describe and provide examples of nonfinancial performance measures.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Many companies use a combination of financial and nonfinancial measures in order for multiple perspectives to be incorporated in evaluating performance. Nonfinancial measures are often used in conjunction with the inputs or outputs of a process or an activity.	• Define, provide the rationale for, and provide examples of nonfinancial performance measures.		
	• Identify nonfinancial inputs and outputs of an activity.	**7-7**	7-7A, 7-7B

Key Terms

budget performance report (278)
budgeted variable factory overhead (286)
controllable variance (286)
cost variance (278)
currently attainable standards (275)
direct labor rate variance (283)
direct labor time variance (283)
direct materials price variance (281)
direct materials quantity variance (281)
factory overhead cost variance report (289)
favorable cost variance (278)
ideal standards (275)
nonfinancial performance measure (294)
process (295)
standard cost (274)
standard cost systems (274)
standards (274)
total manufacturing cost variance (279)
unfavorable cost variance (278)
volume variance (287)

Illustrative Problem

Hawley Inc. manufactures woven baskets for national distribution. The standard costs for the manufacture of Folk Art style baskets were as follows:

	Standard Costs	Actual Costs
Direct materials	1,500 lbs. at $35	1,600 lbs. at $32
Direct labor	4,800 hrs. at $11	4,500 hrs. at $11.80
Factory overhead	Rates per labor hour, based on 100% of normal capacity of 5,500 labor hrs.:	
	Variable cost, $2.40	$12,300 variable cost
	Fixed cost, $3.50	$19,250 fixed cost

Instructions

1. Determine the quantity variance, price variance, and total direct materials cost variance for the Folk Art style baskets.
2. Determine the time variance, rate variance, and total direct labor cost variance for the Folk Art style baskets.
3. Determine the controllable variance, volume variance, and total factory overhead cost variance for the Folk Art style baskets.

Solution

1. **Direct Materials Cost Variance**

Quantity variance:

Direct Materials Quantity Variance = (Actual Quantity − Standard Quantity) × Standard Price
Direct Materials Quantity Variance = (1,600 lbs. − 1,500 lbs.) × $35 per lb.
Direct Materials Quantity Variance = $3,500 Unfavorable Variance

Price variance:

Direct Materials Price Variance = (Actual Price − Standard Price) × Actual Quantity
Direct Materials Price Variance = ($32 per lb. − $35 per lb.) × 1,600 lbs.
Direct Materials Price Variance = −$4,800 Favorable Variance

Total direct materials cost variance:

Direct Materials Cost Variance = Direct Materials Quantity Variance + Direct Materials Price Variance
Direct Materials Cost Variance = $3,500 + ($4,800)
Direct Materials Cost Variance = −$1,300 Favorable Variance

2 . **Direct Labor Cost Variance**

Time variance:

Direct Labor Time Variance = (Actual Direct Labor Hours − Standard Direct Labor Hours) × Standard Rate per Hour
Direct Labor Time Variance = (4,500 hrs. − 4,800 hrs.) × $11 per hour
Direct Labor Time Variance = −$3,300 Favorable Variance

Rate variance:

Direct Labor Rate Variance = (Actual Rate per Hour − Standard Rate per Hour) × Actual Hours
Direct Labor Rate Variance = ($11.80 − $11.00) × 4,500 hrs.
Direct Labor Rate Variance = $3,600 Unfavorable Variance

Total direct labor cost variance:

Direct Labor Cost Variance = Direct Labor Time Variance + Direct Labor Rate Variance
Direct Labor Cost Variance = ($3,300) + $3,600
Direct Labor Cost Variance = $300 Unfavorable Variance

3. **Factory Overhead Cost Variance**

Variable factory overhead—controllable variance:

$$\text{Variable Factory Overhead Controllable Variance} = \text{Actual Variable Factory Overhead} - \text{Budgeted Variable Factory Overhead}$$

$$\text{Variable Factory Overhead Controllable Variance} = \$12{,}300 - \$11{,}520^*$$

$$\text{Variable Factory Overhead Controllable Variance} = \$780 \text{ Unfavorable Variance}$$

*4,800 hrs. × $2.40 per hour

Fixed factory overhead volume variance:

$$\text{Fixed Factory Overhead Volume Variance} = \left(\begin{array}{c}\text{Standard Hours for 100\%}\\ \text{of Normal Capacity}\end{array} - \begin{array}{c}\text{Standard Hours for}\\ \text{Actual Units Produced}\end{array}\right) \times \begin{array}{c}\text{Fixed Factory}\\ \text{Overhead Rate}\end{array}$$

$$\text{Fixed Factory Overhead Volume Variance} = (5{,}500 \text{ hrs.} - 4{,}800 \text{ hrs.}) \times \$3.50 \text{ per hr.}$$

$$\text{Fixed Factory Overhead Volume Variance} = \$2{,}450 \text{ Unfavorable Variance}$$

Total factory overhead cost variance:

$$\text{Factory Overhead Cost Variance} = \begin{array}{c}\text{Variable Factory Overhead}\\ \text{Controllable Variance}\end{array} + \begin{array}{c}\text{Fixed Factory Overhead}\\ \text{Volume Variance}\end{array}$$

$$\text{Factory Overhead Cost Variance} = \$780 + \$2{,}450$$

$$\text{Factory Overhead Cost Variance} = \$3{,}230 \text{ Unfavorable Variance}$$

Self-Examination Questions (Answers at End of Chapter)

1. The actual and standard direct materials costs for producing a specified quantity of product are as follows:

Actual:	51,000 lbs. at $5.05	$257,550
Standard:	50,000 lbs. at $5.00	$250,000

The direct materials price variance is:
A. $50 unfavorable. C. $2,550 unfavorable.
B. $2,500 unfavorable. D. $7,550 unfavorable.

2. Bower Company produced 4,000 units of product. Each unit requires 0.5 standard hour. The standard labor rate is $12 per hour. Actual direct labor for the period was $22,000 (2,200 hrs. × $10 per hr.). The direct labor time variance is:
A. 200 hours unfavorable.
B. $2,000 unfavorable.
C. $4,000 favorable.
D. $2,400 unfavorable.

3. The actual and standard factory overhead costs for producing a specified quantity of product are as follows:

Actual:	Variable factory overhead	$72,500	
	Fixed factory overhead	40,000	$112,500
Standard:	19,000 hrs. at $6 ($4 variable and $2 fixed)		114,000

If 1,000 hours were unused, the fixed factory overhead volume variance would be:
A. $1,500 favorable. C. $4,000 unfavorable.
B. $2,000 unfavorable. D. $6,000 unfavorable.

4. Ramathan Company produced 6,000 units of Product Y, which is 80% of capacity. Each unit required 0.25 standard machine hour for production. The standard variable factory overhead rate is $5.00 per machine hour. The actual variable factory overhead incurred during the period was $8,000. The variable factory overhead controllable variance is:
A. $500 favorable. C. $1,875 favorable.
B. $500 unfavorable. D. $1,875 unfavorable.

5. Applegate Company has a normal budgeted capacity of 200 machine hours. Applegate produced 600 units. Each unit requires a standard 0.2 machine hour to complete. The standard fixed factory overhead is $12.00 per hour, determined at normal capacity. The fixed factory overhead volume variance is:
A. $4,800 unfavorable. C. $960 favorable.
B. $4,800 favorable. D. $960 unfavorable.

Eye Openers

1. What are the basic objectives in the use of standard costs?
2. How can standards be used by management to help control costs?
3. What is meant by reporting by the "principle of exceptions," as the term is used in reference to cost control?
4. How often should standards be revised?
5. How are standards used in budgetary performance evaluation?
6. a. What are the two variances between the actual cost and the standard cost for direct materials?
   b. Discuss some possible causes of these variances.
7. The materials cost variance report for Nickols Inc. indicates a large favorable materials price variance and a significant unfavorable materials quantity variance. What might have caused these offsetting variances?
8. a. What are the two variances between the actual cost and the standard cost for direct labor?
   b. Who generally has control over the direct labor cost?
9. A new assistant controller recently was heard to remark: "All the assembly workers in this plant are covered by union contracts, so there should be no labor variances." Was the controller's remark correct? Discuss.
10. Would the use of standards be appropriate in a nonmanufacturing setting, such as a fast-food restaurant?
11. a. Describe the two variances between the actual costs and the standard costs for factory overhead.
    b. What is a factory overhead cost variance report?
12. What are budgeted fixed costs at normal volume?
13. If variances are recorded in the accounts at the time the manufacturing costs are incurred, what does a debit balance in Direct Materials Price Variance represent?
14. If variances are recorded in the accounts at the time the manufacturing costs are incurred, what does a credit balance in Direct Materials Quantity Variance represent?
15. Briefly explain why firms might use nonfinancial performance measures.

Practice Exercises

PE 7-1A
Direct materials variances
obj. 3
EE 7-1 p. 282

Norris Company produces a product that requires six standard pounds per unit. The standard price is $1.25 per pound. If 500 units required 2,900 pounds, which were purchased at $1.30 per pound, what is the direct materials (a) price variance, (b) quantity variance, and (c) cost variance?

PE 7-1B
Direct materials variances
obj. 3
EE 7-1 p. 282

McLean Company produces a product that requires three standard gallons per unit. The standard price is $18.50 per gallon. If 2,500 units required 8,000 gallons, which were purchased at $18.00 per gallon, what is the direct materials (a) price variance, (b) quantity variance, and (c) cost variance?

PE 7-2A
Direct labor variances
obj. 3
EE 7-2 p. 284

Norris Company produces a product that requires 3.5 standard hours per unit at a standard hourly rate of $12 per hour. If 500 units required 1,500 hours at an hourly rate of $11.50 per hour, what is the direct labor (a) rate variance, (b) time variance, and (c) cost variance?

PE 7-2B
Direct labor variances
obj. 3
EE 7-2 p. 284

McLean Company produces a product that requires two standard hours per unit at a standard hourly rate of $18 per hour. If 2,500 units required 5,500 hours at an hourly rate of $19 per hour, what is the direct labor (a) rate variance, (b) time variance, and (c) cost variance?

PE 7-3A
Factory overhead controllable variance
obj. 4
EE 7-3 p. 287

Norris Company produced 500 units of product that required 3.5 standard hours per unit. The standard variable overhead cost per unit is $0.70 per hour. The actual variable factory overhead was $1,200. Determine the variable factory overhead controllable variance.

PE 7-3B
Factory overhead controllable variance
obj. 4
EE 7-3 p. 287

McLean Company produced 2,500 units of product that required two standard hours per unit. The standard variable overhead cost per unit is $2.50 per hour. The actual variable factory overhead was $12,900. Determine the variable factory overhead controllable variance.

PE 7-4A
Factory overhead volume variance
obj. 4
EE 7-4 p. 289

Norris Company produced 500 units of product that required 3.5 standard hours per unit. The standard fixed overhead cost per unit is $0.30 per hour at 1,800 hours, which is 100% of normal capacity. Determine the fixed factory overhead volume variance.

PE 7-4B
Factory overhead volume variance
obj. 4
EE 7-4 p. 289

McLean Company produced 2,500 units of product that required two standard hours per unit. The standard fixed overhead cost per unit is $1.30 per hour at 4,600 hours, which is 100% of normal capacity. Determine the fixed factory overhead volume variance.

PE 7-5A
Standard cost journal entries
obj. 5
EE 7-5 p. 292

Norris Company produced 500 units that require six standard pounds per unit at $1.25 standard price per pound. The company actually used 2,900 pounds in production. Journalize the entry to record the standard direct materials used in production.

PE 7-5B
Standard cost journal entries
obj. 5
EE 7-5 p. 292

McLean Company produced 2,500 units that require three standard gallons per unit at $18.50 standard price per gallon. The company actually used 8,000 gallons in production. Journalize the entry to record the standard direct materials used in production.

PE 7-6A
Income statement with variances
obj. 5
EE 7-6 p. 294

Prepare an income statement through gross profit for Norris Company using the variance data in Practice Exercises 7-1A, 7-2A, 7-3A, and 7-4A. Assume Norris sold 500 units at $105 per unit.

PE 7-6B
Income statement with variances
obj. 5
EE 7-6 p. 294

Prepare an income statement through gross profit for McLean Company using the variance data in Practice Exercises 7-1B, 7-2B, 7-3B, and 7-4B. Assume McLean sold 2,500 units at $214 per unit.

PE 7-7A
Activity inputs and outputs
obj. 6
EE 7-7 p. 295

The following are inputs and outputs to the cooking process of a restaurant:

Percent of meals prepared on time
Number of unexpected cook absences
Number of times ingredients are missing
Number of server order mistakes
Number of hours kitchen equipment is down for repairs
Number of customer complaints

Identify whether each is an input or output to the cooking process.

PE 7-7B
Activity inputs and outputs
obj. 6
EE 7-7 p. 295

The following are inputs and outputs to the copying process of a copy shop:

Percent jobs done on time
Number of times paper supply runs out
Number of pages copied per hour
Number of employee errors
Number of customer complaints
Copy machine downtime (broken)

Identify whether each is an input or output to the copying process.

Exercises

EX 7-1
Standard direct materials cost per unit
obj. 2

Bavarian Chocolate Company produces chocolate bars. The primary materials used in producing chocolate bars are cocoa, sugar, and milk. The standard costs for a batch of chocolate (5,000 bars) are as follows:

Ingredient	Quantity	Price
Cocoa	510 lbs.	$0.40 per lb.
Sugar	150 lbs.	$0.64 per lb.
Milk	120 gal.	$1.25 per gal.

Determine the standard direct materials cost per bar of chocolate.

EX 7-2
Standard product cost

obj. 2

Hickory Furniture Company manufactures unfinished oak furniture. Hickory uses a standard cost system. The direct labor, direct materials, and factory overhead standards for an unfinished dining room table are as follows:

Direct labor:	standard rate	$18.00 per hr.
	standard time per unit	2.5 hrs.
Direct materials (oak):	standard price	$9.50 per bd. ft.
	standard quantity	18 bd. ft.
Variable factory overhead:	standard rate	$2.80 per direct labor hr.
Fixed factory overhead:	standard rate	$1.20 per direct labor hr.

Determine the standard cost per dining room table.

EX 7-3
Budget performance report

obj. 2

✔ b. Direct labor cost variance, $160 U

Warwick Bottle Company (WBC) manufactures plastic two-liter bottles for the beverage industry. The cost standards per 100 two-liter bottles are as follows:

Cost Category	Standard Cost per 100 Two-Liter Bottles
Direct labor	$1.32
Direct materials	5.34
Factory overhead	0.34
Total	$7.00

At the beginning of July, WBC management planned to produce 650,000 bottles. The actual number of bottles produced for July was 700,000 bottles. The actual costs for July of the current year were as follows:

Cost Category	Actual Cost for the Month Ended July 31, 2010
Direct labor	$ 9,400
Direct materials	36,500
Factory overhead	2,400
Total	$48,300

a. Prepare the July manufacturing standard cost budget (direct labor, direct materials, and factory overhead) for WBC, assuming planned production.
b. Prepare a budget performance report for manufacturing costs, showing the total cost variances for direct materials, direct labor, and factory overhead for July.
c. Interpret the budget performance report.

EX 7-4
Direct materials variances

obj. 3

✔ a. Price variance, $2 ,730 F

The following data relate to the direct materials cost for the production of 2,000 automobile tires:

Actual:	54,600 lbs. at $1.80	$98,280
Standard:	53,400 lbs. at $1.85	$98,790

a. Determine the price variance, quantity variance, and total direct materials cost variance.
b. To whom should the variances be reported for analysis and control?

EX 7-5
Direct materials variances

obj. 3

✔ Quantity variance, $184 U

I-Time, Inc., produces electronic timepieces. The company uses mini-LCD displays for its products. Each timepiece uses one display. The company produced 550 timepieces during March. However, due to LCD defects, the company actually used 570 LCD displays during March. Each display has a standard cost of $9.20. Six hundred LCD displays were purchased for March production at a cost of $6,000.

Determine the price variance, quantity variance, and total direct materials cost variance for March.

EX 7-6
Standard direct materials cost per unit from variance data

objs. 2, 3

The following data relating to direct materials cost for March of the current year are taken from the records of Play Tyme Inc., a manufacturer of plastic toys:

Quantity of direct materials used	5,000 lbs.
Actual unit price of direct materials	$2.40 per lb.
Units of finished product manufactured	1,200 units
Standard direct materials per unit of finished product	4 lbs.
Direct materials quantity variance—unfavorable	$500
Direct materials price variance—favorable	$500

Determine the standard direct materials cost per unit of finished product, assuming that there was no inventory of work in process at either the beginning or the end of the month.

EX 7-7
Standard product cost, direct materials variance

objs. 2, 3

H.J. Heinz Company uses standards to control its materials costs. Assume that a batch of ketchup (1,500 pounds) has the following standards:

	Standard Quantity	Standard Price
Whole tomatoes	2,500 lbs.	$ 0.45 per lb.
Vinegar	140 gal.	2.75 per gal.
Corn syrup	12 gal.	10.00 per gal.
Salt	56 lbs.	2.50 per lb.

The actual materials in a batch may vary from the standard due to tomato characteristics. Assume that the actual quantities of materials for batch K103 were as follows:

2,600 lbs. of tomatoes
135 gal. of vinegar
13 gal. of corn syrup
55 lbs. of salt

a. Determine the standard unit materials cost per pound for a standard batch.
b. Determine the direct materials quantity variance for batch K103.

EX 7-8
Direct labor variances

obj. 3

✔ a. Rate variance, $730 U

The following data relate to labor cost for production of 5,500 cellular telephones:

Actual:	3,650 hrs. at $15.20	$55,480
Standard:	3,710 hrs. at $15.00	$55,650

a. Determine the rate variance, time variance, and total direct labor cost variance.
b. Discuss what might have caused these variances.

EX 7-9
Direct labor variances

objs. 3, 5

✔ a. Time variance, $510 U

Alpine Bicycle Company manufactures mountain bikes. The following data for May of the current year are available:

Quantity of direct labor used	600 hrs.
Actual rate for direct labor	$12.50 per hr.
Bicycles completed in May	280
Standard direct labor per bicycle	2 hrs.
Standard rate for direct labor	$12.75 per hr.
Planned bicycles for May	310

a. Determine the direct labor rate and time variances.
b. How much direct labor should be debited to Work in Process?

EX 7-10
Direct labor variances

obj. 3

✔ a. Cutting Department rate variance, $350 unfavorable

The Freedom Clothes Company produced 18,000 units during June of the current year. The Cutting Department used 3,500 direct labor hours at an actual rate of $12.10 per hour. The Sewing Department used 5,800 direct labor hours at an actual rate of $11.80 per hour. Assume there were no work in process inventories in either department at the beginning or end of the month. The standard labor rate is $12.00. The standard labor time for the Cutting and Sewing departments is 0.20 hour and 0.30 hour per unit, respectively.

a. Determine the direct labor rate and time variance for the (1) Cutting Department and (2) Sewing Department.
b. Interpret your results.

EX 7-11
Direct labor standards for nonmanufacturing expenses

obj. 3

✔ a. $1,440

St. Luke Hospital began using standards to evaluate its Admissions Department. The standard was broken into two types of admissions as follows:

Type of Admission	Standard Time to Complete Admission Record
Unscheduled admission	40 min.
Scheduled admission	10 min.

The unscheduled admission took longer, since name, address, and insurance information needed to be determined at the time of admission. Information was collected on scheduled admissions prior to the admissions, which was less time consuming.

The Admissions Department employs two full-time people (40 productive hours per week, with no overtime) at $18 per hour. For the most recent week, the department handled 66 unscheduled and 240 scheduled admissions.

a. How much was actually spent on labor for the week?
b. What are the standard hours for the actual volume for the week?
c. Calculate a time variance, and report how well the department performed for the week.

EX 7-12
Direct labor standards for nonmanufacturing operations

objs. 2, 3

One of the operations in the U.S. Post Office is a mechanical mail sorting operation. In this operation, letter mail is sorted at a rate of one letter per second. The letter is mechanically sorted from a three-digit code input by an operator sitting at a keyboard. The manager of the mechanical sorting operation wishes to determine the number of temporary employees to hire for December. The manager estimates that there will be an additional 34,560,000 pieces of mail in December, due to the upcoming holiday season.

Assume that the sorting operators are temporary employees. The union contract requires that temporary employees be hired for one month at a time. Each temporary employee is hired to work 150 hours in the month.

a. How many temporary employees should the manager hire for December?
b. If each employee earns a standard $18 per hour, what would be the labor time variance if the actual number of letters sorted in December was 33,840,000?

EX 7-13
Direct materials and direct labor variances

objs. 2, 3

✔ Direct materials quantity variance, $600 U

At the beginning of October, Cornerstone Printers Company budgeted 16,000 books to be printed in October at standard direct materials and direct labor costs as follows:

Direct materials	$24,000
Direct labor	8,000
Total	$32,000

The standard materials price is $0.60 per pound. The standard direct labor rate is $10 per hour. At the end of October, the actual direct materials and direct labor costs were as follows:

Actual direct materials	$21,600
Actual direct labor	7,200
Total	$28,800

There were no direct materials price or direct labor rate variances for October. In addition, assume no changes in the direct materials inventory balances in October. Cornerstone Printers Company actually produced 14,000 units during October.

Determine the direct materials quantity and direct labor time variances.

EX 7-14
Flexible overhead budget

obj. 4

✔ Total factory overhead, 12,000 hrs. $158,920

Western Wood Products Company prepared the following factory overhead cost budget for the Press Department for February 2010, during which it expected to require 10,000 hours of productive capacity in the department:

Variable overhead cost:		
Indirect factory labor	$27,500	
Power and light	3,600	
Indirect materials	23,000	
Total variable cost		$ 54,100
Fixed overhead cost:		
Supervisory salaries	$42,000	
Depreciation of plant and equipment	40,000	
Insurance and property taxes	12,000	
Total fixed cost		94,000
Total factory overhead cost		$148,100

Assuming that the estimated costs for March are the same as for February, prepare a flexible factory overhead cost budget for the Press Department for March for 8,000, 10,000, and 12,000 hours of production.

EX 7-15
Flexible overhead budget

obj. 4

Colliers Company has determined that the variable overhead rate is $2.90 per direct labor hour in the Fabrication Department. The normal production capacity for the Fabrication Department is 14,000 hours for the month. Fixed costs are budgeted at $65,800 for the month.

a. Prepare a monthly factory overhead flexible budget for 13,000, 14,000, and 15,000 hours of production.
b. How much overhead would be applied to production if 15,000 hours were used in the department during the month?

EX 7-16
Factory overhead cost variances

obj. 4

✔ Volume variance, $12,750 U

The following data relate to factory overhead cost for the production of 5,000 computers:

Actual:	Variable factory overhead	$125,000
	Fixed factory overhead	34,000
Standard:	5,000 hrs. at $30	150,000

If productive capacity of 100% was 8,000 hours and the factory overhead cost budgeted at the level of 5,000 standard hours was $162,750, determine the variable factory overhead controllable variance, fixed factory overhead volume variance, and total factory overhead cost variance. The fixed factory overhead rate was $4.25 per hour.

EX 7-17
Factory overhead cost variances

obj. 4

✔ a. $1,000 F

Perma Weave Textiles Corporation began January with a budget for 30,000 hours of production in the Weaving Department. The department has a full capacity of 40,000 hours under normal business conditions. The budgeted overhead at the planned volumes at the beginning of January was as follows:

Variable overhead	$ 75,000
Fixed overhead	52,000
Total	$127,000

The actual factory overhead was $128,500 for January. The actual fixed factory overhead was as budgeted. During January, the Weaving Department had standard hours at actual production volume of 31,000 hours.

a. Determine the variable factory overhead controllable variance.
b. Determine the fixed factory overhead volume variance.

EX 7-18
Factory overhead variance corrections

obj. 4

The data related to Acclaim Sporting Goods Company's factory overhead cost for the production of 50,000 units of product are as follows:

Actual:	Variable factory overhead	$269,000
	Fixed factory overhead	180,000
Standard:	76,000 hrs. at $6.00 ($3.60 for variable factory overhead)	456,000

Productive capacity at 100% of normal was 75,000 hours, and the factory overhead cost budgeted at the level of 76,000 standard hours was $456,000. Based on these data, the chief cost accountant prepared the following variance analysis:

Variable factory overhead controllable variance:		
Actual variable factory overhead cost incurred	$269,000	
Budgeted variable factory overhead for 76,000 hours	273,600	
Variance—favorable		−$4,600
Fixed factory overhead volume variance:		
Normal productive capacity at 100%	75,000 hrs.	
Standard for amount produced	76,000	
Productive capacity not used	1,000 hrs.	
Standard variable factory overhead rate	× $6.00	
Variance—unfavorable		6,000
Total factory overhead cost variance—unfavorable		$1,400

Identify the errors in the factory overhead cost variance analysis.

EX 7-19
Factory overhead cost variance report

obj. 4

✔ Net controllable variance, $500 U

Scientific Molded Products Inc. prepared the following factory overhead cost budget for the Trim Department for August 2010, during which it expected to use 10,000 hours for production:

Variable overhead cost:		
Indirect factory labor	$24,000	
Power and light	4,000	
Indirect materials	12,000	
Total variable cost		$ 40,000
Fixed overhead cost:		
Supervisory salaries	$30,000	
Depreciation of plant and equipment	23,400	
Insurance and property taxes	21,600	
Total fixed cost		75,000
Total factory overhead cost		$115,000

Scientific Molded Products has available 15,000 hours of monthly productive capacity in the Trim Department under normal business conditions. During August, the Trim Department actually used 11,000 hours for production. The actual fixed costs were as budgeted. The actual variable overhead for August was as follows:

Actual variable factory overhead cost:	
Indirect factory labor	$27,000
Power and light	4,000
Indirect materials	13,500
Total variable cost	$44,500

Construct a factory overhead cost variance report for the Trim Department for August.

EX 7-20
Recording standards in accounts

obj. 5

Orion Manufacturing Company incorporates standards in its accounts and identifies variances at the time the manufacturing costs are incurred. Journalize the entries to record the following transactions:

a. Purchased 1,700 units of copper tubing on account at $54.50 per unit. The standard price is $56.00 per unit.
b. Used 1,000 units of copper tubing in the process of manufacturing 120 air conditioners. Eight units of copper tubing are required, at standard, to produce one air conditioner.

EX 7-21
Recording standards in accounts

obj. 5

The Assembly Department produced 2,000 units of product during June. Each unit required 1.5 standard direct labor hours. There were 3,200 actual hours used in the Assembly Department during June at an actual rate of $14.00 per hour. The standard direct labor rate is $15 per hour. Assuming direct labor for a month is paid on the fifth day of the following month, journalize the direct labor in the Assembly Department on June 30.

EX 7-22
Income statement indicating standard cost variances

obj. 5

✔ Income before income tax, $74,050

The following data were taken from the records of Parrott Company for December 2010:

Administrative expenses	$ 72,000
Cost of goods sold (at standard)	345,000
Direct materials price variance—favorable	900
Direct materials quantity variance—favorable	1,200
Direct labor rate variance—unfavorable	500
Direct labor time variance—favorable	450
Variable factory overhead controllable variance—favorable	250
Fixed factory overhead volume variance—unfavorable	3,200
Interest expense	2,250
Sales	580,000
Selling expenses	85,800

Prepare an income statement for presentation to management.

EX 7-23
Nonfinancial performance measures

obj. 6

Under Par, Inc., is an Internet retailer of golf equipment. Customers order golf equipment from the company, using an online catalog. The company processes these orders and delivers the requested product from its warehouse. The company wants to provide customers with an excellent purchase experience in order to expand the business through favorable word-of-mouth advertising and to drive repeat business. To help monitor performance, the company developed a set of performance measures for its order placement and delivery process.

Average computer response time to customer "clicks"
Dollar amount of returned goods
Elapsed time between customer order and product delivery
Maintenance dollars divided by hardware investment
Number of customer complaints divided by the number of orders
Number of misfilled orders divided by the number of orders
Number of orders per warehouse employee
Number of page faults or errors due to software programming errors
Number of software fixes per week
Server (computer) downtime
Training dollars per programmer

a. For each performance measure, identify it as either an input or output measure related to the "order placement and delivery" process.
b. Provide an explanation for each performance measure.

EX 7-24
Nonfinancial performance measures

obj. 6

Tri-County College wishes to monitor the efficiency and quality of its course registration process.

a. Identify three input and three output measures for this process.
b. Why would Tri-County College use nonfinancial measures for monitoring this process?

Problems Series A

PR 7-1A
Direct materials and direct labor variance analysis

objs. 2, 3

✔ c. Direct labor time variance, $1,095 F

Best Bathware Company manufactures faucets in a small manufacturing facility. The faucets are made from zinc. Manufacturing has 50 employees. Each employee presently provides 36 hours of labor per week. Information about a production week is as follows:

Standard wage per hr.	$14.60
Standard labor time per faucet	15 min.
Standard number of lbs. of zinc	1.6 lbs.
Standard price per lb. of zinc	$11.50
Actual price per lb. of zinc	$11.75
Actual lbs. of zinc used during the week	12,400 lbs.
Number of faucets produced during the week	7,500
Actual wage per hr.	$15.00
Actual hrs. per week	1,800 hrs.

Instructions

Determine (a) the standard cost per unit for direct materials and direct labor; (b) the price variance, quantity variance, and total direct materials cost variance; and (c) the rate variance, time variance, and total direct labor cost variance.

PR 7-2A
Flexible budgeting and variance analysis

objs. 2, 3

✔ 1. a. Direct materials price variance, $18,420 U

Scandia Coat Company makes women's and men's coats. Both products require filler and lining material. The following planning information has been made available:

	Standard Quantity		
	Women's Coats	**Men's Coats**	**Standard Price per Unit**
Filler	2.5 lbs.	4.0 lbs.	$1.25
Liner	6.0 yds.	8.5 yds.	6.50
Standard labor time	0.30 hr.	0.45 hr.	
Planned production	4,500 units	5,000 units	
Standard labor rate	$13.40 per hr.	$14.80 per hr.	

Scandia Coat does not expect there to be any beginning or ending inventories of filler and lining material. At the end of the budget year, Scandia Coat experienced the following actual results:

	Women's Coats	**Men's Coats**
Actual production	4,300	5,500
	Actual Price per Unit	**Actual Quantity Purchased and Used**
Filler	$1.15 per lb.	31,950
Liner	6.80 per yd.	72,050
	Actual Labor Rate	**Actual Labor Hours Used**
Women's Coats	$13.25 per hr.	1,300
Men's Coats	15.00 per hr.	2,425

The expected beginning inventory and desired ending inventory were realized.

Instructions

1. Prepare the following variance analyses, based on the actual results and production levels at the end of the budget year:
   a. Direct materials price, quantity, and total variance.
   b. Direct labor rate, time, and total variance.
2. Why are the standard amounts in part (1) based on the actual production at the end of the year instead of the planned production at the beginning of the year?

PR 7-3A
Direct materials, direct labor, and factory overhead cost variance analysis

objs. 3, 4

✔ a. Direct materials price variance, $7,060 F

Road Ready Tire Co. manufactures automobile tires. Standard costs and actual costs for direct materials, direct labor, and factory overhead incurred for the manufacture of 5,200 tires were as follows:

	Standard Costs	**Actual Costs**
Direct materials	71,000 lbs. at $5.10	70,600 lbs. at $5.00
Direct labor	1,300 hrs. at $17.50	1,330 hrs. at $17.80
Factory overhead	Rates per direct labor hr., based on 100% of normal capacity of 1,350 direct labor hrs.:	
	Variable cost, $3.10	$4,000 variable cost
	Fixed cost, $4.90	$6,615 fixed cost

Each tire requires 0.25 hour of direct labor.

Instructions

Determine (a) the price variance, quantity variance, and total direct materials cost variance; (b) the rate variance, time variance, and total direct labor cost variance; and (c) variable factory overhead controllable variance, the fixed factory overhead volume variance, and total factory overhead cost variance.

PR 7-4A
Standard factory overhead variance report

obj. 4

✔ Controllable variance, $640 F

Bio-Care, Inc., a manufacturer of disposable medical supplies, prepared the following factory overhead cost budget for the Assembly Department for March 2010. The company expected to operate the department at 100% of normal capacity of 18,000 hours.

Variable costs:		
Indirect factory wages	$135,000	
Power and light	93,600	
Indirect materials	25,200	
Total variable cost		$253,800
Fixed costs:		
Supervisory salaries	$ 72,000	
Depreciation of plant and equipment	51,500	
Insurance and property taxes	24,100	
Total fixed cost		147,600
Total factory overhead cost		$401,400

During March, the department operated at 16,900 hours, and the factory overhead costs incurred were indirect factory wages, $126,320; power and light, $88,110; indirect materials, $23,220; supervisory salaries, $72,000; depreciation of plant and equipment, $51,500; and insurance and property taxes, $24,100.

Instructions

Prepare a factory overhead cost variance report for March. To be useful for cost control, the budgeted amounts should be based on 16,900 hours.

PR 7-5A
Standards for nonmanufacturing expenses

objs. 3, 6

✔ 2. $256 F

The Radiology Department provides imaging services for Parkside Medical Center. One important activity in the Radiology Department is transcribing digitally recorded analyses of images into a written report. The manager of the Radiology Department determined that the average transcriptionist could type 750 lines of a report in an hour. The plan for the first week in May called for 60,000 typed lines to be written. The Radiology Department has two transcriptionists. Each transcriptionist is hired from an employment firm that requires temporary employees to be hired for a minimum of a 40-hour week. Transcriptionists are paid $16.00 per hour. The manager offered a bonus if the department could type more than 65,000 lines for the week, without overtime. Due to high service demands, the transcriptionists typed more lines in the first week of May than planned. The actual amount of lines typed in the first week of May was 72,000 lines, without overtime. As a result, the bonus caused the average transcriptionist hourly rate to increase to $19.00 per hour during the first week in May.

Instructions

1. If the department typed 60,000 lines according to the original plan, what would have been the labor time variance?
2. What was the labor time variance as a result of typing 72,000 lines?
3. What was the labor rate variance as a result of the bonus?
4. The manager is trying to determine if a better decision would have been to hire a temporary transcriptionist to meet the higher typing demands in the first week of May, rather than paying out the bonus. If another employee was hired from the employment firm, what would have been the labor time variance in the first week?
5. Which decision is better, paying the bonus or hiring another transcriptionist?
6. Are there any performance-related issues that the labor time and rate variances fail to consider? Explain.

Problems Series B

PR 7-1B
Direct materials and direct labor variance analysis

Vintage Dresses Inc. manufactures dresses in a small manufacturing facility. Manufacturing has 20 employees. Each employee presently provides 35 hours of productive labor per week. Information about a production week is as follows:

objs. 2, 3

✔ c. Rate variance, $140 U

Standard wage per hr.	$10.80
Standard labor time per dress	12 min.
Standard number of yds. of fabric per dress	3.8 yds.
Standard price per yd. of fabric	$2.90
Actual price per yd. of fabric	$2.75
Actual yds. of fabric used during the week	12,100 yds.
Number of dresses produced during the week	3,250
Actual wage per hr.	$11.00
Actual hrs. per week	700 hrs.

Instructions

Determine (a) the standard cost per dress for direct materials and direct labor; (b) the price variance, quantity variance, and total direct materials cost variance; and (c) the rate variance, time variance, and total direct labor cost variance.

PR 7-2B

Flexible budgeting and variance analysis

objs. 2, 3

✔ 1. a. Direct materials quantity variance, $2,630 F

Cocoa Delights Chocolate Company makes dark chocolate and light chocolate. Both products require cocoa and sugar. The following planning information has been made available:

	Standard Quantity		
	Dark Chocolate	**Light Chocolate**	**Standard Price per Pound**
Cocoa	12 lbs.	8 lbs.	$4.50
Sugar	9 lbs.	13 lbs.	0.65
Standard labor time	0.35 hr.	0.50 hr.	
Planned production	3,000 cases	5,000 cases	
Standard labor rate	$14.40 per hr.	$14.00 per hr.	

Cocoa Delights Chocolate does not expect there to be any beginning or ending inventories of cocoa or sugar. At the end of the budget year, Cocoa Delights Chocolate had the following actual results:

	Dark Chocolate	**Light Chocolate**
Actual production (cases)	2,800	5,500
	Actual Price per Pound	**Actual Pounds Purchased and Used**
Cocoa	$4.65	76,900
Sugar	0.55	97,500
	Actual Labor Rate	**Actual Labor Hours Used**
Dark chocolate	$14.25 per hr.	960
Light chocolate	14.25 per hr.	2,780

Instructions

1. Prepare the following variance analyses, based on the actual results and production levels at the end of the budget year:
   a. Direct materials price, quantity, and total variance.
   b. Direct labor rate, time, and total variance.
2. Why are the standard amounts in part (1) based on the actual production for the year instead of the planned production for the year?

PR 7-3B

Direct materials, direct labor, and factory overhead cost variance analysis

objs. 3, 4

✔ c. Controllable variance, $150 F

Eastern Polymers, Inc., processes a base chemical into plastic. Standard costs and actual costs for direct materials, direct labor, and factory overhead incurred for the manufacture of 23,500 units of product were as follows:

	Standard Costs	**Actual Costs**
Direct materials	4,280 lbs. at $8.10	4,250 lbs. at $8.32
Direct labor	2,350 hrs. at $17.50	2,400 hrs. at $17.00
Factory overhead	Rates per direct labor hr., based on 100% of normal capacity of 2,000 direct labor hrs.:	
	Variable cost, $2.20	$5,020 variable cost
	Fixed cost, $3.50	$7,000 fixed cost

Each unit requires 0.1 hour of direct labor.

Instructions

Determine (a) the price variance, quantity variance, and total direct materials cost variance; (b) the rate variance, time variance, and total direct labor cost variance; and (c) variable factory overhead controllable variance, the fixed factory overhead volume variance, and total factory overhead cost variance.

PR 7-4B
Standard factory overhead variance report

obj. 4

✔ Controllable variance, $130 U

KAT Equipment Inc., a manufacturer of construction equipment, prepared the following factory overhead cost budget for the Welding Department for December 2010. The company expected to operate the department at 100% of normal capacity of 5,600 hours.

Variable costs:		
Indirect factory wages	$17,640	
Power and light	10,080	
Indirect materials	8,400	
Total variable cost		$36,120
Fixed costs:		
Supervisory salaries	$12,000	
Depreciation of plant and equipment	31,450	
Insurance and property taxes	9,750	
Total fixed cost		53,200
Total factory overhead cost		$89,320

During December, the department operated at 6,000 standard hours, and the factory overhead costs incurred were indirect factory wages, $18,760; power and light, $10,620; indirect materials, $9,450; supervisory salaries, $12,000; depreciation of plant and equipment, $31,450; and insurance and property taxes, $9,750.

Instructions

Prepare a factory overhead cost variance report for December. To be useful for cost control, the budgeted amounts should be based on 6,000 hours.

PR 7-5B
Standards for nonmanufacturing expenses

objs. 3, 6

✔ 3. $960 U

Office Pro, Inc., does software development. One important activity in software development is writing software code. The manager of the WordPro Development Team determined that the average software programmer could write 40 lines of code in an hour. The plan for the first week in May called for 6,000 lines of code to be written on the WordPro product. The WordPro Team has four programmers. Each programmer is hired from an employment firm that requires temporary employees to be hired for a minimum of a 40-hour week. Programmers are paid $28.00 per hour. The manager offered a bonus if the team could generate more than 6,500 lines for the week, without overtime. Due to a project emergency, the programmers wrote more code in the first week of May than planned. The actual amount of code written in the first week of May was 7,000 lines, without overtime. As a result, the bonus caused the average programmer's hourly rate to increase to $34.00 per hour during the first week in May.

Instructions

1. If the team generated 6,000 lines of code according to the original plan, what would have been the labor time variance?
2. What was the actual labor time variance as a result of generating 7,000 lines of code?
3. What was the labor rate variance as a result of the bonus?
4. The manager is trying to determine if a better decision would have been to hire a temporary programmer to meet the higher programming demand in the first week of May, rather than paying out the bonus. If another employee was hired from the employment firm, what would have been the labor time variance in the first week?
5. Which decision is better, paying the bonus or hiring another programmer?
6. Are there any performance-related issues that the labor time and rate variances fail to consider? Explain.

Comprehensive Problem 5

Essence of Persia, Inc., began operations on January 1, 2010. The company produces a hand and body lotion in an eight-ounce bottle called *Eternal Beauty*. The lotion is sold wholesale in 12-bottle cases for $80 per case. There is a selling commission of $16 per case. The January direct materials, direct labor, and factory overhead costs are as follows:

DIRECT MATERIALS

	Cost Behavior	Units per Case	Cost per Unit	Direct Materials Cost per Case
Cream base	Variable	72 ozs.	$0.015	$ 1.08
Natural oils	Variable	24 ozs.	0.250	6.00
Bottle (8-oz.)	Variable	12 bottles	0.400	4.80
				$11.88

DIRECT LABOR

Department	Cost Behavior	Time per Case	Labor Rate per Hour	Direct Labor Cost per Case
Mixing	Variable	16.80 min.	$15.00	$4.20
Filling	Variable	4.20	12.00	0.84
		21.00 min.		$5.04

FACTORY OVERHEAD

	Cost Behavior	Total Cost
Utilities	Mixed	$ 230
Facility lease	Fixed	14,392
Equipment depreciation	Fixed	3,600
Supplies	Fixed	600
		$18,822

Part A—Break-Even Analysis

The management of Essence of Persia, Inc., wishes to determine the number of cases required to break even per month. The utilities cost, which is part of factory overhead, is a mixed cost. The following information was gathered from the first six months of operation regarding this cost:

2010	Case Production	Utility Total Cost
January	300	$230
February	600	263
March	1,000	300
April	900	292
May	750	280
June	825	285

Instructions

1. Determine the fixed and variable portion of the utility cost using the high-low method.
2. Determine the contribution margin per case.
3. Determine the fixed costs per month, including the utility fixed cost from part (1).
4. Determine the break-even number of cases per month.

Part B—August Budgets

During July of the current year, the management of Essence of Persia, Inc., asked the controller to prepare August manufacturing and income statement budgets. Demand was expected to be 1,400 cases at $80 per case for August. Inventory planning information is provided as follows:

Finished Goods Inventory:

	Cases	Cost
Estimated finished goods inventory, August 1, 2010	200	$6,000
Desired finished goods inventory, August 31, 2010	100	3,000

Materials Inventory:

	Cream Base (ozs.)	Oils (ozs.)	Bottles (bottles)
Estimated materials inventory, August 1, 2010	400	240	500
Desired materials inventory, August 31, 2010	600	300	400

There was negligible work in process inventory assumed for either the beginning or end of the month; thus, none was assumed. In addition, there was no change in the cost per unit or estimated units per case operating data from January.

Instructions

5. Prepare the August production budget.
6. Prepare the August direct materials purchases budget.
7. Prepare the August direct labor budget.
8. Prepare the August factory overhead budget.
9. Prepare the August budgeted income statement, including selling expenses.

Part C—August Variance Analysis

During September of the current year, the controller was asked to perform variance analyses for August. The January operating data provided the standard prices, rates, times, and quantities per case. There were 1,500 actual cases produced during August, which was 200 more cases than planned at the beginning of the month. Actual data for August were as follows:

	Actual Direct Materials Price per Case	Actual Direct Materials Quantity per Case
Cream base	$1.05 (for 72 ozs.)	76 ozs.
Natural oils	6.25 (for 24 ozs.)	25 ozs.
Bottle (8-oz.)	4.65 (for 12 bottles)	12.4 bottles

	Actual Direct Labor Rate	Actual Direct Labor Time per Case
Mixing	$15.40	16.00 min.
Filling	11.80	4.60 min.
Actual variable overhead	$158.00	
Normal volume	1,450 cases	

The prices of the materials were different than standard due to fluctuations in market prices. The standard quantity of materials used per case was an ideal standard. The Mixing Department used a higher grade labor classification during the month, thus causing the actual labor rate to exceed standard. The Filling Department used a lower grade labor classification during the month, thus causing the actual labor rate to be less than standard.

Instructions

10. Determine and interpret the direct materials price and quantity variances for the three materials.
11. Determine and interpret the direct labor rate and time variances for the two departments.
12. Determine and interpret the factory overhead controllable variance.
13. Determine and interpret the factory overhead volume variance.
14. Why are the standard direct labor and direct materials costs in the calculations for parts (10) and (11) based on the actual 1,500-case production volume rather than the planned 1,300 cases of production used in the budgets for parts (6) and (7)?

Special Activities

SA 7-1
Ethics and professional conduct in business using nonmanufacturing standards

Michael McIntyre is a cost analyst with Mid-States Insurance Company. Mid-States is applying standards to its claims payment operation. Claims payment is a repetitive operation that could be evaluated with standards. Michael used time and motion studies to identify an ideal standard of 36 claims processed per hour. The Claims Processing Department manager, Kimberly Mann, has rejected this standard and has argued that the standard should be 30 claims processed per hour. Kimberly and Michael were unable to agree, so they decided to discuss this matter openly at a joint meeting with the vice president of operations, who would arbitrate a final decision. Prior to the meeting, Michael wrote the following memo to the VP.

To: T. J. Logan, Vice President of Operations
From: Michael McIntyre
Re: Standards in the Claims Processing Department

As you know, Kimberly and I are scheduled to meet with you to discuss our disagreement with respect to the appropriate standards for the Claims Processing Department. I have conducted time and motion studies and have determined that the ideal standard is 36 claims processed per hour. Kimberly argues that 30 claims processed per hour would be more appropriate. I believe she is trying to "pad" the budget with some slack. I'm not sure what she is trying to get away with, but I believe a tight standard will drive efficiency up in her area. I hope you will agree when we meet with you next week.

Discuss the ethical and professional issues in this situation.

SA 7-2
Nonfinancial performance measures

The senior management of Calvin Company has proposed the following three performance measures for the company:

1. Net income as a percent of stockholders' equity
2. Revenue growth
3. Employee satisfaction

Management believes these three measures combine both financial and nonfinancial measures and are thus superior to using just financial measures.

What advice would you give Calvin Company for improving its performance measurement system?

SA 7-3
Variance interpretation

You have been asked to investigate some cost problems in the Assembly Department of MyLife Electronics Co., a consumer electronics company. To begin your investigation, you have obtained the following budget performance report for the department for the last quarter:

MyLife Electronics Co.—Assembly Department
Quarterly Budget Performance Report

	Standard Quantity at Standard Rates	Actual Quantity at Standard Rates	Quantity Variances
Direct labor	$ 78,750	$113,750	$35,000 U
Direct materials	148,750	192,500	43,750 U
Total	$227,500	$306,250	$78,750 U

The following reports were also obtained:

MyLife Electronics Co.—Purchasing Department
Quarterly Budget Performance Report

	Actual Quantity at Standard Rates	Actual Quantity at Actual Rates	Price Variance
Direct materials	$218,750	$192,500	−$26,250 F

MyLife Electronics Co.—Fabrication Department
Quarterly Budget Performance Report

	Standard Quantity at Standard Rates	Actual Quantity at Standard Rates	Quantity Variances
Direct labor	$122,500	$101,500	−$21,000 F
Direct materials	70,000	70,000	0
Total	$192,500	$171,500	−$21,000 F

You also interviewed the Assembly Department supervisor. Excerpts from the interview follow.

Q: *What explains the poor performance in your department?*
A: *Listen, you've got to understand what it's been like in this department recently. Lately, it seems no matter how hard we try, we can't seem to make the standards. I'm not sure what is going on, but we've been having a lot of problems lately.*
Q: *What kind of problems?*
A: *Well, for instance, all this quarter we've been requisitioning purchased parts from the material storeroom, and the parts just didn't fit together very well. I'm not sure what is going on, but during most of this quarter we've had to scrap and sort purchased parts—just to get our assemblies put together. Naturally, all this takes time and material. And that's not all.*
Q: *Go on.*
A: *All this quarter, the work that we've been receiving from the Fabrication Department has been shoddy. I mean, maybe around 20% of the stuff that comes in from Fabrication just can't be assembled. The fabrication is all wrong. As a result, we've had to scrap and rework a lot of the stuff. Naturally, this has just shot our quantity variances.*

Interpret the variance reports in light of the comments by the Assembly Department supervisor.

SA 7-4
Variance interpretation

Sound Sensation Inc. is a small manufacturer of electronic musical instruments. The plant manager received the following variable factory overhead report for the period:

	Actual	Budgeted Variable Factory Overhead at Actual Production	Controllable Variance
Supplies	$28,000	$26,520	$1,480 U
Power and light	35,000	33,990	1,010 U
Indirect factory wages	26,112	20,400	5,712 U
Total	$89,112	$80,910	$8,202 U

Actual units produced: 10,200 (85% of practical capacity)

The plant manager is not pleased with the $8,202 unfavorable variable factory overhead controllable variance and has come to discuss the matter with the controller. The following discussion occurred:

Plant Manager: I just received this factory report for the latest month of operation. I'm not very pleased with these figures. Before these numbers go to headquarters, you and I will need to reach an understanding.
Controller: Go ahead, what's the problem?
Plant Manager: What's the problem? Well, everything. Look at the variance. It's too large. If I understand the accounting approach being used here, you are assuming that my costs are variable to the units produced. Thus, as the production volume declines, so should these costs. Well, I don't believe that these costs are variable at all. I think they are fixed costs. As a result, when we operate below capacity, the costs really don't go down at all. I'm being penalized for costs I have no control over at all. I need this report to be redone to reflect this fact. If anything, the difference between actual and budget is essentially a volume variance. Listen, I know that you're a team player. You really need to reconsider your assumptions on this one.

If you were in the controller's position, how would you respond to the plant manager?

SA 7-5
Nonmanufacturing performance measures—government

Group Project

Internet Project

Municipal governments are discovering that you can control only what you measure. As a result, many municipal governments are introducing nonfinancial performance measures to help improve municipal services. In a group, use the Google search engine to perform a search for "municipal government performance measurement." Google will provide a list of Internet sites that outline various city efforts in using nonfinancial performance measures. As a group, report on the types of measures used by one of the cities from the search.

Answers to Self-Examination Questions

1. **C** The unfavorable direct materials price variance of $2,550 is determined as follows:

Actual price	$5.05 per lb.
Standard price	5.00
Price variance—unfavorable	$0.05 per lb.

$0.05 × 51,000 actual lbs. = $2,550

2. **D** The unfavorable direct labor time variance of $2,400 is determined as follows:

Actual direct labor time	2,200
Standard direct labor time	2,000*
Direct labor time variance—unfavorable	200 × $12 standard rate = $2,400

*4,000 units × 0.5 hr.

3. **B** The unfavorable factory overhead volume variance of $2,000 is determined as follows:

Productive capacity not used	1,000 hrs.
Standard fixed factory overhead cost rate	× $2
Factory overhead volume variance—unfavorable	$2,000

4. **B** The controllable variable factory overhead variance is determined as follows:

6,000 units × 0.25 hr. = 1,500 hours
1,500 hrs. × $5.00 per hr. = $7,500

Actual variable overhead	$8,000
Less budgeted variable overhead at actual volume	7,500
Unfavorable controllable variance	$ 500

5. **D** The fixed factory overhead volume variance can be determined as follows:

Actual production in standard hours:
600 units × 0.2 machine hr. = 120 machine hrs.

Practical capacity	200 machine hrs.
Standard hours at actual production	120
Idle capacity	80 machine hrs.

80 hrs. × $12.00 = $960 unfavorable volume variance

CHAPTER 8

Performance Evaluation for Decentralized Operations

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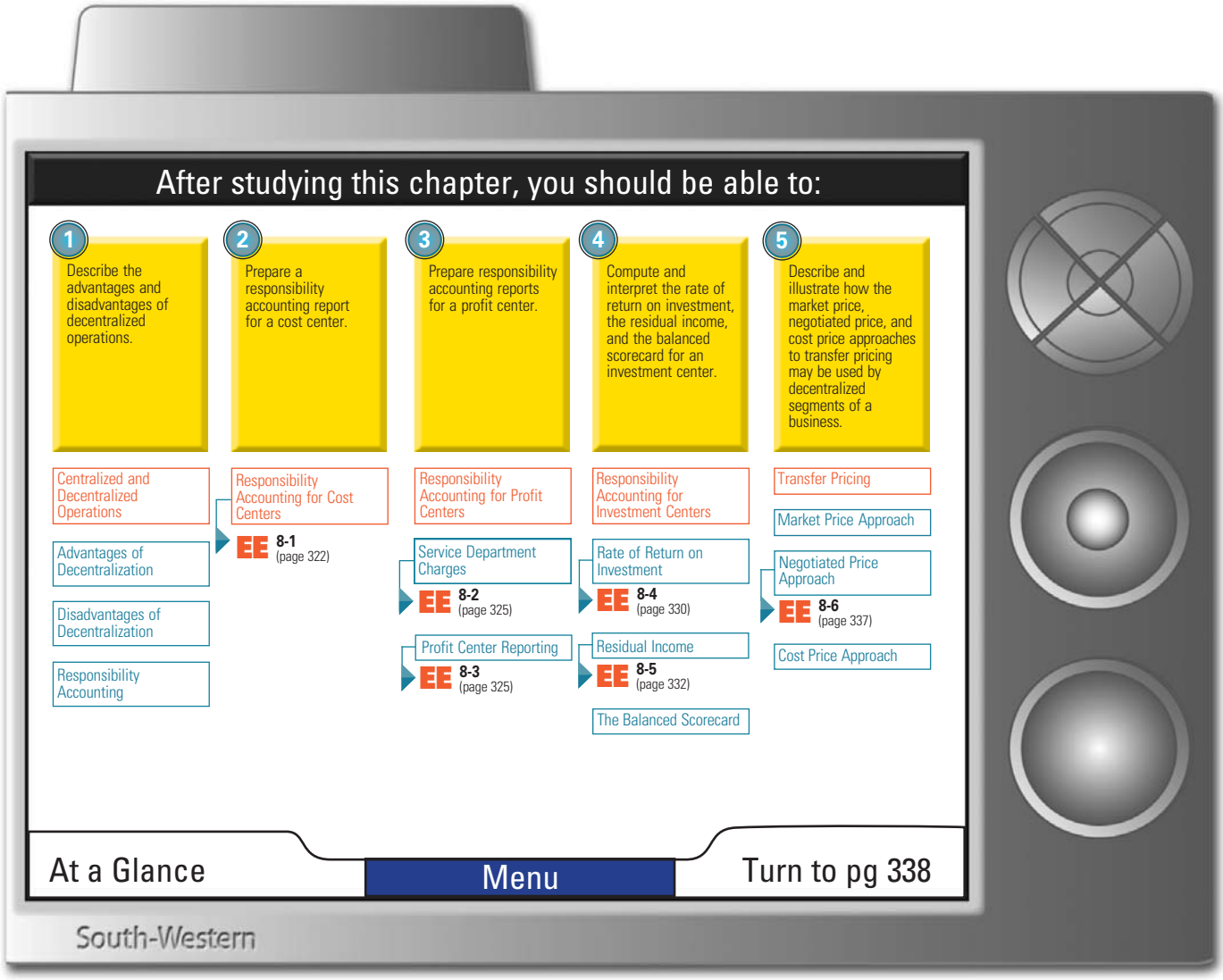
K2 SPORTS

Have you ever wondered why large retail stores like Wal-Mart, The Home Depot, and Sports Authority are divided into departments? Dividing into departments allows retailers to provide products and expertise in specialized areas, while offering a broad line of products. Departments also allow companies to assign responsibility for financial performance. This information can be used to make product decisions, evaluate operations, and guide company strategy. Strong performance in a department might be attributed to a good department manager, who might be rewarded with a promotion. Poor departmental performance might lead to a change in the mix of products that the department sells.

Like retailers, most businesses organize into operational units, such as divisions and departments. For example, K2 Sports, a leading maker of athletic and outdoor equipment, manages its business across four primary business segments: Marine and Outdoor, Action Sports, Team Sports, and Footwear and Apparel. These segments are further divided into product lines, such as K2 skis, Rawlings athletic equipment, Marmot outdoor products, and WGP Paintball.

Managers are responsible for running the operations of their segment of the business. Each segment is evaluated based on operating profit, and this information is used to plan and control K2's operations.

In this chapter, the role of accounting in assisting managers in planning and controlling organizational units, such as departments, divisions, and stores, is described and illustrated.



1 Describe the advantages and disadvantages of decentralized operations.

Procter & Gamble is organized around products such as Tide (laundry soap), Braun (home appliance), Charmin (bath tissue), CoverGirl (skin care), and Crest (tooth paste).

Centralized and Decentralized Operations

In a *centralized* company, all major planning and operating decisions are made by top management. For example, a one-person, owner-manager-operated company is centralized because all plans and decisions are made by one person. In a small owner-manager-operated business, centralization may be desirable. This is because the owner-manager's close supervision ensures that the business will be operated in the way the owner-manager wishes.

In a *decentralized* company, managers of separate divisions or units are delegated operating responsibility. The division (unit) managers are responsible for planning and controlling the operations of their divisions. Divisions are often structured around products, customers, or regions.

The proper amount of decentralization for a company depends on the company's unique circumstances. For example, in some companies, division managers have authority over all operations, including fixed asset purchases. In other companies, division managers have authority over profits but not fixed asset purchases.

Wachovia Corporation, a national bank, decentralized decisions about how the bank does business over the Internet. Each business unit independently decides how it will conduct business over the Internet. For example, the Mortgage Loan Division allows customers to check current mortgage rates and apply for mortgages online.

Advantages of Decentralization

For large companies, it is difficult for top management to do the following:

1. Maintain daily contact with all operations
2. Maintain operating expertise in all product lines and services

In such cases, delegating authority to managers closest to the operations usually results in better decisions. These managers often anticipate and react to operating data more quickly than could top management. These managers also can focus their attention on becoming "experts" in their area of operation.

Decentralized operations provide excellent training for managers. Delegating responsibility allows managers to develop managerial experience early in their careers. This helps a company retain managers, some of whom may be later promoted to top management positions.

Managers of decentralized operations often work closely with customers. As a result, they tend to identify with customers and, thus, are often more creative in suggesting operating and product improvements. This helps create good customer relations.

When the Pizza Hut chain added chicken to its menu, Kentucky Fried Chicken (KFC) retaliated with an advertising campaign against Pizza Hut. However, Pizza Hut and KFC are owned by the same company, Yum! Brands, Inc.

Disadvantages of Decentralization

A primary disadvantage of decentralized operations is that decisions made by one manager may negatively affect the profits of the company. For example, managers of divisions whose products compete with each other might start a price war that decreases the profits of both divisions and, thus, the overall company.

Another disadvantage of decentralized operations is that they may result in duplicate assets and expenses. For example, each manager of a product line might have a separate sales force and office support staff.

The advantages and disadvantages of decentralization are summarized in Exhibit 1.

Exhibit 1

Advantages and Disadvantages of Decentralized Operations

Advantages of Decentralization
Allows managers closest to the operations to make decisions
Provides excellent training for managers
Allows managers to become experts in their area of operation
Helps retain managers
Improves creativity and customer relations

Disadvantages of Decentralization
Decisions made by managers may negatively affect the profits of the company
Duplicates assets and expenses

Responsibility Accounting

In a decentralized business, accounting assists managers in evaluating and controlling their areas of responsibility, called *responsibility centers*. **Responsibility accounting** is the process of measuring and reporting operating data by responsibility center.

Three types of responsibility centers are:

1. Cost centers, which have responsibility over costs
2. Profit centers, which have responsibility over revenues and costs
3. Investment centers, which have responsibility over revenue, costs, and investment in assets

2 Prepare a responsibility accounting report for a cost center.

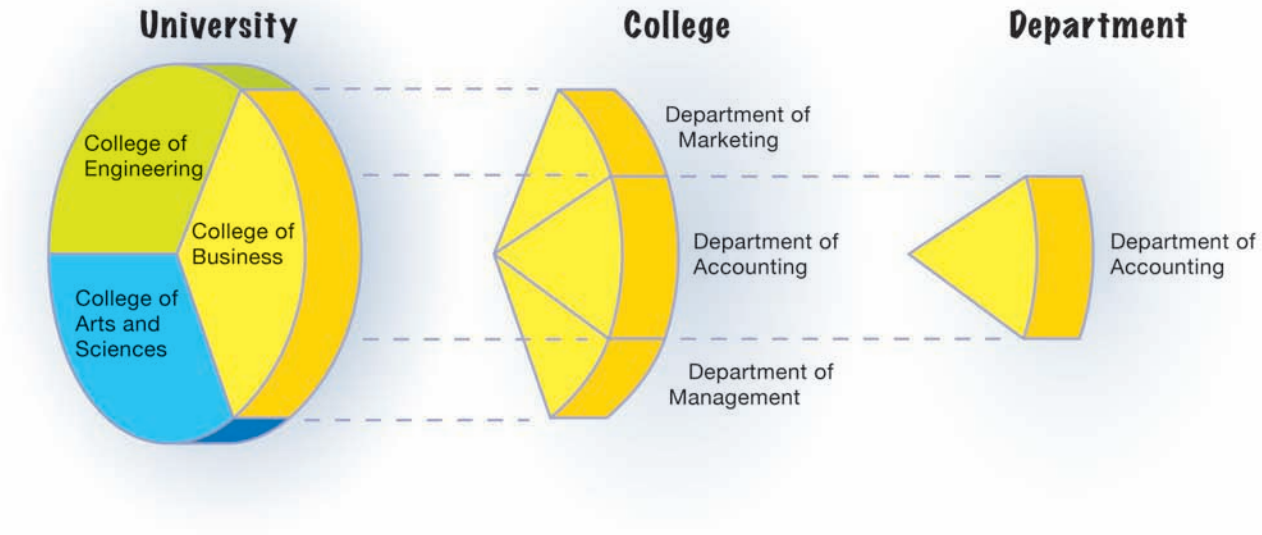
Responsibility Accounting for Cost Centers

A **cost center** manager has responsibility for controlling costs. For example, the supervisor of the Power Department has responsibility for the costs of providing power. A cost center manager does not make decisions concerning sales or the amount of fixed assets invested in the center.

Cost centers may vary in size from a small department to an entire manufacturing plant. In addition, cost centers may exist within other cost centers. For example, an entire university or college could be viewed as a cost center, and each college and department within the university could also be a cost center, as shown in Exhibit 2.

Exhibit 2

Cost Centers in a University



Responsibility accounting for cost centers focuses on controlling and reporting of costs. Budget performance reports that report budgeted and actual costs are normally prepared for each cost center.

Exhibit 3 illustrates budget performance reports for the following cost centers:

1. Vice President, Production
2. Manager, Plant A
3. Supervisor, Department 1—Plant A

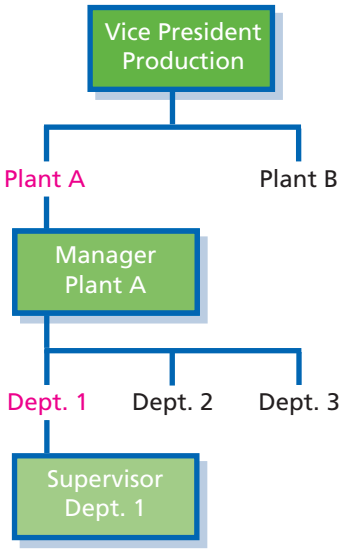
Exhibit 3 shows how cost centers are often linked together within a company. For example, the budget performance report for Department 1—Plant A supports the report for Plant A, which supports the report for the vice president of production.

The reports in Exhibit 3 show the budgeted costs and actual costs along with the differences. Each difference is classified as either *over* budget or *under* budget. Such reports allow cost center managers to focus on areas of significant differences.

For example, the supervisor for Department 1 of Plant A can focus on why the materials cost was over budget. The supervisor might discover that excess materials were scrapped. This could be due to such factors as machine malfunctions, improperly trained employees, or low quality materials.

Exhibit 3

Responsibility Accounting Reports for Cost Centers



Budget Performance Report
Vice President, Production
For the Month Ended October 31, 2010

	Budget	Actual	Over Budget	Under Budget
Administration	$ 19,500	$ 19,700	$ 200	
Plant A	467,475	470,330	2,855	
Plant B	395,225	394,300		$925
	$882,200	$884,330	$3,055	$925

Budget Performance Report
Manager, Plant A
For the Month Ended October 31, 2010

	Budget	Actual	Over Budget	Under Budget
Administration	$ 17,500	$ 17,350		$150
Department 1	109,725	111,280	$1,555	
Department 2	190,500	192,600	2,100	
Department 3	149,750	149,100		650
	$467,475	$470,330	$3,655	$800

Budget Performance Report
Supervisor, Department 1—Plant A
For the Month Ended October 31, 2010

	Budget	Actual	Over Budget	Under Budget
Factory wages	$ 58,100	$ 58,000		$100
Materials	32,500	34,225	$1,725	
Supervisory salaries	6,400	6,400		
Power and light	5,750	5,690		60
Depreciation of plant and equipment	4,000	4,000		
Maintenance	2,000	1,990		10
Insurance and property taxes	975	975		
	$109,725	$111,280	$1,725	$170

As shown in Exhibit 3, responsibility accounting reports are usually more summarized for higher levels of management. For example, the budget performance report for the manager of Plant A shows only administration and departmental data. This report enables the plant manager to identify the departments responsible for major differences. Likewise, the report for the vice president of production summarizes the cost data for each plant.

Example Exercise 8-1 Budgetary Performance for Cost Center 2

Nuclear Power Company's costs were over budget by $24,000. The company is divided into North and South regions. The North Region's costs were under budget by $2,000. Determine the amount that the South Region's costs were over or under budget.

Follow My Example 8-1

$26,000 over budget ($24,000 + $2,000)

For Practice: PE 8-1A, PE 8-1B

3 Prepare responsibility accounting reports for a profit center.

Responsibility Accounting for Profit Centers

A **profit center** manager has the responsibility and authority for making decisions that affect revenues and costs and, thus, profits. Profit centers may be divisions, departments, or products.

Profit centers may be divisions, departments, or products.

The manager of a profit center does not make decisions concerning the fixed assets invested in the center. However, profit centers are an excellent training assignment for new managers.

Responsibility accounting for profit centers focuses on reporting revenues, expenses, and income from operations. Thus, responsibility accounting reports for profit centers take the form of income statements.

Lester B. Korn of Korn/ Ferry International offered the following strategy for young executives en route to top management positions: "Get profit-center responsibility."

The profit center income statement should include only revenues and expenses that are controlled by the manager. **Controllable revenues** are revenues earned by the profit center. **Controllable expenses** are costs that can be influenced (controlled) by the decisions of profit center managers.

Service Department Charges

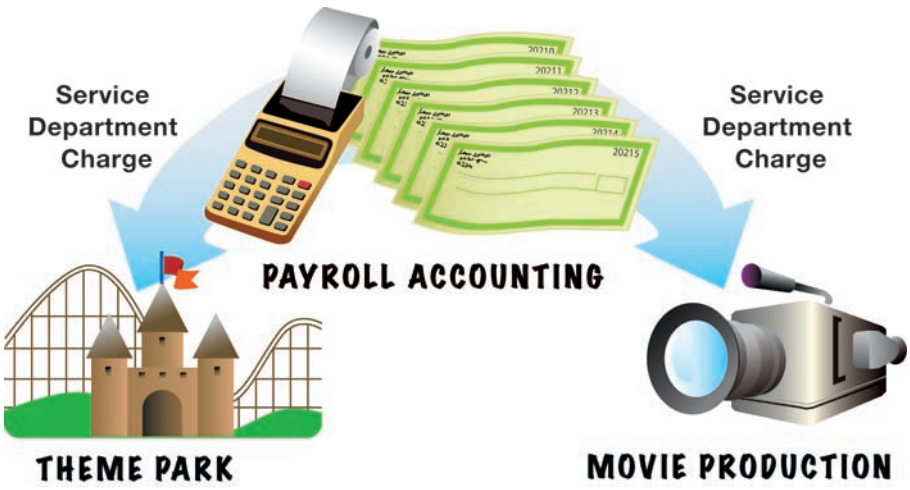
The controllable expenses of profit centers include *direct operating expenses* such as sales salaries and utility expenses. In addition, a profit center may incur expenses provided by internal centralized *service departments*. Examples of such service departments include the following:

1. Research and Development
2. Legal
3. Telecommunications
4. Information and Computer Systems
5. Facilities Management
6. Purchasing
7. Publications and Graphics
8. Payroll Accounting
9. Transportation
10. Personnel Administration

Service department charges are *indirect* expenses to a profit center. They are similar to the expenses that would be incurred if the profit center purchased the services from outside the company. A profit center manager has control over service department expenses if the manager is free to choose how much service is used. In such cases, **service department charges** are allocated to profit centers based on the usage of the service by each profit center. For example, Exhibit 4 shows the allocation of payroll accounting costs to NEG's Theme Park and Movie Production divisions based on the number of payroll checks processed.

Exhibit 4

Payroll Accounting Department Charges to NEG's Theme Park and Movie Production Divisions



To illustrate, Nova Entertainment Group (NEG), a diversified entertainment company, is used. NEG has the following two operating divisions organized as profit centers:

1. Theme Park Division
2. Movie Production Division

Employees of IBM speak of "green money" and "blue money." Green money comes from customers. Blue money comes from providing services to other IBM departments via service department charges. IBM employees note that blue money is easier to earn than green money; yet from the stockholders' perspective, green money is the only money that counts.

The revenues and direct operating expenses for the two divisions are shown below. The operating expenses consist of direct expenses, such as the wages and salaries of a division's employees.

	Theme Park Division	Movie Production Division
Revenues	$6,000,000	$2,500,000
Operating expenses	2,495,000	405,000

NEG's service departments and the expenses they incurred for the year ended December 31, 2010, are as follows:

Purchasing	$400,000
Payroll Accounting	255,000
Legal	250,000
Total	$905,000

An activity base for each service department is used to charge service department expenses to the Theme Park and Movie Production divisions. The activity base for each service department is a measure of the services performed. For NEG, the service department activity bases are as follows:

Department	Activity Base
Purchasing	Number of purchase requisitions
Payroll Accounting	Number of payroll checks
Legal	Number of billed hours

The use of services by the Theme Park and Movie Production divisions is as follows:

	Service Usage		
Division	**Purchasing**	**Payroll Accounting**	**Legal**
Theme Park	25,000 purchase requisitions	12,000 payroll checks	100 billed hrs.
Movie Production	15,000	3,000	900
Total	40,000 purchase requisitions	15,000 payroll checks	1,000 billed hrs.

The rates at which services are charged to each division are called *service department charge rates*. These rates are computed as follows:

$$\text{Service Department Charge Rate} = \frac{\text{Service Department Expense}}{\text{Total Service Department Usage}}$$

NEG's service department charge rates are computed as follows:

$$\text{Purchasing Charge Rate} = \frac{\$400{,}000}{40{,}000 \text{ purchase requisitions}} = \$10 \text{ per purchase requisition}$$

$$\text{Payroll Charge Rate} = \frac{\$255{,}000}{15{,}000 \text{ payroll checks}} = \$17 \text{ per payroll check}$$

$$\text{Legal Charge Rate} = \frac{\$250{,}000}{1{,}000 \text{ billed hrs.}} = \$250 \text{ per hr.}$$

The services used by each division are multiplied by the service department charge rates to determine the service charges for each division, as shown below.

$$\text{Service Department Charge} = \text{Service Usage} \times \text{Service Department Charge Rate}$$

Exhibit 5 illustrates the service department charges and related computations for NEG's Theme Park and Movie Production divisions.

Exhibit 5

Service Department Charges to NEG Divisions

Nova Entertainment Group
Service Department Charges to NEG Divisions
For the Year Ended December 31, 2010

Service Department	Theme Park Division	Movie Production Division
Purchasing (Note A)	$250,000	$150,000
Payroll Accounting (Note B)	204,000	51,000
Legal (Note C)	25,000	225,000
Total service department charges	$479,000	$426,000

Note A:
25,000 purchase requisitions × $10 per purchase requisition = $250,000
15,000 purchase requisitions × $10 per purchase requisition = $150,000
Note B:
12,000 payroll checks × $17 per check = $204,000
3,000 payroll checks × $17 per check = $51,000
Note C:
100 hours × $250 per hour = $25,000
900 hours × $250 per hour = $225,000

The differences in the service department charges between the two divisions can be explained by the nature of their operations and, thus, usage of services. For example, the Theme Park Division employs many part-time employees who are paid weekly. As a result, the Theme Park Division requires 12,000 payroll checks and incurs a $204,000 payroll service department charge (12,000 × $17). In contrast, the Movie Production Division has more permanent employees who are paid monthly. Thus, the Movie Production Division requires only 3,000 payroll checks and incurs a payroll service department charge of $51,000 (3,000 × $17).

Example Exercise 8-2 Service Department Charges 3

The centralized legal department of Johnson Company has expenses of $60,000. The department has provided a total of 2,000 hours of service for the period. The East Division has used 500 hours of legal service during the period, and the West Division has used 1,500 hours. How much should each division be charged for legal services?

Follow My Example 8-2

East Division Service Charge for Legal Department:
$15,000 = 500 billed hours × ($60,000/2,000 hours)

West Division Service Charge for Legal Department:
$45,000 = 1,500 billed hours × ($60,000/2,000 hours)

For Practice: PE 8-2A, PE 8-2B

Profit Center Reporting

The divisional income statements for NEG are shown in Exhibit 6.

Exhibit 6

Divisional Income Statements—NEG

Nova Entertainment Group
Divisional Income Statements
For the Year Ended December 31, 2010

	Theme Park Division	Movie Production Division
Revenues*	$6,000,000	$2,500,000
Operating expenses	2,495,000	405,000
Income from operations before service department charges	$3,505,000	$2,095,000
Less service department charges:		
Purchasing	$ 250,000	$ 150,000
Payroll Accounting	204,000	51,000
Legal	25,000	225,000
Total service department charges	$ 479,000	$ 426,000
Income from operations	$3,026,000	$1,669,000

*For a profit center that sells products, the income statement would show: Net sales − Cost of goods sold = Gross profit. The operating expenses would be deducted from the gross profit to get the income from operations before service department charges.

In evaluating the profit center manager, the income from operations should be compared over time to a budget. However, it should not be compared across profit centers, since the profit centers are usually different in terms of size, products, and customers.

Example Exercise 8-3 Income from Operations for Profit Center 3

Using the data for Johnson Company from Example Exercise 8-2 along with the data given below, determine the divisional income from operations for the East and West divisions.

	East Division	West Division
Sales	$300,000	$800,000
Cost of goods sold	165,000	420,000
Selling expenses	85,000	185,000

Follow My Example 8-3

	East Division	West Division
Net sales	$300,000	$800,000
Cost of goods sold	165,000	420,000
Gross profit	$135,000	$380,000
Selling expenses	85,000	185,000
Income from operations before service department charges	$ 50,000	$195,000
Service department charges	15,000	45,000
Income from operations	$ 35,000	$150,000

For Practice: PE 8-3A, PE 8-3B

4 Compute and interpret the rate of return on investment, the residual income, and the balanced scorecard for an investment center.

Responsibility Accounting for Investment Centers

An **investment center** manager has the responsibility and the authority to make decisions that affect not only costs and revenues but also the assets invested in the center. Investment centers are often used in diversified companies organized by divisions. In such cases, the divisional manager has authority similar to that of a chief operating officer or president of a company.

Since investment center managers have responsibility for revenues and expenses, *income from operations* is part of investment center reporting. In addition, because the manager has responsibility for the assets invested in the center, the following two additional measures of performance are used:

1. Rate of return on investment
2. Residual income

To illustrate, DataLink Inc., a cellular phone company with three regional divisions, is used. Condensed divisional income statements for the Northern, Central, and Southern divisions of DataLink are shown in Exhibit 7.

Exhibit 7

Divisional Income Statements—DataLink Inc.

DataLink Inc.
Divisional Income Statements
For the Year Ended December 31, 2010

	Northern Division	Central Division	Southern Division
Revenues	$560,000	$672,000	$750,000
Operating expenses	336,000	470,400	562,500
Income from operations before service department charges	$224,000	$201,600	$187,500
Service department charges	154,000	117,600	112,500
Income from operations	$ 70,000	$ 84,000	$ 75,000

Using only income from operations, the Central Division is the most profitable division. However, income from operations does not reflect the amount of assets invested in each center. For example, the Central Division could have twice as many assets as the Northern Division. For this reason, performance measures that consider the amount of invested assets, such as the rate of return on investment and residual income, are used.

The interest you earn on a savings account is *your* "rate of return on investment."

Rate of Return on Investment

Since investment center managers control the amount of assets invested in their centers, they should be evaluated based on the use of these assets. One measure that considers the amount of assets invested is the **rate of return on investment (ROI)** or *rate of return on assets*. It is computed as follows:

$$\text{Rate of Return on Investment (ROI)} = \frac{\text{Income from Operations}}{\text{Invested Assets}}$$

The rate of return on investment is useful because the three factors subject to control by divisional managers (revenues, expenses, and invested assets) are considered. The higher the rate of return on investment, the better the division is using its assets to generate income. In effect, the rate of return on investment measures the income (return) on each dollar invested. As a result, the rate of return on investment can be used as a common basis for comparing divisions with each other.

To illustrate, the invested assets of DataLink's three divisions are as follows:

	Invested Assets
Northern Division	$350,000
Central Division	700,000
Southern Division	500,000

Using the income from operations for each division shown in Exhibit 7, the rate of return on investment for each division is computed below.

Northern Division:

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Invested Assets}} = \frac{\$70,000}{\$350,000} = 20\%$$

Central Division:

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Invested Assets}} = \frac{\$84,000}{\$700,000} = 12\%$$

Southern Division:

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Invested Assets}} = \frac{\$75,000}{\$500,000} = 15\%$$

Although the Central Division generated the largest income from operations, its rate of return on investment (12%) is the lowest. Hence, relative to the assets invested, the Central Division is the least profitable division. In comparison, the rate of return on investment of the Northern Division is 20%, and the Southern Division is 15%.

To analyze differences in the rate of return on investment across divisions, the **DuPont formula** for the rate of return on investment is often used.[1] The DuPont formula views the rate of return on investment as the product of the following two factors:

1. **Profit margin**, which is the ratio of income from operations to sales.
2. **Investment turnover**, which is the ratio of sales to invested assets.

1 The DuPont formula was created by a financial executive of E. I. du Pont de Nemours and Company in 1919.

Using the DuPont formula, the rate of return on investment is expressed as follows:

$$\text{Rate of Return on Investment} = \text{Profit Margin} \times \text{Investment Turnover}$$

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

The DuPont formula is useful in evaluating divisions. This is because the profit margin and the investment turnover reflect the following underlying operating relationships of each division:

1. Profit margin indicates *operating profitability* by computing the rate of profit earned on each sales dollar.
2. Investment turnover indicates *operating efficiency* by computing the number of sales dollars generated by each dollar of invested assets.

If a division's profit margin increases, and all other factors remain the same, the division's rate of return on investment will increase. For example, a division might add more profitable products to its sales mix and, thus, increase its operating profit, profit margin, and rate of return on investment.

If a division's investment turnover increases, and all other factors remain the same, the division's rate of return on investment will increase. For example, a division might attempt to increase sales through special sales promotions and thus increase operating efficiency, investment turnover, and rate of return on investment.

The graphic at the left illustrates the relationship of the rate of return on investment, the profit margin, and investment turnover. Specifically, more income can be earned by either increasing the investment turnover (turning the crank faster), by increasing the profit margin (increasing the size of the opening), or both.

Using the DuPont formula yields the same rate of return on investment for each of DataLink's divisions, as shown below.

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

Northern Division:

$$\text{Rate of Return on Investment} = \frac{\$70{,}000}{\$560{,}000} \times \frac{\$560{,}000}{\$350{,}000} = 12.5\% \times 1.6 = 20\%$$

Central Division:

$$\text{Rate of Return on Investment} = \frac{\$84{,}000}{\$672{,}000} \times \frac{\$672{,}000}{\$700{,}000} = 12.5\% \times 0.96 = 12\%$$

Southern Division:

$$\text{Rate of Return on Investment} = \frac{\$75{,}000}{\$750{,}000} \times \frac{\$750{,}000}{\$500{,}000} = 10\% \times 1.5 = 15\%$$

The Northern and Central divisions have the same profit margins of 12.5%. However, the Northern Division's investment turnover of 1.6 is larger than that of the Central Division's turnover of 0.96. By using its invested assets more efficiently, the Northern Division's rate of return on investment of 20% is 8 percentage points higher than the Central Division's rate of return of 12%.

The Southern Division's profit margin of 10% and investment turnover of 1.5 are lower than those of the Northern Division. The product of these factors results in a return on investment of 15% for the Southern Division, compared to 20% for the Northern Division.

The profit margin indicates the rate of profit on each sales dollar. The investment turnover indicates the rate of sales on each dollar of invested assets.

Even though the Southern Division's profit margin is lower than the Central Division's, its higher turnover of 1.5 results in a rate of return of 15%, which is greater than the Central Division's rate of return of 12%.

To increase the rate of return on investment, the profit margin and investment turnover for a division may be analyzed. For example, assume that the Northern Division is in a highly competitive industry in which the profit margin cannot be easily increased. As a result, the division manager might focus on increasing the investment turnover.

To illustrate, assume that the revenues of the Northern Division could be increased by $56,000 through increasing operating expenses, such as advertising, to $385,000. The Northern Division's income from operations will increase from $70,000 to $77,000, as shown below.

Revenues ($560,000 + $56,000)	$616,000
Operating expenses	385,000
Income from operations before service department charges	$231,000
Service department charges	154,000
Income from operations	$ 77,000

The rate of return on investment for the Northern Division, using the DuPont formula, is recomputed as follows:

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

$$\text{Rate of Return on Investment} = \frac{\$77,000}{\$616,000} \times \frac{\$616,000}{\$350,000} = 12.5\% \times 1.76 = 22\%$$

Although the Northern Division's profit margin remains the same (12.5%), the investment turnover has increased from 1.6 to 1.76, an increase of 10% (0.16 ÷ 1.6). The 10% increase in investment turnover increases the rate of return on investment by 10% (from 20% to 22%).

The rate of return on investment is also useful in deciding where to invest additional assets or expand operations. For example, DataLink should give priority to expanding operatons in the Northern Division because it earns the highest rate of return on investment. In other words, an investment in the Northern Division will return 20 cents (20%) on each dollar invested. In contrast, investments in the Central and Southern divisions will earn only 12 cents and 15 cents per dollar invested.

A disadvantage of the rate of return on investment as a performance measure is that it may lead divisional managers to reject new investments that could be profitable for the company as a whole. To illustrate, assume the following rates of return for the Northern Division of DataLink:

The CFO of Millennium Chemicals stated: "We had too many divisional executives who failed to spend money on capital projects with more than satisfactory returns because those projects would have lowered the average return on assets of their particular business."

Current rate of return on investment	20%
Minimum acceptable rate of return on investment set by top management	10%
Expected rate of return on investment for new project	14%

If the manager of the Northern Division invests in the new project, the Northern Division's overall rate of return will decrease from 20% due to averaging. Thus, the division manager might decide to reject the project, even though the new project's expected rate of return of 14% exceeds DataLink's minimum acceptable rate of return of 10%.

Example Exercise 8-4 Profit Margin, Investment Turnover, and ROI 4

Campbell Company has income from operations of $35,000, invested assets of $140,000, and sales of $437,500. Use the DuPont formula to compute the rate of return on investment and show (a) the profit margin, (b) the investment turnover, and (c) the rate of return on investment.

Follow My Example 8-4

a. Profit Margin = $35,000/$437,500 = 8%
b. Investment Turnover = $437,500/$140,000 = 3.125
c. Rate of Return on Investment = 8% × 3.125 = 25%

For Practice: PE 8-4A, PE 8-4B

Business Connection

RETURN ON INVESTMENT

The annual reports of public companies must provide segment disclosure information identifying revenues, income from operations, and total assets. This information can be used to compute the return on investment for the segments of a company. For example, The E.W. Scripps Company, a media company, operates four major segments:

1. Newspapers: Owns and operates daily and community newspapers in 19 markets in the United States.
2. Scripps Networks: Owns and operates five national television networks: Home and Garden Television, Food Network, DIY Network, Fine Living, and Great American Country.
3. Broadcast Television: Owns and operates several local televisions in various markets.
4. Shop at Home: Markets a range of consumer goods to television viewers and visitors to its Internet site.

The DuPont formulas for these segments, as derived from a recent annual report, are as follows:

	Segment Profit Margin	×	Investment Turnover	=	Return on Investment
Newspapers	34.9%		0.55		19.2%
Scripps Networks	42.0%		0.67		28.1%
Broadcast Television	31.6%		0.69		21.8%
Shop at Home	−7.5%		0.80		−6.0%

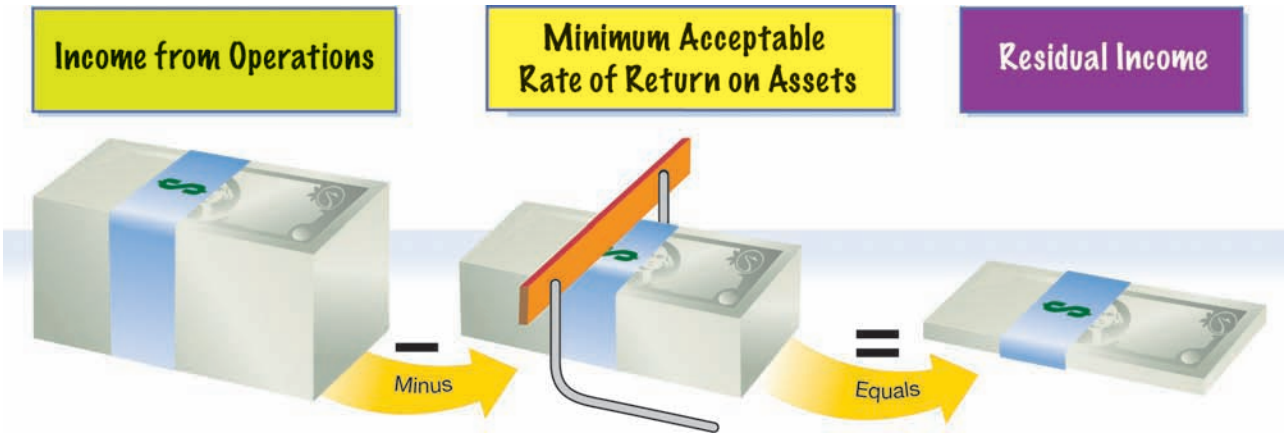
As can be seen from the data, E.W. Scripps' three business segments (Newspapers, Scripps Networks, and Broadcast Television) have relatively low investment turnover, with all three being slightly above 0.50. Each of these segments also had very strong profit margins, ranging from 31.6% to 42.0%. Multiplying the profit margin by the investment turnover yields the ROI. The ROI is strong for the three primary business segments. The Shop at Home segment, however, is not performing as well. While this segment has a stronger investment turnover than the other three segments, it operates at a negative profit. This is the newest segment of the company and represents a relatively small portion of the company's total revenues. As the segment grows, the company should be careful to control costs to ensure that this segment attains a level of profitability consistent with the company's other segments.

Residual Income

Residual income is useful in overcoming some of the disadvantages of the rate of return on investment. **Residual income** is the excess of income from operations over a minimum acceptable income from operations, as shown below.[2]

Income from operations	$XXX
Less minimum acceptable income from operations as a percent of invested assets	XXX
Residual income	$XXX

2 Another popular term for residual income is economic value added (EVA), which has been trademarked by the consulting firm Stern Stewart & Co.



The minimum acceptable income from operations is computed by multiplying the company minimum rate of return by the invested assets. The minimum rate is set by top management, based on such factors as the cost of financing.

To illustrate, assume that DataLink Inc. has established 10% as the minimum acceptable rate of return on divisional assets. The residual incomes for the three divisions are as follows:

	Northern Division	Central Division	Southern Division
Income from operations	$70,000	$84,000	$75,000
Less minimum acceptable income from operations as a percent of invested assets:			
$350,000 × 10%	35,000		
$700,000 × 10%		70,000	
$500,000 × 10%			50,000
Residual income	$35,000	$14,000	$25,000

The Northern Division has more residual income ($35,000) than the other divisions, even though it has the least amount of income from operations ($70,000). This is because the invested assets are less for the Northern Division than for the other divisions.

The major advantage of residual income as a performance measure is that it considers both the minimum acceptable rate of return, invested assets, and the income from operations for each division. In doing so, residual income encourages division managers to maximize income from operations in excess of the minimum. This provides an incentive to accept any project that is expected to have a rate of return in excess of the minimum.

To illustrate, assume the following rates of return for the Northern Division of DataLink:

Current rate of return on investment	20%
Minimum acceptable rate of return on investment set by top management	10%
Expected rate of return on investment for new project	14%

If the manager of Northern Division is evaluated using only return on investment, the division manager might decide to reject the new project. This is because investing in the new project will decrease Northern's current rate of return of 20%. Thus, the manager might reject the new project even though its expected rate of return of 14% exceeds DataLink's minimum acceptable rate of return of 10%.

In contrast, if the manager of the Northern Division is evaluated using residual income, the new project would probably be accepted because it will increase Northern Division's residual income. In this way, residual income supports both divisional and overall company objectives.

Example Exercise 8-5 Residual Income 4

The Wholesale Division of PeanutCo has income from operations of $87,000 and assets of $240,000. The minimum acceptable rate of return on assets is 12%. What is the residual income for the division?

Follow My Example 8-5

Income from operations	$87,000
Minimum acceptable income from operations as a percent of assets ($240,000 × 12%)	28,800
Residual income	$58,200

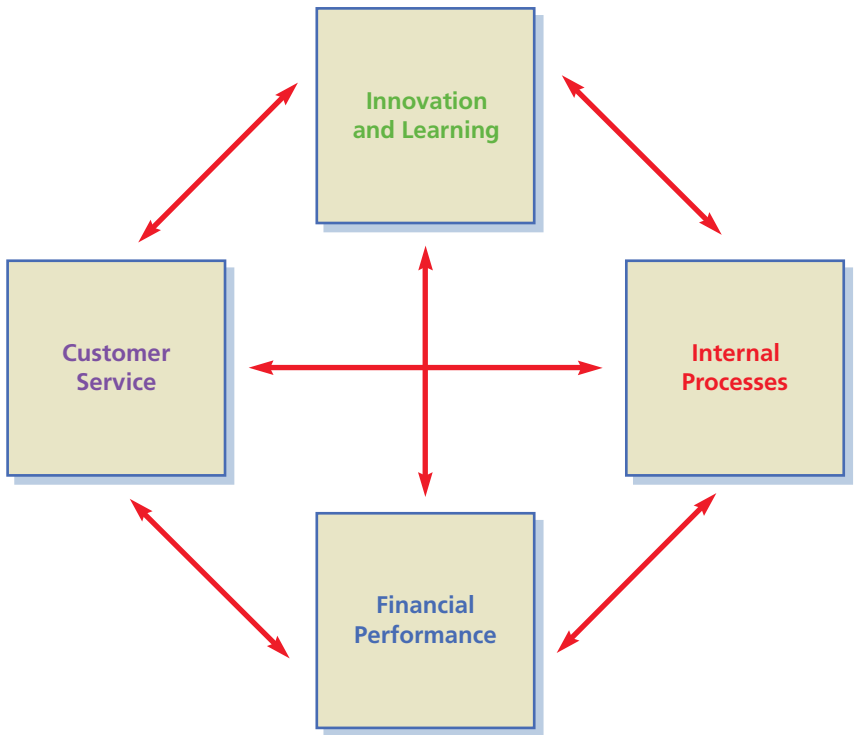
For Practice: PE 8-5A, PE 8-5B

The Balanced Scorecard[3]

The **balanced scorecard** is a set of multiple performance measures for a company. In addition to financial performance, a balanced scorecard normally includes performance measures for customer service, innovation and learning, and internal processes, as shown in Exhibit 8.

Exhibit 8

The Balanced Scorecard



Merck & Co., Inc. measures the number of drugs in its FDA (Food and Drug Administration) approval pipeline and the length of time it takes to turn ideas into marketable products.

Performance measures for learning and innovation often revolve around a company's research and development efforts. For example, the number of new products developed during a year and the time it takes to bring new products to the market are performance measures for innovation. Performance measures for learning could include the number of employee training sessions and the number of employees who are cross-trained in several skills.

3 The balanced scorecard was developed by R. S. Kaplan and D. P. Norton and explained in *The Balanced Scorecard: Translating Strategy into Action* (Cambridge: Harvard Business School Press, 1996).

Performance measures for customer service include the number of customer complaints and the number of repeat customers. Customer surveys can also be used to gather measures of customer satisfaction with the company as compared to competitors.

Performance measures for internal processes include the length of time it takes to manufacture a product. The amount of scrap and waste is a measure of the efficiency of a company's manufacturing processes. The number of customer returns is a performance measure of both the manufacturing and sales ordering processes.

All companies will use financial performance measures. Some financial performance measures have been discussed earlier in this chapter and include income from operations, rate of return on investment, and residual income.

A survey by Bain & Co., a consulting firm, indicated that 57% of large companies use the balanced scorecard.

The balanced scorecard attempts to identify the underlying nonfinancial drivers, or causes, of financial performance related to innovation and learning, customer service, and internal processes. In this way, the financial performance may be improved. For example, customer satisfaction is often measured by the number of repeat customers. By increasing the number of repeat customers, sales and income from operations can be increased.

Some common performance measures used in the balanced scorecard approach are shown below.

Hilton Hotels Corporation uses a balanced scorecard to measure employee satisfaction, customer loyalty, and financial performance.

Innovation and Learning	Internal Processes
Number of new products	Waste and scrap
Number of new patents	Time to manufacture products
Number of cross-trained employees	Number of defects
Number of training hours	Number of rejected sales orders
Number of ethics violations	Number of stockouts
Employee turnover	Labor utilization
Customer Service	**Financial**
Number of repeat customers	Sales
Customer brand recognition	Income from operations
Delivery time to customer	Return on investment
Customer satisfaction	Profit margin and investment turnover
Number of sales returns	Residual income
Customer complaints	Actual versus budgeted (standard) costs

Transfer Pricing

5 Describe and illustrate how the market price, negotiated price, and cost price approaches to transfer pricing may be used by decentralized segments of a business.

When divisions transfer products or render services to each other, a **transfer price** is used to charge for the products or services.[4] Since transfer prices will affect a division's financial performance, setting a transfer price is a sensitive matter for the managers of both the selling and buying divisions.

Three common approaches to setting transfer prices are as follows:

1. Market price approach
2. Negotiated price approach
3. Cost approach

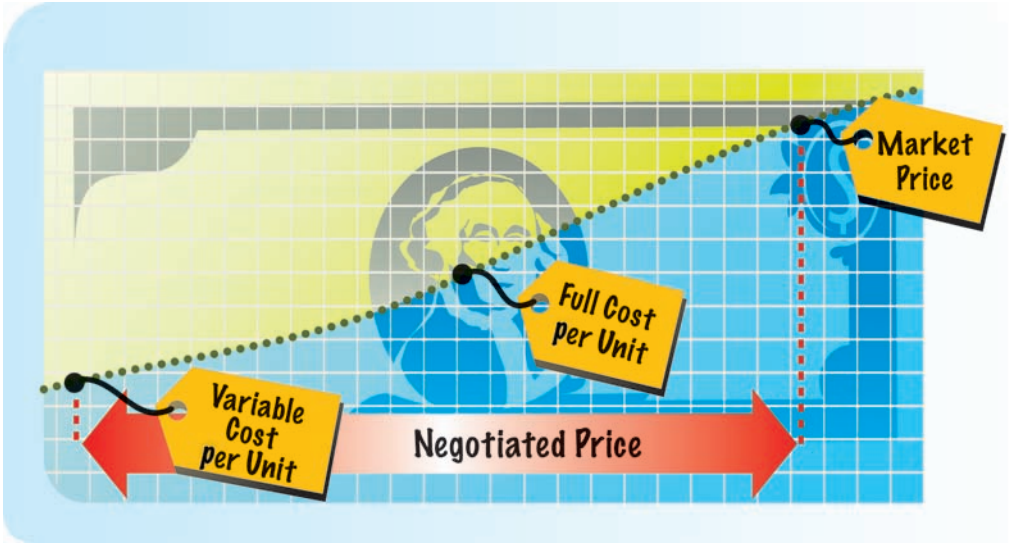
Transfer prices may be used for cost, profit, or investment centers. The objective of setting a transfer price is to motivate managers to behave in a manner that will increase the overall company income. As will be illustrated, however, transfer prices may be misused in such a way that overall company income suffers.

Transfer prices can be set as low as the variable cost per unit or as high as the market price. Often, transfer prices are negotiated at some point between variable cost per unit and market price. Exhibit 9 shows the possible range of transfer prices.

4 The discussion in this chapter highlights the essential concepts of transfer pricing. In-depth discussion of transfer pricing can be found in advanced texts.

Exhibit 9

Commonly Used Transfer Prices



To illustrate, Wilson Company, a packaged snack food company with no service departments, is used. Wilson Company has two operating divisions (Eastern and Western) that are organized as investment centers. Condensed income statements for Wilson Company, assuming no transfers between divisions, are shown in Exhibit 10.

Exhibit 10

Income Statements—No Transfers Between Divisions

Wilson Company
Income Statements
For the Year Ended December 31, 2010

	Eastern Division	Western Division	Total Company
Sales:			
50,000 units × $20 per unit	$1,000,000		$1,000,000
20,000 units × $40 per unit		$800,000	800,000
			$1,800,000
Expenses:			
Variable:			
50,000 units × $10 per unit	$ 500,000		$ 500,000
20,000 units × $30* per unit		$600,000	600,000
Fixed	300,000	100,000	400,000
Total expenses	$ 800,000	$700,000	$1,500,000
Income from operations	$ 200,000	$100,000	$ 300,000

*$20 of the $30 per unit represents materials costs, and the remaining $10 per unit represents other variable conversion expenses incurred within the Western Division.

Market Price Approach

Using the **market price approach**, the transfer price is the price at which the product or service transferred could be sold to outside buyers. If an outside market exists for the product or service transferred, the current market price may be a proper transfer price.

Transfer Price = Market Price

To illustrate, assume that materials used by Wilson Company in producing snack food in the Western Division are currently purchased from an outside supplier at $20 per unit. The same materials are produced by the Eastern Division. The Eastern Division is operating at full capacity of 50,000 units and can sell all it produces to either the Western Division or to outside buyers.

A transfer price of $20 per unit (the market price) has no effect on the Eastern Division's income or total company income. The Eastern Division will earn revenues of $20 per unit on all its production and sales, regardless of who buys its product.

Likewise, the Western Division will pay $20 per unit for materials (the market price). Thus, the use of the market price as the transfer price has no effect on the Eastern Division's income or total company income.

In this situation, the use of the market price as the transfer price is proper. The condensed divisional income statements for Wilson Company would be the same as shown in Exhibit 10.

Negotiated Price Approach

If unused or excess capacity exists in the supplying division (the Eastern Division), and the transfer price is equal to the market price, total company profit may not be maximized. This is because the manager of the Western Division will be indifferent toward purchasing materials from the Eastern Division or from outside suppliers. That is, in both cases the Western Division manager pays $20 per unit (the market price). As a result, the Western Division may purchase the materials from outside suppliers.

If, however, the Western Division purchases the materials from the Eastern Division, the difference between the market price of $20 and the variable costs of the Eastern Division of $10 per unit (from Exhibit 10) can cover fixed costs and contribute to overall company profits. Thus, the Western Division manager should be encouraged to purchase the materials from the Eastern Division.

The **negotiated price approach** allows the managers to agree (negotiate) among themselves on a transfer price. The only constraint is that the transfer price be less than the market price, but greater than the supplying division's variable costs per unit, as shown below.

$$\text{Variable Costs per Unit} < \text{Transfer Price} < \text{Market Price}$$

To illustrate, assume that instead of a capacity of 50,000 units, the Eastern Division's capacity is 70,000 units. In addition, assume that the Eastern Division can continue to sell only 50,000 units to outside buyers.

A transfer price less than $20 would encourage the manager of the Western Division to purchase from the Eastern Division. This is because the Western Division is currently purchasing its materials from outside suppliers at a cost of $20 per unit. Thus, its materials cost would decrease, and its income from operations would increase.

At the same time, a transfer price above the Eastern Division's variable costs per unit of $10 (from Exhibit 10) would encourage the manager of the Eastern Division to supply materials to the Western Division. In doing so, the Eastern Division's income from operations would also increase.

Exhibit 11 illustrates the divisional and company income statements, assuming that the Eastern and Western division managers agree to a transfer price of $15.

The Eastern Division increases its sales by $300,000 (20,000 units × $15 per unit) to $1,300,000. As a result, the Eastern Division's income from operations increases by $100,000 ($300,000 sales − $200,000 variable costs) to $300,000, as shown in Exhibit 11.

The increase of $100,000 in the Eastern Division's income can also be computed as follows:

$$\text{Increase in Eastern (Supplying) Division's Income from Operations} = (\text{Transfer Price} - \text{Variable Cost per Unit}) \times \text{Units Transferred}$$

$$\text{Increase in Eastern (Supplying) Division's Income from Operations} = (\$15 - \$10) \times 20{,}000 \text{ units} = \$100{,}000$$

Exhibit 11

Income Statements—Negotiated Transfer Price

Wilson Company
Income Statements
For the Year Ended December 31, 2010

	Eastern Division	Western Division	Total Company
Sales:			
50,000 units × $20 per unit	$1,000,000		$1,000,000
20,000 units × $15 per unit	300,000		300,000
20,000 units × $40 per unit		$800,000	800,000
	$1,300,000	$800,000	$2,100,000
Expenses:			
Variable:			
70,000 units × $10 per unit	$ 700,000		$ 700,000
20,000 units × $25* per unit		$500,000	500,000
Fixed	300,000	100,000	400,000
Total expenses	$1,000,000	$600,000	$1,600,000
Income from operations	$ 300,000	$200,000	$ 500,000

*$10 of the $25 represents variable conversion expenses incurred solely within the Western Division, and $15 per unit represents the transfer price per unit from the Eastern Division.

Western Division's materials cost decreases by $5 per unit ($20 − $15) for a total of $100,000 (20,000 units × $5 per unit). Thus, Western Division's income from operations increases by $100,000 to $200,000, as shown in Exhibit 11.

The increase of $100,000 in the Western Division's income can also be computed as follows:

$$\text{Increase in Western (Purchasing) Division's Income from Operations} = (\text{Market Price} - \text{Transfer Price}) \times \text{Units Transferred}$$

$$\text{Increase in Western (Purchasing) Division's Income from Operations} = (\$20 - \$15) \times 20{,}000 \text{ units} = \$100{,}000$$

Comparing Exhibits 10 and 11 shows that Wilson Company's income from operations increased by $200,000, as shown below.

	Income from Operations		
	No Units Transferred (Exhibit 10)	20,000 Units Transferred at $15 per Unit (Exhibit 11)	Increase (Decrease)
Eastern Division	$200,000	$300,000	$100,000
Western Division	100,000	200,000	100,000
Wilson Company	$300,000	$500,000	$200,000

In the preceding illustration, any negotiated transfer price between $10 and $20 is acceptable, as shown below.

$$\text{Variable Costs per Unit} < \text{Transfer Price} < \text{Market Price}$$

$$\$10 < \text{Transfer Price} < \$20$$

Any transfer price within this range will increase the overall income from operations for Wilson Company by $200,000. However, the increases in the Eastern and Western divisions' income from operations will vary depending on the transfer price.

To illustrate, a transfer price of $16 would increase the Eastern Division's income from operations by $120,000, as shown below.

$$\text{Increase in Eastern (Supplying) Division's Income from Operations} = (\text{Transfer Price} - \text{Variable Cost per Unit}) \times \text{Units Transferred}$$

$$\text{Increase in Eastern (Supplying) Division's Income from Operations} = (\$16 - \$10) \times 20{,}000 \text{ units} = \$120{,}000$$

A transfer price of $16 would increase the Western Division's income from operations by $80,000, as shown below.

$$\text{Increase in Western (Purchasing) Division's Income from Operations} = (\text{Market Price} - \text{Transfer Price}) \times \text{Units Transferred}$$

$$\text{Increase in Western (Purchasing) Division's Income from Operations} = (\$20 - \$16) \times 20{,}000 \text{ units} = \$80{,}000$$

With a transfer price of $16, Wilson Company's income from operations still increases by $200,000, which consists of the Eastern Division's increase of $120,000 plus the Western Division's increase of $80,000.

As shown above, negotiated price provides each division manager with an incentive to negotiate the transfer of materials. At the same time, the overall company's income from operations will also increase. However, the negotiated approach only applies when the supplying division has excess capacity. In other words, the supplying division cannot sell all its production to outside buyers at the market price.

Example Exercise 8-6 Transfer Pricing

5

The materials used by the Winston-Salem Division of Fox Company are currently purchased from outside suppliers at $30 per unit. These same materials are produced by Fox's Flagstaff Division. The Flagstaff Division can produce the materials needed by the Winston-Salem Division at a variable cost of $15 per unit. The division is currently producing 70,000 units and has capacity of 100,000 units. The two divisions have recently negotiated a transfer price of $22 per unit for 30,000 units. By how much will each division's income increase as a result of this transfer?

Follow My Example 8-6

$$\text{Increase in Flagstaff (Supplying) Division's Income from Operations} = (\text{Transfer Price} - \text{Variable Cost per Unit}) \times \text{Units Transferred}$$

$$\text{Increase in Flagstaff (Supplying) Division's Income from Operations} = (\$22 - \$15) \times 30{,}000 \text{ units} = \$210{,}000$$

$$\text{Increase in Winston-Salem (Purchasing) Division's Income from Operations} = (\text{Market Price} - \text{Transfer Price}) \times \text{Units Transferred}$$

$$\text{Increase in Winston-Salem (Purchasing) Division's Income from Operations} = (\$30 - \$22) \times 30{,}000 \text{ units} = \$240{,}000$$

For Practice: PE 8-6A, PE 8-6B

Cost Price Approach

Under the **cost price approach**, cost is used to set transfer prices. A variety of costs may be used in this approach, including the following:

1. Total product cost per unit
2. Variable product per unit

If total product cost per unit is used, direct materials, direct labor, and factory overhead are included in the transfer price. If variable product cost per unit is used, the fixed factory overhead cost is excluded from the transfer price.

Actual costs or standard (budgeted) costs may be used in applying the cost price approach. If actual costs are used, inefficiencies of the producing (supplying) division are transferred to the purchasing division. Thus, there is little incentive for the producing (supplying) division to control costs. For this reason, most companies use standard costs in the cost price approach. In this way, differences between actual and standard costs remain with the producing (supplying) division for cost control purposes.

The cost price approach is most often used when the responsibility centers are organized as cost centers. When the responsibility centers are organized as profit or investment centers, the cost price approach is normally not used.

For example, using the cost price approach when the supplying division is organized as a profit center ignores the supplying division manager's responsibility for earning profits. In this case, using the cost price approach prevents the supplying division from reporting any profit (revenues − costs) on the units transferred. As a result, the division manager has little incentive to transfer units to another division, even though it may be in the best interests of the company.

Integrity, Objectivity, and Ethics in Business

SHIFTING INCOME THROUGH TRANSFER PRICES

Transfer prices allow companies to minimize taxes by shifting taxable income from countries with high tax rates to countries with low taxes. For example, GlaxoSmithKline, a British company, and the second biggest drug maker in the world, had been in a dispute with the U.S. Internal Revenue Service (IRS) over international transfer prices since the early 1990s. The company pays U.S. taxes on income from its U.S. Division and British taxes on income from the British Division. The IRS, however, claimed that the transfer prices on sales from the British Division to the U.S. Division were too high, which reduced profits and taxes in the U.S. Division. The company received a new tax bill from the IRS in 2005 for almost $1.9 billion related to the transfer pricing issue, raising the total bill to almost $5 billion. In January 2006, the company agreed to settle this dispute with the IRS for $3.4 billion, the largest tax settlement in history.

Source: J. Whalen, "Glaxo Gets New IRS Bill Seeking Another $1.9 Billion in BackTax," *The Wall Street Journal*, January 27, 2005.

At a Glance 8

1 Describe the advantages and disadvantages of decentralized operations.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
In a centralized business, all major planning and operating decisions are made by top management. In a decentralized business, these responsibilities are delegated to unit managers. Decentralization may allow a company to be more effective because operational decisions are made by the managers closest to the operations, allowing top management to focus on strategic issues.	• Describe the advantages of decentralization. • Describe the disadvantages of decentralization. • Describe the common types of responsibility centers and the role of responsibility accounting.		

2 Prepare a responsibility accounting report for a cost center.

Key Points

Cost centers limit the responsibility and authority of managers to decisions related to the costs of their unit. The primary accounting tools for planning and controlling costs for a cost center are budgets and budget performance reports.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe cost centers.		
• Describe the responsibility reporting for a cost center.		
• Compute the over (under) budgeted costs for a cost center.	8-1	8-1A, 8-1B

3 Prepare responsibility accounting reports for a profit center.

Key Points

In a profit center, managers have the responsibility and authority to make decisions that affect both revenues and costs. Responsibility reports for a profit center usually show income from operations for the unit.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe profit centers.		
• Determine how service department charges are allocated to profit centers.	8-2	8-2A, 8-2B
• Describe the responsibility reporting for a profit center.		
• Compute income from operations for a profit center.	8-3	8-3A, 8-3B

4 Compute and interpret the rate of return on investment, the residual income, and the balanced scorecard for an investment center.

Key Points

In an investment center, the unit manager has the responsibility and authority to make decisions that affect the unit's revenues, expenses, and assets invested in the center. Three measures are commonly used to assess investment center performance: return on investment (ROI), residual income, and the balanced scorecard. These measures are often used to compare and assess investment center performance.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe investment centers.		
• Describe the responsibility reporting for an investment center.		
• Compute the rate of return on investment (ROI).	8-4	8-4A, 8-4B
• Compute residual income.	8-5	8-5A, 8-5B
• Describe the balanced scorecard approach.		

5 Describe and illustrate how the market price, negotiated price, and cost price approaches to transfer pricing may be used by decentralized segments of a business.

Key Points

When divisions within a company transfer products or provide services to each other, a transfer price is used to charge for the products or services. Transfer prices should be set so that the overall company income is increased when goods are transferred between divisions. One of three common approaches is typically used to establish transfer prices: market price, negotiated price, or cost price.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe how companies determine the price used to transfer products or services between divisions.		
• Determine transfer prices using the market price approach.		
• Determine transfer prices using the negotiated price approach.	8-6	8-6A, 8-6B
• Describe the cost price approach to determining transfer price.		

Key Terms

balanced scorecard (332)
controllable expenses (322)
controllable revenues (322)
cost center (320)
cost price approach (337)
DuPont formula (327)
investment center (326)
investment turnover (327)
market price approach (334)
negotiated price approach (335)
profit center (322)
profit margin (327)
rate of return on investment (ROI) (327)
residual income (330)
responsibility accounting (319)
service department charges (322)
transfer price (333)

Illustrative Problem

Quinn Company has two divisions, Domestic and International. Invested assets and condensed income statement data for each division for the past year ended December 31 are as follows:

	Domestic Division	International Division
Revenues	$675,000	$480,000
Operating expenses	450,000	372,400
Service department charges	90,000	50,000
Invested assets	600,000	384,000

Instructions

1. Prepare condensed income statements for the past year for each division.
2. Using the DuPont formula, determine the profit margin, investment turnover, and rate of return on investment for each division.
3. If management's minimum acceptable rate of return is 10%, determine the residual income for each division.

Solution

1.

Quinn Company
Divisional Income Statements
For the Year Ended December 31, 2010

	Domestic Division	International Division
Revenues	$675,000	$480,000
Operating expenses	450,000	372,400
Income from operations before service department charges	$225,000	$107,600
Service department charges	90,000	50,000
Income from operations	$135,000	$ 57,600

2. Rate of Return on Investment = Profit Margin × Investment Turnover

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

$$\text{Domestic Division: ROI} = \frac{\$135,000}{\$675,000} \times \frac{\$675,000}{\$600,000}$$

$$\text{ROI} = 20\% \times 1.125$$

$$\text{ROI} = 22.5\%$$

$$\text{International Division: ROI} = \frac{\$57,600}{\$480,000} \times \frac{\$480,000}{\$384,000}$$

$$\text{ROI} = 12\% \times 1.25$$

$$\text{ROI} = 15\%$$

3. Domestic Division: $75,000 [$135,000 − (10% × $600,000)]
International Division: $19,200 [$57,600 − (10% × $384,000)]

Self-Examination Questions (Answers at End of Chapter)

1. When the manager has the responsibility and authority to make decisions that affect costs and revenues but no responsibility for or authority over assets invested in the department, the department is called a(n):
   A. cost center. C. investment center.
   B. profit center. D. service department.
2. The Accounts Payable Department has expenses of $600,000 and makes 150,000 payments to the various vendors who provide products and services to the divisions. Division A has income from operations of $900,000, before service department charges, and requires 60,000 payments to vendors. If the Accounts Payable Department is treated as a service department, what is Division A's income from operations?
   A. $300,000 C. $660,000
   B. $900,000 D. $540,000
3. Division A of Kern Co. has sales of $350,000, cost of goods sold of $200,000, operating expenses of $30,000, and invested assets of $600,000. What is the rate of return on investment for Division A?
   A. 20% C. 33%
   B. 25% D. 40%
4. Division L of Liddy Co. has a rate of return on investment of 24% and an investment turnover of 1.6. What is the profit margin?
   A. 6% C. 24%
   B. 15% D. 38%
5. Which approach to transfer pricing uses the price at which the product or service transferred could be sold to outside buyers?
   A. Cost price approach
   B. Negotiated price approach
   C. Market price approach
   D. Standard cost approach

Eye Openers

1. Differentiate between a cost center and a profit center.
2. Differentiate between a profit center and an investment center.
3. In what major respect would budget performance reports prepared for the use of plant managers of a manufacturing business with cost centers differ from those prepared for the use of the various department supervisors who report to the plant managers?
4. For what decisions is the manager of a cost center *not* responsible?

5. Weyerhaeuser developed a system that assigns service department expenses to user divisions on the basis of actual services consumed by the division. Here are a number of Weyerhaeuser's activities in its central Financial Services Department:
   - Payroll
   - Accounts payable
   - Accounts receivable
   - Database administration—report preparation

   For each activity, identify an activity base that could be used to charge user divisions for service.
6. What is the major shortcoming of using income from operations as a performance measure for investment centers?
7. Why should the factors under the control of the investment center manager (revenues, expenses, and invested assets) be considered in computing the rate of return on investment?
8. In a decentralized company in which the divisions are organized as investment centers, how could a division be considered the least profitable even though it earned the largest amount of income from operations?
9. How does using the rate of return on investment facilitate comparability between divisions of decentralized companies?
10. The rates of return on investment for Fosina Co.'s three divisions, East, Central, and West, are 26%, 20%, and 15%, respectively. In expanding operations, which of Fosina Co.'s divisions should be given priority? Explain.
11. Why would a firm use a balanced scorecard in evaluating divisional performance?
12. What is the objective of transfer pricing?

13. When is the negotiated price approach preferred over the market price approach in setting transfer prices?
14. Why would standard cost be a more appropriate transfer cost between cost centers than actual cost?
15. When using the negotiated price approach to transfer pricing, within what range should the transfer price be established?

Practice Exercises

PE 8-1A
Budgetary performance for cost center
obj. 2
EE 8-1 p. 322

Harding Company's costs were under budget by $200,000. The company is divided into North and South regions. The North Region's costs were over budget by $40,000. Determine the amount that the South Region's costs were over or under budget.

PE 8-1B
Budgetary performance for cost center
obj. 2
EE 8-1 p. 322

Magic Motion Company's costs were over budget by $63,000. The company is divided into Southwest and Northeast regions. The Southwest Region's costs were under budget by $17,000. Determine the amount that the Northeast Region's costs were over or under budget.

PE 8-2A
Service department charges
obj. 3
EE 8-2 p. 325

The centralized employee Travel Department of Teapot Dome Company has expenses of $180,000. The department has serviced a total of 2,000 travel reservations for the period. The Norsk Division has made 750 reservations during the period, and the West Division has made 1,250 reservations. How much should each division be charged for travel services?

PE 8-2B
Service department charges
obj. 3
EE 8-2 p. 325

The centralized Help Desk of Hayman Company has expenses of $140,000. The department has provided a total of 5,000 hours of service for the period. Computer Division has used 2,000 hours of Help Desk service during the period, and Peripheral Division has used 3,000 hours of Help Desk service. How much should each division be charged for Help Desk services?

PE 8-3A
Income from operations for profit center
obj. 3
EE 8-3 p. 325

Using the data for Teapot Dome Company from Practice Exercise 8-2A along with the data provided below, determine the divisional income from operations for the Norsk and West divisions.

	Norsk Division	West Division
Sales	$700,000	$770,000
Cost of goods sold	365,000	462,000
Selling expenses	142,500	173,000

PE 8-3B
Income from operations for profit center
obj. 3
EE 8-3 p. 325

Using the data for the Hayman Company from Practice Exercise 8-2B along with the data provided below, determine the divisional income from operations for the Computer Division and the Peripheral Division.

	Computer Division	Peripheral Division
Sales	$1,200,000	$1,305,000
Cost of goods sold	610,000	764,000
Selling expenses	264,000	235,000

PE 8-4A
Profit margin, investment turnover, and ROI
obj. 4
EE 8-4 p. 330

Mathews Company has income from operations of $50,000, invested assets of $200,000, and sales of $500,000. Use the DuPont formula to compute the rate of return on investment and show (a) the profit margin, (b) the investment turnover, and (c) the rate of return on investment.

PE 8-4B
Profit margin, investment turnover, and ROI
obj. 4
EE 8-4 p. 330

Wakelin Company has income from operations of $20,125 invested assets of $87,500 and sales of $175,000. Use the DuPont formula to compute the rate of return on investment and show (a) the profit margin, (b) the investment turnover, and (c) the rate of return on investment.

PE 8-5A
Residual income
obj. 4
EE 8-5 p. 332

The Consumer Division of Woods Company has income from operations of $60,000 and assets of $440,000. The minimum acceptable rate of return on assets is 12%. What is the residual income for the division?

PE 8-5B
Residual income
obj. 4
EE 8-5 p. 332

The Commercial Division of LaSalle Company has income from operations of $135,000 and assets of $650,000. The minimum acceptable rate of return on assets is 10%. What is the residual income for the division?

PE 8-6A
Transfer pricing
obj. 5
EE 8-6 p. 337

The materials used by the Laramie Division of Barron Company are currently purchased from outside suppliers at $40 per unit. These same materials are produced by Barron's Astoria Division. The Astoria Division can produce the materials needed by the Laramie Division at a variable cost of $28 per unit. The division is currently producing 80,000 units and has capacity of 100,000 units. The two divisions have recently negotiated a transfer price of $35 per unit for 20,000 units. By how much will each division's income increase as a result of this transfer?

PE 8-6B
Transfer pricing
obj. 5
EE 8-6 p. 337

The materials used by the Kenosha Division of Ehrlich Company are currently purchased from outside suppliers at $75 per unit. These same materials are produced by the High Point Division. The High Point Division can produce the materials needed by the Kenosha Division at a variable cost of $55 per unit. The division is currently producing 140,000 units and has capacity of 175,000 units. The two divisions have recently negotiated a transfer price of $65 per unit for 30,000 units. By how much will each division's income increase as a result of this transfer?

Exercises

EX 8-1
Budget performance reports for cost centers
obj. 2
✔ a. (c) $2,640

Partially completed budget performance reports for Iliad Company, a manufacturer of air conditioners, are provided below.

Iliad Company
Budget Performance Report—Vice President, Production
For the Month Ended April 30, 2010

Plant	Budget	Actual	Over Budget	Under Budget
Mid-Atlantic Region	$ 416,000	$416,000		$ 0
West Region	297,600	296,000		1,600
South Region	(g)	(h)	(i)	
	$ (j)	$ (k)	$ (l)	$1,600

Iliad Company
Budget Peformance Report—Manager, South Region Plant
For the Month Ended April 30, 2010

Department	Budget	Actual	Over Budget	Under Budget
Chip Fabrication	$ (a)	$ (b)	$ (c)	
Electronic Assembly	85,120	86,240	1,120	
Final Assembly	137,120	136,640		$480
	$ (d)	$ (e)	$ (f)	$480

Iliad Company
Budget Performance Report—Supervisor, Chip Fabrication
For the Month Ended April 30, 2010

Department	Budget	Actual	Over Budget	Under Budget
Factory wages	$ 24,640	$ 26,400	$1,760	
Materials	69,600	69,120		$480
Power and light	3,840	4,560	720	
Maintenance	6,720	7,360	640	
	$104,800	$107,440	$3,120	$480

a. Complete the budget performance reports by determining the correct amounts for the lettered spaces.

b. Compose a memo to Dana Johnson, vice president of production for Iliad Company, explaining the performance of the production division for April.

EX 8-2
Divisional income statements

obj. 3

✔ Residential Division income from operations, $78,900

The following data were summarized from the accounting records for DeSalvo Construction Company for the year ended June 30, 2010:

Cost of goods sold:		Service department charges:	
Residential Division	$415,200	Residential Division	$ 56,400
Industrial Division	206,350	Industrial Division	35,480
Administrative expenses:		Net sales:	
Residential Division	$ 74,500	Residential Division	$625,000
Industrial Division	72,400	Industrial Division	367,500

Prepare divisional income statements for DeSalvo Construction Company.

EX 8-3
Service department charges and activity bases

obj. 3

For each of the following service departments, identify an activity base that could be used for charging the expense to the profit center.

a. Central purchasing
b. Legal
c. Accounts receivable
d. Duplication services
e. Electronic data processing
f. Telecommunications

EX 8-4
Activity bases for service department charges

obj. 3

For each of the following service departments, select the activity base listed that is most appropriate for charging service expenses to responsible units.

Service Department	Activity Base
a. Central Purchasing	1. Number of travel claims
b. Training	2. Number of payroll checks
c. Conferences	3. Number of sales invoices
d. Telecommunications	4. Number of purchase requisitions
e. Accounts Receivable	5. Number of telephone lines
f. Employee Travel	6. Number of employees trained
g. Payroll Accounting	7. Number of computers
h. Computer Support	8. Number of conference attendees

EX 8-5
Service department charges

obj. 3

✔ b. Commercial payroll, $12,468

In divisional income statements prepared for Mills Construction Company, the Payroll Department costs are charged back to user divisions on the basis of the number of payroll checks, and the Purchasing Department costs are charged back on the basis of the number of purchase requisitions. The Payroll Department had expenses of $45,900, and the Purchasing Department had expenses of $22,000 for the year. The following annual

data for Residential, Commercial, and Government Contract Divisions were obtained from corporate records:

	Residential	Commercial	Government Contract
Sales	$460,000	$610,000	$1,400,000
Number of employees:			
Weekly payroll (52 weeks per year)	125	70	75
Monthly payroll	32	43	30
Number of purchase requisitions per year	2,100	1,500	1,400

a. Determine the total amount of payroll checks and purchase requisitions processed per year by each division.
b. Using the activity base information in (a), determine the annual amount of payroll and purchasing costs charged back to the Residential, Commercial, and Government Contract divisions from payroll and purchasing services.
c. Why does the Residential Division have a larger service department charge than the other two divisions, even though its sales are lower?

EX 8-6
Service department charges and activity bases

obj. 3

✔ b. Help desk, $30,600

Harris Corporation, a manufacturer of electronics and communications systems, uses a service department charge system to charge profit centers with Computing and Communications Services (CCS) service department costs. The following table identifies an abbreviated list of service categories and activity bases used by the CCS department. The table also includes some assumed cost and activity base quantity information for each service for April.

CCS Service Category	Activity Base	Assumed Cost	Assumed Activity Base Quantity
Help desk	Number of calls	$ 88,400	2,600
Network center	Number of devices monitored	609,375	9,750
Electronic mail	Number of user accounts	67,080	6,450
Local voice support	Number of phone extensions	152,720	9,200

One of the profit centers for Harris Corporation is the Communication Systems (COMM) sector. Assume the following information for the COMM sector:

- The sector has 3,000 employees, of whom 40% are office employees.
- All the office employees have a phone, and 75% of them have a computer on the network.
- Ninety-five percent of the employees with a computer also have an e-mail account.
- The average number of help desk calls for April was 1.0 call per individual with a computer.
- There are 250 additional printers, servers, and peripherals on the network beyond the personal computers.

a. Determine the service charge rate for the four CCS service categories for April.
b. Determine the charges to the COMM sector for the four CCS service categories for April.

EX 8-7
Divisional income statements with service department charges

obj. 3

✔ Retail income from operations, $1,386,134

Encounter Sporting Goods Company has two divisions, Wholesale and Retail, and two corporate service departments, Tech Support and Accounts Payable. The corporate expenses for the year ended December 31, 2010, are as follows:

Tech Support Department	$ 705,000
Accounts Payable Department	278,000
Other corporate administrative expenses	415,000
Total corporate expense	$1,398,000

The other corporate administrative expenses include officers' salaries and other expenses required by the corporation. The Tech Support Department charges the divisions for services rendered, based on the number of computers in the department, and the Accounts Payable Department charges divisions for services, based on the number of checks issued. The usage of service by the two divisions is as follows:

	Tech Support	Accounts Payable
Wholesale Division	300 computers	7,060 checks
Retail Division	200	12,940
Total	500 computers	20,000 checks

The service department charges of the Tech Support Department and the Accounts Payable Department are considered controllable by the divisions. Corporate administrative expenses are not considered controllable by the divisions. The revenues, cost of goods sold, and operating expenses for the two divisions are as follows:

	Wholesale	Retail
Revenues	$6,720,000	$5,712,000
Cost of goods sold	3,528,000	2,688,000
Operating expenses	1,260,000	1,176,000

Prepare the divisional income statements for the two divisions.

EX 8-8
Corrections to service department charges

obj. 3

✔ b. Income from operations, Cargo Division, $80,500

Trans-Continental Airlines, Inc., has two divisions organized as profit centers, the Passenger Division and the Cargo Division. The following divisional income statements were prepared:

Trans-Continental Airlines, Inc.
Divisional Income Statements
For the Year Ended June 30, 2010

	Passenger Division		Cargo Division	
Revenues		$1,400,000		$1,400,000
Operating expenses		950,000		1,200,000
Income from operations before service department charges		$ 450,000		$ 200,000
Less service department charges:				
Training	$ 80,000		$ 80,000	
Flight scheduling	75,000		75,000	
Reservations	105,000	260,000	105,000	260,000
Income from operations		$ 190,000		$ (60,000)

The service department charge rate for the service department costs was based on revenues. Since the revenues of the two divisions were the same, the service department charges to each division were also the same.

The following additional information is available:

	Passenger Division	Cargo Division	Total
Number of personnel trained	200	50	250
Number of flights	250	350	600
Number of reservations requested	14,000	0	14,000

a. Does the income from operations for the two divisions accurately measure performance?
b. Correct the divisional income statements, using the activity bases provided above in revising the service department charges.

EX 8-9
Profit center responsibility reporting

objs. 3, 5

✔ Income from operations, Action Sports Division, $571,400

X-Out Sporting Goods Co. operates two divisions—the Action Sports Division and the Team Sports Division. The following income and expense accounts were provided from the trial balance as of June 30, 2010, the end of the current fiscal year, after all adjustments, including those for inventories, were recorded and posted:

Sales—Action Sports (AS) Division	$14,500,000
Sales—Team Sports (TS) Division	17,600,000
Cost of Goods Sold—Action Sports (AS) Division	8,700,000
Cost of Goods Sold—Team Sports (TS) Division	10,208,000
Sales Expense—Action Sports (AS) Division	2,320,000
Sales Expense—Team Sports (TS) Division	2,464,000
Administrative Expense—Action Sports (AS) Division	1,450,000
Administrative Expense—Team Sports (TS) Division	1,566,400

(*continued*)

Advertising Expense	$ 642,000
Transportation Expense	314,960
Accounts Receivable Collection Expense	201,750
Warehouse Expense	1,600,000

The bases to be used in allocating expenses, together with other essential information, are as follows:

a. Advertising expense—incurred at headquarters, charged back to divisions on the basis of usage: Action Sports Division, $256,800; Team Sports Division, $385,200.
b. Transportation expense—charged back to divisions at a charge rate of $12.40 per bill of lading: Action Sports Division, 12,000 bills of lading; Team Sports Division, 13,400 bills of lading.
c. Accounts receivable collection expense—incurred at headquarters, charged back to divisions at a charge rate of $7.50 per invoice: Action Sports Division, 12,400 sales invoices; Team Sports Division, 14,500 sales invoices.
d. Warehouse expense—charged back to divisions on the basis of floor space used in storing division products: Action Sports Division, 120,000 square feet; Team Sports Division, 80,000 square feet.

Prepare a divisional income statement with two column headings: Action Sports Division and Team Sports Division. Provide supporting schedules for determining service department charges.

EX 8-10
Rate of return on investment

obj. 4

✔ a. Health Care Division, 16%

The income from operations and the amount of invested assets in each division of Devon Industries are as follows:

	Income from Operations	Invested Assets
Sporting Goods Division	$80,000	$400,000
Health Care Division	41,600	260,000
Commercial Division	70,400	320,000

a. Compute the rate of return on investment for each division.
b. Which division is the most profitable per dollar invested?

EX 8-11
Residual income

obj. 4

✔ a. Sporting Goods Division, $40,000

Based on the data in Exercise 8-10, assume that management has established a 10% minimum acceptable rate of return for invested assets.

a. Determine the residual income for each division.
b. Which division has the most residual income?

EX 8-12
Determining missing items in rate of return computation

obj. 4

✔ d. 0.70

One item is omitted from each of the following computations of the rate of return on investment:

Rate of Return on Investment	=	Profit Margin	×	Investment Turnover
22%	=	10%	×	(a)
(b)	=	16%	×	0.75
18%	=	(c)	×	1.50
14%	=	20%	×	(d)
(e)	=	15%	×	1.60

Determine the missing items, identifying each by the appropriate letter.

EX 8-13
Profit margin, investment turnover, and rate of return on investment

obj. 4

✔ a. ROI, 15%

The condensed income statement for the International Division of King Industries Inc. is as follows (assuming no service department charges):

Sales	$1,200,000
Cost of goods sold	600,000
Gross profit	$ 600,000
Administrative expenses	300,000
Income from operations	$ 300,000

The manager of the International Division is considering ways to increase the rate of return on investment.

a. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment of the International Division, assuming that $2,000,000 of assets have been invested in the International Division.
b. If expenses could be reduced by $60,000 without decreasing sales, what would be the impact on the profit margin, investment turnover, and rate of return on investment for the International Division?

EX 8-14
Rate of return on investment

obj. 4

✔ a. Media Networks ROI, 15.4%

The Walt Disney Company has four major sectors, described as follows:

- **Media Networks:** The ABC television and radio network, Disney channel, ESPN, A&E, E!, and Disney.com.
- **Parks and Resorts:** Walt Disney World Resort, Disneyland, Disney Cruise Line, and other resort properties.
- **Studio Entertainment:** Walt Disney Pictures, Touchstone Pictures, Hollywood Pictures, Miramax Films, and Buena Vista Theatrical Productions.
- **Consumer Products:** Character merchandising, Disney stores, books, and magazines.

Disney recently reported sector income from operations, revenue, and invested assets (in millions) as follows:

	Income from Operations	Revenue	Invested Assets
Media Networks	$4,285	$15,046	$27,692
Parks and Resorts	1,710	10,626	16,311
Studio Entertainment	1,201	7,491	10,812
Consumer Products	631	2,347	1,553

a. Use the DuPont formula to determine the rate of return on investment for the four Disney sectors. Round whole percents to one decimal place and investment turnover to two decimal places.
b. How do the four sectors differ in their profit margin, investment turnover, and return on investment?

EX 8-15
Determining missing items in rate of return and residual income computations

obj. 4

✔ c. $92,400

Data for Schmidt Company is presented in the following table of rates of return on investment and residual incomes:

Invested Assets	Income from Operations	Rate of Return on Investment	Minimum Rate of Return	Minimum Acceptable Income from Operations	Residual Income
$840,000	$210,000	(a)	14%	(b)	(c)
$500,000	(d)	(e)	(f)	$64,000	$27,500
$320,000	(g)	16%	(h)	$40,000	(i)
$240,000	$48,000	(j)	12%	(k)	(l)

Determine the missing items, identifying each item by the appropriate letter.

EX 8-16
Determining missing items from computations

obj. 4

✔ a. (e) $520,000

Data for the North, South, East, and West divisions of McGonigel Company are as follows:

	Sales	Income from Operations	Invested Assets	Rate of Return on Investment	Profit Margin	Investment Turnover
North	$525,000	(a)	(b)	18%	12%	(c)
South	(d)	$65,000	(e)	(f)	10%	1.25
East	$700,000	(g)	$350,000	15%	(h)	(i)
West	$800,000	$140,000	$1,000,000	(j)	(k)	(l)

a. Determine the missing items, identifying each by the letters (a) through (l). Round whole percents to one decimal place and investment turnover to two decimal places.
b. Determine the residual income for each division, assuming that the minimum acceptable rate of return established by management is 10%.
c. Which division is the most profitable in terms of (1) return on investment and (2) residual income?

EX 8-17
Rate of return on investment, residual income

obj. 4

Hilton Hotels Corporation provides lodging services around the world. The company is separated into three major divisions.

- **Hotel Ownership:** Hotels owned and operated by Hilton.
- **Managing and Franchising:** Hotels franchised to others or managed for others.
- **Timeshare:** Resort properties managed for timeshare vacation owners.

Financial information for each division, from a recent annual report, is as follows (in millions):

	Hotel Ownership	Managing and Franchising	Timeshare
Revenues	$4,985	$2,527	$ 650
Income from operations	904	600	152
Total assets	9,681	5,191	1,078

a. Use the DuPont formula to determine the return on investment for each of the Hilton business divisions. Round whole percents to one decimal place and investment turnover to one decimal place.
b. Determine the residual income for each division, assuming a minimum acceptable income of 10% of total assets. Round minimal acceptable return to the nearest million dollars.
c. Interpret your results.

EX 8-18
Balanced scorecard

obj. 4

American Express Company is a major financial services company, noted for its American Express® card. Below are some of the performance measures used by the company in its balanced scorecard.

Average cardmember spending	Number of merchant signings
Cards in force	Number of card choices
Earnings growth	Number of new card launches
Hours of credit consultant training	Return on equity
Investment in information technology	Revenue growth
Number of Internet features	

For each measure, identify whether the measure best fits the innovation, customer, internal process, or financial dimension of the balanced scorecard.

EX 8-19
Balanced scorecard

obj. 4

Several years ago, United Parcel Service (UPS) believed that the Internet was going to change the parcel delivery market and would require UPS to become a more nimble and customer-focused organization. As a result, UPS replaced its old measurement system, which was 90% oriented toward financial performance, with a balanced scorecard. The scorecard emphasized four "point of arrival" measures, which were:

1. Customer satisfaction index—a measure of customer satisfaction.
2. Employee relations index—a measure of employee sentiment and morale.
3. Competitive position—delivery performance relative to competition.
4. Time in transit—the time from order entry to delivery.

a. Why did UPS introduce a balanced scorecard and nonfinancial measures in its new performance measurement system?
b. Why do you think UPS included a factor measuring employee sentiment?

EX 8-20
Decision on transfer pricing

obj. 5

✔ a. $1,225,000

Electronic components used by the Engine Division of Armstrong Manufacturing are currently purchased from outside suppliers at a cost of $200 per unit. However, the same materials are available from the Components Division. The Components Division has unused capacity and can produce the materials needed by the Engine Division at a variable cost of $165 per unit.

a. If a transfer price of $180 per unit is established and 35,000 units of materials are transferred, with no reduction in the Components Division's current sales, how much would Armstrong Manufacturing's total income from operations increase?
b. How much would the Engine Division's income from operations increase?
c. How much would the Components Division's income from operations increase?

EX 8-21
Decision on transfer pricing

obj. 5

✔ b. $350,000

Based on Armstrong Manufacturing's data in Exercise 8-20, assume that a transfer price of $190 has been established and that 35,000 units of materials are transferred, with no reduction in the Components Division's current sales.

a. How much would Armstrong Manufacturing's total income from operations increase?
b. How much would the Engine Division's income from operations increase?
c. How much would the Components Division's income from operations increase?
d. If the negotiated price approach is used, what would be the range of acceptable transfer prices and why?

Problems Series A

PR 8-1A
Budget performance report for a cost center

obj. 2

Amoruso Parts Company sells vehicle parts to automotive companies. The Truck Division is organized as a cost center. The budget for the Truck Division for the month ended October 31, 2010, is as follows (in thousands):

Customer service salaries	$ 260,450
Insurance and property taxes	54,600
Distribution salaries	415,400
Marketing salaries	489,700
Engineer salaries	398,500
Warehouse wages	279,100
Equipment depreciation	87,500
Total	$1,985,250

During October, the costs incurred in the Truck Division were as follows:

Customer service salaries	$ 333,370
Insurance and property taxes	52,960
Distribution salaries	411,250
Marketing salaries	548,460
Engineer salaries	390,530
Warehouse wages	267,930
Equipment depreciation	87,500
Total	$2,092,000

Instructions

1. Prepare a budget performance report for the director of the Truck Division for the month of October.
2. For which costs might the director be expected to request supplemental reports?

PR 8-2A
Profit center responsibility reporting

obj. 3

✔ 1. Income from operations, Metro Division, $274,400

Browning Transportation Co. has three regional divisions organized as profit centers. The chief executive officer (CEO) evaluates divisional performance, using income from operations as a percent of revenues. The following quarterly income and expense accounts were provided from the trial balance as of December 31, 2010:

Revenues—East Division	$600,000
Revenues—West Division	710,000
Revenues—Metro Division	980,000
Operating Expenses—East Division	362,400
Operating Expenses—West Division	393,540
Operating Expenses—Metro Division	527,760
Corporate Expenses—Shareholder Relations	87,500
Corporate Expenses—Customer Support	300,000
Corporate Expenses—Legal	122,400
General Corporate Officers' Salaries	204,000

The company operates three service departments: Shareholder Relations, Customer Support, and Legal. The Shareholder Relations Department conducts a variety of services for shareholders of the company. The Customer Support Department is the company's point of contact for new service, complaints, and requests for repair. The

department believes that the number of customer contacts is an activity base for this work. The Legal Department provides legal services for division management. The department believes that the number of hours billed is an activity base for this work. The following additional information has been gathered:

	East	West	Metro
Number of customer contacts	3,750	4,500	6,750
Number of hours billed	850	1,360	1,190

Instructions

1. Prepare quarterly income statements showing income from operations for the three divisions. Use three column headings: East, West, and Metro.
2. Identify the most successful division according to the profit margin. Round to two decimal places.
3. Provide a recommendation to the CEO for a better method for evaluating the performance of the divisions. In your recommendation, identify the major weakness of the present method.

PR 8-3A

Divisional income statements and rate of return on investment analysis

obj. 4

✔ 2. Bread Division, ROI, 13.5%

Sunshine Baking Company is a diversified food products company with three operating divisions organized as investment centers. Condensed data taken from the records of the three divisions for the year ended June 30, 2010, are as follows:

	Bread Division	Snack Cake Division	Retail Bakeries Division
Sales	$ 8,100,000	$ 8,700,000	$7,800,000
Cost of goods sold	4,980,000	5,400,000	4,600,000
Operating expenses	1,662,000	1,995,000	1,484,000
Invested assets	10,800,000	10,875,000	6,000,000

The management of Sunshine Baking Company is evaluating each division as a basis for planning a future expansion of operations.

Instructions

1. Prepare condensed divisional income statements for the three divisions, assuming that there were no service department charges.
2. Using the DuPont formula for rate of return on investment, compute the profit margin, investment turnover, and rate of return on investment for each division.
3. If available funds permit the expansion of operations of only one division, which of the divisions would you recommend for expansion, based on parts (1) and (2)? Explain.

PR 8-4A

Effect of proposals on divisional performance

obj. 4

✔ 1. ROI, 14.4%

A condensed income statement for the Snowboard Division of New Wave Rides Inc. for the year ended December 31, 2010, is as follows:

Sales	$1,200,000
Cost of goods sold	826,000
Gross profit	$ 374,000
Operating expenses	230,000
Income from operations	$ 144,000
Invested assets	$1,000,000

Assume that the Snowboard Division received no charges from service departments. The president of New Wave Rides has indicated that the division's rate of return on a $1,000,000 investment must be increased to at least 18% by the end of the next year if operations are to continue. The division manager is considering the following three proposals:

Proposal 1: Transfer equipment with a book value of $40,000 to other divisions at no gain or loss and lease similar equipment. The annual lease payments would exceed the amount of depreciation expense on the old equipment by $24,000. This increase in expense would be included as part of the cost of goods sold. Sales would remain unchanged.

Proposal 2: Purchase new and more efficient machining equipment and thereby reduce the cost of goods sold by $120,000. Sales would remain unchanged, and the old

equipment, which has no remaining book value, would be scrapped at no gain or loss. The new equipment would increase invested assets by an additional $600,000 for the year.

Proposal 3: Reduce invested assets by discontinuing an engine line. This action would eliminate sales of $330,000, cost of goods sold of $286,300, and operating expenses of $65,000. Assets of $420,000 would be transferred to other divisions at no gain or loss.

Instructions

1. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment for the Snowboard Division for the past year.
2. Prepare condensed estimated income statements and compute the invested assets for each proposal.
3. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment for each proposal.
4. Which of the three proposals would meet the required 18% rate of return on investment?
5. If the Snowboard Division were in an industry where the profit margin could not be increased, how much would the investment turnover have to increase to meet the president's required 18% rate of return on investment?

PR 8-5A
Divisional performance analysis and evaluation

obj. 4

✔ 2. Touring Bike Division ROI, 24.5%

The vice president of operations of Rucker-Putnam Bike Company is evaluating the performance of two divisions organized as investment centers. Invested assets and condensed income statement data for the past year for each division are as follows:

	Touring Bike Division	Off-Road Bike Division
Sales	$2,800,000	$2,950,000
Cost of goods sold	1,240,000	1,375,000
Operating expenses	1,168,000	1,073,500
Invested assets	1,600,000	2,950,000

Instructions

1. Prepare condensed divisional income statements for the year ended December 31, 2010, assuming that there were no service department charges.
2. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment for each division.
3. If management desires a minimum acceptable rate of return of 18%, determine the residual income for each division.
4. Discuss the evaluation of the two divisions, using the performance measures determined in parts (1), (2), and (3).

PR 8-6A
Transfer pricing

obj. 5

✔ 3. Total income from operations, $253,000

Bay Area Scientific, Inc. manufactures electronic products, with two operating divisions, the Performance Materials and Communication Technologies divisions. Condensed divisional income statements, which involve no intracompany transfers and which include a breakdown of expenses into variable and fixed components, are as follows:

Bay Area Scientific, Inc.
Divisional Income Statements
For the Year Ended December 31, 2010

	Performance Materials Division	Communication Technologies Division	Total
Sales:			
8,000 units @ $ 78 per unit	$624,000		$ 624,000
12,000 units @ $152 per unit		$1,824,000	1,824,000
	$624,000	$1,824,000	$2,448,000
Expenses:			
Variable:			
8,000 units @ $ 58 per unit	$464,000		$ 464,000
12,000 units @ $108* per unit		$1,296,000	1,296,000
Fixed	124,000	288,000	412,000
Total expenses	$588,000	$1,584,000	$2,172,000
Income from operations	$ 36,000	$ 240,000	$ 276,000

*$78 of the $108 per unit represents materials costs, and the remaining $30 per unit represents other variable conversion expenses incurred within the Communication Technologies Division.

The Performance Materials Division is presently producing 8,000 units out of a total capacity of 9,600 units. Materials used in producing the Communication Technologies Division's product are currently purchased from outside suppliers at a price of $78 per unit. The Performance Materials Division is able to produce the materials used by the Communication Technologies Division. Except for the possible transfer of materials between divisions, no changes are expected in sales and expenses.

Instructions

1. Would the market price of $78 per unit be an appropriate transfer price for Bay Area Scientific, Inc.? Explain.
2. If the Communication Technologies Division purchases 1,600 units from the Performance Materials Division, rather than externally, at a negotiated transfer price of $64 per unit, how much would the income from operations of each division and the total company income from operations increase?
3. Prepare condensed divisional income statements for Bay Area Scientific, Inc., based on the data in part (2).
4. If a transfer price of $70 per unit is negotiated, how much would the income from operations of each division and the total company income from operations increase?
5. a. What is the range of possible negotiated transfer prices that would be acceptable for Bay Area Scientific, Inc.?
   b. Assuming that the managers of the two divisions cannot agree on a transfer price, what price would you suggest as the transfer price?

Problems Series B

PR 8-1B
Budget performance report for a cost center

obj. 2

The Northeast District of Vidovich Beverages, Inc., is organized as a cost center. The budget for the Northeast District of Vidovich Beverages, Inc., for the month ended May 31, 2010, is as follows:

Sales salaries	$ 569,400
System administration salaries	311,220
Customer service salaries	106,000
Billing salaries	68,560
Maintenance	188,480
Depreciation of plant and equipment	64,050
Insurance and property taxes	28,670
Total	$1,336,380

During May, the costs incurred in the Northeast District were as follows:

Sales salaries	$ 568,680
System administration salaries	310,900
Customer service salaries	125,080
Billing salaries	68,145
Maintenance	189,530
Depreciation of plant and equipment	64,050
Insurance and property taxes	28,770
Total	$1,355,155

Instructions

1. Prepare a budget performance report for the manager of the Northeast District of Vidovich Beverages for the month of May.
2. For which costs might the supervisor be expected to request supplemental reports?

PR 8-2B
Profit center responsibility reporting

obj. 3

✔ 1. Income from operations, South Region, $399,000

Tri-State Railroad Company organizes its three divisions, the Southeast (SE), East (E), and South (S) regions, as profit centers. The chief executive officer (CEO) evaluates divisional performance, using income from operations as a percent of revenues. The following quarterly income and expense accounts were provided from the trial balance as of December 31, 2010:

Revenues—SE Region	$2,100,000
Revenues—E Region	3,150,000
Revenues—S Region	2,850,000
Operating Expenses—SE Region	1,367,350
Operating Expenses—E Region	2,321,870
Operating Expenses—S Region	1,963,180
Corporate Expenses—Dispatching	165,600
Corporate Expenses—Equipment Management	1,085,000
Corporate Expenses—Treasurer's	425,000
General Corporate Officers' Salaries	860,000

The company operates three service departments: the Dispatching Department, the Equipment Management Department, and the Treasurer's Department. The Dispatching Department manages the scheduling and releasing of completed trains. The Equipment Management Department manages the railroad cars inventories. It makes sure the right freight cars are at the right place at the right time. The Treasurer's Department conducts a variety of services for the company as a whole. The following additional information has been gathered:

	Southeast	East	South
Number of scheduled trains	450	765	585
Number of railroad cars in inventory	4,375	6,125	7,000

Instructions

1. Prepare quarterly income statements showing income from operations for the three regions. Use three column headings: Southeast, East, and South.
2. Identify the most successful region according to the profit margin. Round to two decimal places.
3. Provide a recommendation to the CEO for a better method for evaluating the performance of the regions. In your recommendation, identify the major weakness of the present method.

PR 8-3B
Divisional income statements and rate of return on investment analysis

obj. 4

✔ 2. Retail Division ROI, 18%

Performance Financial Services Inc. is a diversified investment company with three operating divisions organized as investment centers. Condensed data taken from the records of the three divisions for the year ended June 30, 2010, are as follows:

	Retail Division	Electronic Brokerage Division	Investment Banking Division
Fee revenue	$2,500,000	$1,400,000	$3,250,000
Operating expenses	1,600,000	1,302,000	2,600,000
Invested assets	5,000,000	350,000	4,062,500

The management of Performance Financial Services Inc. is evaluating each division as a basis for planning a future expansion of operations.

Instructions

1. Prepare condensed divisional income statements for the three divisions, assuming that there were no service department charges.
2. Using the DuPont formula for rate of return on investment, compute the profit margin, investment turnover, and rate of return on investment for each division.
3. If available funds permit the expansion of operations of only one division, which of the divisions would you recommend for expansion, based on parts (1) and (2)? Explain.

PR 8-4B
Effect of proposals on divisional performance

obj. 4

✔ 3. Proposal 3 ROI, 16%

A condensed income statement for the Water Sports Division of South Mountain Sports Inc. for the year ended January 31, 2010, is as follows:

Sales	$600,000
Cost of goods sold	236,000
Gross profit	$364,000
Operating expenses	274,000
Income from operations	$ 90,000
Invested assets	$500,000

Assume that the Water Sports Division received no charges from service departments.

The president of South Mountain Sports Inc. has indicated that the division's rate of return on a $500,000 investment must be increased to at least 22% by the end of the next year if operations are to continue. The division manager is considering the following three proposals:

Proposal 1: Transfer equipment with a book value of $100,000 to other divisions at no gain or loss and lease similar equipment. The annual lease payments would be less than the amount of depreciation expense on the old equipment by $18,000. This decrease in expense would be included as part of the cost of goods sold. Sales would remain unchanged.

Proposal 2: Reduce invested assets by discontinuing a product line. This action would eliminate sales of $75,000, cost of goods sold of $26,600, and operating expenses of $21,400. Assets of $150,000 would be transferred to other divisions at no gain or loss.

Proposal 3: Purchase new and more efficient machinery and thereby reduce the cost of goods sold by $30,000. Sales would remain unchanged, and the old machinery, which has no remaining book value, would be scrapped at no gain or loss. The new machinery would increase invested assets by $250,000 for the year.

Instructions

1. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment for the Water Sports Division for the past year.
2. Prepare condensed estimated income statements and compute the invested assets for each proposal.
3. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment for each proposal.
4. Which of the three proposals would meet the required 22% rate of return on investment?
5. If the Water Sports Division were in an industry where the profit margin could not be increased, how much would the investment turnover have to increase to meet the president's required 22% rate of return on investment? Round to two decimal places.

PR 8-5B
Divisional performance analysis and evaluation

obj. 4

✔ 2. Network Equipment Division ROI, 21%

The vice president of operations of Six Layer Computers Inc. is evaluating the performance of two divisions organized as investment centers. Invested assets and condensed income statement data for the past year for each division are as follows:

	Network Equipment Division	Personal Computing Division
Sales	$1,400,000	$1,120,000
Cost of goods sold	845,000	690,000
Operating expenses	345,000	206,000
Invested assets	1,000,000	1,400,000

Instructions

1. Prepare condensed divisional income statements for the year ended December 31, 2010, assuming that there were no service department charges.
2. Using the DuPont formula for rate of return on investment, determine the profit margin, investment turnover, and rate of return on investment for each division.
3. If management's minimum acceptable rate of return is 14%, determine the residual income for each division.
4. Discuss the evaluation of the two divisions, using the performance measures determined in parts (1), (2), and (3).

PR 8-6B
Transfer pricing

obj. 5

✔ 3. Navigational Systems Division, $106,500

Knopfler Industries, Inc. is a diversified aerospace company, including two operating divisions, Specialized Semiconductors and Navigational Systems divisions. Condensed divisional income statements, which involve no intracompany transfers and which include a breakdown of expenses into variable and fixed components, are as follows:

Knopfler Industries, Inc.
Divisional Income Statements
For the Year Ended December 31, 2010

	Specialized Semi-conductors Division	Navigational Systems Division	Total
Sales:			
1,600 units @ $ 825 per unit	$1,320,000		$1,320,000
2,500 units @ $1,240 per unit		$3,100,000	3,100,000
	$1,320,000	$3,100,000	$4,420,000
Expenses:			
Variable:			
1,600 units @ $485 per unit	$ 776,000		$ 776,000
2,500 units @ $975* per unit		$2,437,500	2,437,500
Fixed	488,000	636,000	1,124,000
Total expenses	$1,264,000	$3,073,500	$4,337,500
Income from operations	$ 56,000	$ 26,500	$ 82,500

*$825 of the $975 per unit represents materials costs, and the remaining $150 per unit represents other variable conversion expenses incurred within the Navigational Systems Division.

The Specialized Semiconductors Division is presently producing 1,600 units out of a total capacity of 2,000 units. Materials used in producing the Navigational Systems Division's product are currently purchased from outside suppliers at a price of $825 per unit. The Specialized Semiconductors Division is able to produce the components used by the Navigational Systems Division. Except for the possible transfer of materials between divisions, no changes are expected in sales and expenses.

Instructions

1. Would the market price of $825 per unit be an appropriate transfer price for Knopfler Industries, Inc.? Explain.
2. If the Navigational Systems Division purchases 400 units from the Specialized Semiconductors Division, rather than externally, at a negotiated transfer price of $625 per unit, how much would the income from operations of each division and total company income from operations increase?
3. Prepare condensed divisional income statements for Knopfler Industries, Inc., based on the data in part (2).
4. If a transfer price of $700 per unit is negotiated, how much would the income from operations of each division and total company income from operations increase?
5. a. What is the range of possible negotiated transfer prices that would be acceptable for Knopfler Industries, Inc.?
   b. Assuming that the managers of the two divisions cannot agree on a transfer price, what price would you suggest as the transfer price?

Special Activities

SA 8-1
Ethics and professional conduct in business

Evigi Company has two divisions, the Semiconductor Division and the PC Division. The PC Division may purchase semiconductors from the Semiconductor Division or from outside suppliers. The Semiconductor Division sells semiconductor products both internally and externally. The market price for semiconductors is $150 per 100 semiconductors. Dan Robbin is the controller of the PC Division, and Jamie Palders is the controller of the Semiconductor Division. The following conversation took place between Dan and Jamie:

Dan: I hear you are having problems selling semiconductors out of your division. Maybe I can help.

Jamie: You've got that right. We're producing and selling at about 80% of our capacity to outsiders. Last year we were selling 100% of capacity. Would it be possible for your division to pick up some of our excess capacity? After all, we are part of the same company.

Dan: What kind of price could you give me?

Jamie: Well, you know as well as I that we are under strict profit responsibility in our divisions, so I would expect to get market price, $150 for 100 semiconductors.

Dan: I'm not so sure we can swing that. I was expecting a price break from a "sister" division.

Jamie: Hey, I can only take this "sister" stuff so far. If I give you a price break, our profits will fall from last year's levels. I don't think I could explain that. I'm sorry, but I must remain firm—market price. After all, it's only fair—that's what you would have to pay from an external supplier.

Dan: Fair or not, I think we'll pass. Sorry we couldn't have helped.

Was Dan behaving ethically by trying to force the Semiconductor Division into a price break? Comment on Jamie's reactions.

SA 8-2
Service department charges

The Customer Service Department of Schweitzer Industries asked the Publications Department to prepare a brochure for its training program. The Publications Department delivered the brochures and charged the Customer Service Department a rate that was 25% higher than could be obtained from an outside printing company. The policy of the company required the Customer Service Department to use the internal publications group for brochures. The Publications Department claimed that it had a drop in demand for its services during the fiscal year, so it had to charge higher prices in order to recover its payroll and fixed costs.

Should the cost of the brochure be transferred to the Customer Service Department in order to hold the department head accountable for the cost of the brochure? What changes in policy would you recommend?

SA 8-3
Evaluating divisional performance

The three divisions of Monstore Foods are Snack Goods, Cereal, and Frozen Foods. The divisions are structured as investment centers. The following responsibility reports were prepared for the three divisions for the prior year:

	Snack Goods	Cereal	Frozen Foods
Revenues	$1,500,000	$2,400,000	$1,350,000
Operating expenses	684,600	1,179,000	483,000
Income from operations before service department charges	$ 815,400	$1,221,000	$ 867,000
Service department charges:			
Promotion	$ 210,000	$ 415,000	$ 325,000
Legal	95,400	86,000	164,000
	$ 305,400	$ 501,000	$ 489,000
Income from operations	$ 510,000	$ 720,000	$ 378,000
Invested assets	$2,500,000	$4,800,000	$1,800,000

1. Which division is making the best use of invested assets and thus should be given priority for future capital investments?
2. Assuming that the minimum acceptable rate of return on new projects is 12%, would all investments that produce a return in excess of 12% be accepted by the divisions?
3. Can you identify opportunities for improving the company's financial performance?

SA 8-4
Evaluating division performance over time

The Truck Division of Estatoe Motors Inc. has been experiencing revenue and profit growth during the years 2008–2010. The divisional income statements are provided below.

Estatoe Motors Inc.
Divisional Income Statements, Truck Division
For the Years Ended December 31, 2008–2010

	2008	2009	2010
Sales	$840,000	$1,200,000	$1,400,000
Cost of goods sold	605,000	856,000	987,000
Gross profit	$235,000	$ 344,000	$ 413,000
Operating expenses	109,000	128,000	133,000
Income from operations	$126,000	$ 216,000	$ 280,000

Assume that there are no charges from service departments. The vice president of the division, Eddie Wadsley, is proud of his division's performance over the last three years. The president of Estatoe Motors Inc., Kurt Hartisan, is discussing the division's performance with Eddie, as follows:

Eddie: As you can see, we've had a successful three years in the Truck Division.

Kurt: I'm not too sure.

Eddie: What do you mean? Look at our results. Our income from operations has more than doubled, while our profit margins are improving.

Kurt: I am looking at your results. However, your income statements fail to include one very important piece of information; namely, the invested assets. You have been investing a great deal of assets into the division. You had $420,000 in invested assets in 2008, $800,000 in 2009, and $1,750,000 in 2010.

Eddie: You are right. I've needed the assets in order to upgrade our technologies and expand our operations. The additional assets are one reason we have been able to grow and improve our profit margins. I don't see that this is a problem.

Kurt: The problem is that we must maintain a 20% rate of return on invested assets.

1. Determine the profit margins for the Truck Division for 2008–2010.
2. Compute the investment turnover for the Truck Division for 2008–2010.
3. Compute the rate of return on investment for the Truck Division for 2008–2010.
4. Evaluate the division's performance over the 2008–2010 time period. Why was Kurt concerned about the performance?

SA 8-5
Evaluating division performance

Casual Living Inc. is a privately held diversified company with five separate divisions organized as investment centers. A condensed income statement for the Apparel Division for the past year, assuming no service department charges, is as follows:

Casual Living Inc.—Apparel Division
Income Statement
For the Year Ended December 31, 2009

Sales	$22,500,000
Cost of goods sold	16,870,000
Gross profit	$ 5,630,000
Operating expenses	1,130,000
Income from operations	$ 4,500,000
Invested assets	$30,000,000

The manager of the Apparel Division was recently presented with the opportunity to add an additional product line, which would require invested assets of $15,000,000. A projected income statement for the new product line is as follows:

New Product Line
Projected Income Statement
For the Year Ended December 31, 2010

Sales	$9,000,000
Cost of goods sold	5,200,000
Gross profit	$3,800,000
Operating expenses	2,450,000
Income from operations	$1,350,000

The Apparel Division currently has $30,000,000 in invested assets, and Casual Living Inc.'s overall rate of return on investment, including all divisions, is 8%. Each division manager is evaluated on the basis of divisional rate of return on investment, and a bonus equal to $9,000 for each percentage point by which the division's rate of return on investment exceeds the company average is awarded each year.

The president is concerned that the manager of the Apparel Division rejected the addition of the new product line, when all estimates indicated that the product line would be profitable and would increase overall company income. You have been asked to analyze the possible reasons why the Apparel Division manager rejected the new product line.

1. Determine the rate of return on investment for the Apparel Division for the past year.
2. Determine the Apparel Division manager's bonus for the past year.
3. Determine the estimated rate of return on investment for the new product line. Round whole percents to one decimal place.
4. Why might the manager of the Apparel Division decide to reject the new product line? Support your answer by determining the projected rate of return on investment for 2010, assuming that the new product line was launched in the Apparel Division, and 2010 actual operating results were similar to those of 2009.
5. Can you suggest an alternative performance measure for motivating division managers to accept new investment opportunities that would increase the overall company income and rate of return on investment?

SA 8-6
The balanced scorecard and EVA

Group Project

Internet Project

Divide responsibilities between two groups, with one group going to the home page of The Palladium Group at **http://www.thepalladiumgroup.com**, and the second group going to the home page of Stern Stewart & Co. at **http://www.eva.com**. The Palladium Group is a consulting firm that helped develop the balanced scorecard concept. Stern Stewart & Co. is a consulting firm that developed the concept of economic value added (EVA), another method of measuring corporate and divisional performance, similar to residual income.

After reading about the balanced scorecard at the palladiumgroup.com site, prepare a brief report describing the balanced scorecard and its claimed advantages. In the Stern group, use links in the home page of Stern Stewart & Co. to learn about EVA. After reading about EVA, prepare a brief report describing EVA and its claimed advantages. After preparing these reports, both groups should discuss their research and prepare a brief analysis comparing and contrasting these two approaches to corporate and divisional performance measurement.

Answers to Self-Examination Questions

1. **B** The manager of a profit center (answer B) has responsibility for and authority over costs and revenues. If the manager has responsibility for only costs, the department is called a cost center (answer A). If the responsibility and authority extend to the investment in assets as well as costs and revenues, it is called an investment center (answer C). A service department (answer D) provides services to other departments. A service department could be a cost center, a profit center, or an investment center.
2. **C** $600,000/150,000 = $4 per payment. Division A anticipates 60,000 payments or $240,000 (60,000 × $4) in service department charges from the Accounts Payable Department. Income from operations is thus $900,000 − $240,000, or $660,000. Answer A assumes that all of the service department overhead is assigned to Division A, which would be incorrect, since Division A does not use all of the accounts payable service. Answer B incorrectly assumes that there are no service department charges from Accounts Payable. Answer D incorrectly determines the accounts payable transfer rate from Division A's income from operations.
3. **A** The rate of return on investment for Division A is 20% (answer A), computed as follows:

$$\text{Rate of Return on Investment} = \frac{\text{Income from Operations}}{\text{Invested Assets}}$$

$$\text{ROI} = \frac{\$350{,}000 - \$200{,}000 - \$30{,}000}{\$600{,}000} = 20\%$$

4. **B** The profit margin for Division L of Liddy Co. is 15% (answer B), computed as follows:

$$\text{Rate of Return on Investment} = \text{Profit Margin} \times \text{Investment Turnover}$$

$$24\% = \text{Profit Margin} \times 1.6$$

$$15\% = \text{Profit Margin}$$

5. **C** The market price approach (answer C) to transfer pricing uses the price at which the product or service transferred could be sold to outside buyers. The cost price approach (answer A) uses cost as the basis for setting transfer prices. The negotiated price approach (answer B) allows managers of decentralized units to agree (negotiate) among themselves as to the proper transfer price. The standard cost approach (answer D) is a version of the cost price approach that uses standard costs in setting transfer prices.

CHAPTER 9

Differential Analysis and Product Pricing

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REALNETWORKS, INC.

Many of the decisions that you make depend on comparing the estimated costs of alternatives. The payoff from such comparisons is described in the following report from a University of Michigan study.

Richard Nisbett and two colleagues quizzed Michigan faculty members and university seniors on such questions as how often they walk out on a bad movie, refuse to finish a bad meal, start over on a weak term paper, or abandon a research project that no longer looks promising. They believe that people who cut their losses this way are following sound economic rules: calculating the net benefits of alternative courses of action, writing off past costs that can't be recovered, and weighing the opportunity to use future time and effort more profitably elsewhere.

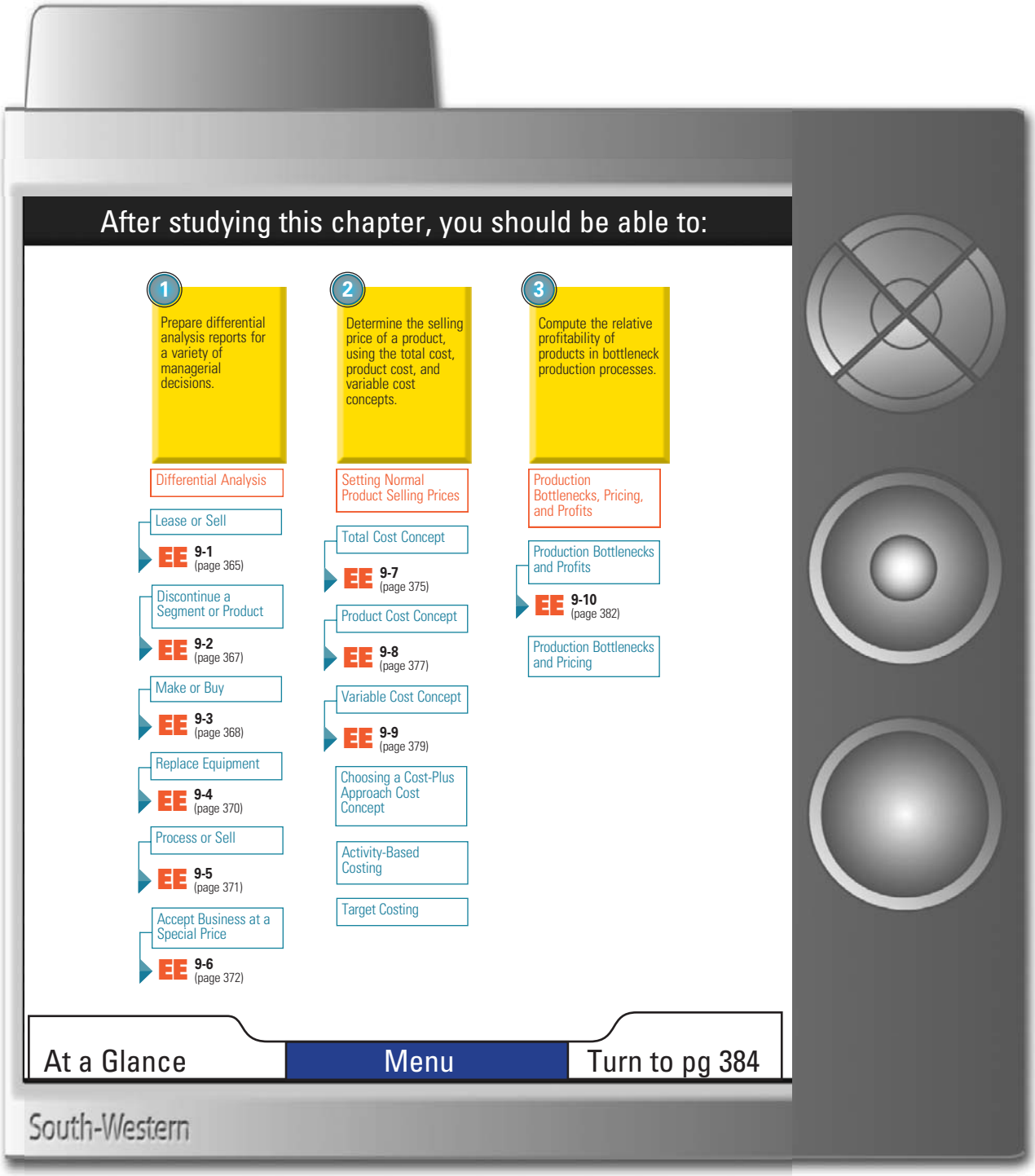
Among students, those who have learned to use cost-benefit analysis frequently are apt to have far better grades than their Scholastic Aptitude Test scores would have predicted. Again, the more economics courses the students have, the more likely they are to apply cost-benefit analysis outside the classroom.

Dr. Nisbett concedes that for many Americans, cost-benefit rules often appear to conflict with such traditional principles as "never give up" and "waste not, want not."

Managers must also apply cost-benefit rules in making decisions affecting their business. RealNetworks, Inc., the Internet-based music and game company, like most companies must choose between alternatives. Examples of decisions faced by RealNetworks include whether it should expand or discontinue services, such as its recent decision to Mac-enable its digital music service, Rhapsody,® and whether to accept business at special prices, such as special pricing on its Helix Media Delivery System®. Other decisions include whether to replace network equipment, develop its own software, or buy software from others.

In this chapter, differential analysis, which reports the effects of decisions on total revenues and costs, is discussed. Practical approaches to setting product prices are also described and illustrated. Finally, how production bottlenecks influence product mix and pricing decisions is discussed.

Source: Alan L. Otten, "Economic Perspective Produces Steady Yields," from People Patterns, *The Wall Street Journal*, March 31, 1992, p. B1.



1 Prepare differential analysis reports for a variety of managerial decisions.

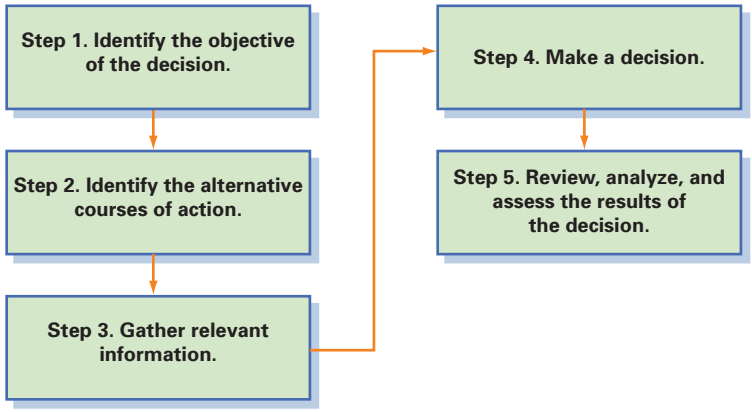
Differential Analysis

Managerial decision making involves choosing between alternative courses of action. Although the managerial decision-making process varies by the type of decision, it normally involves the steps shown at the top of page 363.

The objective (Step 1) for most decisions is to maximize the company's profits. The alternative courses of action (Step 2) could include actions such as discontinuing an unprofitable segment, replacing equipment, or offering a product at a special price to an exporter. The relevant information (Step 3) varies by decision, but oftentimes

The management of Delta Air Lines decided to discontinue its low-fare Song Airline subsidiary after assessing its profitability.

Have you ever walked out on a bad movie? The cost of the ticket is a sunk cost and, thus, irrelevant to the decision to walk out early.



includes estimates and data that are not available in the accounting records. Making decisions (Step 4) is the most important function of managers. Once the decision is made, the results of the decision (Step 5) should be reviewed, analyzed, and assessed in terms of the initial objective of the decision.

Accounting facilitates the preceding process by:

1. Gathering relevant information for managerial decisions
2. Reporting this information to management
3. Providing management feedback on the results of the decisions

For managerial decisions, estimated future revenues and costs are relevant. Costs that have been incurred in the past are not relevant to the decision. These costs are called **sunk costs**.

Differential revenue is the amount of increase or decrease in revenue that is expected from a course of action as compared to an alternative. To illustrate, assume that equipment can be used to manufacture digital clocks or calculators. The estimated revenue from each product is as follows:

Product	Estimated Revenue
Digital clocks	$175,000
Calculators	150,000
Differential revenue	$ 25,000

The differential revenue from making and selling digital clocks is $25,000.

Differential cost is the amount of increase or decrease in cost that is expected from a course of action as compared to an alternative. For example, if increasing advertising expenses from $100,000 to $150,000 is being considered, the differential cost is $50,000.

Differential income (or **loss**) is the difference between the differential revenue and the differential costs. Differential income indicates that a decision is expected to be profitable, while a differential loss indicates the opposite.

Differential analysis, sometimes called *incremental analysis*, focuses on the effect of alternative courses of action on revenues and costs. An example of a reporting format for differential analysis is shown in Exhibit 1.

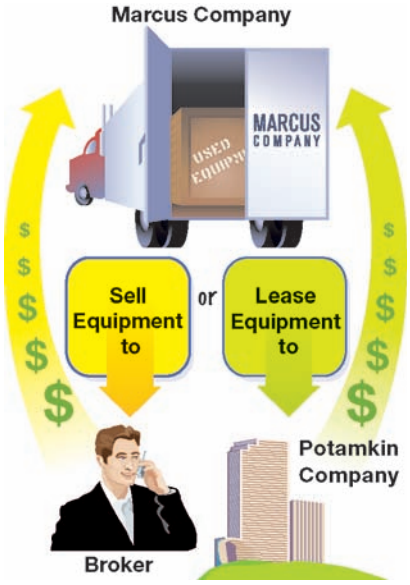
Exhibit 1

Differential Analysis

Differential revenue from alternatives:		
Revenue from alternative A	$XXX	
Revenue from alternative B	XXX	
Differential revenue		$XXX
Differential cost of alternatives:		
Cost of alternative A	$XXX	
Cost of alternative B	XXX	
Differential cost		XXX
Net differential income or loss from alternatives		**$XXX**

In this chapter, differential analysis is illustrated for the following decisions:

1. Leasing or selling equipment
2. Discontinuing an unprofitable segment
3. Manufacturing or purchasing a needed part
4. Replacing fixed assets
5. Processing further or selling a product
6. Accepting additional business at a special price



Lease or Sell

Management may lease or sell a piece of equipment that is no longer needed. This may occur when a company changes its manufacturing process and can no longer use the equipment in the manufacturing process. In making a decision, differential analysis can be used.

To illustrate, assume that Marcus Company is considering leasing or disposing of the following equipment:

Cost of equipment	$200,000
Less accumulated depreciation	120,000
Book value	$ 80,000
Lease Option:	
Total revenue for five-year lease	$160,000
Total estimated repair, insurance, and property tax expenses during life of lease	35,000
Residual value at end of fifth year of lease	0
Sell Option:	
Sales price	$100,000
Commission on sales	6%

Exhibit 2 shows the differential analysis of whether to lease or sell the equipment.

Exhibit 2

Differential Analysis Report—Lease or Sell

Proposal to Lease or Sell Equipment
June 22, 2010

Differential revenue from alternatives:		
Revenue from lease	$160,000	
Revenue from sale	100,000	
Differential revenue from lease		$60,000
Differential cost of alternatives:		
Repair, insurance, and property tax expenses from lease	$ 35,000	
Commission expense on sale ($100,000 × 6%)	6,000	
Differential cost of lease		29,000
Net differential income from the lease alternative		**$31,000**

Many companies that manufacture expensive equipment give customers the choice of leasing the equipment. For example, construction equipment from Caterpillar can either be purchased outright or leased through Caterpillar's financial services subsidiary.

Exhibit 2 includes only the differential revenues and differential costs associated with the lease or sell decision. The $80,000 book value ($200,000 − $120,000) of the equipment is a *sunk* cost and is not considered in the differential analysis shown in Exhibit 2. In other words, the $80,000 does not affect the decision to lease or sell the equipment. This analysis is verified by the more traditional analysis shown in Exhibit 3.

To simplify, the following factors were not considered in Exhibits 2 and 3:

1. Differential revenue from investing funds
2. Differential income tax

Differential revenue (interest) could arise from investing the cash created by the two alternatives. Differential income tax could arise from differences in the timing of the income from the two alternatives and differences in the amount that is taxed. These factors are discussed in Chapter 10.

Exhibit 3

Traditional Analysis

Lease or Sell			
Lease alternative:			
Revenue from lease		$160,000	
Depreciation expense for remaining five years	$80,000		
Repair, insurance, and property tax expenses	35,000	115,000	
Net gain			$45,000
Sell alternative:			
Sales price		$100,000	
Book value of equipment	$80,000		
Commission expense	6,000	86,000	
Net gain			14,000
Net differential income from the lease alternative			**$31,000**

Example Exercise 9-1 Lease or Sell 1

Casper Company owns office space with a cost of $100,000 and accumulated depreciation of $30,000 that can be sold for $150,000, less a 6% broker commission. Alternatively, the office space can be leased by Casper Company for 10 years for a total of $170,000, at the end of which there is no residual value. In addition, repair, insurance, and property tax that would be incurred by Casper Company on the rented office space would total $24,000 over the 10 years. Determine the differential income or loss from the lease alternative for Casper Company.

Follow My Example 9-1

Differential revenue from alternatives:		
Revenue from lease	$170,000	
Revenue from sale	150,000	
Differential revenue from lease		$20,000
Differential cost of alternatives:		
Repair, insurance, and property tax expenses from lease	$ 24,000	
Commission expense on sale	9,000	
Differential cost of lease		15,000
Net differential income from the lease alternative		$ 5,000

For Practice: PE 9-1A, PE 9-1B

Discontinue a Segment or Product

A product, department, branch, territory, or other segment of a business may be generating losses. As a result, management may consider discontinuing (eliminating) the product or segment. In such cases, it may be erroneously assumed that the total company income will increase by eliminating the operating loss.

Discontinuing the product or segment usually eliminates all of the product's or segment's variable costs. Such costs include direct materials, direct labor, variable factory overhead, and sales commissions. However, fixed costs such as depreciation, insurance, and property taxes may not be eliminated. Thus, it is possible for total company income to decrease rather than increase if the unprofitable product or segment is discontinued.

To illustrate, the income statement for Battle Creek Cereal Co. is shown in Exhibit 4. As shown in Exhibit 4, Bran Flakes incurred an operating loss of $11,000. Because Bran Flakes has incurred annual losses for several years, management is considering discontinuing it.

Exhibit 4

Income (Loss) by Product

Battle Creek Cereal Co.
Condensed Income Statement
For the Year Ended August 31, 2010

	Corn Flakes	Toasted Oats	Bran Flakes	Total Company
Sales	$500,000	$400,000	$100,000	$1,000,000
Cost of goods sold:				
Variable costs	$220,000	$200,000	$ 60,000	$ 480,000
Fixed costs	120,000	80,000	20,000	220,000
Total cost of goods sold	$340,000	$280,000	$ 80,000	$ 700,000
Gross profit	$160,000	$120,000	$ 20,000	$ 300,000
Operating expenses:				
Variable expenses	$ 95,000	$ 60,000	$ 25,000	$ 180,000
Fixed expenses	25,000	20,000	6,000	51,000
Total operating expenses	$120,000	$ 80,000	$ 31,000	$ 231,000
Income (loss) from operations	$ 40,000	$ 40,000	$ (11,000)	$ 69,000

If Bran Flakes is discontinued, what would be the total annual operating income of Battle Creek Cereal? The first impression is that total annual operating income would be $80,000, as shown below.

	Corn Flakes	Toasted Oats	Total Company
Income from operations	$40,000	$40,000	$80,000

However, the differential analysis report in Exhibit 5 indicates that discontinuing Bran Flakes actually decreases operating income by $15,000. This is because discontinuing Bran Flakes has no effect on fixed costs and expenses. This is supported by the traditional analysis in Exhibit 6, which indicates that income from operations would decrease from $69,000 to $54,000.

Exhibits 5 and 6 consider only the short-term (one-year) effects of discontinuing Bran Flakes. When discontinuing a product or segment, long-term effects should also be considered. For example, discontinuing Bran Flakes could decrease sales of other products. This might be the case if customers upset with the discontinuance of Bran Flakes quit buying other products from the company. Finally, employee morale and productivity might suffer if employees have to be laid off or relocated.

Exhibit 5

Differential Analysis Report—Discontinue an Unprofitable Segment

Proposal to Discontinue Bran Flakes
September 29, 2010

Differential revenue from annual sales of Bran Flakes:		
Revenue from sales		$100,000
Differential cost of annual sales of Bran Flakes:		
Variable cost of goods sold	$60,000	
Variable operating expenses	25,000	85,000
Annual differential income from sales of Bran Flakes		**$ 15,000**

Exhibit 6

Traditional Analysis

Proposal to Discontinue Bran Flakes
September 29, 2010

	Bran Flakes, Toasted Oats, and Corn Flakes	Discontinue Bran Flakes*	Toasted Oats and Corn Flakes
Sales	$1,000,000	$100,000	$900,000
Cost of goods sold:			
Variable costs	$ 480,000	$ 60,000	$420,000
Fixed costs	220,000	—	220,000
Total cost of goods sold	$ 700,000	$ 60,000	$640,000
Gross profit	$ 300,000	$ 40,000	$260,000
Operating expenses:			
Variable expenses	$ 180,000	$ 25,000	$155,000
Fixed expenses	51,000	—	51,000
Total operating expenses	$ 231,000	$ 25,000	$206,000
Income (loss) from operations	**$ 69,000**	**$ 15,000**	**$ 54,000**

*Fixed costs are assumed to remain unchanged with the discontinuance of Bran Flakes.

Example Exercise 9-2 Discontinue a Segment 1

Product A has revenue of $65,000, variable cost of goods sold of $50,000, variable selling expenses of $12,000, and fixed costs of $25,000, creating a loss from operations of $22,000.

a. Determine the differential income or loss from sales of Product A.
b. Should Product A be discontinued?

Follow My Example 9-2

a. Differential revenue from annual sales of Product A:

Revenue from sales		$65,000
Differential cost of annual sales of Product A:		
Variable cost of goods sold	$50,000	
Variable selling expenses	12,000	62,000
Annual differential income from sales of Product A		$ 3,000

b. Product A should not be discontinued.

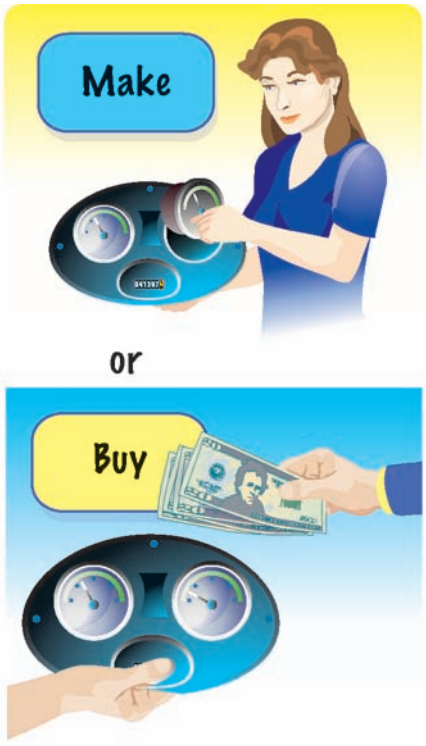
For Practice: PE 9-2A, PE 9-2B

Ford Motor Co. purchases spark plugs, GPS units, nuts, and bolts from suppliers.

Make or Buy

Companies often manufacture products made up of components that are assembled into a final product. For example, an automobile manufacturer assembles tires, radios, motors, interior seats, transmissions, and other parts into a finished automobile. In such cases, the manufacturer must decide whether to make a part or purchase it from a supplier.

Differential analysis can be used to decide whether to make or buy a part. The analysis is similar whether management is considering making a part that is currently being purchased or purchasing a part that is currently being made.



To illustrate, assume that an automobile manufacturer has been purchasing instrument panels for $240 a unit. The factory is currently operating at 80% of capacity, and no major increase in production is expected in the near future. The cost per unit of manufacturing an instrument panel internally is estimated as follows:

Direct materials	$ 80
Direct labor	80
Variable factory overhead	52
Fixed factory overhead	68
Total cost per unit	$280

If the make price of $280 is simply compared with the buy price of $240, the decision is to buy the instrument panel. However, if unused capacity could be used in manufacturing the part, there would be no increase in the total fixed factory overhead costs. Thus, only the variable factory overhead costs would be incurred.

The differential report for this make or buy decision is shown in Exhibit 7. As shown in Exhibit 7, there is a cost savings from manufacturing the instrument panel of $28 per panel. However, other factors should also be considered. For example, productive capacity used to make the instrument panel would not be available for other production. The decision may also affect the future business relationship with the instrument panel supplier. For example, if the supplier provides other parts, the company's decision to make instrument panels might jeopardize the timely delivery of other parts.

Exhibit 7

Differential Analysis Report—Make or Buy

Proposal to Manufacture Instrument Panels
February 15, 2010

Purchase price of an instrument panel		$240
Differential cost to manufacture:		
Direct materials	$80	
Direct labor	80	
Variable factory overhead	52	212
Cost savings from manufacturing an instrument panel		**$ 28**

Example Exercise 9-3 Make or Buy

1

A company manufactures a subcomponent of an assembly for $80 per unit, including fixed costs of $25 per unit. A proposal is offered to purchase the subcomponent from an outside source for $60 per unit, plus $5 per unit freight. Provide a differential analysis of the outside purchase proposal.

Follow My Example 9-3

Differential cost to purchase:		
Purchase price of the subcomponent	$60	
Freight for subcomponent	5	$65
Differential cost to manufacture:		
Variable manufacturing costs ($80 − $25 fixed costs)		55
Cost savings from manufacturing subcomponent		$10

For Practice: PE 9-3A, PE 9-3B

Replace Equipment

The usefulness of a fixed asset may decrease before it is worn out. For example, old equipment may no longer be as efficient as new equipment.

Differential analysis can be used for decisions to replace fixed assets such as equipment and machinery. The analysis normally focuses on the costs of continuing to use the old equipment versus replacing the equipment. The book value of the old equipment is a sunk cost and, thus, is irrelevant.

To illustrate, assume that a business is considering replacing the following machine:

Old Machine	
Book value	$100,000
Estimated annual variable manufacturing costs	225,000
Estimated selling price	25,000
Estimated remaining useful life	5 years
New Machine	
Cost of new machine	$250,000
Estimated annual variable manufacturing costs	150,000
Estimated residual value	0
Estimated useful life	5 years

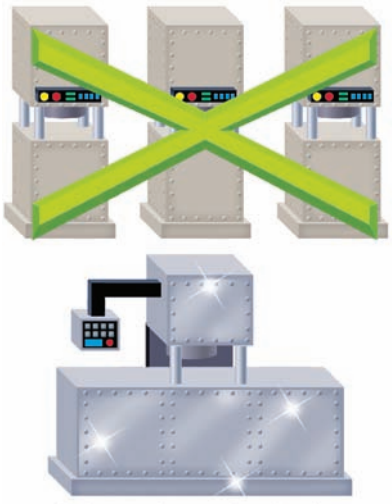
The differential report for the decision to replace the old machine is shown in Exhibit 8.

Exhibit 8

Differential Analysis Report—Replace Machine

Proposal to Replace Machine
November 28, 2010

Annual variable costs—present machine	$225,000	
Annual variable costs—new machine	150,000	
Annual differential decrease in cost	$ 75,000	
Number of years applicable	× 5	
Total differential decrease in cost	$375,000	
Proceeds from sale of present machine	25,000	$400,000
Cost of new machine		250,000
Net differential decrease in cost, five-year total		$150,000
Annual net differential decrease in cost—new machine		**$ 30,000**



Estimated annual reduction of costs of $75,000

As shown in Exhibit 8, there is an annual decrease in cost of $30,000 ($150,000 ÷ 5 years) from replacing the old machine. Thus, the decision should be to purchase the new machine and sell the old machine.

Other factors are often important in equipment replacement decisions. For example, differences between the remaining useful life of the old equipment and the estimated life of the new equipment could exist. In addition, the new equipment might improve the overall quality of the product and, thus, increase sales.

The time value of money and other uses for the cash needed to purchase the new equipment could also affect the decision to replace equipment.[1] The revenue that is forgone from an alternative use of an asset, such as cash, is called an **opportunity cost**. Although the opportunity cost is not recorded in the accounting records, it is useful in analyzing alternative courses of action.

To illustrate, assume that in the preceding illustration the cash outlay of $250,000 for the new machine, less the $25,000 proceeds from the sale of the old machine, could be invested to yield a 15% return. Thus, the annual opportunity cost related to the purchase of the new machine is $33,750 (15% × $225,000). Since the opportunity cost of $33,750 exceeds the annual cost savings of $30,000, the old machine should not be replaced.

1 The time value of money in purchasing equipment (capital assets) is discussed in Chapter 10.

Integrity, Objectivity, and Ethics in Business

RELATED-PARTY DEALS

The make-or-buy decision can be complicated if the purchase (buy) is being made by a related party. A related party is one in which there is direct or indirect control of one party over another or the presence of a family member in a transaction. Such dependence or familiarity may interfere with the appropriateness of the business transaction. One investor has said, "Related parties are akin to steroids used by athletes. If you're an athlete and you can cut the mustard, you don't need steroids to make yourself stronger or faster. By the same token, if you're a good company, you don't need related parties or deals that don't make sense." While related-party transactions are legal, GAAP (FASB Statement No. 56) and the Sarbanes-Oxley Act require that they must be disclosed under the presumption that such transactions are less than arm's length.

Source: Herb Greenberg, "Poor Relations: The Problem with Related-Party Transactions," *Fortune Advisor* (February 5, 2001), p. 198.

Example Exercise 9-4 Replace Equipment

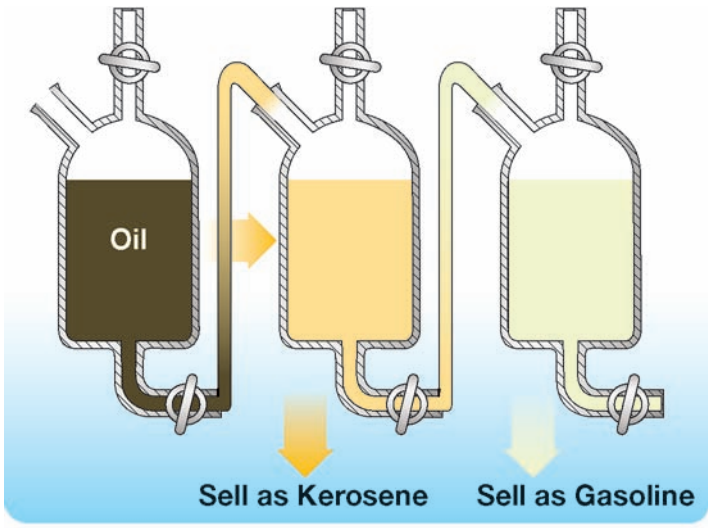
1

A machine with a book value of $32,000 has an estimated four-year life. A proposal is offered to sell the old machine for $10,000 and replace it with a new machine at a cost of $45,000. The new machine has a four-year life with no residual value. The new machine would reduce annual direct labor costs by $11,000. Provide a differential analysis on the proposal to replace the machine.

Follow My Example 9-4

Annual direct labor cost reduction	$11,000	
Number of years applicable	× 4	
Total differential decrease in cost	$44,000	
Proceeds from sale of old equipment	10,000	$54,000
Cost of new equipment		45,000
Net differential decrease in cost from replacing equipment, four-year total		$ 9,000
Annual net differential decrease in cost—new equipment		$ 2,250

For Practice: PE 9-4A, PE 9-4B



Process or Sell

During manufacturing, a product normally progresses through various stages or processes. In some cases, a product can be sold at an intermediate stage of production, or it can be processed further and then sold.

Differential analysis can be used to decide whether to sell a product at an intermediate stage or to process it further. In doing so, the differential revenues and costs from further processing are compared. The costs of producing the intermediate product do not change, regardless of whether the intermediate product is sold or processed further. These costs are sunk costs and are irrelevant to the decision.

To illustrate, assume that a business produces kerosene as follows:

Kerosene:

Batch size	4,000 gallons
Cost of producing kerosene	$2,400 per batch
Selling price	$2.50 per gallon

The kerosene can be processed further to yield gasoline as follows:

Gasoline:

Input batch size	4,000 gallons
Less evaporation (20%)	800 (4,000 × 20%)
Output batch size	3,200 gallons
Additional processing costs	$650 per batch
Selling price	$3.50 per gallon

The differential report for the decision to process the kerosene further is shown in Exhibit 9.

Exhibit 9

Differential Analysis Report—Process or Sell

Proposal to Process Kerosene Further
October 1, 2010

Differential revenue from further processing per batch:		
Revenue from sale of gasoline [(4,000 gallons − 800 gallons evaporation) × $3.50]	$11,200	
Revenue from sale of kerosene (4,000 gallons × $2.50)	10,000	
Differential revenue		$1,200
Differential cost per batch:		
Additional cost of producing gasoline		650
Differential income from further processing gasoline per batch		**$550**

The initial cost of producing the kerosene of $2,400 is not considered in deciding whether to process kerosene further. This initial cost will be incurred, regardless of whether gasoline is produced and, thus, is a sunk cost.

As shown in Exhibit 9, there is additional income from further processing the kerosene into gasoline of $550 per batch. Therefore, the decision should be to process the kerosene further.

Example Exercise 9-5 Process or Sell

1

Product T is produced for $2.50 per gallon including a $1.00 per gallon fixed cost. Product T can be sold without additional processing for $3.50 per gallon, or processed further into Product V at an additional cost of $1.60 per gallon, including a $0.90 per gallon fixed cost. Product V can be sold for $4.00 per gallon. Provide a differential analysis for further processing into Product V.

Follow My Example 9-5

Differential revenue from further processing per gallon:		
Revenue per gallon from sale of Product V	$4.00	
Revenue per gallon from sale of Product T	3.50	
Differential revenue		$0.50
Differential cost per gallon:		
Additional cost for producing Product V ($1.60 − $0.90)		0.70
Differential loss from further processing into Product V		$0.20

For Practice: PE 9-5A, PE 9-5B

Accept Business at a Special Price

A company may be offered the opportunity to sell its products at prices other than normal prices. For example, an exporter may offer to sell a company's products overseas at special discount prices.

The Internet is forcing many companies to respond to "dynamic" pricing. For example, in Priceline.com Inc.'s "name your price" format, customers tell the company what they are willing to pay and then the company must decide if it is willing to sell at that price.

Differential analysis can be used to decide whether to accept additional business at a special price. The differential revenue from accepting the additional business is compared to the differential costs of producing and delivering the product to the customer.

The differential costs of accepting additional business depend on whether the company is operating at full capacity.

1. If the company is *operating at full capacity*, any additional production increases fixed and variable manufacturing costs. Selling and administrative expenses may also increase because of the additional business.
2. If the company is *operating below full capacity*, any additional production does not increase fixed manufacturing costs. In this case, the differential costs of the additional production are the variable manufacturing costs. Selling and administrative expenses may also increase because of the additional business.

To illustrate, assume that B-Ball Inc. manufactures basketballs as follows:

Monthly productive capacity	12,500 basketballs
Current monthly sales	10,000 basketballs
Normal (domestic) selling price	$30.00 per basketball
Manufacturing costs:	
Variable costs	$12.50 per basketball
Fixed costs	7.50
Total	$20.00 per basketball

B-Ball Inc. has received an offer from an exporter for 5,000 basketballs at $18 each. Production can be spread over three months without interfering with normal production or incurring overtime costs. Pricing policies in the domestic market will not be affected.

Comparing the special offer sales price of $18 with the manufacturing cost of $20 per basketball indicates that the offer should be rejected. However, as shown in Exhibit 10, differential analysis indicates that the offer should be accepted.

Exhibit 10

Differential Analysis Report—Sell at Special Price

Proposal to Sell Basketballs to Exporter
March 10, 2010

Differential revenue from accepting offer:	
Revenue from sale of 5,000 additional units at $18	$90,000
Differential cost of accepting offer:	
Variable costs of 5,000 additional units at $12.50	62,500
Differential income from accepting offer	**$27,500**

Proposals to sell products at special prices often require additional considerations. For example, special prices in one geographic area may result in price reductions in other areas with the result that total company sales decrease. Manufacturers must also conform to the Robinson-Patman Act, which prohibits price discrimination within the United States unless price differences can be justified by different costs.

Example Exercise 9-6 Accept Business at Special Price 1

Product D is normally sold for $4.40 per unit. A special price of $3.60 is offered for the export market. The variable production cost is $3.00 per unit. An additional export tariff of 10% of revenue must be paid for all export products. Determine the differential income or loss per unit from selling Product D for export.

(continued)

Follow My Example 9-6

Differential revenue from export:		
Revenue per unit from export sale		$3.60
Differential cost from export:		
Variable manufacturing costs	$3.00	
Export tariff (10% × $3.60)	0.36	3.36
Differential income from accepting export sale		$0.24

For Practice: PE 9-6A, PE 9-6B

2 Determine the selling price of a product, using the total cost, product cost, and variable cost concepts.

Setting Normal Product Selling Prices

The *normal* selling price is the target selling price to be achieved in the long term. The normal selling price must be set high enough to cover all costs and expenses (fixed and variable) and provide a reasonable profit. Otherwise, the business will not survive.

In contrast, in deciding whether to accept additional business at a special price, only differential costs are considered. Any price above the differential costs will increase profits in the short term. However, in the long term, products are sold at normal prices rather than special prices.

Managers can use one of two market methods to determine selling price:

1. Demand-based concept
2. Competition-based concept

Hotels and motels use the demand-based concept in setting room rates. Room rates are set low during off-season travel periods (low demand) and high for peak-season travel periods (high demand) such as holidays.

The demand-based concept sets the price according to the demand for the product. If there is high demand for the product, then the price is set high. Likewise, if there is a low demand for the product, then the price is set low.

The competition-based concept sets the price according to the price offered by competitors. For example, if a competitor reduces the price, then management adjusts the price to meet the competition. The market-based pricing approaches are discussed in greater detail in marketing courses.

Electronic stores such as Best Buy use the competition-based concept. If a buyer demonstrates that a lower price is available from Circuit City or another competitor, Best Buy will often match the price.

Managers can also use one of three cost-plus methods to determine the selling price:

1. Total cost concept
2. Product cost concept
3. Variable cost concept

Cost-plus methods determine the normal selling price by estimating a cost amount per unit and adding a markup, as shown below.

$$\text{Normal Selling Price} = \text{Cost Amount per Unit} + \text{Markup}$$

The cost amount per unit depends on the cost concept used. Management determines the **markup** based on the desired profit for the product. The markup should be sufficient to earn the desired profit plus cover any cost and expenses that are not included in the cost amount.

Total Cost Concept

Under the **total cost concept**, manufacturing cost plus the selling and administrative expenses are included in the total cost per unit. The markup per unit is then computed and added to total cost per unit to determine the normal selling price.

The total cost concept is applied using the following steps:

Step 1. Estimate the total manufacturing cost as shown below.

Manufacturing costs:	
Direct materials	$XXX
Direct labor	XXX
Factory overhead	XXX
Total manufacturing cost	$XXX

Step 2. Estimate the total selling and administrative expenses.

Step 3. Estimate the total cost as shown below.

Total manufacturing costs	$XXX
Selling and administrative expenses	XXX
Total cost	$XXX

Step 4. Divide the total cost by the number of units expected to be produced and sold to determine the total cost per unit, as shown below.

$$\text{Total Cost per Unit} = \frac{\text{Total Cost}}{\text{Estimated Units Produced and Sold}}$$

Step 5. Compute the markup percentage as follows:

$$\text{Markup Percentage} = \frac{\text{Desired Profit}}{\text{Total Cost}}$$

The desired profit is normally computed based on a rate of return on assets as follows:

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets}$$

Step 6. Determine the markup per unit by multiplying the markup percentage times the total cost per unit as follows:

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Total Cost per Unit}$$

Step 7. Determine the normal selling price by adding the markup per unit to the total cost per unit as follows:

Total cost per unit	$XXX
Markup per unit	XXX
Normal selling price per unit	$XXX

To illustrate, assume the following data for 100,000 calculators that Digital Solutions Inc. expects to produce and sell during the current year:

Manufacturing costs:		
Direct materials ($3.00 × 100,000)		$ 300,000
Direct labor ($10.00 × 100,000)		1,000,000
Factory overhead:		
Variable costs ($1.50 × 100,000)	$150,000	
Fixed costs	50,000	200,000
Total manufacturing cost		$1,500,000
Selling and administrative expenses:		
Variable expenses ($1.50 × 100,000)	$150,000	
Fixed costs	20,000	
Total selling and administrative expenses		170,000
Total cost		$1,670,000
Desired rate of return		20%
Total assets		$800,000

Using the total cost concept, the normal selling price of $18.30 is determined as follows:

Step 1. Total manufacturing cost: $1,500,000
Step 2. Total selling and administrative expenses: $170,000
Step 3. Total cost: $1,670,000
Step 4. Total cost per unit: $16.70

$$\text{Total Cost per Unit} = \frac{\text{Total Cost}}{\text{Estimated Units Produced and Sold}} = \frac{\$1{,}670{,}000}{100{,}000 \text{ units}} = \$16.70 \text{ per unit}$$

Step 5. Markup percentage: 9.6% (rounded)

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets} = 20\% \times \$800{,}000 = \$160{,}000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit}}{\text{Total Cost}} = \frac{\$160{,}000}{\$1{,}670{,}000} = 9.6\% \text{ (rounded)}$$

Step 6. Markup per unit: $1.60

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Total Cost per Unit}$$
$$\text{Markup per Unit} = 9.6\% \times \$16.70 = \$1.60 \text{ per unit}$$

Step 7. Normal selling price: $18.30

Total cost per unit	$16.70
Markup per unit	1.60
Normal selling price per unit	$18.30

The ability of the selling price of $18.30 to generate the desired profit of $160,000 is illustrated by the income statement shown below.

Digital Solutions Inc.
Income Statement
For the Year Ended December 31, 2010

Sales (100,000 units × $18.30)		$1,830,000
Expenses:		
Variable (100,000 units × $16.00)	$1,600,000	
Fixed ($50,000 + $20,000)	70,000	1,670,000
Income from operations		$ 160,000

The total cost concept is often used by contractors who sell products to government agencies. This is because in many cases government contractors are required by law to be reimbursed for their products on a total-cost-plus-profit basis.

Example Exercise 9-7 Total Cost Markup Percentage

2

Apex Corporation produces and sells Product Z at a total cost of $30 per unit, of which $20 is product cost and $10 is selling and administrative expenses. In addition, the total cost of $30 is made up of $18 variable cost and $12 fixed cost. The desired profit is $3 per unit. Determine the markup percentage on total cost.

Follow My Example 9-7

Markup percentage on total cost: $\frac{\$3}{\$30} = 10.0\%$

For Practice: PE 9-7A, PE 9-7B

Integrity, Objectivity, and Ethics in Business

PRICE FIXING

Federal law prevents companies competing in similar markets from sharing cost and price information, or what is commonly termed "price fixing." For example, the Federal Trade Commission brought a suit against the major record labels and music retailers for conspiring to set CD prices at a minimum level, or MAP (minimum advertised price). In settling the suit, the major labels ceased their MAP policies and provided $143 million in cash and CDs for consumers.

Product Cost Concept

Under the **product cost concept**, only the costs of manufacturing the product, termed the *product costs*, are included in the cost amount per unit to which the markup is added. Estimated selling expenses, administrative expenses, and desired profit are included in the markup. The markup per unit is then computed and added to the product cost per unit to determine the normal selling price.

The product cost concept is applied using the following steps:

Step 1. Estimate the total product costs as follows:

Product costs:	
Direct materials	$XXX
Direct labor	XXX
Factory overhead	XXX
Total product cost	$XXX

Step 2. Estimate the total selling and administrative expenses.

Step 3. Divide the total product cost by the number of units expected to be produced and sold to determine the total product cost per unit, as shown below.

$$\text{Product Cost per Unit} = \frac{\text{Total Product Cost}}{\text{Estimated Units Produced and Sold}}$$

Step 4. Compute the markup percentage as follows:

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$$

The numerator of the markup percentage is the desired profit plus the total selling and administrative expenses. These expenses must be included in the markup percentage, since they are not included in the cost amount to which the markup is added.

As illustrated for the total cost concept, the desired profit is normally computed based on a rate of return on assets as follows:

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets}$$

Step 5. Determine the markup per unit by multiplying the markup percentage times the product cost per unit as follows:

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Product Cost per Unit}$$

Step 6. Determine the normal selling price by adding the markup per unit to the product cost per unit as follows:

Product cost per unit	$XXX
Markup per unit	XXX
Normal selling price per unit	$XXX

To illustrate, assume the same data for the production and sale of 100,000 calculators by Digital Solutions Inc. as in the preceding example. The normal selling price of $18.30 is determined under the product cost concept as follows:

Step 1. Total product cost: $1,500,000
Step 2. Total selling and administrative expenses: $170,000
Step 3. Total product cost per unit: $15.00

$$\text{Total Cost per Unit} = \frac{\text{Total Product Cost}}{\text{Estimated Units Produced and Sold}} = \frac{\$1,500,000}{100,000 \text{ units}} = \$15.00 \text{ per unit}$$

Step 4. Markup percentage: 22%

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets} = 20\% \times \$800,000 = \$160,000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$$

$$\text{Markup Percentage} = \frac{\$160,000 + \$170,000}{\$1,500,000} = \frac{\$330,000}{\$1,500,000} = 22\%$$

Step 5. Markup per unit: $3.30

$$\text{Markup per unit} = \text{Markup Percentage} \times \text{Product Cost per Unit}$$
$$\text{Markup per unit} = 22\% \times \$15.00 = \$3.30 \text{ per unit}$$

Step 6. Normal selling price: $18.30

Total product cost per unit	$15.00
Markup per unit	3.30
Normal selling price per unit	$18.30

Example Exercise 9-8 Product Cost Markup Percentage 2

Apex Corporation produces and sells Product Z at a total cost of $30 per unit, of which $20 is product cost and $10 is selling and administrative expenses. In addition, the total cost of $30 is made up of $18 variable cost and $12 fixed cost. The desired profit is $3 per unit. Determine the markup percentage on product cost.

Follow My Example 9-8

Markup percentage on product cost: $\frac{\$3 + \$10}{\$20} = 65.0\%$

For Practice: PE 9-8A, PE 9-8B

Variable Cost Concept

Under the **variable cost concept**, only variable costs are included in the cost amount per unit to which the markup is added. All variable manufacturing costs, as well as variable selling and administrative expenses, are included in the cost amount. Fixed manufacturing costs, fixed selling and administrative expenses, and desired profit are included in the markup. The markup per unit is then added to the variable cost per unit to determine the normal selling price.

The variable cost concept is applied using the following steps:

Step 1. Estimate the total variable product cost as follows:

Variable product costs:	
Direct materials	$XXX
Direct labor	XXX
Variable factory overhead	XXX
Total variable product cost	$XXX

Step 2. Estimate the total variable selling and administrative expenses.
Step 3. Determine the total variable cost as follows:

Total variable product cost	$XXX
Total variable selling and administrative expenses	XXX
Total variable cost	$XXX

Step 4. Compute the variable cost per unit as follows:

$$\text{Variable Cost per Unit} = \frac{\text{Total Variable Cost}}{\text{Estimated Units Produced and Sold}}$$

Step 5. Compute the markup percentage as follows:

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Fixed Costs and Expenses}}{\text{Total Variable Cost}}$$

The numerator of the markup percentage is the desired profit plus the total fixed costs (fixed factory overhead) and expenses (selling and administrative). These fixed costs and expenses must be included in the markup percentage, since they are not included in the cost amount to which the markup is added.

As illustrated for the total and product cost concepts, the desired profit is normally computed based on a rate of return on assets as follows:

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets}$$

Step 6. Determine the markup per unit by multiplying the markup percentage times the variable cost per unit as follows:

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Variable Cost per Unit}$$

Step 7. Determine the normal selling price by adding the markup per unit to the variable cost per unit as follows:

Variable cost per unit	$XXX
Markup per unit	XXX
Normal selling price per unit	$XXX

To illustrate, assume the same data for the production and sale of 100,000 calculators by Digital Solutions Inc. as in the preceding example. The normal selling price of $18.30 is determined under the variable cost concept as follows:

Step 1. Total variable product cost: $1,450,000

Variable product costs:	
Direct materials ($3 × 100,000)	$ 300,000
Direct labor ($10 × 100,000)	1,000,000
Variable factory overhead ($1.50 × 100,000)	150,000
Total variable product cost	$1,450,000

Step 2. Total variable selling and administrative expenses: $150,000 ($1.50 × 100,000)
Step 3. Total variable cost: $1,600,000 ($1,450,000 + $150,000)
Step 4. Variable cost per unit: $16.00

$$\text{Variable Cost per Unit} = \frac{\text{Total Variable Cost}}{\text{Estimated Units Produced and Sold}} = \frac{\$1{,}600{,}000}{100{,}000 \text{ units}} = \$16 \text{ per unit}$$

Step 5. Markup percentage: 14.4% (rounded)

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets} = 20\% \times \$800{,}000 = \$160{,}000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Fixed Costs and Expenses}}{\text{Total Variable Cost}}$$

$$\text{Markup Percentage} = \frac{\$160{,}000 + \$50{,}000 + \$20{,}000}{\$1{,}600{,}000} = \frac{\$230{,}000}{\$1{,}600{,}000}$$

$$\text{Markup Percentage} = 14.4\% \text{ (rounded)}$$

Step 6. Markup per unit: $2.30

Markup per Unit = Markup Percentage × Variable Cost per Unit
Markup per Unit = 14.4% × $16.00 = $2.30 per unit

Step 7. Normal selling price: $18.30

Total variable cost per unit	$16.00
Markup per unit	2.30
Normal selling price per unit	$18.30

Example Exercise 9-9 Variable Cost Markup Percentage 2

Apex Corporation produces and sells Product Z at a total cost of $30 per unit, of which $20 is product cost and $10 is selling and administrative expenses. In addition, the total cost of $30 is made up of $18 variable cost and $12 fixed cost. The desired profit is $3 per unit. Determine the markup percentage on variable cost, rounding to one decimal place.

Follow My Example 9-9

Markup percentage on variable cost: $\frac{\$3 + \$12}{\$18} = 83.3\%$, rounded to one decimal place

For Practice: PE 9-9A, PE 9-9B

Choosing a Cost-Plus Approach Cost Concept

All three cost-plus concepts produced the same selling price ($18.30) for Digital Solutions Inc. The three cost-plus concepts are summarized in Exhibit 11.

Exhibit 11

Cost-Plus Approach to Setting Normal Selling Prices

Normal Selling Price = Cost Amount per Unit + Markup

$$\text{Cost Amount per Unit} = \frac{\text{Cost Amount}}{\text{Estimated Units Produced and Sold}}$$

Markup = Cost Amount per Unit × Markup Percentage

Cost-Plus Concept	Cost Amount	Markup Percentage
Total cost	Manufacturing (product) costs: Direct materials Direct labor Factory overhead Selling and administrative expenses	$\frac{\text{Desired Profit}}{\text{Total Cost}}$
Product cost	Manufacturing (product) costs: Direct materials Direct labor Factory overhead	$\frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$
Variable cost	Variable manufacturing (product) costs: Direct materials Direct labor Variable factory overhead Variable selling and administrative expenses	$\frac{\text{Desired Profit} + \text{Total Fixed Costs and Expenses}}{\text{Total Variable Cost}}$

Estimated, rather than actual costs and expenses, may be used with any of the three cost-plus concepts. Management should be careful, however, when using estimated or standard costs in applying the cost-plus approach. Specifically, estimates should be based on normal (attainable) operating levels and not theoretical (ideal) levels of performance. In product pricing, the use of estimates based on ideal- or maximum-capacity operating levels could lead to setting product prices too low. In such cases, the costs of such factors as normal spoilage or normal periods of idle time might not be considered.

The decision-making needs of management are also an important factor in selecting a cost concept for product pricing. For example, managers who often make special pricing decisions are more likely to use the variable cost concept. In contrast, a government defense contractor would be more likely to use the total cost concept.

Activity-Based Costing

As illustrated, costs are important in setting product prices and decision making. Inaccurate costs may lead to incorrect decisions and prices. To more accurately measure the costs and expenses, some companies use activity-based costing. **Activity-based costing (ABC)** identifies and traces costs and expenses to activities and then to specific products.

Activity-based costing is particularly useful when manufacturing operations involve large amounts of factory overhead. In such cases, traditional overhead allocation bases such as units produced, direct labor hours, direct labor costs, or machine hours may yield inaccurate cost allocations. This, in turn, may result in distorted product costs and product prices.[2]

Target Costing

Target costing is a method of setting prices that combines market-based pricing with a cost-reduction emphasis. Under target costing, a future selling price is anticipated, using the demand-based or the competition-based concepts. The target cost is then determined by subtracting a desired profit from the expected selling price, as shown below.

$$\text{Target Cost} = \text{Expected Selling Price} - \text{Desired Profit}$$

Target costing tries to reduce costs as shown in Exhibit 12. The bar at the left in Exhibit 12 shows the actual cost and profit that can be earned during the current period. The bar at the right shows that the market price is expected to decline in the future. The target cost is estimated as the difference between the expected market price and the desired profit.

The target cost is normally less than the current cost. Thus, managers must try to reduce costs from the design and manufacture of the product. The planned cost reduction is sometimes referred to as the cost "drift." Costs can be reduced in a variety of ways such as the following:

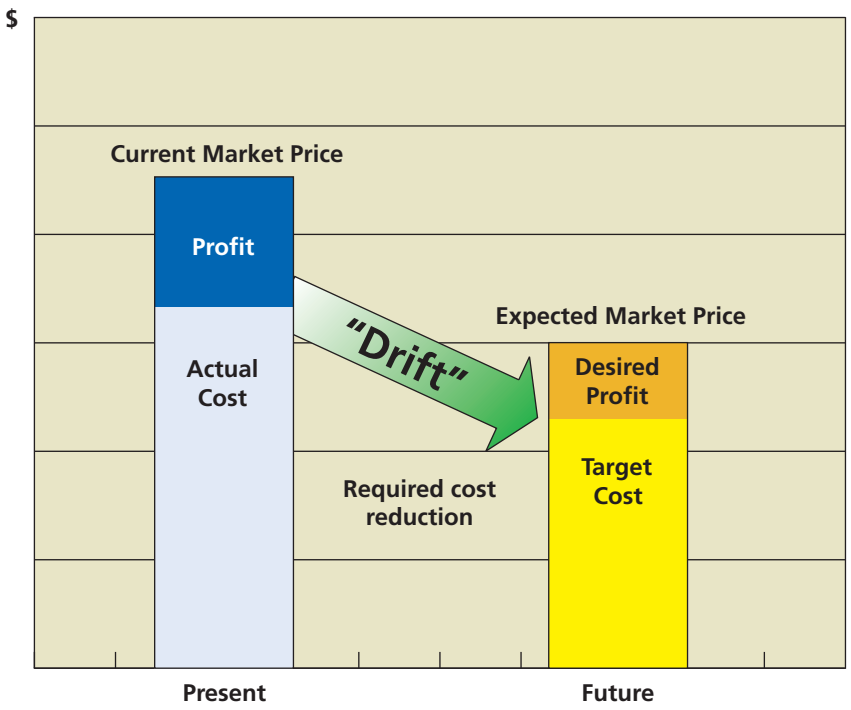
1. Simplifying the design
2. Reducing the cost of direct materials
3. Reducing the direct labor costs
4. Eliminating waste

Target costing is especially useful in highly competitive markets such as the market for personal computers. Such markets require continual product cost reductions to remain competitive.

2 Activity-based costing is further discussed and illustrated in Chapter 11.

Exhibit 12

Target Cost Concept



3 Compute the relative profitability of products in bottleneck production processes.

Production Bottlenecks, Pricing, and Profits

A **production bottleneck** (or *constraint*) is a point in the manufacturing process where the demand for the company's product exceeds the ability to produce the product. The **theory of constraints (TOC)** is a manufacturing strategy that focuses on reducing the influence of bottlenecks on production processes.

Production Bottlenecks and Profits

When a company has a production bottleneck in its production process, it should attempt to maximize its profits, subject to the production bottleneck. In doing so, the unit contribution margin of each product per production bottleneck constraint is used.

To illustrate, assume that PrideCraft Tool Company makes three types of wrenches: small, medium, and large. All three products are processed through a heat treatment operation, which hardens the steel tools. PrideCraft Tool's heat treatment process is operating at full capacity and is a production bottleneck. The product unit contribution margin and the number of hours of heat treatment used by each type of wrench are as follows:

	Small Wrench	Medium Wrench	Large Wrench
Unit selling price	$130	$140	$160
Unit variable cost	40	40	40
Unit contribution margin	$ 90	$100	$120
Heat treatment hours per unit	1 hr.	4 hrs.	8 hrs.

The large wrench appears to be the most profitable product because its unit contribution margin of $120 is the greatest. However, the unit contribution margin can be misleading in a production bottleneck operation.

In a production bottleneck operation, the best measure of profitability is the unit contribution margin per production bottleneck constraint. For PrideCraft Tool, the production bottleneck constraint is heat treatment process hours. Therefore, the unit contribution margin per bottleneck constraint is expressed as follows:

$$\text{Unit Contribution Margin per Production Bottleneck Hour} = \frac{\text{Unit Contribution Margin}}{\text{Heat Treatment Hours per Unit}}$$

The unit contribution per production bottleneck hour for each of the wrenches produced by PrideCraft Tool is computed below.

Small Wrenches

$$\text{Unit Contribution Margin per Production Bottleneck Hour} = \frac{\$90}{1 \text{ hr.}} = \$90 \text{ per hr.}$$

Medium Wrenches

$$\text{Unit Contribution Margin per Production Bottleneck Hour} = \frac{\$100}{4 \text{ hrs.}} = \$25 \text{ per hr.}$$

Large Wrenches

$$\text{Unit Contribution Margin per Production Bottleneck Hour} = \frac{\$120}{8 \text{ hrs.}} = \$15 \text{ per hr.}$$

The small wrench produces the highest unit contribution margin per production bottleneck hour (heat treatment) of $90 per hour. In contrast, the large wrench has the largest contribution margin per unit of $120, but has the smallest unit contribution margin per production bottleneck hour of $15 per hour. Thus, the small wrench is the most profitable product per production bottleneck hour.

Example Exercise 9-10 Bottleneck Profit 3

Product A has a unit contribution margin of $15. Product B has a unit contribution margin of $20. Product A requires three furnace hours, while Product B requires five furnace hours. Determine the most profitable product, assuming the furnace is a constraint.

Follow My Example 9-10

	Product A	Product B
Unit contribution margin	$15	$20
Furnace hours per unit	÷ 3	÷ 5
Unit contribution margin per production bottleneck hour	$ 5	$ 4

Product A is the most profitable in using bottleneck resources.

For Practice: PE 9-10A, PE 9-10B

Production Bottlenecks and Pricing

When a company has a production bottleneck, the unit contribution margin per bottleneck hour is a measure of each product's profitability. This measure can be used to adjust product prices to reflect the product's use of the bottleneck.

To illustrate, the large wrench produced by PrideCraft Tool Company uses eight bottleneck hours, but produces a contribution margin per unit of only $120. As a result, the large wrench is the least profitable of the wrenches per bottleneck hour ($15 per hour).

PrideCraft Tool Company can improve the profitability of producing large wrenches by any combination of the following:

1. Increase the selling price of the large wrenches.
2. Decrease the variable cost per unit of the large wrenches.
3. Decrease the heat treatment hours required for the large wrenches.

Business Connection

WHAT IS A PRODUCT?

A product is often thought of in terms beyond just its physical attributes. For example, why a customer buys a product usually impacts how a business markets the product. Other considerations, such as warranty needs, servicing needs, and perceived quality, also affect business strategies.

Consider the four different types of products listed below. For these products, the frequency of purchase, the profit per unit, and the number of retailers differ. As a result, the sales and marketing approach for each product differs.

Product	Type of Product	Frequency of Purchase	Profit per Unit	Number of Retailers	Sales/Marketing Approach
Snickers®	Convenience	Often	Low	Many	Mass advertising
Sony® TV	Shopping	Occasional	Moderate	Many	Mass advertising; personal selling
Diamond ring	Specialty	Seldom	High	Few	Personal selling
Prearranged funeral	Unsought	Rare	High	Few	Aggressive selling

Assume that the variable cost per unit and the heat treatment hours for the large wrench cannot be decreased. In this case, PrideCraft Tool might be able to increase the selling price of the large wrenches.

The price of the large wrench that would make it as profitable as the small wrench is determined as follows:[3]

$$\text{Unit Contribution Margin per Bottleneck Hour for Small Wrench} = \frac{\text{Revised Price of Large Wrench} - \text{Unit Variable Cost for Large Wrench}}{\text{Bottleneck Hours per Unit for Large Wrench}}$$

$$\$90 = \frac{\text{Revised Price of Large Wrench} - \$40}{8}$$

$$\$720 = \text{Revised Price of Large Wrench} - \$40$$

$$\$760 = \text{Revised Price of Large Wrench}$$

If the large wrench's price is increased to $760, it would provide the same unit contribution margin per bottleneck hour as the small wrench, as shown below.

$$\text{Unit Contribution Margin per Bottleneck Hour} = \frac{\text{Unit Contribution Margin}}{\text{Heat Treatment Hours per Unit}}$$

$$\text{Unit Contribution Margin per Bottleneck Hour} = \frac{\$760 - \$40}{8 \text{ hrs.}} = \$90 \text{ per hr.}$$

At a price of $760, PrideCraft Tool Company would be indifferent between producing and selling the small wrench or the large wrench. This assumes that there is unlimited demand for the products. If the market were unwilling to purchase the large wrench at a price of $760, then the company should produce and sell the small wrenches.

3 Assuming that the selling price of the large wrench cannot be increased, the same approach (equation) could be used to determine the decrease in variable cost per unit or decrease in bottleneck hours that is required to make the large wrench as profitable as the small wrench.

1 Prepare differential analysis reports for a variety of managerial decisions.

Key Points

Differential analysis reports for leasing or selling, discontinuing a segment or product, making or buying, replacing equipment, processing or selling, and accepting business at a special price are illustrated in the text. Each analysis focuses on the differential revenues and/or costs of the alternative courses of action.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Prepare a lease or sell differential analysis.	**9-1**	9-1A, 9-1B
• Prepare a discontinued segment differential analysis.	**9-2**	9-2A, 9-2B
• Prepare a make-or-buy differential analysis.	**9-3**	9-3A, 9-3B
• Prepare an equipment replacement differential analysis.	**9-4**	9-4A, 9-4B
• Prepare a process or sell differential analysis.	**9-5**	9-5A, 9-5B
• Prepare an accept business at a special price differential analysis.	**9-6**	9-6A, 9-6B

2 Determine the selling price of a product, using the total cost, product cost, and variable cost concepts.

Key Points

The three cost concepts commonly used in applying the cost-plus approach to product pricing are the total cost, product cost, and variable cost concepts.

Activity-based costing can be used to provide more accurate cost information in applying cost-plus concepts when indirect costs are significant. Target costing combines market-based methods with a cost-reduction emphasis.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Compute the markup percentage using the total cost concept.	**9-7**	9-7A, 9-7B
• Compute the markup percentage using the product cost concept.	**9-8**	9-8A, 9-8B
• Compute the markup percentage using the variable cost concept.	**9-9**	9-9A, 9-9B
• Describe activity-based costing.		
• Define and describe target costing.		

3 Compute the relative profitability of products in bottleneck production processes.

Key Points

The profitability of a product in a bottleneck production environment is determined by dividing the unit contribution margin by the bottleneck hours per unit. The resulting measure indicates the product's profitability per hour of bottleneck use. This information can be used to support product pricing decisions.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Compute the unit contribution margin per bottleneck hour.	**9-10**	9-10A, 9-10B
• Compute the indifference price between products using the unit contribution margin per bottleneck hour.		

Key Terms

activity-based costing (ABC) (380)
differential analysis (363)
differential cost (363)
differential income (or loss) (363)
differential revenue (363)
markup (373)
opportunity cost (369)
product cost concept (376)
production bottleneck (381)
sunk cost (363)
target costing (380)
theory of constraints (TOC) (381)
total cost concept (373)
variable cost concept (377)

Illustrative Problem

Inez Company recently began production of a new product, M, which required the investment of $1,600,000 in assets. The costs of producing and selling 80,000 units of Product M are estimated as follows:

Variable costs:	
Direct materials	$10.00 per unit
Direct labor	6.00
Factory overhead	4.00
Selling and administrative expenses	5.00
Total	$25.00 per unit
Fixed costs:	
Factory overhead	$800,000
Selling and administrative expenses	400,000

Inez Company is currently considering establishing a selling price for Product M. The president of Inez Company has decided to use the cost-plus approach to product pricing and has indicated that Product M must earn a 10% rate of return on invested assets.

Instructions

1. Determine the amount of desired profit from the production and sale of Product M.
2. Assuming that the total cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of Product M.
3. Assuming that the product cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of Product M.
4. Assuming that the variable cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of Product M.
5. Assume that for the current year, the selling price of Product M was $42 per unit. To date, 60,000 units have been produced and sold, and analysis of the domestic market indicates that 15,000 additional units are expected to be sold during the remainder of the year. Recently, Inez Company received an offer from Wong Inc. for 4,000 units of Product M at $28 each. Wong Inc. will market the units in Korea under its own brand name, and no selling and administrative expenses associated with the sale will be incurred by Inez Company. The additional business is not expected to affect the domestic sales of Product M, and the additional units could be produced during the current year, using existing capacity. (a) Prepare a differential analysis report of the proposed sale to Wong Inc. (b) Based on the differential analysis report in part (a), should the proposal be accepted?

Solution

1. $160,000 ($1,600,000 × 10%)

2. a. Total costs:

Variable ($25 × 80,000 units)	$2,000,000
Fixed ($800,000 + $400,000)	1,200,000
Total	$3,200,000

Cost amount per unit: $3,200,000/80,000 units = $40.00

b. $$\text{Markup Percentage} = \frac{\text{Desired Profit}}{\text{Total Costs}}$$

$$\text{Markup Percentage} = \frac{\$160,000}{\$3,200,000} = 5\%$$

c.

Cost amount per unit	$40.00
Markup ($40 × 5%)	2.00
Selling price	$42.00

3. a. Total manufacturing costs:

Variable ($20 × 80,000 units)	$1,600,000
Fixed factory overhead	800,000
Total	$2,400,000

Cost amount per unit: $2,400,000/80,000 units = $30.00

b. $$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$$

$$\text{Markup Percentage} = \frac{\$160,000 + \$400,000 + (\$5 \times 80,000 \text{ units})}{\$2,400,000}$$

$$\text{Markup Percentage} = \frac{\$160,000 + \$400,000 + \$400,000}{\$2,400,000}$$

$$\text{Markup Percentage} = \frac{\$960,000}{\$2,400,000} = 40\%$$

c.

Cost amount per unit	$30.00
Markup ($30 × 40%)	12.00
Selling price	$42.00

4. a. Variable cost amount per unit: $25.

Total variable costs: $25 × 80,000 units = $2,000,000

b. $$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Fixed Costs}}{\text{Total Variable Cost}}$$

$$\text{Markup Percentage} = \frac{\$160,000 + \$800,000 + \$400,000}{\$2,000,000}$$

$$\text{Markup Percentage} = \frac{\$1,360,000}{\$2,000,000} = 68\%$$

c.

Cost amount per unit	$25.00
Markup ($25 × 68%)	17.00
Selling price	$42.00

5. a.

Proposal to Sell to Wong Inc.

Differential revenue from accepting offer:	
Revenue from sale of 4,000 additional units at $28	$112,000
Differential cost from accepting offer:	
Variable production costs of 4,000 additional units at $20	80,000
Differential income from accepting offer	$ 32,000

b. The proposal should be accepted.

Self-Examination Questions (Answers at End of Chapter)

1. Marlo Company is considering discontinuing a product. The costs of the product consist of $20,000 fixed costs and $15,000 variable costs. The variable operating expenses related to the product total $4,000. What is the differential cost?
   A. $19,000 C. $35,000
   B. $15,000 D. $39,000
2. Victor Company is considering disposing of equipment that was originally purchased for $200,000 and has $150,000 of accumulated depreciation to date. The same equipment would cost $310,000 to replace. What is the sunk cost?
   A. $50,000 C. $200,000
   B. $150,000 D. $310,000
3. Henry Company is considering spending $100,000 for a new grinding machine. This amount could be invested to yield a 12% return. What is the opportunity cost?
   A. $112,000 C. $12,000
   B. $88,000 D. $100,000
4. For which cost concept used in applying the cost-plus approach to product pricing are fixed manufacturing costs, fixed selling and administrative expenses, and desired profit allowed for in determining the markup?
   A. Total cost C. Variable cost
   B. Product cost D. Standard cost
5. Mendosa Company produces three products. All the products use a furnace operation, which is a production bottleneck. The following information is available:

	Product 1	Product 2	Product 3
Unit volume—March	1,000	1,500	1,000
Per-unit information:			
Sales price	$35	$33	$29
Variable cost	15	15	15
Unit contribution margin	$20	$18	$14
Furnace hours	4	3	2

From a profitability perspective, which product should be emphasized in April's advertising campaign?
   A. Product 1 C. Product 3
   B. Product 2 D. All three

Eye Openers

1. Explain the meaning of (a) differential revenue, (b) differential cost, and (c) differential income.
2. It was reported that Exabyte Corporation, a fast growing Colorado marketer of back-up tape drives, has decided to purchase key components of its product from others. For example, Sony Corporation of America provides Exabyte with mechanical decks, and Solectron Corporation provides circuit boards. A former chief executive officer of Exabyte stated, "If we'd tried to build our own plants, we could never have grown that fast or maybe survived." The decision to purchase key product components is an example of what type of decision illustrated in this chapter?
3. A company could sell a building for $250,000 or lease it for $2,500 per month. What would need to be considered in determining if the lease option would be preferred?
4. A chemical company has a commodity-grade and premium-grade product. Why might the company elect to process the commodity-grade product further to the premium-grade product?
5. A company accepts incremental business at a special price that exceeds the variable cost. What other issues must the company consider in deciding whether to accept the business?
6. A company fabricates a component at a cost of $6.00. A supplier offers to supply the same component for $5.50. Under what circumstances is it reasonable to purchase from the supplier?
7. Many fast-food restaurant chains, such as McDonald's, will occasionally discontinue restaurants in their system. What are some financial considerations in deciding to eliminate a store?
8. In the long run, the normal selling price must be set high enough to cover what factors?

9. Why might the use of ideal standards in applying the cost-plus approach to product pricing lead to setting product prices that are too low?
10. Although the cost-plus approach to product pricing may be used by management as a general guideline, what are some examples of other factors that managers should also consider in setting product prices?
11. What method of determining product cost may be appropriate in settings where the manufacturing process is complex?
12. How does the target cost concept differ from cost-plus approaches?
13. Under what circumstances is it appropriate to use the target cost concept?
14. What is a production bottleneck?
15. What is the appropriate measure of a product's value when a firm is operating under production bottlenecks?

Practice Exercises

PE 9-1A
Lease or sell
obj. 1
EE 9-1 p. 365

Jefferson Company owns equipment with a cost of $95,000 and accumulated depreciation of $60,000 that can be sold for $40,000, less a 6% sales commission. Alternatively, the equipment can be leased by Jefferson Company for five years for a total of $42,000, at the end of which there is no residual value. In addition, repair, insurance, and property tax that would be incurred by Jefferson Company on the equipment would total $7,000 over the five years. Determine the differential income or loss from the lease alternative for Jefferson Company.

PE 9-1B
Lease or sell
obj. 1
EE 9-1 p. 365

Grey Company owns a machine with a cost of $320,000 and accumulated depreciation of $60,000 that can be sold for $250,000, less a 5% sales commission. Alternatively, the machine can be leased by Grey Company for three years for a total of $268,000, at the end of which there is no residual value. In addition, repair, insurance, and property tax that would be incurred by Grey Company on the machine would total $24,000 over the three years. Determine the differential income or loss from the lease alternative for Grey Company.

PE 9-2A
Discontinue a segment
obj. 1
EE 9-2 p. 367

Product L has revenue of $56,000, variable cost of goods sold of $29,000, variable selling expenses of $12,000, and fixed costs of $18,000, creating a loss from operations of $3,000.

a. Determine the differential income or loss from sales of Product L.
b. Should Product L be discontinued?

PE 9-2B
Discontinue a segment
obj. 1
EE 9-2 p. 367

Product V has revenue of $204,000, variable cost of goods sold of $134,000, variable selling expenses of $74,000, and fixed costs of $14,000, creating a loss from operations of $18,000.

a. Determine the differential income or loss from sales of Product V.
b. Should Product V be discontinued?

PE 9-3A
Make or buy
obj. 1
EE 9-3 p. 368

A company manufactures various sized plastic bottles for its medicinal product. The manufacturing cost for small bottles is $52 per unit (1,000 bottles), including fixed costs of $15 per unit. A proposal is offered to purchase small bottles from an outside source for $32 per unit, plus $7 per unit for freight. Provide a differential analysis of the outside purchase proposal.

PE 9-3B
Make or buy
obj. 1
EE 9-3 p. 368

A restaurant bakes its own bread for $160 per unit (100 loaves), including fixed costs of $38 per unit. A proposal is offered to purchase bread from an outside source for $109 per unit, plus $8 per unit for delivery. Provide a differential analysis of the outside purchase proposal.

PE 9-4A
Replace equipment
obj. 1
EE 9-4 p. 370

A machine with a book value of $48,000 has an estimated five-year life. A proposal is offered to sell the old machine for $50,000 and replace it with a new machine at a cost of $62,000. The new machine has a five-year life with no residual value. The new machine would reduce annual direct labor costs by $2,800. Provide a differential analysis on the proposal to replace the machine.

PE 9-4B
Replace equipment
obj. 1
EE 9-4 p. 370

A machine with a book value of $250,000 has an estimated six-year life. A proposal is offered to sell the old machine for $243,000 and replace it with a new machine at a cost of $320,000. The new machine has a six-year life with no residual value. The new machine would reduce annual direct labor costs by $12,000. Provide a differential analysis on the proposal to replace the machine.

PE 9-5A
Process or sell
obj. 1
EE 9-5 p. 371

Product D is produced for $60 per gallon, including a $5 per gallon fixed cost. Product D can be sold without additional processing for $85 per gallon, or processed further into Product E at an additional cost of $19 per gallon, including a $3 per gallon fixed cost. Product E can be sold for $105 per gallon. Provide a differential analysis for further processing into Product E.

PE 9-5B
Process or sell
obj. 1
EE 9-5 p. 371

Product T is produced for $3.20 per pound, including a $0.20 per pound fixed cost. Product T can be sold without additional processing for $4.10 per pound, or processed further into Product U at an additional cost of $0.50 per pound, including a $0.12 per pound fixed cost. Product U can be sold for $4.45 per pound. Provide a differential analysis for further processing into Product U.

PE 9-6A
Accept business at special price
obj. 1
EE 9-6 p. 372

Product A is normally sold for $6.50 per unit. A special price of $5.60 is offered for the export market. The variable production cost is $4.50 per unit. An additional export tariff of 25% of revenue must be paid for all export products. Determine the differential income or loss per unit from selling Product A for export.

PE 9-6B
Accept business at special price
obj. 1
EE 9-6 p. 372

Product R is normally sold for $55 per unit. A special price of $46 is offered for the export market. The variable production cost is $32 per unit. An additional export tariff of 15% of revenue must be paid for all export products. Determine the differential income or loss per unit from selling Product R for export.

PE 9-7A
Total cost markup percentage
obj. 2
EE 9-7 p. 375

Eden Garden Tools Inc. produces and sells home and garden tools and equipment. A lawnmower has a total cost of $150 per unit, of which $100 is product cost and $50 is selling and administrative expenses. In addition, the total cost of $150 is made up of $125 variable cost and $25 fixed cost. The desired profit is $30 per unit. Determine the markup percentage on total cost.

PE 9-7B
Total cost markup percentage
obj. 2
EE 9-7 p. 375

Crescent Lighting Inc. produces and sells lighting fixtures. An entry light has a total cost of $80 per unit, of which $36 is product cost and $44 is selling and administrative expenses. In addition, the total cost of $80 is made up of $30 variable cost and $50 fixed cost. The desired profit is $10 per unit. Determine the markup percentage on total cost. Round to one decimal place.

PE 9-8A
Product cost markup percentage
obj. 2
EE 9-8 p. 377

Eden Garden Tools Inc. produces and sells home and garden tools and equipment. A lawnmower has a total cost of $150 per unit, of which $100 is product cost and $50 is selling and administrative expenses. In addition, the total cost of $150 is made up of $125 variable cost and $25 fixed cost. The desired profit is $30 per unit. Determine the markup percentage on product cost.

PE 9-8B
Product cost markup percentage
obj. 2
EE 9-8 p. 377

Crescent Lighting Inc. produces and sells lighting fixtures. An entry light has a total cost of $80 per unit, of which $36 is product cost and $44 is selling and administrative expenses. In addition, the total cost of $80 is made up of $30 variable cost and $50 fixed cost. The desired profit is $10 per unit. Determine the markup percentage on product cost.

PE 9-9A
Variable cost markup percentage
obj. 2
EE 9-9 p. 379

Eden Garden Tools Inc. produces and sells home and garden tools and equipment. A lawnmower has a total cost of $150 per unit, of which $100 is product cost and $50 is selling and administrative expenses. In addition, the total cost of $150 is made up of $125 variable cost and $25 fixed cost. The desired profit is $30 per unit. Determine the markup percentage on variable cost.

PE 9-9B
Variable cost markup percentage
obj. 2
EE 9-9 p. 379

Crescent Lighting Inc. produces and sells lighting fixtures. An entry light has a total cost of $80 per unit, of which $36 is product cost and $44 is selling and administrative expenses. In addition, the total cost of $80 is made up of $30 variable cost and $50 fixed cost. The desired profit is $10 per unit. Determine the markup percentage on variable cost.

PE 9-10A
Bottleneck profit
obj. 3
EE 9-10 p. 382

Product K has a unit contribution margin of $240. Product L has a unit contribution margin of $200. Product K requires eight furnace hours, while Product L requires five furnace hours. Determine the most profitable product, assuming the furnace is a constraint.

PE 9-10B
Bottleneck profit
obj. 3
EE 9-10 p. 382

Product A has a unit contribution margin of $45. Product B has a unit contribution margin of $60. Product A requires three testing hours, while Product B requires five testing hours. Determine the most profitable product, assuming the testing is a constraint.

Exercises

EX 9-1
Lease or sell decision

obj. 1

✔ a. Differential revenue from lease, $20,000

Inman Construction Company is considering selling excess machinery with a book value of $280,000 (original cost of $400,000 less accumulated depreciation of $120,000) for $292,000, less a 5% brokerage commission. Alternatively, the machinery can be leased for a total of $312,000 for five years, after which it is expected to have no residual value. During the period of the lease, Inman Construction Company's costs of repairs, insurance, and property tax expenses are expected to be $36,000.

a. Prepare a differential analysis report, dated January 3, 2010, for the lease or sell decision.

b. On the basis of the data presented, would it be advisable to lease or sell the machinery? Explain.

EX 9-2
Differential analysis report for a discontinued product

obj. 1

✔ a. Differential variable costs, $227,280

A condensed income statement by product line for British Beverage Inc. indicated the following for Royal Cola for the past year:

Sales	$254,000
Cost of goods sold	122,000
Gross profit	$132,000
Operating expenses	156,000
Loss from operations	$ (24,000)

It is estimated that 16% of the cost of goods sold represents fixed factory overhead costs and that 20% of the operating expenses are fixed. Since Royal Cola is only one of many products, the fixed costs will not be materially affected if the product is discontinued.

a. Prepare a differential analysis report, dated March 3, 2010, for the proposed discontinuance of Royal Cola.

b. Should Royal Cola be retained? Explain.

EX 9-3
Differential analysis report for a discontinued product

obj. 1

✔ a. Differential income: bowls, $17,980

The condensed product-line income statement for Suffolk China Ware Company for the month of December is as follows:

Suffolk China Ware Company
Product-Line Income Statement
For the Month Ended December 31, 2010

	Bowls	Plates	Cups
Sales	$54,000	$68,500	$24,500
Cost of goods sold	22,400	31,700	11,900
Gross profit	$31,600	$36,800	$12,600
Selling and administrative expenses	28,300	25,300	20,400
Income (loss) from operations	$ 3,300	$11,500	$ (7,800)

Fixed costs are 15% of the cost of goods sold and 40% of the selling and administrative expenses. Suffolk China Ware assumes that fixed costs would not be materially affected if the Cups line were discontinued.

a. Prepare a differential analysis report for all three products for December, 2010.

b. Should the Cups line be retained? Explain.

EX 9-4
Segment analysis, Charles Schwab Corporation

obj. 1

The Charles Schwab Corporation is one of the more innovative brokerage and financial service companies in the United States. The company recently provided information about its major business segments as follows (in millions):

	Individual Investor	Institutional Investor	Corporate and Retirement Services
Revenues	$3,352	$1,121	$506
Income from operations	1,237	482	139
Depreciation	98	25	15

a. How do you believe Schwab defines the difference between the "Individual Investor" and "Institutional Investor" segments?
b. Provide a specific example of a variable and fixed cost in the "Individual Investor" segment.
c. Estimate the contribution margin for each segment.
d. If Schwab decided to sell its "Institutional Investor" accounts to another company, estimate how much operating income would decline.

EX 9-5
Decision to discontinue a product

obj. 1

On the basis of the following data, the general manager of Sole Mates Inc. decided to discontinue Children's Shoes because it reduced income from operations by $28,000. What is the flaw in this decision?

Sole Mates Inc.
Product-Line Income Statement
For the Year Ended August 31, 2010

	Children's Shoes	Men's Shoes	Women's Shoes	Total
Sales	$170,000	$300,000	$500,000	$970,000
Costs of goods sold:				
Variable costs	$100,000	$150,000	$220,000	$470,000
Fixed costs	50,000	60,000	120,000	230,000
Total cost of goods sold	$150,000	$210,000	$340,000	$700,000
Gross profit	$ 20,000	$ 90,000	$160,000	$270,000
Selling and adminstrative expenses:				
Variable selling and admin. expenses	$ 30,000	$ 45,000	$ 95,000	$170,000
Fixed selling and admin. expenses	18,000	20,000	25,000	63,000
Total selling and admin. expenses	$ 48,000	$ 65,000	$120,000	$233,000
Income (loss) from operations	$(28,000)	$ 25,000	$ 40,000	$ 37,000

EX 9-6
Make-or-buy decision

obj. 1

✔ a. Cost savings from making, $6.20 per case

Companion Computer Company has been purchasing carrying cases for its portable computers at a delivered cost of $68 per unit. The company, which is currently operating below full capacity, charges factory overhead to production at the rate of 40% of direct labor cost. The fully absorbed unit costs to produce comparable carrying cases are expected to be as follows:

Direct materials	$25.00
Direct labor	32.00
Factory overhead (40% of direct labor)	12.80
Total cost per unit	$69.80

If Companion Computer Company manufactures the carrying cases, fixed factory overhead costs will not increase and variable factory overhead costs associated with the cases are expected to be 15% of the direct labor costs.

a. Prepare a differential analysis report, dated October 11, 2010, for the make-or-buy decision.
b. On the basis of the data presented, would it be advisable to make the carrying cases or to continue buying them? Explain.

EX 9-7
Make-or-buy decision

obj. 1

The Theater Arts Guild of Chicago (TAG-C) employs five people in its Publication Department. These people lay out pages for pamphlets, brochures, and other publications for the TAG-C productions. The pages are delivered to an outside company for printing. The company is considering an outside publication service for the layout work. The outside service is quoting a price of $15 per layout page. The budget for the Publication Department for 2010 is as follows:

Salaries	$220,000
Benefits	35,000
Supplies	30,000
Office expenses	25,000
Office depreciation	30,000
Computer depreciation	22,000
Total	$362,000

The department expects to lay out 20,000 pages for 2010. The computers used by the department have an estimated residual value of $7,000. The Publication Department office space would be used for future administrative needs, if the department's function were purchased from the outside.

a. Prepare a differential analysis report, dated December 15, 2009, for the make-or-buy decision, considering the 2010 differential revenues and costs.
b. On the basis of your analysis in part (a), should the page layout work be purchased from an outside company?
c. What additional considerations might factor into the decision making?

EX 9-8
Machine replacement decision

obj. 1

A company is considering replacing an old piece of machinery, which cost $600,000 and has $350,000 of accumulated depreciation to date, with a new machine that costs $450,000. The old equipment could be sold for $72,000. The annual variable production costs associated with the old machine are estimated to be $165,000 for eight years. The annual variable production costs for the new machine are estimated to be $112,750 for eight years.

a. Determine the total and annualized differential income or loss anticipated from replacing the old machine.
b. What is the sunk cost in this situation?

EX 9-9
Differential analysis report for machine replacement

obj. 1

✔ a. Annual differential increase in costs, $7,200

Singapore Digital Components Company assembles circuit boards by using a manually operated machine to insert electronic components. The original cost of the machine is $60,000, the accumulated depreciation is $24,000, its remaining useful life is five years, and its residual value is negligible. On February 20, 2010, a proposal was made to replace the present manufacturing procedure with a fully automatic machine that will cost $111,000. The automatic machine has an estimated useful life of five years and no significant residual value. For use in evaluating the proposal, the accountant accumulated the following annual data on present and proposed operations:

	Present Operations	Proposed Operations
Sales	$290,000	$290,000
Direct materials	$ 86,000	$ 86,000
Direct labor	40,000	—
Power and maintenance	8,000	30,000
Taxes, insurance, etc.	4,000	7,000
Selling and administrative expenses	65,000	65,000
Total expenses	$203,000	$188,000

a. Prepare a differential analysis report for the proposal to replace the machine. Include in the analysis both the net differential change in costs anticipated over the five years and the net annual differential change in costs anticipated.
b. Based only on the data presented, should the proposal be accepted?
c. What are some of the other factors that should be considered before a final decision is made?

EX 9-10
Sell or process further

obj. 1

✔ a. $205

Bunyon Lumber Company incurs a cost of $490 per hundred board feet in processing certain "rough-cut" lumber, which it sells for $635 per hundred board feet. An alternative is to produce a "finished cut" at a total processing cost of $565 per hundred board feet, which can be sold for $840 per hundred board feet. What is the amount of (a) the differential revenue, (b) differential cost, and (c) differential income for processing rough-cut lumber into finished cut?

EX 9-11
Sell or process further

obj. 1

Seattle Roast Coffee Company produces Colombian coffee in batches of 8,000 pounds. The standard quantity of materials required in the process is 8,000 pounds, which cost $5.00 per pound. Colombian coffee can be sold without further processing for $10.80 per pound. Colombian coffee can also be processed further to yield Decaf Colombian, which can be sold for $12.50 per pound. The processing into Decaf Colombian requires additional processing costs of $10,500 per batch. The additional processing will also cause a 5% loss of product due to evaporation.

a. Prepare a differential analysis report for the decision to sell or process further.
b. Should Seattle Roast sell Colombian coffee or process further and sell Decaf Colombian?
c. Determine the price of Decaf Colombian that would cause neither an advantage or disadvantage for processing further and selling Decaf Colombian.

EX 9-12
Decision on accepting additional business

obj. 1

✔ a. Differential income, $126,000

Down Home Jeans Co. has an annual plant capacity of 65,000 units, and current production is 45,000 units. Monthly fixed costs are $40,000, and variable costs are $22 per unit. The present selling price is $35 per unit. On March 18, 2010, the company received an offer from Fields Company for 18,000 units of the product at $29 each. Fields Company will market the units in a foreign country under its own brand name. The additional business is not expected to affect the domestic selling price or quantity of sales of Down Home Jeans Co.

a. Prepare a differential analysis report for the proposed sale to Fields Company.
b. Briefly explain the reason why accepting this additional business will increase operating income.
c. What is the minimum price per unit that would produce a contribution margin?

EX 9-13
Accepting business at a special price

obj. 1

Power Serve Company expects to operate at 85% of productive capacity during April. The total manufacturing costs for April for the production of 30,000 batteries are budgeted as follows:

Direct materials	$285,000
Direct labor	104,000
Variable factory overhead	31,000
Fixed factory overhead	58,000
Total manufacturing costs	$478,000

The company has an opportunity to submit a bid for 2,000 batteries to be delivered by April 30 to a government agency. If the contract is obtained, it is anticipated that the additional activity will not interfere with normal production during April or increase the selling or administrative expenses. What is the unit cost below which Power Serve Company should not go in bidding on the government contract?

EX 9-14
Decision on accepting additional business

obj. 1

✔ a. Differential revenue, $1,875,000

Roadworthy Tire and Rubber Company has capacity to produce 170,000 tires. Roadworthy presently produces and sells 130,000 tires for the North American market at a price of $90 per tire. Roadworthy is evaluating a special order from a European automobile company, Euro Motors. Euro is offering to buy 25,000 tires for $75 per tire. Roadworthy's accounting system indicates that the total cost per tire is as follows:

Direct materials	$32
Direct labor	8
Factory overhead (60% variable)	25
Selling and administrative expenses (35% variable)	20
Total	$85

Roadworthy pays a selling commission equal to 5% of the selling price on North American orders, which is included in the variable portion of the selling and administrative expenses. However, this special order would not have a sales commission. If the order was accepted, the tires would be shipped overseas for an additional shipping cost of $6.00 per tire. In addition, Euro has made the order conditional on receiving European safety certification. Roadworthy estimates that this certification would cost $125,000.

a. Prepare a differential analysis report dated May 4, 2010, for the proposed sale to Euro Motors.
b. What is the minimum price per unit that would be financially acceptable to Roadworthy?

EX 9-15
Total cost concept of product costing

obj. 2

✔ d. $318

MyPhone Inc. uses the total cost concept of applying the cost-plus approach to product pricing. The costs of producing and selling 5,000 units of cellular phones are as follows:

Variable costs:		Fixed costs:	
Direct materials	$125 per unit	Factory overhead	$215,000
Direct labor	45	Selling and adm. exp.	75,000
Factory overhead	40		
Selling and adm. exp.	30		
Total	$240 per unit		

MyPhone desires a profit equal to a 25% rate of return on invested assets of $400,000.

a. Determine the amount of desired profit from the production and sale of cellular phones.
b. Determine the total costs and the cost amount per unit for the production and sale of 5,000 units of cellular phones.
c. Determine the total cost markup percentage (rounded to two decimal places) for cellular phones.
d. Determine the selling price of cellular phones. Round to the nearest dollar.

EX 9-16
Product cost concept of product pricing

obj. 2

✔ b. 25.69%

Based on the data presented in Exercise 9-15, assume that MyPhone Inc. uses the product cost concept of applying the cost-plus approach to product pricing.

a. Determine the total manufacturing costs and the cost amount per unit for the production and sale of 5,000 units of cellular phones.
b. Determine the product cost markup percentage (rounded to two decimal places) for cellular phones.
c. Determine the selling price of cellular phones. Round to the nearest dollar.

EX 9-17
Variable cost concept of product pricing

obj. 2

✔ b. 32.5%

Based on the data presented in Exercise 9-15, assume that MyPhone Inc. uses the variable cost concept of applying the cost-plus approach to product pricing.

a. Determine the variable costs and the cost amount per unit for the production and sale of 5,000 units of cellular phones.
b. Determine the variable cost markup percentage (rounded to two decimal places) for cellular phones.
c. Determine the selling price of cellular phones. Round to the nearest dollar.

EX 9-18
Target costing

obj. 2

Toyota Motor Corporation uses target costing. Assume that Toyota marketing personnel estimate that the competitive selling price for the Camry in the upcoming model year will need to be $22,000. Assume further that the Camry's total unit cost for the upcoming model year is estimated to be $18,100 and that Toyota requires a 20% profit margin on selling price (which is equivalent to a 25% markup on total cost).

a. What price will Toyota establish for the Camry for the upcoming model year?
b. What impact will target costing have on Toyota, given the assumed information?

EX 9-19
Target costing

obj. 2

✔ b. $16

Laser Cast, Inc., manufactures color laser printers. Model A200 presently sells for $400 and has a total product cost of $320, as follows:

Direct materials	$230
Direct labor	60
Factory overhead	30
Total	$320

It is estimated that the competitive selling price for color laser printers of this type will drop to $380 next year. Laser Cast has established a target cost to maintain its historical markup percentage on product cost. Engineers have provided the following cost reduction ideas:

1. Purchase a plastic printer cover with snap-on assembly. This will reduce the amount of direct labor by nine minutes per unit.
2. Add an inspection step that will add six minutes per unit of direct labor but reduce the materials cost by $8 per unit.
3. Decrease the cycle time of the injection molding machine from four minutes to three minutes per part. Thirty percent of the direct labor and 42% of the factory overhead is related to running injection molding machines.

The direct labor rate is $25 per hour.

a. Determine the target cost for Model A200 assuming that the historical markup on product cost is maintained.
b. Determine the required cost reduction.
c. Evaluate the three engineering improvements to determine if the required cost reduction (drift) can be achieved.

EX 9-20
Product decisions under bottlenecked operations

obj. 3

Armstrong Alloys Inc. has three grades of metal product, Type 5, Type 10, and Type 20. Financial data for the three grades are as follows:

	Type 5	Type 10	Type 20
Revenues	$36,000	$40,000	$22,000
Variable cost	$22,500	$20,000	$15,000
Fixed cost	6,000	6,000	6,000
Total cost	$28,500	$26,000	$21,000
Income from operations	$ 7,500	$14,000	$ 1,000
Number of units	÷ 5,000	÷ 5,000	÷ 5,000
Income from operations per unit	$ 1.50	$ 2.80	$ 0.20

Armstrong's operations require all three grades to be melted in a furnace before being formed. The furnace runs 24 hours a day, 7 days a week, and is a production bottleneck. The furnace hours required per unit of each product are as follows:

Type 5:	5 hours
Type 10:	10 hours
Type 20:	5 hours

The Marketing Department is considering a new marketing and sales campaign.

Which product should be emphasized in the marketing and sales campaign in order to maximize profitability?

EX 9-21
Product decisions under bottlenecked operations

obj. 3

✔ a. Total income from operations, $88,000

Ohio Glass Company manufactures three types of safety plate glass: large, medium, and small. All three products have high demand. Thus, Ohio Glass is able to sell all the safety glass that it can make. The production process includes an autoclave operation, which is a pressurized heat treatment. The autoclave is a production bottleneck. Total fixed costs are $74,000. In addition, the following information is available about the three products:

	Large	Medium	Small
Unit selling price	$120	$100	$90
Unit variable cost	96	85	75
Unit contribution margin	$ 24	$ 15	$15
Autoclave hours per unit	4	2	1
Total process hours per unit	8	6	3
Budgeted units of production	3,000	3,000	3,000

a. Determine the contribution margin by glass type and the total company income from operations for the budgeted units of production.
b. Prepare an analysis showing which product is the most profitable per bottleneck hour.

EX 9-22
Product pricing under bottlenecked operations

obj. 3

✔ Medium, $115

Based on the data presented in Exercise 9-21, assume that Ohio Glass wanted to price all products so that they produced the same profit potential as the highest profit product. Thus, determine the prices for each of the products so that they would produce a profit equal to the highest profit product.

Problems Series A

PR 9-1A
Differential analysis report involving opportunity costs

obj. 1

On March 1, Midway Distribution Company is considering leasing a building and buying the necessary equipment to operate a public warehouse. Alternatively, the company could use the funds to invest in $750,000 of 7% U.S. Treasury bonds that mature in 14 years. The bonds could be purchased at face value. The following data have been assembled:

Cost of equipment	$750,000
Life of equipment	14 years
Estimated residual value of equipment	$76,000
Yearly costs to operate the warehouse, excluding depreciation of equipment	$195,000
Yearly expected revenues—years 1–7	$330,000
Yearly expected revenues—years 8–14	$280,000

Instructions

1. Prepare a report as of March 1, 2010, presenting a differential analysis of the proposed operation of the warehouse for the 14 years as compared with present conditions.
2. Based on the results disclosed by the differential analysis, should the proposal be accepted?
3. If the proposal is accepted, what is the total estimated income from operations of the warehouse for the 14 years?

PR 9-2A
Differential analysis report for machine replacement proposal

obj. 1

Flint Tooling Company is considering replacing a machine that has been used in its factory for two years. Relevant data associated with the operations of the old machine and the new machine, neither of which has any estimated residual value, are as follows:

	Old Machine
Cost of machine, eight-year life	$48,000
Annual depreciation (straight-line)	6,000
Annual manufacturing costs, excluding depreciation	14,500
Annual nonmanufacturing operating expenses	2,900
Annual revenue	29,600
Current estimated selling price of the machine	18,000

	New Machine
Cost of machine, six-year life	$58,500
Annual depreciation (straight-line)	9,750
Estimated annual manufacturing costs, exclusive of depreciation	5,200

Annual nonmanufacturing operating expenses and revenue are not expected to be affected by purchase of the new machine.

Instructions

1. Prepare a differential analysis report as of May 22, 2010, comparing operations utilizing the new machine with operations using the present equipment. The analysis should indicate the differential income that would result over the six-year period if the new machine is acquired.
2. List other factors that should be considered before a final decision is reached.

PR 9-3A
Differential analysis report for sales promotion proposal

obj. 1

✔ 1. Differential income, tennis shoe, $225,000

Glide Shoe Company is planning a one-month campaign for May to promote sales of one of its two shoe products. A total of $125,000 has been budgeted for advertising, contests, redeemable coupons, and other promotional activities. The following data have been assembled for their possible usefulness in deciding which of the products to select for the campaign.

	Tennis Shoe	Walking Shoe
Unit selling price	$110	$100
Unit production costs:		
Direct materials	$ 20	$ 22
Direct labor	8	9
Variable factory overhead	5	6
Fixed factory overhead	12	10
Total unit production costs	$ 45	$ 47
Unit variable selling expenses	7	5
Unit fixed selling expenses	16	12
Total unit costs	$ 68	$ 64
Operating income per unit	$ 42	$ 36

No increase in facilities would be necessary to produce and sell the increased output. It is anticipated that 5,000 additional units of tennis shoes or 6,000 additional units of walking shoes could be sold without changing the unit selling price of either product.

Instructions

1. Prepare a differential analysis report as of May 13, 2010, presenting the additional revenue and additional costs anticipated from the promotion of tennis shoes and walking shoes.
2. The sales manager had tentatively decided to promote walking shoes, estimating that operating income would be increased by $91,000 ($36 operating income per unit for 6,000 units, less promotion expenses of $125,000). The manager also believed that the selection of tennis shoes would increase operating income by $85,000 ($42 operating income per unit for 5,000 units, less promotion expenses of $125,000). State briefly your reasons for supporting or opposing the tentative decision.

PR 9-4A
Differential analysis report for further processing

obj. 1

✔ 1. Differential revenue, $25,300

The management of Allegheny Valley Aluminum Co. is considering whether to process aluminum ingot further into rolled aluminum. Rolled aluminum can be sold for $1,600 per ton, and ingot can be sold without further processing for $950 per ton. Ingot is produced in batches of 66 tons by smelting 400 tons of bauxite, which costs $450 per ton. Rolled aluminum will require additional processing costs of $425 per ton of ingot, and 1.2 tons of ingot will produce 1 ton of rolled aluminum (due to trim losses).

Instructions

1. Prepare a report as of December 20, 2010, presenting a differential analysis associated with the further processing of aluminum ingot to produce rolled aluminum.
2. Briefly report your recommendations.

PR 9-5A
Product pricing using the cost-plus approach concepts; differential analysis report for accepting additional business

objs. 1, 2

✔ 3. b. Markup percentage, 28%

Night Watch Company recently began production of a new product, the halogen light, which required the investment of $500,000 in assets. The costs of producing and selling 12,000 halogen lights are estimated as follows:

Variable costs per unit:		Fixed costs:	
Direct materials	$22	Factory overhead	$120,000
Direct labor	12	Selling and administrative expenses	60,000
Factory overhead	6		
Selling and administrative expenses	4		
Total	$44		

Night Watch Company is currently considering establishing a selling price for the halogen light. The president of Night Watch Company has decided to use the cost-plus approach to product pricing and has indicated that the halogen light must earn a 12% rate of return on invested assets.

Instructions

1. Determine the amount of desired profit from the production and sale of the halogen light.
2. Assuming that the total cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of the halogen light (rounded to nearest whole dollar).
3. Assuming that the product cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of the halogen light.
4. Assuming that the variable cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of the halogen light (rounded to nearest whole dollar).
5. Comment on any additional considerations that could influence establishing the selling price for the halogen light.
6. Assume that as of September 1, 2010, 7,000 units of halogen light have been produced and sold during the current year. Analysis of the domestic market indicates that 3,000 additional units of the halogen light are expected to be sold during the remainder of the year at the normal product price determined under the total cost concept. On September 5, Night Watch Company received an offer from Forever Glow Inc. for 2,000 units of the halogen light at $45 each. Forever Glow Inc. will market the units in Japan under its own brand name, and no selling and administrative expenses associated with the sale will be incurred by Night Watch Company. The additional business is not expected to affect the domestic sales of the halogen light, and the additional units could be produced using existing capacity.
   a. Prepare a differential analysis report of the proposed sale to Forever Glow Inc.
   b. Based on the differential analysis report in part (a), should the proposal be accepted?

PR 9-6A
Product pricing and profit analysis with bottleneck operations

objs. 1, 3

✔ 1. Ethylene, $34

Delaware Bay Chemical Company produces three products: ethylene, butane, and ester. Each of these products has high demand in the market, and Delaware Bay Chemical is able to sell as much as it can produce of all three. The reaction operation is a bottleneck in the process and is running at 100% of capacity. Delaware Bay wants to improve chemical operation profitability. The variable conversion cost is $7 per process hour. The fixed cost is $550,000. In addition, the cost analyst was able to determine the following information about the three products:

	Ethylene	Butane	Ester
Budgeted units produced	9,000	9,000	9,000
Total process hours per unit	3	3	2
Reactor hours per unit	1.0	0.8	0.5
Unit selling price	$165	$128	$115
Direct materials cost per unit	$110	$75	$85

The reaction operation is part of the total process for each of these three products. Thus, for example, 1.0 of the 3 hours required to process ethylene are associated with the reactor.

Instructions

1. Determine the unit contribution margin for each product.
2. Provide an analysis to determine the relative product profitabilities, assuming that the reactor is a bottleneck.
3. Assume that management wishes to improve profitability by increasing prices on selected products. At what price would ethylene and ester need to be offered in order to produce the same relative profitability as butane?

Problems Series B

PR 9-1B
Differential analysis report involving opportunity costs

obj. 1

On November 1, Essence Stores Inc. is considering leasing a building and purchasing the necessary equipment to operate a retail store. Alternatively, the company could use the funds to invest in $140,000 of 5% U.S. Treasury bonds that mature in 16 years. The bonds could be purchased at face value. The following data have been assembled:

Cost of store equipment	$140,000
Life of store equipment	16 years
Estimated residual value of store equipment	$15,000
Yearly costs to operate the store, excluding depreciation of store equipment	$62,000
Yearly expected revenues—years 1–8	$78,000
Yearly expected revenues—years 9–16	$72,000

Instructions

1. Prepare a report as of November 1, 2010, presenting a differential analysis of the proposed operation of the store for the 16 years as compared with present conditions.
2. Based on the results disclosed by the differential analysis, should the proposal be accepted?
3. If the proposal is accepted, what would be the total estimated income from operations of the store for the 16 years?

PR 9-2B
Differential analysis report for machine replacement proposal

obj. 1

Golden Printing Company is considering replacing a machine that has been used in its factory for four years. Relevant data associated with the operations of the old machine and the new machine, neither of which has any estimated residual value, are as follows:

Old Machine	
Cost of machine, 10-year life	$126,000
Annual depreciation (straight-line)	12,600
Annual manufacturing costs, excluding depreciation	42,500
Annual nonmanufacturing operating expenses	12,300
Annual revenue	95,000
Current estimated selling price of machine	32,400

New Machine	
Cost of machine, six-year life	$144,000
Annual depreciation (straight-line)	24,000
Estimated annual manufacturing costs, exclusive of depreciation	18,900

Annual nonmanufacturing operating expenses and revenue are not expected to be affected by purchase of the new machine.

Instructions

1. Prepare a differential analysis report as of August 13, 2010, comparing operations utilizing the new machine with operations using the present equipment. The analysis should indicate the total differential income that would result over the six-year period if the new machine is acquired.
2. List other factors that should be considered before a final decision is reached.

PR 9-3B
Differential analysis report for sales promotion proposal

obj. 1

✔ 1. Moisturizer differential income, $177,000

Belle Cosmetics Company is planning a one-month campaign for June to promote sales of one of its two cosmetics products. A total of $120,000 has been budgeted for advertising, contests, redeemable coupons, and other promotional activities. The following data have been assembled for their possible usefulness in deciding which of the products to select for the campaign:

	Moisturizer	Perfume
Unit selling price	$52	$68
Unit production costs:		
Direct materials	$ 9	$11
Direct labor	2	3
Variable factory overhead	3	4
Fixed factory overhead	5	6
Total unit production costs	$19	$24
Unit variable selling expenses	11	15
Unit fixed selling expenses	4	8
Total unit costs	$34	$47
Operating income per unit	$18	$21

No increase in facilities would be necessary to produce and sell the increased output. It is anticipated that 11,000 additional units of moisturizer or 9,000 additional units of perfume could be sold without changing the unit selling price of either product.

Instructions

1. Prepare a differential analysis report as of June 15, 2010, presenting the additional revenue and additional costs anticipated from the promotion of moisturizer and perfume.
2. The sales manager had tentatively decided to promote moisturizer, estimating that operating income would be increased by $78,000 ($18 operating income per unit for 11,000 units, less promotion expenses of $120,000). The manager also believed that the selection of perfume would have less of an impact on operating income, $69,000 ($21 operating income per unit for 9,000 units, less promotion expenses of $120,000). State briefly your reasons for supporting or opposing the tentative decision.

PR 9-4B
Differential analysis report for further processing

obj. 1

✔ 1. Differential revenue, $13,050

The management of Caribbean Sugar Company is considering whether to process further raw sugar into refined sugar. Refined sugar can be sold for $1.90 per pound, and raw sugar can be sold without further processing for $1.10 per pound. Raw sugar is produced in batches of 27,000 pounds by processing 90,000 pounds of sugar cane, which costs $0.25 per pound. Refined sugar will require additional processing costs of $0.35 per pound of raw sugar, and 1.2 pounds of raw sugar will produce 1 pound of refined sugar.

Instructions

1. Prepare a report as of January 30, 2010, presenting a differential analysis of the further processing of raw sugar to produce refined sugar.
2. Briefly report your recommendations.

PR 9-5B
Product pricing using the cost-plus approach concepts; differential analysis report for accepting additional business

objs. 1, 2

✔ 3. b. Markup percentage, 30%

HD Labs Inc. recently began production of a new product, flat panel displays, which required the investment of $1,500,000 in assets. The costs of producing and selling 12,000 units of flat panel displays are estimated as follows:

Variable costs per unit:	
Direct materials	$140
Direct labor	30
Factory overhead	50
Selling and administrative expenses	25
Total	$245

Fixed costs:	
Factory overhead	$960,000
Selling and administrative expenses	480,000

HD Labs Inc. is currently considering establishing a selling price for flat panel displays. The president of HD Labs has decided to use the cost-plus approach to product pricing and has indicated that the displays must earn a 20% rate of return on invested assets.

Instructions

1. Determine the amount of desired profit from the production and sale of flat panel displays.
2. Assuming that the total cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of flat panel displays (rounded to nearest whole dollar).
3. Assuming that the product cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of flat panel displays.
4. Assuming that the variable cost concept is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of flat panel displays.
5. Comment on any additional considerations that could influence establishing the selling price for flat panel displays.
6. Assume that as of August 1, 2010, 5,000 units of flat panel displays have been produced and sold during the current year. Analysis of the domestic market indicates that 4,000 additional units are expected to be sold during the remainder of the year at the normal product price determined under the total cost concept. On August 3, HD Labs Inc. received an offer from Vision Systems Inc. for 1,500 units of flat panel displays at $235 each. Vision Systems Inc. will market the units in Canada under its own brand name, and no selling and administrative expenses associated with the sale will be incurred by HD Labs Inc. The additional business is not expected to affect the domestic sales of flat panel displays, and the additional units could be produced using existing capacity.
   a. Prepare a differential analysis report of the proposed sale to Vision Systems Inc.
   b. Based on the differential analysis report in part (a), should the proposal be accepted?

PR 9-6B
Product pricing and profit analysis with bottleneck operations

objs. 1, 3

✔ 1. High Grade, $30

Gemini Steel Company produces three grades of steel: high, good, and regular grade. Each of these products (grades) has high demand in the market, and Gemini is able to sell as much as it can produce of all three. The furnace operation is a bottleneck in the process and is running at 100% of capacity. Gemini wants to improve steel operation profitability. The variable conversion cost is $8 per process hour. The fixed cost is $410,000. In addition, the cost analyst was able to determine the following information about the three products:

	High Grade	Good Grade	Regular Grade
Budgeted units produced	5,000	5,000	5,000
Total process hours per unit	15	15	12
Furnace hours per unit	5	4	3
Unit selling price	$270	$250	$210
Direct materials cost per unit	$120	$100	$78

The furnace operation is part of the total process for each of these three products. Thus, for example, 5 of the 15 hours required to process High Grade steel are associated with the furnace.

Instructions

1. Determine the unit contribution margin for each product.
2. Provide an analysis to determine the relative product profitabilities, assuming that the furnace is a bottleneck.
3. Assume that management wishes to improve profitability by increasing prices on selected products. At what price would High and Good grades need to be offered in order to produce the same relative profitability as Regular Grade steel?

Special Activities

SA 9-1
Product pricing

Lucinda Lopez is a cost accountant for Northern Apparel Inc. Marcus Murry, vice president of marketing, has asked Lucinda to meet with representatives of Northern Apparel's major competitor to discuss product cost data. Marcus indicates that the sharing of these data will enable Northern to determine a fair and equitable price for its products.

Would it be ethical for Lucinda to attend the meeting and share the relevant cost data?

SA 9-2
Decision on accepting additional business

A manager of Fairways and Greens Sporting Goods Company is considering accepting an order from an overseas customer. This customer has requested an order for 20,000 dozen golf balls at a price of $24 per dozen. The variable cost to manufacture a dozen golf balls is $18 per dozen. The full cost is $26 per dozen. Fairways and Greens has a normal selling price of $34 per dozen. Fairways and Greens' plant has just enough excess capacity on the second shift to make the overseas order.

What are some considerations in accepting or rejecting this order?

SA 9-3
Accept business at a special price

Internet Project

If you are not familiar with Priceline.com Inc., go to its Web site. Assume that an individual "names a price" of $70 on Priceline.com for a room in Dallas, Texas, on August 24. Assume that August 24 is a Saturday, with low expected room demand in Dallas at a Marriott International, Inc., hotel, so there is excess room capacity. The fully allocated cost per room per day is assumed from hotel records as follows:

Housekeeping labor cost*	$ 34
Hotel depreciation expense	42
Cost of room supplies (soap, paper, etc.)	6
Laundry labor and material cost*	10
Cost of desk staff	5
Utility cost (mostly air conditioning)	4
Total cost per room per day	$101

*Both housekeeping and laundry staff include many part-time workers, so that the workload is variable to demand.

Should Marriott accept the customer bid for a night in Dallas on August 24 at a price of $70?

SA 9-4
Cost-plus and target costing concepts

The following conversation took place between Cam Hudson, vice president of marketing, and Alan Attawry, controller of Digi-Comp Computer Company:

Cam: I am really excited about our new computer coming out. I think it will be a real market success.

Alan: I'm really glad you think so. I know that our success will be determined by our price. If our price is too high, our competitors will be the ones with the market success.

Cam: Don't worry about it. We'll just mark our product cost up by 25% and it will all work out. I know we'll make money at those markups. By the way, what does the estimated product cost look like?

Alan: Well, there's the rub. The product cost looks as if it's going to come in at around $1,200. With a 25% markup, that will give us a selling price of $1,500.

Cam: I see your concern. That's a little high. Our research indicates that computer prices are dropping and that this type of computer should be selling for around $1,250 when we release it to the market.

Alan: I'm not sure what to do.

Cam: Let me see if I can help. How much of the $1,200 is fixed cost?

Alan: About $200.

Cam: There you go. The fixed cost is sunk. We don't need to consider it in our pricing decision. If we reduce the product cost by $200, the new price with a 25% markup would be right at $1,250. Boy, I was really worried for a minute there. I knew something wasn't right.

a. If you were Alan, how would you respond to Cam's solution to the pricing problem?
b. How might target costing be used to help solve this pricing dilemma?

SA 9-5
Pricing decisions and markup on variable costs

Internet Project

Group Project

Many businesses are offering their products and services over the Internet. Some of these companies and their Internet addresses are listed below.

Company Name	Internet Address (URL)	Product
Delta Air Lines	http://www.delta.com	Airline tickets
Amazon.com	http://www.amazon.com	Books
Dell Inc.	http://www.dell.com	Personal computers

a. In groups of three, assign each person in your group to one of the Internet sites listed above. For each site, determine the following:
   1. A product (or service) description.
   2. A product price.
   3. A list of costs that are required to produce and sell the product selected in part (1) as listed in the annual report on SEC Form 10-K.
   4. Whether the costs identified in part (3) are fixed costs or variable costs.

b. Which of the three products do you believe has the largest markup on variable cost?

Answers to Self-Examination Questions

1. **A** Differential cost is the amount of increase or decrease in cost that is expected from a particular course of action compared with an alternative. For Marlo Company, the differential cost is $19,000 (answer A). This is the total of the variable product costs ($15,000) and the variable operating expenses ($4,000), which would not be incurred if the product is discontinued.
2. **A** A sunk cost is not affected by later decisions. For Victor Company, the sunk cost is the $50,000 (answer A) book value of the equipment, which is equal to the original cost of $200,000 (answer C) less the accumulated depreciation of $150,000 (answer B).
3. **C** The amount of income that could have been earned from the best available alternative to a proposed use of cash is the opportunity cost. For Henry Company, the opportunity cost is 12% of $100,000, or $12,000 (answer C).
4. **C** Under the variable cost concept of product pricing (answer C), fixed manufacturing costs, fixed administrative and selling expenses, and desired profit are allowed for in determining the markup. Only desired profit is allowed for in the markup under the total cost concept (answer A). Under the product cost concept (answer B), total selling and administrative expenses and desired profit are allowed for in determining the markup. Standard cost (answer D) can be used under any of the cost-plus approaches to product pricing.
5. **C** Product 3 has the highest unit contribution margin per bottleneck hour ($14/2 = $7). Product 1 (answer A) has the largest unit contribution margin, but the lowest unit contribution per bottleneck hour ($20/4 = $5), so it is the least profitable product in the constrained environment. Product 2 (answer B) has the highest total profitability in March (1,500 units × $18), but this does not suggest that it has the highest profit potential. Product 2's unit contribution per bottleneck hour ($18/3 = $6) is between Products 1 and 3. Answer D is not true, since the products all have different profit potential in terms of unit contribution margin per bottleneck hour.

CHAPTER 10

Capital Investment Analysis

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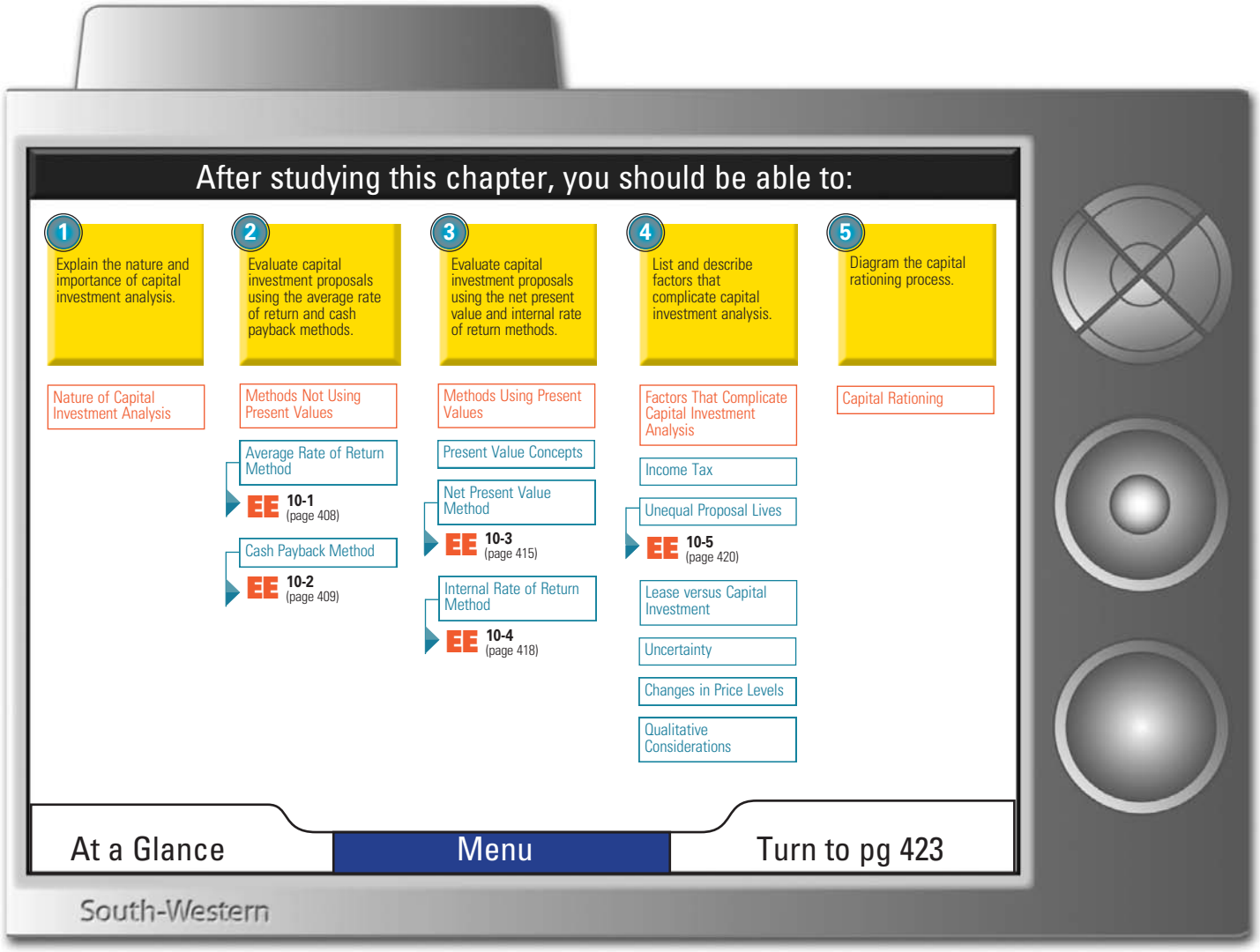
CARNIVAL CORPORATION

Why are you paying tuition, studying this text, and spending time and money on a higher education? Most people believe that the money and time spent now will return them more earnings in the future. In other words, the cost of higher education is an investment in your future earning ability. How would you know if this investment is worth it?

One method would be for you to compare the cost of a higher education against the estimated increase in your future earning power. The bigger the difference between your expected future earnings and the cost of your education, the better the investment. The same is true for the investments businesses make in fixed assets. Business organizations use a variety of methods to compare the cost of an investment to its future earnings and cash flows.

For example, Carnival Corporation is the largest vacation cruise company in the world, with over 85 cruise ships that sail to locations around the world. Carnival's fleet required an investment of nearly $29 billion, with each new ship costing approximately $600 million. Carnival used capital investment analysis to compare this investment with the future earnings ability of the ships over their 30-year expected lives. Carnival must be satisfied with their investments, because they have signed agreements with shipyards to add an additional 22 cruise ships to its fleet from 2008–2012.

In this chapter, the methods used to make investment decisions, which may involve thousands, millions, or even billions of dollars, are described and illustrated. The similarities and differences among the most commonly used methods of evaluating investment proposals, as well as the benefits of each method, are emphasized. Qualitative considerations affecting investment analyses, considerations complicating investment analyses, and the process of allocating available investment funds among competing proposals are also discussed.



1 Explain the nature and importance of capital investment analysis.

During 2007, Delta Air Lines invested $1.0 billion in capital expenditures, which focused primarily on customer service initiatives, such as new flight equipment and improvements at Delta's Atlanta and New York–JFK hubs.

Nature of Capital Investment Analysis

Companies use capital investment analysis to evaluate long-term investments. **Capital investment analysis** (or *capital budgeting*) is the process by which management plans, evaluates, and controls investments in fixed assets. Capital investments use funds and affect operations for many years and must earn a reasonable rate of return. Thus, capital investment decisions are some of the most important decisions that management makes.

Capital investment evaluation methods can be grouped into the following categories:

Methods That Do Not Use Present Values

1. Average rate of return method
2. Cash payback method

Methods That Use Present Values

1. Net present value method
2. Internal rate of return method

The two methods that use present values consider the time value of money. The **time value of money concept** recognizes that an amount of cash invested today will earn income and thus has value over time.

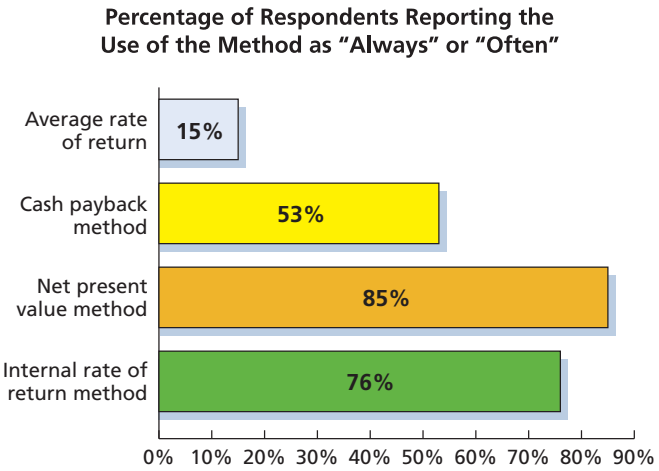
2 Evaluate capital investment proposals using the average rate of return and cash payback methods.

Methods Not Using Present Values

The methods not using present values are often useful in evaluating capital investment proposals that have relatively short useful lives. In such cases, the timing of the cash flows (the time value of money) is less important.

Since the methods not using present values are easy to use, they are often used to screen proposals. Minimum standards for accepting proposals are set, and proposals not meeting these standards are dropped. If a proposal meets the minimum standards, it may be subject to further analysis using the present value methods.

A CFO survey of capital investment analysis methods used by large U.S. companies reported the following:



Source: Patricia A. Ryan and Glenn P. Ryan, "Capital Budgeting Practice of the Fortune 1000: How Have Things Changed?" *Journal of Business and Management* (Winter 2002).

Average Rate of Return Method

The **average rate of return**, sometimes called the *accounting rate of return*, measures the average income as a percent of the average investment. The average rate of return is computed as follows:

$$\text{Average Rate of Return} = \frac{\text{Estimated Average Annual Income}}{\text{Average Investment}}$$

In the preceding equation, the numerator is the average of the annual income expected to be earned from the investment over its life, after deducting depreciation. The denominator is the average investment (book value) over the life of the investment. Assuming straight-line depreciation, the average investment is computed as follows:

$$\text{Average Investment} = \frac{\text{Initial Cost} + \text{Residual Value}}{2}$$

To illustrate, assume that management is evaluating the purchase of a new machine as follows:

Cost of new machine	$500,000
Residual value	0
Estimated total income from machine	200,000
Expected useful life	4 years

The average estimated annual income from the machine is $50,000 ($200,000/4 years). The average investment is $250,000, as computed below.

$$\text{Average Investment} = \frac{\text{Initial Cost} + \text{Residual Value}}{2} = \frac{\$500{,}000 + \$0}{2} = \$250{,}000$$

The average rate of return on the average investment is 20%, as computed below.

$$\text{Average Rate of Return} = \frac{\text{Estimated Average Annual Income}}{\text{Average Investment}} = \frac{\$50{,}000}{\$250{,}000} = 20\%$$

The average rate of return of 20% should be compared to the minimum rate of return required by management. If the average rate of return equals or exceeds the minimum rate, the machine should be purchased or considered for further analysis.

Several capital investment proposals can be ranked by their average rates of return. The higher the average rate of return, the more desirable the proposal. For example,

assume that management is considering two capital investment proposals with the following average rates of return:

	Proposal A	Proposal B
Average Rate of Return	20%	25%

If only the average rate of return is considered, Proposal B, with an average rate of return of 25%, is preferred over Proposal A.

The average rate of return has the following three advantages:

1. It is easy to compute.
2. It includes the entire amount of income earned over the life of the proposal.
3. It emphasizes accounting income, which is often used by investors and creditors in evaluating management performance.

The average rate of return method considers the amount of income earned over the life of a proposal.

The average rate of return has the following two disadvantages:

1. It does not directly consider the expected cash flows from the proposal.
2. It does not directly consider the timing of the expected cash flows.

Example Exercise 10-1 Average Rate of Return 2

Determine the average rate of return for a project that is estimated to yield total income of $273,600 over three years, has a cost of $690,000, and has a $70,000 residual value.

Follow My Example 10-1

Estimated average annual income	$91,200 ($273,600/3 years)
Average investment	$380,000 ($690,000 + $70,000)/2
Average rate of return	24% ($91,200/$380,000)

For Practice: PE 10-1A, PE 10-1B

Cash Payback Method

A capital investment uses cash and must return cash in the future to be successful. The expected period of time between the date of an investment and the recovery in cash of the amount invested is the **cash payback period**.

When annual net cash inflows are equal, the cash payback period is computed as follows:

$$\text{Cash Payback Period} = \frac{\text{Initial Cost}}{\text{Annual Net Cash Inflow}}$$

To illustrate, assume that management is evaluating the purchase of the following new machine:

Cost of new machine	$200,000
Cash revenues from machine per year	50,000
Expenses of machine per year	30,000
Depreciation per year	20,000

To simplify, the revenues and expenses other than depreciation are assumed to be in cash. Hence, the net cash inflow per year from use of the machine is as follows:

Net cash inflow per year:		
Cash revenues from machine		$50,000
Less cash expenses of machine		
Expenses of machine	$30,000	
Less depreciation	20,000	10,000
Net cash inflow per year		$40,000

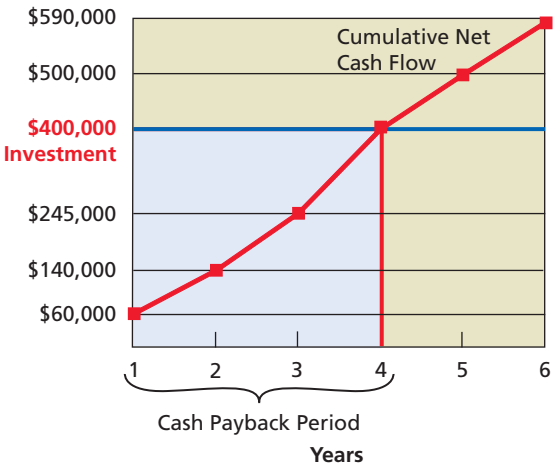
The time required for the net cash flow to equal the cost of the new machine is the payback period. Thus, the estimated cash payback period for the investment is five years, as computed below.

$$\text{Cash Payback Period} = \frac{\text{Initial Cost}}{\text{Annual Net Cash Inflow}} = \frac{\$200{,}000}{\$40{,}000} = 5 \text{ years}$$

In the preceding illustration, the annual net cash inflows are equal ($40,000 per year). When the annual net cash inflows are not equal, the cash payback period is determined by adding the annual net cash inflows until the cumulative total equals the initial cost of the proposed investment.

To illustrate, assume that a proposed investment has an initial cost of $400,000. The annual and cumulative net cash inflows over the proposal's six-year life are as follows:

Year	Net Cash Flow	Cumulative Net Cash Flow
1	$ 60,000	$ 60,000
2	80,000	140,000
3	105,000	245,000
4	155,000	400,000
5	100,000	500,000
6	90,000	590,000



The cumulative net cash flow at the end of Year 4 equals the initial cost of the investment, $400,000. Thus, the payback period is four years.

If the initial cost of the proposed investment had been $450,000, the cash payback period would occur during Year 5. Since $100,000 of net cash flow is expected during Year 5, the additional $50,000 to increase the cumulative total to $450,000 occurs halfway through the year ($50,000/$100,000). Thus, the cash payback period would be 4 ½ years.[1]

A short cash payback period is desirable. This is because the sooner cash is recovered, the sooner it can be reinvested in other projects. In addition, there is less chance of losses from changing economic conditions or other risks such as a decreasing customer demand when the payback period is short.

A short cash payback period is also desirable for repaying debt used to purchase the investment. The sooner the cash is recovered, the sooner the debt can be paid.

A disadvantage of the cash payback method is that it ignores cash flows occurring after the payback period. In addition, the cash payback method does not use present value concepts in valuing cash flows occurring in different periods.

Example Exercise 10-2 Cash Payback Period 2

A project has estimated annual net cash flows of $30,000. It is estimated to cost $105,000. Determine the cash payback period.

Follow My Example 10-2

3.5 years ($105,000/$30,000)

For Practice: PE 10-2A, PE 10-2B

1 Unless otherwise stated, net cash inflows are received uniformly throughout the year.

3 Evaluate capital investment proposals using the net present value and internal rate of return methods.

Methods Using Present Values

An investment in fixed assets may be viewed as purchasing a series of net cash flows over a period of time. The timing of when the net cash flows will be received is important in determining the value of a proposed investment.

Present value methods use the amount and timing of the net cash flows in evaluating an investment. The two methods of evaluating capital investments using present values are as follows:

1. Net present value method
2. Internal rate of return method

Present value concepts can also be used to evaluate personal finances. For example, you can determine house or car payments under various interest rate and term assumptions using present value concepts.

Present Value Concepts

Both the net present value and the internal rate of return methods use the following two **present value concepts**:[2]

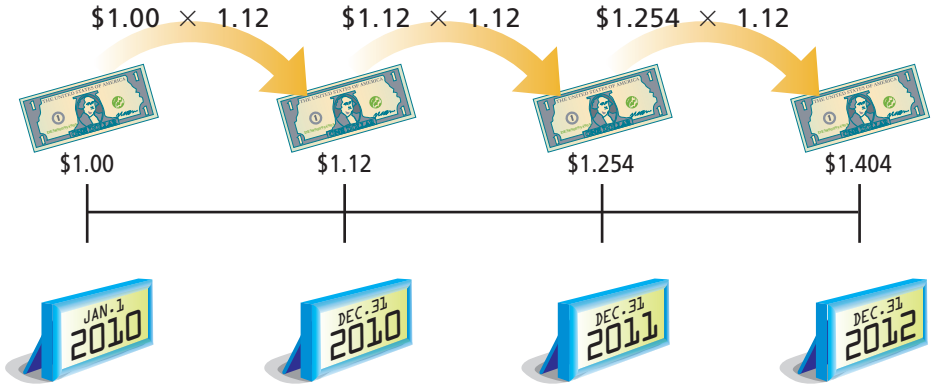
1. Present value of an amount
2. Present value of an annuity

Present Value of an Amount If you were given the choice, would you prefer to receive $1 now or $1 three years from now? You should prefer to receive $1 now, because you could invest the $1 and earn interest for three years. As a result, the amount you would have after three years would be greater than $1.

To illustrate, assume that you have $1 to invest as follows:

Amount to be invested	$1
Period to be invested	3 years
Interest rate	12%

After one year, the $1 earns interest of $0.12 ($1 × 12%) and, thus, will grow to $1.12 ($1 × 1.12). In the second year, the $1.12 earns 12% interest of $0.134 ($1.12 × 12%) and, thus, will grow to $1.254 ($1.12 × 1.12) by the end of the second year. This process of interest earning interest is called *compounding*. By the end of the third year, your $1 investment will grow to $1.404 as shown below.



On January 1, 2010, what is the present value of $1.404 to be received on December 31, 2012? This is a present value question. The answer can be determined with the aid of a present value of $1 table. For example, the partial table in Exhibit 1 indicates that the present value of $1 to be received in three years with earnings compounded at the rate of 12% a year is 0.712. Multiplying 0.712 by $1.404 yields $1 as follows:

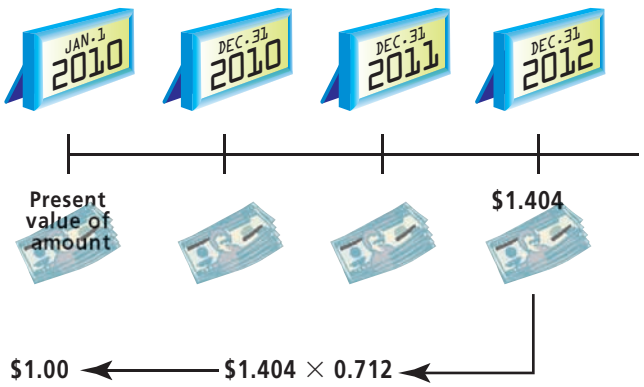
Present Value		Amount to Be Received in 3 Years		Present Value of $1 to Be Received in 3 Years (from Exhibit 1)
$1	=	$1.404	×	0.712

Exhibit 1

Partial Present Value of $1 Table

	Present Value of $1 at Compound Interest				
Year	6%	10%	12%	15%	20%
1	0.943	0.909	0.893	0.870	0.833
2	0.890	0.826	0.797	0.756	0.694
3	0.840	0.751	0.712	0.658	0.579
4	0.792	0.683	0.636	0.572	0.482
5	0.747	0.621	0.567	0.497	0.402
6	0.705	0.564	0.507	0.432	0.335
7	0.665	0.513	0.452	0.376	0.279
8	0.627	0.467	0.404	0.327	0.233
9	0.592	0.424	0.361	0.284	0.194
10	0.558	0.386	0.322	0.247	0.162

In other words, the present value of $1.404 to be received in three years using a compound interest rate of 12% is $1, as shown below.[2]

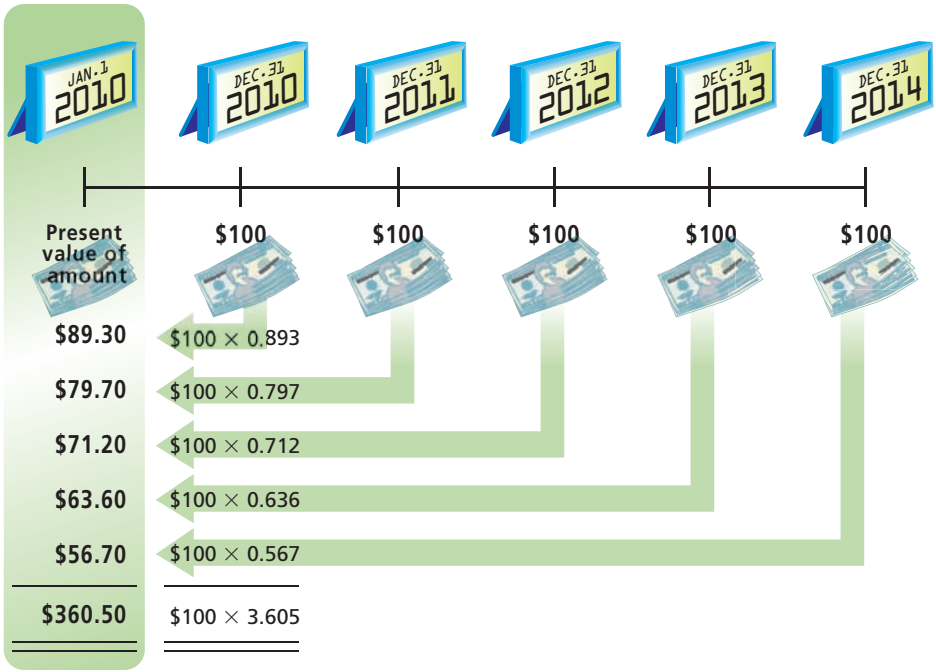


Present Value of an Annuity An **annuity** is a series of equal net cash flows at fixed time intervals. Cash payments for monthly rent, salaries, and bond interest are all examples of annuities.

The present value of an annuity is the sum of the present values of each cash flow. That is, the **present value of an annuity** is the amount of cash needed today to yield a series of equal net cash flows at fixed time intervals in the future.

2 The present value factors in the table are rounded to three decimal places. More complete tables of present values are in Appendix A.

To illustrate, the present value of a $100 annuity for five periods at 12% could be determined by using the present value factors in Exhibit 1. Each $100 net cash flow could be multiplied by the present value of $1 at a 12% factor for the appropriate period and summed to determine a present value of $360.50, as shown below.



Using a present value of an annuity table is a simpler approach. Exhibit 2 is a partial table of present value of annuity factors.[3]

Exhibit 2

Partial Present Value of an Annuity Table

Present Value of an Annuity of $1 at Compound Interest					
Year	6%	10%	12%	15%	20%
1	0.943	0.909	0.893	0.870	0.833
2	1.833	1.736	1.690	1.626	1.528
3	2.673	2.487	2.402	2.283	2.106
4	3.465	3.170	3.037	2.855	2.589
5	4.212	3.791	3.605	3.353	2.991
6	4.917	4.355	4.111	3.785	3.326
7	5.582	4.868	4.564	4.160	3.605
8	6.210	5.335	4.968	4.487	3.837
9	6.802	5.759	5.328	4.772	4.031
10	7.360	6.145	5.650	5.019	4.192

The present value factors in the table shown in Exhibit 2 are the sum of the present value of $1 factors in Exhibit 1 for the number of annuity periods. Thus, 3.605 in the annuity table (Exhibit 2) is the sum of the five present value of $1 factors at 12%, as shown on the following page.

3 The present value factors in the table are rounded to three decimal places. More complete tables of present values are in Appendix A.

	Present Value of $1 (Exhibit 1)
Present value of $1 for 1 year @12%	0.893
Present value of $1 for 2 years @12%	0.797
Present value of $1 for 3 years @12%	0.712
Present value of $1 for 4 years @12%	0.636
Present value of $1 for 5 years @12%	0.567
Present value of an annuity of $1 for 5 years (from Exhibit 2)	3.605

Multiplying $100 by 3.605 yields the same amount ($360.50) as follows:

Present Value		Amount to Be Received Annually for 5 Years		Present Value of an Annuity of $1 to Be Received for 5 Years (Exhibit 2)
$360.50	=	$100	×	3.605

This amount ($360.50) is the same as what was determined in the preceding illustration by five successive multiplications.

Net Present Value Method

A 55-year-old janitor won a $5 million lottery jackpot, payable in 21 annual installments of $240,245. Unfortunately, the janitor died after collecting only one payment. What happens to the remaining unclaimed payments? In this case, the lottery winnings were auctioned off for the benefit of the janitor's estate. The winning bid approximated the present value of the remaining cash flows, or about $2.1 million.

The net present value method compares an investment's initial cash outflow with the present value of its cash inflows.

The **net present value method** compares the amount to be invested with the present value of the net cash inflows. It is sometimes called the *discounted cash flow method*.

The interest rate (return) used in net present value analysis is the company's minimum desired rate of return. This rate, sometimes termed the *hurdle rate*, is based on such factors as the purpose of the investment and the cost of obtaining funds for the investment. If the present value of the cash inflows equals or exceeds the amount to be invested, the proposal is desirable.

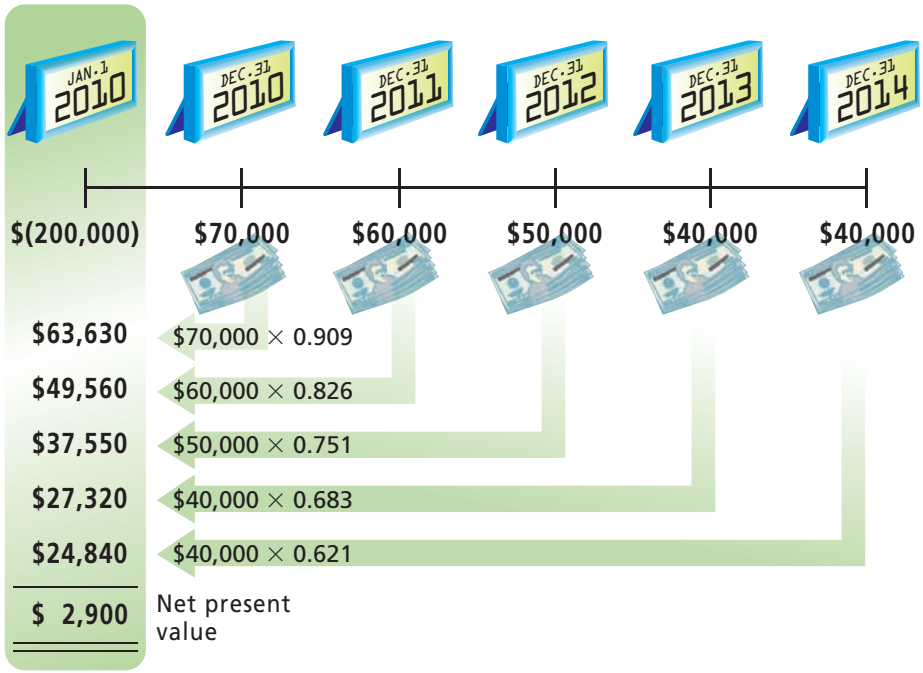
To illustrate, assume the following data for a proposed investment in new equipment:

Cost of new equipment	$200,000
Expected useful life	5 years
Minimum desired rate of return	10%
Expected cash flows to be received each year:	
Year 1	$ 70,000
Year 2	60,000
Year 3	50,000
Year 4	40,000
Year 5	40,000
Total expected cash flows	$260,000

The present value of the net cash flow for each year is computed by multiplying the net cash flow for the year by the present value factor of $1 for that year as shown below.

Year	Present Value of $1 at 10%	Net Cash Flow	Present Value of Net Cash Flow
1	0.909	$ 70,000	$ 63,630
2	0.826	60,000	49,560
3	0.751	50,000	37,550
4	0.683	40,000	27,320
5	0.621	40,000	24,840
Total		$260,000	$202,900
Amount to be invested			200,000
Net present value			$ 2,900

The preceding computations are also graphically illustrated on the following page.



The net present value of $2,900 indicates that the purchase of the new equipment is expected to recover the investment and provide more than the minimum rate of return of 10%. Thus, the purchase of the new equipment is desirable.

When capital investment funds are limited and the proposals involve different investments, a ranking of the proposals can be prepared by using a present value index. The **present value index** is computed as follows:

$$\text{Present Value Index} = \frac{\text{Total Present Value of Net Cash Flow}}{\text{Amount to Be Invested}}$$

The present value index for the investment in the preceding illustration is 1.0145, as computed below.

$$\text{Present Value Index} = \frac{\text{Total Present Value of Net Cash Flow}}{\text{Amount to Be Invested}}$$

$$\text{Present Value Index} = \frac{\$202,900}{\$200,000} = 1.0145$$

To illustrate, assume that a company is considering three proposals. The net present value and the present value index for each proposal are as follows:

	Proposal A	Proposal B	Proposal C
Total present value of net cash flow	$107,000	$86,400	$86,400
Amount to be invested	100,000	80,000	90,000
Net present value	$ 7,000	$ 6,400	$ (3,600)
Present value index:			
Proposal A ($107,000/$100,000)	1.07		
Proposal B ($86,400/$80,000)		1.08	
Proposal C ($86,400/$90,000)			0.96

A project will have a present value index greater than 1 when the net present value is positive. This is the case for Proposals A and B. When the net present value is negative, the present value index will be less than 1, as is the case for Proposal C.

The use of spreadsheet software such as Microsoft Excel can simplify present value computations.

Although Proposal A has the largest net present value, the present value indices indicate that it is not as desirable as Proposal B. That is, Proposal B returns $1.08 present value per dollar invested, whereas Proposal A returns only $1.07. Proposal B requires an investment of $80,000, compared to an investment of $100,000 for Proposal A. The possible use of the $20,000 difference between Proposals A and B investments should also be considered before making a final decision.

An advantage of the net present value method is that it considers the time value of money. A disadvantage is that the computations are more complex than the average rate of return and cash payback methods. In addition, the net present value method assumes that the cash received from the proposal can be reinvested at the minimum desired rate of return. This assumption may not always be reasonable.

Example Exercise 10-3 Net Present Value 3

A project has estimated annual net cash flows of $50,000 for seven years and is estimated to cost $240,000. Assume a minimum acceptable rate of return of 12%. Using Exhibit 2, determine (a) the net present value of the project and (b) the present value index, rounded to two decimal places.

Follow My Example 10-3

a. ($11,800) [($50,000 × 4.564) − $240,000]
b. 0.95 ($228,200/$240,000)

For Practice: PE 10-3A, PE 10-3B

Internal Rate of Return Method

The **internal rate of return (IRR) method** uses present value concepts to compute the rate of return from a capital investment proposal based on its expected net cash flows. This method, sometimes called the *time-adjusted rate of return method*, starts with the proposal's net cash flows and works backward to estimate the proposal's expected rate of return.

To illustrate, assume that management is evaluating the following proposal to purchase new equipment:

Cost of new equipment	$33,530
Yearly expected cash flows to be received	10,000
Expected life	5 years
Minimum desired rate of return	12%

The present value of the net cash flows, using the present value of an annuity table in Exhibit 2, is $2,520, as shown in Exhibit 3.

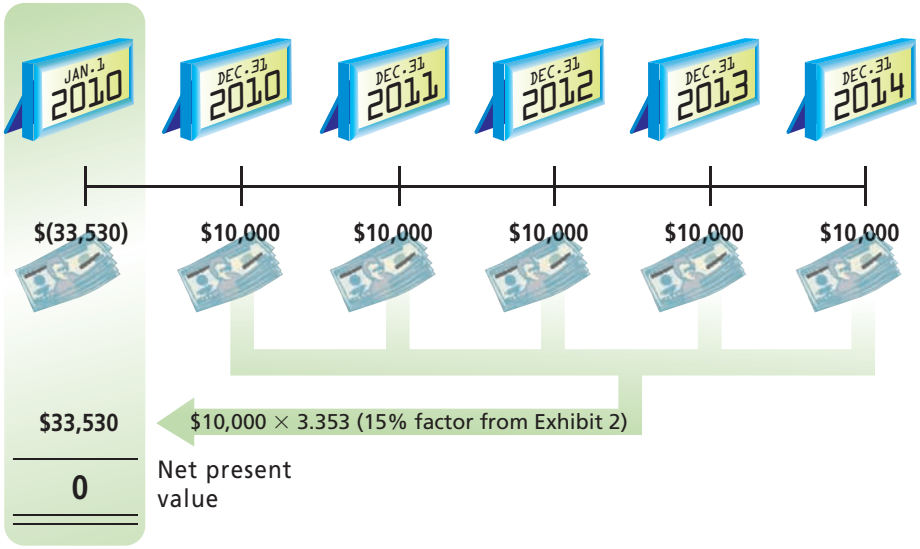
Exhibit 3

Net Present Value Analysis at 12%

Annual net cash flow (at the end of each of five years)	$10,000
Present value of an annuity of $1 at 12% for five years (Exhibit 2)	× 3.605
Present value of annual net cash flows	$36,050
Less amount to be invested	33,530
Net present value	$ 2,520

In Exhibit 3, the $36,050 present value of the cash inflows, based on a 12% rate of return, is greater than the $33,530 to be invested. Thus, the internal rate of return must

be greater than 12%. Through trial and error, the rate of return equating the $33,530 cost of the investment with the present value of the net cash flows can be determined to be 15%, as shown below.



When equal annual net cash flows are expected from a proposal, as in the above example, the internal rate of return can be determined as follows:[4]

Step 1. Determine a present value factor for an annuity of $1 as follows:

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$$

Step 2. Locate the present value factor determined in Step 1 in the present value of an annuity of $1 table (Exhibit 2) as follows:
   a. Locate the number of years of expected useful life of the investment in the Year column.
   b. Proceed horizontally across the table until you find the present value factor computed in Step 1.

Step 3. Identify the internal rate of return by the heading of the column in which the present value factor in Step 2 is located.

To illustrate, assume that management is evaluating the following proposal to purchase new equipment:

Cost of new equipment	$97,360
Yearly expected cash flows to be received	20,000
Expected useful life	7 years

The present value factor for an annuity of $1 is 4.868, as shown below.

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$$

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\$97,360}{\$20,000} = 4.868$$

Using the partial present value of an annuity of $1 table shown at the top of the next page and a period of seven years, the factor 4.868 is related to 10%. Thus, the internal rate of return for this proposal is 10%.

4 To simplify, equal annual net cash flows are assumed. If the net cash flows are not equal, spreadsheet software can be used to determine the rate of return.

Present Value of an Annuity of $1 at Compound Interest

Year	6%	10% (Step 3)	12%
1	0.943	0.909	0.893
2	1.833	1.736	1.690
3	2.673	2.487	2.402
4	3.465	3.170	3.037
5	4.212	3.791	3.605
6	4.917	Step 2(b) 4.355	4.111
Step 2(a) 7	5.582	4.868	4.564
8	6.210	5.335	4.968
9	6.802	5.759	5.328
10	7.360	6.145	5.650

Step 1: Determine present value factor for an annuity of $1 $= \frac{\$97,360}{\$20,000} = 4.868$

The minimum acceptable rate of return for Owens Corning is 18%; for General Electric Company, it is 20%. The CFO of Owens Corning states, "I'm here to challenge anyone—even the CEO—who gets emotionally attached to a project that doesn't reach our benchmark."

If the minimum acceptable rate of return is 10%, then the proposal is considered acceptable. Several proposals can be ranked by their internal rates of return. The proposal with the highest rate is the most desirable.

A primary advantage of the internal rate of return method is that the present values of the net cash flows over the entire useful life of the proposal are considered. In addition, all proposals can be compared based on their internal rates of return.

The primary disadvantage of the internal rate of return method is that the computations are more complex. Also, like the net present value method, it assumes that the cash received from a proposal can be reinvested at the internal rate of return. This assumption may not always be reasonable.

Business Connection

PANERA BREAD STORE RATE OF RETURN

Panera Bread owns, operates, and franchises bakery-cafes throughout the United States. A recent annual report to the Securities and Exchange Commission (SEC Form 10-K) disclosed the following information about an average company-owned store:

Operating profit	$ 302,000
Depreciation	98,000
Investment	1,000,000

Assume that the operating profit and depreciation will remain unchanged for the next 10 years. Assume operating profit plus depreciation approximates annual net cash flows, and that the investment residual value will be zero. The average rate of return and internal rate of return can then be estimated. The average rate of return on a company-owned store is:

$$\frac{\$302,000}{\$1,000,000/2} = 60.4\%$$

The internal rate of return is calculated by first determining the present value of an annuity of $1:

$$\text{Present value of an annuity of \$1} = \frac{\$1,000,000}{\$302,000 + \$98,000} = 2.50$$

For a period of three years, this factor implies an internal rate of return near 10% (from Exhibit 2). However, if we more realistically assumed these cash flows for 10 years, Panera's company-owned stores generate an estimated internal rate of return of approximately 38% (from a spreadsheet calculation). Clearly, both investment evaluation methods indicate a highly successful business.

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Example Exercise 10-4 Internal Rate of Return 3

A project is estimated to cost $208,175 and provide annual net cash flows of $55,000 for six years. Determine the internal rate of return for this project, using Exhibit 2.

Follow My Example 10-4

15% [($208,175/$55,000) = 3.785, the present value of an annuity factor for six periods at 15%, from Exhibit 2]

For Practice: PE 10-4A, PE 10-4B

4 List and describe factors that complicate capital investment analysis.

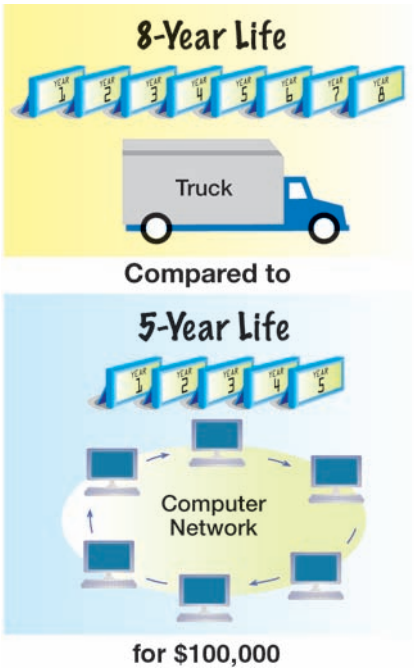
Factors That Complicate Capital Investment Analysis

Four widely used methods of evaluating capital investment proposals have been described and illustrated in this chapter. In practice, additional factors such as the following may impact capital investment decisions:

1. Income tax
2. Proposals with unequal lives
3. Leasing versus purchasing
4. Uncertainty
5. Changes in price levels
6. Qualitative factors

Income Tax

The impact of income taxes on capital investment decisions can be material. For example, in determining depreciation for federal income tax purposes, useful lives that are much shorter than the actual useful lives are often used. Also, depreciation for tax purposes often differs from depreciation for financial statement purposes. As a result, the timing of the cash flows for income taxes can have a significant impact on capital investment analysis.[5]



Unequal Proposal Lives

The prior capital investment illustrations assumed that the alternative proposals had the same useful lives. In practice, however, proposals often have different lives.

To illustrate, assume that a company is considering purchasing a new truck or a new computer network. The data for each proposal are shown below.

	Truck	Computer Network
Cost	$100,000	$100,000
Minimum desired rate of return	10%	10%
Expected useful life	8 years	5 years
Yearly expected cash flows to be received:		
Year 1	$ 30,000	$ 30,000
Year 2	30,000	30,000
Year 3	25,000	30,000
Year 4	20,000	30,000
Year 5	15,000	35,000
Year 6	15,000	0
Year 7	10,000	0
Year 8	10,000	0
Total	$155,000	$155,000

The expected cash flows and net present value for each proposal are shown in Exhibit 4. Because of the unequal useful lives, however, the net present values in Exhibit 4 are not comparable.

To make the proposals comparable, the useful lives are adjusted to end at the same time. In this illustration, this is done by assuming that the truck will be sold at the end

5 The impact of taxes on capital investment analysis is covered in advanced accounting textbooks.

Exhibit 4

Net Present Value Analysis—Unequal Lives of Proposals

	A	B	C	D
1		Truck		
2	Year	Present	Net	Present
3		Value of	Cash	Value of
4		$1 at 10%	Flow	Net Cash Flow
5	1	0.909	$ 30,000	$ 27,270
6	2	0.826	30,000	24,780
7	3	0.751	25,000	18,775
8	4	0.683	20,000	13,660
9	5	0.621	15,000	9,315
10	6	0.564	15,000	8,460
11	7	0.513	10,000	5,130
12	8	0.467	10,000	4,670
13	Total		$155,000	$112,060
14				
15	Amount to be invested			100,000
16	Net present value			$ 12,060

	A	B	C	D
1		Computer Network		
2	Year	Present	Net	Present
3		Value of	Cash	Value of
4		$1 at 10%	Flow	Net Cash Flow
5	1	0.909	$ 30,000	$ 27,270
6	2	0.826	30,000	24,780
7	3	0.751	30,000	22,530
8	4	0.683	30,000	20,490
9	5	0.621	35,000	21,735
10	Total		$155,000	$116,805
11				
12	Amount to be invested			100,000
13	Net present value			$ 16,805

Exhibit 5

Net Present Value Analysis—Equalized Lives of Proposals

	A	B	C	D
1		Truck—Revised to 5-Year Life		
2	Year	Present	Net	Present
3		Value of	Cash	Value of
4		$1 at 10%	Flow	Net Cash Flow
5	1	0.909	$ 30,000	$ 27,270
6	2	0.826	30,000	24,780
7	3	0.751	25,000	18,775
8	4	0.683	20,000	13,660
9	5	0.621	15,000	9,315
10	5 (Residual			
11	value)	0.621	40,000	24,840
12	Total		$160,000	$118,640
13				
14	Amount to be invested			100,000
15	Net present value			$ 18,640

Truck Net Present Value Greater than Computer Network Net Present Value by $1,835

of five years. The selling price (residual value) of the truck at the end of five years is estimated and included in the cash inflows. Both proposals will then cover five years; thus, the net present value analyses will be comparable.

To illustrate, assume that the truck's estimated selling price (residual value) at the end of Year 5 is $40,000. Exhibit 5 shows the truck's revised present value analysis assuming a five-year life.

As shown in Exhibit 5, the net present value for the truck exceeds the net present value for the computer network by $1,835 ($18,640 − $16,805). Thus, the truck is the more attractive of the two proposals.

Example Exercise 10-5 Net Present Value—Unequal Lives 4

Project 1 requires an original investment of $50,000. The project will yield cash flows of $12,000 per year for seven years. Project 2 has a calculated net present value of $8,900 over a five-year life. Project 1 could be sold at the end of five years for a price of $30,000. (a) Determine the net present value of Project 1 over a five-year life with residual value, assuming a minimum rate of return of 12%. (b) Which project provides the greatest net present value?

Follow My Example 10-5

Project 1

a. Present value of $12,000 per year at 12% for 5 years	$43,260	[$12,000 × 3.605 (Exhibit 2, 12%, 5 years)]
Present value of $30,000 at 12% at the end of 5 years	17,010	[$30,000 × 0.567 (Exhibit 1, 12%, 5 years)]
Total present value of Project 1	$60,270	
Total cost of Project 1	50,000	
Net present value of Project 1	$10,270	

b. Project 1—$10,270 is greater than the net present value of Project 2, $8,900.

For Practice: PE 10-5A, PE 10-5B

Lease versus Capital Investment

Leasing fixed assets is common in many industries. For example, hospitals often lease medical equipment. Some advantages of leasing a fixed asset include the following:

1. The company has use of the fixed asset without spending large amounts of cash to purchase the asset.
2. The company eliminates the risk of owning an obsolete asset.
3. The company may deduct the annual lease payments for income tax purposes.

A disadvantage of leasing a fixed asset is that it is normally more costly than purchasing the asset. This is because the lessor (owner of the asset) includes in the rental price not only the costs of owning the asset, but also a profit.

The methods of evaluating capital investment proposals illustrated in this chapter can also be used to decide whether to lease or purchase a fixed asset.

Uncertainty

All capital investment analyses rely on factors that are uncertain. For example, estimates of revenues, expenses, and cash flows are uncertain. This is especially true for long-term capital investments. Errors in one or more of the estimates could lead to incorrect decisions. Methods that consider the impact of uncertainty on capital investment analysis are discussed in advanced accounting and finance textbooks.

Changes in Price Levels

Price levels normally change as the economy improves or deteriorates. General price levels often increase in a rapidly growing economy, which is called **inflation**. During such periods, the rate of return on an investment should exceed the rising price level. If this is not the case, the cash returned on the investment will be less than expected.

Price levels may also change for foreign investments. This occurs as currency exchange rates change. **Currency exchange rates** are the rates at which currency in another country can be exchanged for U.S. dollars.

If the amount of local dollars that can be exchanged for one U.S. dollar increases, then the local currency is said to be weakening to the dollar. When a company has an

investment in another country where the local currency is weakening, the return on the investment, as expressed in U.S. dollars, is adversely impacted. This is because the expected amount of local currency returned on the investment would purchase fewer U.S. dollars.[6]

Qualitative Considerations

Some benefits of capital investments are qualitative in nature and cannot be estimated in dollar terms. However, if a company does not consider qualitative considerations, an acceptable investment proposal could be rejected.

Some examples of qualitative considerations that may influence capital investment analysis include the impact of the investment proposal on the following:

IBM decided to develop molecular and atomic-level nanotechnology based more on its strategic market potential than on an economic analysis of cash flows.

1. Product quality
2. Manufacturing flexibility
3. Employee morale
4. Manufacturing productivity
5. Market (strategic) opportunities

Many qualitative factors, such as those listed above, may be as important, if not more important, than quantitative factors.

Integrity, Objectivity, and Ethics in Business

ASSUMPTION FUDGING

The results of any capital budgeting analysis depend on many subjective estimates, such as the cash flows, discount rate, time period, and total investment amount. The results of the analysis should be used to either support or reject a project. Capital budgeting should not be used to justify an assumed net present value. That is, the analyst should not work backwards, filling in assumed numbers that will produce the desired net present value. Such a reverse approach reduces the credibility of the entire process.

5 Diagram the capital rationing process.

Capital Rationing

Capital rationing is the process by which management allocates funds among competing capital investment proposals. In this process, management often uses a combination of the methods described in this chapter.

Exhibit 6 illustrates the capital rationing decision process. Alternative proposals are initially screened by establishing minimum standards using the cash payback and the average rate of return methods. The proposals that survive this screening are further analyzed, using the net present value and internal rate of return methods.

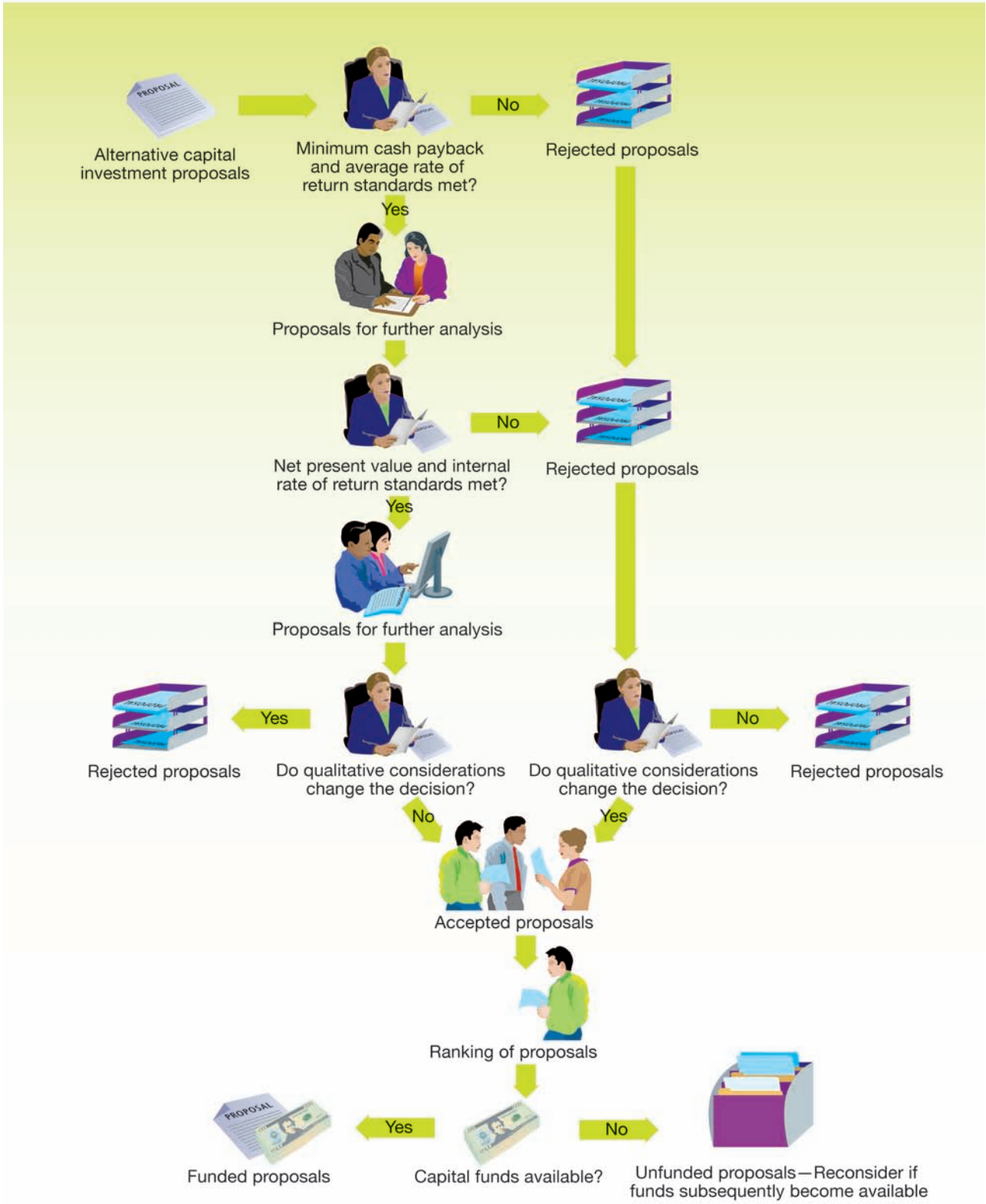
Qualitative factors related to each proposal should also be considered throughout the capital rationing process. For example, new equipment might improve the quality of the product and, thus, increase consumer satisfaction and sales.

At the end of the capital rationing process, accepted proposals are ranked and compared with the funds available. Proposals that are selected for funding are included in the capital expenditures budget. Unfunded proposals may be reconsidered if funds later become available.

6 Further discussion on accounting for foreign currency transactions is available on the companion Web site at www.cengage.com/accounting/warren.

Exhibit 6

Capital Rationing Decision Process



1 Explain the nature and importance of capital investment analysis.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Capital investment analysis is the process by which management plans, evaluates, and controls investments involving fixed assets. Capital investment analysis is important to a business because such investments affect profitability for a long period of time.	• Describe the purpose of capital investment analysis.		

2 Evaluate capital investment proposals using the average rate of return and cash payback methods.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The average rate of return method measures the expected profitability of an investment in fixed assets. The expected period of time that will pass between the date of an investment and the complete recovery in cash (or equivalent) of the amount invested is the cash payback period.	• Compute the average rate of return of a project.	**10-1**	10-1A, 10-1B
	• Compute the cash payback period of a project.	**10-2**	10-2A, 10-2B

3 Evaluate capital investment proposals using the net present value and internal rate of return methods.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The net present value method uses present values to compute the net present value of the cash flows expected from a proposal. The internal rate of return method uses present values to compute the rate of return from the net cash flows expected from capital investment proposals.	• Compute the net present value of a project.	**10-3**	10-3A, 10-3B
	• Compute the internal rate of return of a project.	**10-4**	10-4A, 10-4B

4 List and describe factors that complicate capital investment analysis.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Factors that may complicate capital investment analysis include the impact of income tax, unequal lives of alternative proposals, leasing, uncertainty, changes in price levels, and qualitative considerations.	• Describe the impact of income taxes in capital investment analysis.		
	• Evaluate projects with unequal lives.	**10-5**	10-5A, 10-5B
	• Describe leasing versus capital investment.		
	• Describe uncertainty, changes in price levels, and qualitative considerations in capital investment analysis.		

5 Diagram the capital rationing process.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Capital rationing refers to the process by which management allocates available investment funds among competing capital investment proposals. A diagram of the capital rationing process appears in Exhibit 6.	• Define *capital rationing.* • Diagram the capital rationing process.		

Key Terms

annuity (411)
average rate of return (407)
capital investment analysis (406)
capital rationing (421)
cash payback period (408)
currency exchange rate (420)
inflation (420)
internal rate of return (IRR) method (415)
net present value method (413)
present value concept (410)
present value index (414)
present value of an annuity (411)
time value of money concept (407)

Illustrative Problem

The capital investment committee of Hopewell Company is currently considering two investments. The estimated income from operations and net cash flows expected from each investment are as follows:

	Truck		Equipment	
Year	Income from Operations	Net Cash Flow	Income from Operations	Net Cash Flow
1	$ 6,000	$ 22,000	$13,000	$ 29,000
2	9,000	25,000	10,000	26,000
3	10,000	26,000	8,000	24,000
4	8,000	24,000	8,000	24,000
5	11,000	27,000	3,000	19,000
	$44,000	$124,000	$42,000	$122,000

Each investment requires $80,000. Straight-line depreciation will be used, and no residual value is expected. The committee has selected a rate of 15% for purposes of the net present value analysis.

Instructions

1. Compute the following:
   a. The average rate of return for each investment.
   b. The net present value for each investment. Use the present value of $1 table appearing in this chapter.
2. Why is the net present value of the equipment greater than the truck, even though its average rate of return is less?
3. Prepare a summary for the capital investment committee, advising it on the relative merits of the two investments.

Solution

1. a. Average rate of return for the truck:

$$\frac{\$44{,}000 \div 5}{(\$80{,}000 + \$0) \div 2} = 22\%$$

Average rate of return for the equipment:

$$\frac{\$42{,}000 \div 5}{(\$80{,}000 + \$0) \div 2} = 21\%$$

b. Net present value analysis:

Year	Present Value of $1 at 15%	Net Cash Flow		Present Value of Net Cash Flow	
		Truck	Equipment	Truck	Equipment
1	0.870	$ 22,000	$ 29,000	$19,140	$25,230
2	0.756	25,000	26,000	18,900	19,656
3	0.658	26,000	24,000	17,108	15,792
4	0.572	24,000	24,000	13,728	13,728
5	0.497	27,000	19,000	13,419	9,443
Total		$124,000	$122,000	$82,295	$83,849
Amount to be invested				80,000	80,000
Net present value				$ 2,295	$ 3,849

2. The equipment has a lower average rate of return than the truck because the equipment's total income from operations for the five years is $42,000, which is $2,000 less than the truck's. Even so, the net present value of the equipment is greater than that of the truck, because the equipment has higher cash flows in the early years.
3. Both investments exceed the selected rate established for the net present value analysis. The truck has a higher average rate of return, but the equipment offers a larger net present value. Thus, if only one of the two investments can be accepted, the equipment would be the more attractive.

Self-Examination Questions (Answers at End of Chapter)

1. Methods of evaluating capital investment proposals that ignore present value include:
   A. average rate of return.
   B. cash payback.
   C. both A and B.
   D. neither A nor B.
2. Management is considering a $100,000 investment in a project with a five-year life and no residual value. If the total income from the project is expected to be $60,000 and straight-line depreciation is used, the average rate of return is:
   A. 12%. C. 60%.
   B. 24%. D. 75%.
3. The expected period of time that will elapse between the date of a capital investment and the complete recovery of the amount of cash invested is called the:
   A. average rate of return period.
   B. cash payback period.
   C. net present value period.
   D. internal rate of return period.
4. A project that will cost $120,000 is estimated to generate cash flows of $25,000 per year for eight years. What is the net present value of the project, assuming an 11% required rate of return? (Use the present value tables in Appendix A.)
   A. ($38,214) C. $55,180
   B. $8,653 D. $75,000
5. A project is estimated to generate cash flows of $40,000 per year for 10 years. The cost of the project is $226,009. What is the internal rate of return for this project?
   A. 8% C. 12%
   B. 10% D. 14%

Eye Openers

1. What are the principal objections to the use of the average rate of return method in evaluating capital investment proposals?
2. Discuss the principal limitations of the cash payback method for evaluating capital investment proposals.
3. Why would the average rate of return differ from the internal rate of return on the same project?
4. What information does the cash payback period ignore that is included by the net present value method?
5. Your boss has suggested that a one-year payback period is the same as a 100% average rate of return. Do you agree?
6. Why would the cash payback method understate the attractiveness of a project with a large residual value?
7. Why would the use of the cash payback period for analyzing the financial performance of theatrical releases from a motion picture production studio be supported over the net present value method?
8. A net present value analysis used to evaluate a proposed equipment acquisition indicated a $7,900 net present value. What is the meaning of the $7,900 as it relates to the desirability of the proposal?
9. Two projects have an identical net present value of $9,000. Are both projects equal in desirability?
10. What are the major disadvantages of the use of the net present value method of analyzing capital investment proposals?
11. What are the major disadvantages of the use of the internal rate of return method of analyzing capital investment proposals?
12. What provision of the Internal Revenue Code is especially important to consider in analyzing capital investment proposals?
13. What method can be used to place two capital investment proposals with unequal useful lives on a comparable basis?
14. What are the major advantages of leasing a fixed asset rather than purchasing it?
15. Give an example of a qualitative factor that should be considered in a capital investment analysis related to acquiring automated factory equipment.

16. Monsanto Company, a large chemical and fibers company, invested $37 million in state-of-the-art systems to improve process control, laboratory automation, and local area network (LAN) communications. The investment was not justified merely on cost savings but was also justified on the basis of qualitative considerations. Monsanto management viewed the investment as a critical element toward achieving its vision of the future. What qualitative and quantitative considerations do you believe Monsanto would have considered in its strategic evaluation of these investments?

Practice Exercises

PE 10-1A
Average rate of return
obj. 2
EE 10-1 p. 408

Determine the average rate of return for a project that is estimated to yield total income of $36,000 over three years, has a cost of $65,000, and has a $15,000 residual value. Round to one decimal place.

PE 10-1B
Average rate of return
obj. 2
EE 10-1 p. 408

Determine the average rate of return for a project that is estimated to yield total income of $136,000 over five years, has a cost of $380,000, and has a $20,000 residual value. Round to one decimal place.

PE 10-2A
Cash payback period
obj. 2
EE 10-2 p. 409

A project has estimated annual net cash flows of $8,400. It is estimated to cost $37,800. Determine the cash payback period. Round to one decimal place.

PE 10-2B
Cash payback period
obj. 2
EE 10-2 p. 409

A project has estimated annual net cash flows of $114,000. It is estimated to cost $706,800. Determine the cash payback period. Round to one decimal place.

PE 10-3A
Net present value
obj. 3
EE 10-3 p. 415

A project has estimated annual net cash flows of $9,000 for four years and is estimated to cost $30,050. Assume a minimum acceptable rate of return of 10%. Using Exhibit 2, determine (1) the net present value of the project and (2) the present value index, rounded to two decimal places.

PE 10-3B
Net present value
obj. 3
EE 10-3 p. 415

A project has estimated annual net cash flows of $82,000 for five years and is estimated to cost $259,000. Assume a minimum acceptable rate of return of 12%. Using Exhibit 2, determine (1) the net present value of the project and (2) the present value index, rounded to two decimal places.

PE 10-4A
Internal rate of return
obj. 3
EE 10-4 p. 418

A project is estimated to cost $427,779 and provide annual net cash flows of $87,000 for six years. Determine the internal rate of return for this project, using Exhibit 2.

PE 10-4B
Internal rate of return
obj. 3
EE 10-4 p. 418

A project is estimated to cost $56,434 and provide annual net cash flows of $14,000 for nine years. Determine the internal rate of return for this project, using Exhibit 2.

PE 10-5A
Net present value—unequal lives
obj. 4
EE 10-5 p. 420

Project 1 requires an original investment of $10,000. The project will yield cash flows of $3,000 per year for seven years. Project 2 has a calculated net present value of $2,500 over a four-year life. Project 1 could be sold at the end of four years for a price of $9,000. (a) Determine the net present value of Project 1 over a four-year life with residual value, assuming a minimum rate of return of 20%. (b) Which project provides the greatest net present value?

PE 10-5B
Net present value—unequal lives
obj. 4
EE 10-5 p. 420

Project A requires an original investment of $125,000. The project will yield cash flows of $24,000 per year for nine years. Project B has a calculated net present value of $2,400 over a six-year life. Project A could be sold at the end of six years for a price of $60,000. (a) Determine the net present value of Project A over a six-year life with residual value, assuming a minimum rate of return of 12%. (b) Which project provides the greatest net present value?

Exercises

EX 10-1
Average rate of return

obj. 2

✔ Testing equipment, 5.5%

The following data are accumulated by Eco-Labs, Inc. in evaluating two competing capital investment proposals:

	Testing Equipment	Vehicle
Amount of investment	$80,000	$28,000
Useful life	6 years	8 years
Estimated residual value	0	0
Estimated total income over the useful life	$13,200	$14,000

Determine the expected average rate of return for each proposal. Round to one decimal place.

EX 10-2
Average rate of return—cost savings

obj. 2

Master Fab Inc. is considering an investment in equipment that will replace direct labor. The equipment has a cost of $115,000 with a $10,000 residual value and a 10-year life. The equipment will replace one employee who has an average wage of $26,000 per year. In addition, the equipment will have operating and energy costs of $5,500 per year.

Determine the average rate of return on the equipment, giving effect to straight-line depreciation on the investment.

EX 10-3
Average rate of return—new product

obj. 2

✔ Average annual income, $138,000

Pocket Pilot Inc. is considering an investment in new equipment that will be used to manufacture a mobile communications device. The device is expected to generate additional annual sales of 6,000 units at $280 per unit. The equipment has a cost of $640,000, residual value of $50,000, and an eight-year life. The equipment can only be used to manufacture the device. The cost to manufacture the device is shown below.

Cost per unit:	
Direct labor	$ 45.00
Direct materials	180.00
Factory overhead (including depreciation)	32.00
Total cost per unit	$257.00

Determine the average rate of return on the equipment.

EX 10-4
Calculate cash flows

obj. 2

Year 1: ($102,900)

Out of Eden, Inc. is planning to invest in new manufacturing equipment to make a new garden tool. The new garden tool is expected to generate additional annual sales of 9,000 units at $42 each. The new manufacturing equipment will cost $156,000 and is expected to have a 10-year life and $12,000 residual value. Selling expenses related to the new product are expected to be 5% of sales revenue. The cost to manufacture the product includes the following on a per-unit basis:

Direct labor	$ 7.00
Direct materials	23.40
Fixed factory overhead—depreciation	1.60
Variable factory overhead	3.60
Total	$35.60

Determine the net cash flows for the first year of the project, Years 2–9, and for the last year of the project.

EX 10-5
Cash payback period

obj. 2

✔ Location 1: 6 years

Primera Banco is evaluating two capital investment proposals for a drive-up ATM kiosk, each requiring an investment of $360,000 and each with an eight-year life and expected total net cash flows of $480,000. Location 1 is expected to provide equal annual net cash flows of $60,000, and Location 2 is expected to have the following unequal annual net cash flows:

Year 1	$120,000	Year 5	$30,000
Year 2	90,000	Year 6	30,000
Year 3	75,000	Year 7	30,000
Year 4	75,000	Year 8	30,000

Determine the cash payback period for both location proposals.

EX 10-6
Cash payback method

obj. 2

✔ a. Liquid Soap: 3 years

Gentle Care Products Company is considering an investment in one of two new product lines. The investment required for either product line is $500,000. The net cash flows associated with each product are as follows:

Year	Liquid Soap	Body Lotion
1	$190,000	$100,000
2	180,000	100,000
3	130,000	100,000
4	110,000	100,000
5	80,000	100,000
6	50,000	100,000
7	30,000	100,000
8	30,000	100,000
Total	$800,000	$800,000

a. Recommend a product offering to Gentle Care Products Company, based on the cash payback period for each product line.
b. Why is one product line preferred over the other, even though they both have the same total net cash flows through eight periods?

EX 10-7
Net present value method

obj. 3

✔ a. NPV, $27,370

The following data are accumulated by Reynolds Company in evaluating the purchase of $104,000 of equipment, having a four-year useful life:

	Net Income	Net Cash Flow
Year 1	$38,000	$64,000
Year 2	23,000	49,000
Year 3	11,000	37,000
Year 4	(1,000)	25,000

a. Assuming that the desired rate of return is 15%, determine the net present value for the proposal. Use the table of the present value of $1 appearing in Exhibit 1 of this chapter.
b. Would management be likely to look with favor on the proposal? Explain.

EX 10-8
Net present value method

obj. 3

✔ a. 2011, $11,000

Rapid Delivery, Inc. is considering the purchase of an additional delivery vehicle for $38,000 on January 1, 2010. The truck is expected to have a five-year life with an expected residual value of $5,000 at the end of five years. The expected additional revenues from the added delivery capacity are anticipated to be $60,000 per year for each of the next five years. A driver will cost $43,000 in 2010, with an expected annual salary increase of $2,000 for each year thereafter. The insurance for the truck is estimated to cost $4,000 per year.

a. Determine the expected annual net cash flows from the delivery truck investment for 2010–2014.
b. Calculate the net present value of the investment, assuming that the minimum desired rate of return is 12%. Use the present value of $1 table appearing in Exhibit 1 of this chapter.
c. Is the additional truck a good investment based on your analysis?

EX 10-9
Net present value method—annuity

obj. 3

a. $24 million

Hideaway Hotels is considering the construction of a new hotel for $150 million. The expected life of the hotel is 30 years with no residual value. The hotel is expected to earn revenues of $44 million per year. Total expenses, including depreciation, are expected to be $25 million per year. Hideaway management has set a minimum acceptable rate of return of 14%.

a. Determine the equal annual net cash flows from operating the hotel.
b. Calculate the net present value of the new hotel using the present value of an annuity of $1 table found in Appendix A. Round to the nearest million dollars.
c. Does your analysis support construction of the new hotel?

EX 10-10
Net present value method—annuity

obj. 3

✔ a. $69,000

E & T Excavation Company is planning an investment of $245,000 for a bulldozer. The bulldozer is expected to operate for 1,500 hours per year for five years. Customers will be charged $130 per hour for bulldozer work. The bulldozer operator costs $32 per hour in wages and benefits. The bulldozer is expected to require annual maintenance costing $15,000. The bulldozer uses fuel that is expected to cost $42 per hour of bulldozer operation.

a. Determine the equal annual net cash flows from operating the bulldozer.
b. Determine the net present value of the investment, assuming that the desired rate of return is 10%. Use the table of present values of an annuity of $1 in the chapter. Round to the nearest dollar.
c. Should E & T invest in the bulldozer, based on this analysis?

EX 10-11
Net present value method

obj. 3

✔ a. $288,800,000

Carnival Corporation has recently placed into service some of the largest cruise ships in the world. One of these ships, the *Carnival Dream*, can hold up to 3,600 passengers and cost $750 million to build. Assume the following additional information:

- There will be 300 cruise days per year operated at a full capacity of 3,600 passengers.
- The variable expenses per passenger are estimated to be $90 per cruise day.
- The revenue per passenger is expected to be $450 per cruise day.
- The fixed expenses for running the ship, other than depreciation, are estimated to be $100,000,000 per year.
- The ship has a service life of 10 years, with a residual value of $120,000,000 at the end of 10 years.

a. Determine the annual net cash flow from operating the cruise ship.
b. Determine the net present value of this investment, assuming a 12% minimum rate of return. Use the present value tables provided in the chapter in determining your answer.

EX 10-12
Present value index

obj. 3

✔ Location A, 1.07

Hot on the Spot Doughnuts has computed the net present value for capital expenditure locations A and B, using the net present value method. Relevant data related to the computation are as follows:

	Location A	Location B
Total present value of net cash flow	$371,290	$396,096
Amount to be invested	347,000	412,600
Net present value	$ (24,290)	$ (16,504)

Determine the present value index for each proposal.

EX 10-13
Net present value method and present value index

obj. 3

✔ b. Packing Machine, 1.18

MVP Sports Equipment Company is considering an investment in one of two machines. The sewing machine will increase productivity from sewing 150 baseballs per hour to sewing 270 per hour. The contribution margin is $0.48 per baseball. Assume that any increased production of baseballs can be sold. The second machine is an automatic packing machine for the golf ball line. The packing machine will reduce packing labor cost. The labor cost saved is equivalent to $26 per hour. The sewing machine will cost $384,600, have an eight-year life, and will operate for 1,700 hours per year. The packing machine will cost $157,900, have an eight-year life, and will operate for 1,600 hours per year. MVP seeks a minimum rate of return of 15% on its investments.

a. Determine the net present value for the two machines. Use the table of present values of an annuity of $1 in the chapter. Round to the nearest dollar.
b. Determine the present value index for the two machines. Round to two decimal places.
c. If MVP has sufficient funds for only one of the machines and qualitative factors are equal between the two machines, in which machine should it invest?

EX 10-14
Average rate of return, cash payback period, net present value method

objs. 2, 3

✔ b. 4 years

Great Plains Transportation Inc. is considering acquiring equipment at a cost of $246,000. The equipment has an estimated life of 10 years and no residual value. It is expected to provide yearly net cash flows of $61,500. The company's minimum desired rate of return for net present value analysis is 10%.

Compute the following:

a. The average rate of return, giving effect to straight-line depreciation on the investment.
b. The cash payback period.
c. The net present value. Use the table of the present value of an annuity of $1 appearing in this chapter. Round to the nearest dollar.

EX 10-15
Payback period, net present value analysis, and qualitative considerations

objs. 2, 3, 4

✔ a. 4 years

The plant manager of Shannon Electronics Company is considering the purchase of new automated assembly equipment. The new equipment will cost $2,400,000. The manager believes that the new investment will result in direct labor savings of $600,000 per year for 10 years.

a. What is the payback period on this project?
b. What is the net present value, assuming a 10% rate of return?
c. What else should the manager consider in the analysis?

EX 10-16
Internal rate of return method

obj. 3

✔ a. 3.326

The internal rate of return method is used by Carlisle Construction Co. in analyzing a capital expenditure proposal that involves an investment of $49,890 and annual net cash flows of $15,000 for each of the six years of its useful life.

a. Determine a present value factor for an annuity of $1 which can be used in determining the internal rate of return.
b. Using the factor determined in part (a) and the present value of an annuity of $1 table appearing in this chapter, determine the internal rate of return for the proposal.

EX 10-17
Internal rate of return method

obj. 3

The Canyons Resort, a Utah ski resort, recently announced a $400 million expansion to lodging properties, lifts, and terrain. Assume that this investment is estimated to produce $95.42 million in equal annual cash flows for each of the first 10 years of the project life.

Determine the expected internal rate of return of this project for 10 years, using the present value of an annuity of $1 table found in Exhibit 2.

EX 10-18
Internal rate of return method—two projects

obj. 3

✔ a. Delivery truck, 15%

Cousin's Salted Snack Company is considering two possible investments: a delivery truck or a bagging machine. The delivery truck would cost $39,287 and could be used to deliver an additional 48,200 bags of taquitos chips per year. Each bag of chips can be sold for a contribution margin of $0.42. The delivery truck operating expenses, excluding depreciation, are $0.60 per mile for 18,000 miles per year. The bagging machine would replace an old bagging machine, and its net investment cost would be $65,718. The new machine would require three fewer hours of direct labor per day. Direct labor is $18 per hour. There are 250 operating days in the year. Both the truck and the bagging machine are estimated to have seven-year lives. The minimum rate of return is 13%. However, Cousin's has funds to invest in only one of the projects.

a. Compute the internal rate of return for each investment. Use the table of present values of an annuity of $1 in the chapter.
b. Provide a memo to management with a recommendation.

EX 10-19
Net present value method and internal rate of return method

obj. 3

✔ a. ($10,582)

Buckeye Healthcare Corp. is proposing to spend $109,296 on an eight-year project that has estimated net cash flows of $22,000 for each of the eight years.

a. Compute the net present value, using a rate of return of 15%. Use the table of present values of an annuity of $1 in the chapter.
b. Based on the analysis prepared in part (a), is the rate of return (1) more than 15%, (2) 15%, or (3) less than 15%? Explain.
c. Determine the internal rate of return by computing a present value factor for an annuity of $1 and using the table of the present value of an annuity of $1 presented in the text.

EX 10-20
Identify error in capital investment analysis calculations

obj. 3

Horizon Solutions Inc. is considering the purchase of automated machinery that is expected to have a useful life of five years and no residual value. The average rate of return on the average investment has been computed to be 20%, and the cash payback period was computed to be 5.5 years.

Do you see any reason to question the validity of the data presented? Explain.

EX 10-21
Net present value—unequal lives

objs. 3, 4

✔ Net present value, Apartment Complex, $24,530

Lordsland Development Company has two competing projects: an apartment complex and an office building. Both projects have an initial investment of $720,000. The net cash flows estimated for the two projects are as follows:

	Net Cash Flow	
Year	Apartment Complex	Office Building
1	$225,000	$290,000
2	200,000	290,000
3	200,000	230,000
4	140,000	220,000
5	140,000	
6	105,000	
7	80,000	
8	50,000	

The estimated residual value of the apartment complex at the end of Year 4 is $325,000.

Determine which project should be favored, comparing the net present values of the two projects and assuming a minimum rate of return of 15%. Use the table of present values in the chapter.

EX 10-22
Net present value—unequal lives

objs. 3, 4

Al a Mode, Inc. is considering one of two investment options. Option 1 is a $40,000 investment in new blending equipment that is expected to produce equal annual cash flows of $12,000 for each of seven years. Option 2 is a $45,000 investment in a new computer system that is expected to produce equal annual cash flows of $15,500 for each of five years. The residual value of the blending equipment at the end of the fifth year is estimated to be $8,000. The computer system has no expected residual value at the end of the fifth year.

Assume there is sufficient capital to fund only one of the projects. Determine which project should be selected, comparing the (a) net present values and (b) present value indices of the two projects, assuming a minimum rate of return of 10%. Round the present value index to two decimal places. Use the table of present values in the chapter.

Problems Series A

PR 10-1A
Average rate of return method, net present value method, and analysis

objs. 2, 3

✔ 1.a. 17.5%

The capital investment committee of Cross Continent Trucking Inc. is considering two investment projects. The estimated income from operations and net cash flows from each investment are as follows:

	Warehouse		Tracking Technology	
Year	Income from Operations	Net Cash Flow	Income from Operations	Net Cash Flow
1	$ 42,000	$138,000	$ 89,000	$185,000
2	42,000	138,000	69,000	165,000
3	42,000	138,000	34,000	130,000
4	42,000	138,000	14,000	110,000
5	42,000	138,000	4,000	100,000
Total	$210,000	$690,000	$210,000	$690,000

Each project requires an investment of $480,000. Straight-line depreciation will be used, and no residual value is expected. The committee has selected a rate of 15% for purposes of the net present value analysis.

Instructions

1. Compute the following:
   a. The average rate of return for each investment. Round to one decimal place.
   b. The net present value for each investment. Use the present value of $1 table appearing in this chapter.
2. Prepare a brief report for the capital investment committee, advising it on the relative merits of the two projects.

PR 10-2A
Cash payback period, net present value method, and analysis

objs. 2, 3

✔ 1. b. Home & Garden, $127,158

At Home Publications Inc. is considering two new magazine products. The estimated net cash flows from each product are as follows:

Year	Home & Garden	Music Beat
1	$150,000	$125,000
2	120,000	145,000
3	105,000	100,000
4	84,000	70,000
5	41,000	60,000
Total	$500,000	$500,000

Each product requires an investment of $270,000. A rate of 10% has been selected for the net present value analysis.

Instructions

1. Compute the following for each product:
   a. Cash payback period.
   b. The net present value. Use the present value of $1 table appearing in this chapter.
2. Prepare a brief report advising management on the relative merits of each of the two products.

PR 10-3A
Net present value method, present value index, and analysis

obj. 3

✔ 2. Branch office expansion, 1.07

United Bankshores, Inc. wishes to evaluate three capital investment projects by using the net present value method. Relevant data related to the projects are summarized as follows:

	Branch Office Expansion	Computer System Upgrade	Install Internet Bill-Pay
Amount to be invested	$700,000	$475,000	$280,000
Annual net cash flows:			
Year 1	350,000	250,000	160,000
Year 2	325,000	225,000	110,000
Year 3	300,000	200,000	80,000

Instructions

1. Assuming that the desired rate of return is 15%, prepare a net present value analysis for each project. Use the present value of $1 table appearing in this chapter.
2. Determine a present value index for each project. Round to two decimal places.
3. Which project offers the largest amount of present value per dollar of investment? Explain.

PR 10-4A
Net present value method, internal rate of return method, and analysis

obj. 3

✔ 1. a. Radio station, $110,250

The management of Quest Media Inc. is considering two capital investment projects. The estimated net cash flows from each project are as follows:

Year	Radio Station	TV Station
1	$350,000	$700,000
2	350,000	700,000
3	350,000	700,000
4	350,000	700,000

The radio station requires an investment of $999,250, while the TV station requires an investment of $2,125,900. No residual value is expected from either project.

Instructions

1. Compute the following for each project:
   a. The net present value. Use a rate of 10% and the present value of an annuity of $1 table appearing in this chapter.
   b. A present value index. Round to two decimal places.
2. Determine the internal rate of return for each project by (a) computing a present value factor for an annuity of $1 and (b) using the present value of an annuity of $1 table appearing in this chapter.
3. What advantage does the internal rate of return method have over the net present value method in comparing projects?

PR 10-5A
Evaluate alternative capital investment decisions

objs. 3, 4

✔ 1. Site B, $159,920

The investment committee of Grid Iron Restaurants Inc. is evaluating two restaurant sites. The sites have different useful lives, but each requires an investment of $565,000. The estimated net cash flows from each site are as follows:

	Net Cash Flows	
Year	Site A	Site B
1	$225,000	$280,000
2	225,000	280,000
3	225,000	280,000
4	225,000	280,000
5	225,000	
6	225,000	

The committee has selected a rate of 20% for purposes of net present value analysis. It also estimates that the residual value at the end of each restaurant's useful life is $0, but at the end of the fourth year, Site A's residual value would be $290,000.

Instructions

1. For each site, compute the net present value. Use the present value of an annuity of $1 table appearing in this chapter. (Ignore the unequal lives of the projects.)
2. For each site, compute the net present value, assuming that Site A is adjusted to a four-year life for purposes of analysis. Use the present value of $1 table appearing in this chapter.
3. Prepare a report to the investment committee, providing your advice on the relative merits of the two sites.

PR 10-6A
Capital rationing decision involving four proposals

objs. 2, 3, 5

✔ 5. Proposal B, 1.26

Grant Communications Inc. is considering allocating a limited amount of capital investment funds among four proposals. The amount of proposed investment, estimated income from operations, and net cash flow for each proposal are as follows:

	Investment	Year	Income from Operations	Net Cash Flow
Proposal A:	$425,000	1	$ 40,000	$ 125,000
		2	40,000	125,000
		3	40,000	125,000
		4	15,000	100,000
		5	(35,000)	50,000
			$100,000	$ 525,000
Proposal B:	$610,000	1	$158,000	$ 280,000
		2	158,000	280,000
		3	78,000	200,000
		4	28,000	150,000
		5	(22,000)	100,000
			$400,000	$1,010,000
Proposal C:	$275,000	1	$ 45,000	$ 100,000
		2	45,000	100,000
		3	45,000	100,000
		4	45,000	100,000
		5	35,000	90,000
			$215,000	$ 490,000

(continued)

	Investment	Year	Income from Operations	Net Cash Flow
Proposal D:	$190,000	1	$22,000	$ 60,000
		2	22,000	60,000
		3	22,000	60,000
		4	2,000	40,000
		5	2,000	40,000
			$70,000	$260,000

The company's capital rationing policy requires a maximum cash payback period of three years. In addition, a minimum average rate of return of 12% is required on all projects. If the preceding standards are met, the net present value method and present value indexes are used to rank the remaining proposals.

Instructions

1. Compute the cash payback period for each of the four proposals.
2. Giving effect to straight-line depreciation on the investments and assuming no estimated residual value, compute the average rate of return for each of the four proposals. Round to one decimal place.
3. Using the following format, summarize the results of your computations in parts (1) and (2). By placing the calculated amounts in the first two columns on the left and by placing a check mark in the appropriate column to the right, indicate which proposals should be accepted for further analysis and which should be rejected.

Proposal	Cash Payback Period	Average Rate of Return	Accept for Further Analysis	Reject
A				
B				
C				
D				

4. For the proposals accepted for further analysis in part (3), compute the net present value. Use a rate of 12% and the present value of $1 table appearing in this chapter. Round to the nearest dollar.
5. Compute the present value index for each of the proposals in part (4). Round to two decimal places.
6. Rank the proposals from most attractive to least attractive, based on the present values of net cash flows computed in part (4).
7. Rank the proposals from most attractive to least attractive, based on the present value indexes computed in part (5). Round to two decimal places.
8. Based on the analyses, comment on the relative attractiveness of the proposals ranked in parts (6) and (7).

Problems Series B

PR 10-1B
Average rate of return method, net present value method, and analysis

objs. 2, 3

✔ 1. a. 60%

The capital investment committee of Windsor Landscaping Company is considering two capital investments. The estimated income from operations and net cash flows from each investment are as follows:

	Greenhouse		Skid Loader	
Year	Income from Operations	Net Cash Flow	Income from Operations	Net Cash Flow
1	$ 27,000	$ 45,000	$ 47,000	$ 65,000
2	27,000	45,000	32,000	50,000
3	27,000	45,000	24,000	42,000
4	27,000	45,000	17,000	35,000
5	27,000	45,000	15,000	33,000
	$135,000	$225,000	$135,000	$225,000

Each project requires an investment of $90,000. Straight-line depreciation will be used, and no residual value is expected. The committee has selected a rate of 12% for purposes of the net present value analysis.

Instructions

1. Compute the following:
   a. The average rate of return for each investment.
   b. The net present value for each investment. Use the present value of $1 table appearing in this chapter.
2. Prepare a brief report for the capital investment committee, advising it on the relative merits of the two investments.

PR 10-2B
Cash payback period, net present value method, and analysis

objs. 2, 3

✔ 1. b. Plant Expansion, $11,100

Be You Apparel Inc. is considering two investment projects. The estimated net cash flows from each project are as follows:

Year	Plant Expansion	Retail Store Expansion
1	$170,000	$200,000
2	170,000	160,000
3	140,000	120,000
4	110,000	120,000
5	120,000	110,000
Total	$710,000	$710,000

Each project requires an investment of $480,000. A rate of 15% has been selected for the net present value analysis.

Instructions

1. Compute the following for each product:
   a. Cash payback period.
   b. The net present value. Use the present value of $1 table appearing in this chapter.
2. Prepare a brief report advising management on the relative merits of each project.

PR 10-3B
Net present value method, present value index, and analysis

obj. 3

✔ 2. Railcars, 1.17

Atlantic Coast Railroad Company wishes to evaluate three capital investment proposals by using the net present value method. Relevant data related to the proposals are summarized as follows:

	New Maintenance Yard	Acquire Railcars	Route Expansion
Amount to be invested	$14,000,000	$45,000,000	$25,000,000
Annual net cash flows:			
Year 1	7,400,000	32,000,000	18,500,000
Year 2	6,000,000	24,500,000	14,500,000
Year 3	5,500,000	15,800,000	10,800,000

Instructions

1. Assuming that the desired rate of return is 20%, prepare a net present value analysis for each proposal. Use the present value of $1 table appearing in this chapter.
2. Determine a present value index for each proposal. Round to two decimal places.
3. Which proposal offers the largest amount of present value per dollar of investment? Explain.

PR 10-4B
Net present value method, internal rate of return method, and analysis

obj. 3

✔ 1. a. Generating unit, $248,240

The management of Mid South Utilities Inc. is considering two capital investment projects. The estimated net cash flows from each project are as follows:

Year	Generating Unit	Distribution Network Expansion
1	$580,000	$210,000
2	580,000	210,000
3	580,000	210,000
4	580,000	210,000

The generating unit requires an investment of $1,761,460, while the distribution network expansion requires an investment of $665,700. No residual value is expected from either project.

Instructions

1. Compute the following for each project:
   a. The net present value. Use a rate of 6% and the present value of an annuity of $1 table appearing in this chapter.
   b. A present value index. Round to two decimal places.
2. Determine the internal rate of return for each project by (a) computing a present value factor for an annuity of $1 and (b) using the present value of an annuity of $1 table appearing in this chapter.
3. What advantage does the internal rate of return method have over the net present value method in comparing projects?

PR 10-5B
Evaluate alternative capital investment decisions

objs. 3, 4

✔ 1. Project II, $79,625

The investment committee of Reliant Insurance Co. is evaluating two projects. The projects have different useful lives, but each requires an investment of $300,000. The estimated net cash flows from each project are as follows:

	Net Cash Flows	
Year	Project I	Project II
1	$90,000	$125,000
2	90,000	125,000
3	90,000	125,000
4	90,000	125,000
5	90,000	
6	90,000	

The committee has selected a rate of 12% for purposes of net present value analysis. It also estimates that the residual value at the end of each project's useful life is $0, but at the end of the fourth year, Project I's residual value would be $175,000.

Instructions

1. For each project, compute the net present value. Use the present value of an annuity of $1 table appearing in this chapter. (Ignore the unequal lives of the projects.)
2. For each project, compute the net present value, assuming that Project I is adjusted to a four-year life for purposes of analysis. Use the present value of $1 table appearing in this chapter.
3. Prepare a report to the investment committee, providing your advice on the relative merits of the two projects.

PR 10-6B
Capital rationing decision involving four proposals

objs. 2, 3, 5

✔ 5. Proposal B, 1.15

Empire Capital Group is considering allocating a limited amount of capital investment funds among four proposals. The amount of proposed investment, estimated income from operations, and net cash flow for each proposal are as follows:

	Investment	Year	Income from Operations	Net Cash Flow
Proposal A:	$420,000	1	$ 86,000	$ 170,000
		2	46,000	130,000
		3	16,000	100,000
		4	(4,000)	80,000
		5	(4,000)	80,000
			$140,000	$ 560,000
Proposal B:	$850,000	1	$130,000	$ 300,000
		2	130,000	300,000
		3	130,000	300,000
		4	130,000	300,000
		5	80,000	250,000
			$600,000	$1,450,000
Proposal C:	$250,000	1	$ 20,000	$ 70,000
		2	20,000	70,000
		3	20,000	70,000
		4	(10,000)	40,000
		5	(10,000)	40,000
			$ 40,000	$ 290,000

(continued)

	Investment	Year	Income from Operations	Net Cash Flow
Proposal D:	$180,000	1	$ 54,000	$ 90,000
		2	24,000	60,000
		3	24,000	60,000
		4	14,000	50,000
		5	14,000	50,000
			$130,000	$310,000

The company's capital rationing policy requires a maximum cash payback period of three years. In addition, a minimum average rate of return of 12% is required on all projects. If the preceding standards are met, the net present value method and present value indexes are used to rank the remaining proposals.

Instructions

1. Compute the cash payback period for each of the four proposals.
2. Giving effect to straight-line depreciation on the investments and assuming no estimated residual value, compute the average rate of return for each of the four proposals. Round to one decimal place.
3. Using the following format, summarize the results of your computations in parts (1) and (2). By placing the calculated amounts in the first two columns on the left and by placing a check mark in the appropriate column to the right, indicate which proposals should be accepted for further analysis and which should be rejected.

Proposal	Cash Payback Period	Average Rate of Return	Accept for Further Analysis	Reject
A				
B				
C				
D				

4. For the proposals accepted for further analysis in part (3), compute the net present value. Use a rate of 15% and the present value of $1 table appearing in this chapter. Round to the nearest dollar.
5. Compute the present value index for each of the proposals in part (4). Round to two decimal places.
6. Rank the proposals from most attractive to least attractive, based on the present values of net cash flows computed in part (4).
7. Rank the proposals from most attractive to least attractive, based on the present value indexes computed in part (5).
8. Based on the analyses, comment on the relative attractiveness of the proposals ranked in parts (6) and (7).

Special Activities

SA 10-1
Ethics and professional conduct in business

Dawn Jeffries was recently hired as a cost analyst by Carenet Medical Supplies Inc. One of Dawn's first assignments was to perform a net present value analysis for a new warehouse. Dawn performed the analysis and calculated a present value index of 0.75. The plant manager, I. M. Madd, is very intent on purchasing the warehouse because he believes that more storage space is needed. I. M. Madd asks Dawn into his office and the following conversation takes place:

I. M.: Dawn, you're new here, aren't you?

Dawn: Yes, sir.

I. M.: Well, Dawn, let me tell you something. I'm not at all pleased with the capital investment analysis that you performed on this new warehouse. I need that warehouse for my production. If I don't get it, where am I going to place our output?

Dawn: Hopefully with the customer, sir.

I. M.: Now don't get smart with me.

Dawn: No, really, I was being serious. My analysis does not support constructing a new warehouse. The numbers don't lie, the warehouse does not meet our investment return targets. In fact, it seems to me that purchasing a warehouse does not add much value to the business. We need to be producing product to satisfy customer orders, not to fill a warehouse.

I. M.: Listen, you need to understand something. The headquarters people will not allow me to build the warehouse if the numbers don't add up. You know as well as I that many assumptions go into your net present value analysis. Why don't you relax some of your assumptions so that the financial savings will offset the cost?

Dawn: I'm willing to discuss my assumptions with you. Maybe I overlooked something.

I. M.: Good. Here's what I want you to do. I see in your analysis that you don't project greater sales as a result of the warehouse. It seems to me, if we can store more goods, then we will have more to sell. Thus, logically, a larger warehouse translates into more sales. If you incorporate this into your analysis, I think you'll see that the numbers will work out. Why don't you work it through and come back with a new analysis. I'm really counting on you on this one. Let's get off to a good start together and see if we can get this project accepted.

What is your advice to Dawn?

SA 10-2
Personal investment analysis

A Masters of Accountancy degree at Mid-State University would cost $10,000 for an additional fifth year of education beyond the bachelor's degree. Assume that all tuition is paid at the beginning of the year. A student considering this investment must evaluate the present value of cash flows from possessing a graduate degree versus holding only the undergraduate degree. Assume that the average student with an undergraduate degree is expected to earn an annual salary of $46,000 per year (assumed to be paid at the end of the year) for 10 years. Assume that the average student with a graduate Masters of Accountancy degree is expected to earn an annual salary of $57,000 per year (assumed to be paid at the end of the year) for nine years after graduation. Assume a minimum rate of return of 10%.

1. Determine the net present value of cash flows from an undergraduate degree. Use the present value tables provided in this chapter.
2. Determine the net present value of cash flows from a Masters of Accountancy degree, assuming no salary is earned during the graduate year of schooling.
3. What is the net advantage or disadvantage of pursuing a graduate degree under these assumptions?

SA 10-3
Changing prices

International Electronics Inc. invested $1,000,000 to build a plant in a foreign country. The labor and materials used in production are purchased locally. The plant expansion was estimated to produce an internal rate of return of 20% in U.S. dollar terms. Due to a currency crisis, the currency exchange rate between the local currency and the U.S. dollar doubled from two local units per U.S. dollar to four local units per U.S. dollar.

a. Assume that the plant produced and sold product in the local economy. Explain what impact this change in the currency exchange rate would have on the project's internal rate of return.
b. Assume that the plant produced product in the local economy but exported the product back to the United States for sale. Explain what impact the change in the currency exchange rate would have on the project's internal rate of return under this assumption.

SA 10-4
Qualitative issues in investment analysis

The following are some selected quotes from senior executives:

CEO, Worthington Industries *(a high technology steel company): "We try to find the best technology, stay ahead of the competition, and serve the customer. . . . We'll make any investment that will pay back quickly . . . but if it is something that we really see as a must down the road, payback is not going to be that important."*

Chairman of Amgen Inc. *(a biotech company): "You cannot really run the numbers, do net present value calculations, because the uncertainties are really gigantic . . . You decide on a project you want to run, and then you run the numbers [as a reality check on your assumptions]. Success in a business like this is much more dependent on tracking rather than on predicting,*

much more dependent on seeing results over time, tracking and adjusting and readjusting, much more dynamic, much more flexible."

Chief Financial Officer of Merck & Co., Inc. *(a pharmaceutical company): " . . . at the individual product level—the development of a successful new product requires on the order of $230 million in R&D, spread over more than a decade—discounted cash flow style analysis does not become a factor until development is near the point of manufacturing scale-up effort. Prior to that point, given the uncertainties associated with new product development, it would be lunacy in our business to decide that we know exactly what's going to happen to a product once it gets out."*

Explain the role of capital investment analysis for these companies.

SA 10-5
Net present value method

Metro-Goldwyn-Mayer Studios Inc. (MGM) is a major producer and distributor of theatrical and television filmed entertainment. Regarding theatrical films, MGM states, "Our feature films are exploited through a series of sequential domestic and international distribution channels, typically beginning with theatrical exhibition. Thereafter, feature films are first made available for home video generally six months after theatrical release; for pay television, one year after theatrical release; and for syndication, approximately three to five years after theatrical release."

Assume that MGM produces a film during early 2011 at a cost of $195 million, and releases it halfway through the year. During the last half of 2011, the film earns revenues of $235 million at the box office. The film requires $50 million of advertising during the release. One year later, by the end of 2012, the film is expected to earn MGM net cash flows from home video sales of $36 million. By the end of 2013, the film is expected to earn MGM $43 million from pay TV; and by the end of 2014, the film is expected to earn $12 million from syndication.

a. Determine the net present value of the film as of the beginning of 2011 if the desired rate of return is 20%. To simplify present value calculations, assume all annual net cash flows occur at the end of each year. Use the table of the present value of $1 appearing in Exhibit 1 of this chapter. Round to the nearest whole million dollars.
b. Under the assumptions provided here, is the film expected to be financially successful?

SA 10-6
Capital investment analysis

Internet Project

Group Project

In one group, find a local business, such as a copy shop, that rents time on desktop computers for an hourly rate. Determine the hourly rate. In the other group, determine the price of a mid-range desktop computer at **http://www.dell.com**. Combine this information from the two groups and perform a capital budgeting analysis. Assume that one student will use the computer for 40 hours per semester for the next three years. Also assume that the minimum rate of return is 10%. Use the interest tables in Appendix A in performing your analysis. (*Hint:* Use the appropriate present value factor for 5% compounded for six semiannual periods.)

Does your analysis support the student purchasing the computer?

Answers to Self-Examination Questions

1. **C** Methods of evaluating capital investment proposals that ignore the time value of money include the average rate of return method (answer A) and the cash payback method (answer B).
2. **B** The average rate of return is 24% (answer B), determined by dividing the expected average annual earnings by the average investment, as follows:

$$\frac{\$60{,}000/5}{[(\$100{,}000) + 0]/2} = 24\%$$

3. **B** Of the four methods of analyzing proposals for capital investments, the cash payback period (answer B) refers to the expected period of time required to recover the amount of cash to be invested. The average rate of return (answer A) is a measure of the anticipated profitability of a proposal. The net present value method (answer C) reduces the expected future net cash flows originating from a proposal to their present values. The internal rate of return method (answer D) uses present value concepts to compute the rate of return from the net cash flows expected from the investment.
4. **B** The net present value is determined as follows:

Present value of $25,000 for 8 years at 11% ($25,000 × 5.14612)	$128,653
Less project cost	120,000
Net present value	$ 8,653

5. **C** The internal rate of return for this project is determined by solving for the present value of an annuity factor that when multiplied by $40,000 will equal $226,009. By division, the factor is:

$$\frac{\$226,009}{\$40,000} = 5.65022$$

In Appendix A on pp. A-4 and A-5, scan along the $n = 10$ years row until finding the 5.65022 factor. The column for this factor is 12%.

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CHAPTER 11

Cost Allocation and Activity-Based Costing

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COLD STONE CREAMERY

Have you ever had to request service repairs on an appliance at your home? The repair person may arrive and take five minutes to replace a part. Yet, the bill may indicate a minimum charge for more than five minutes of work.

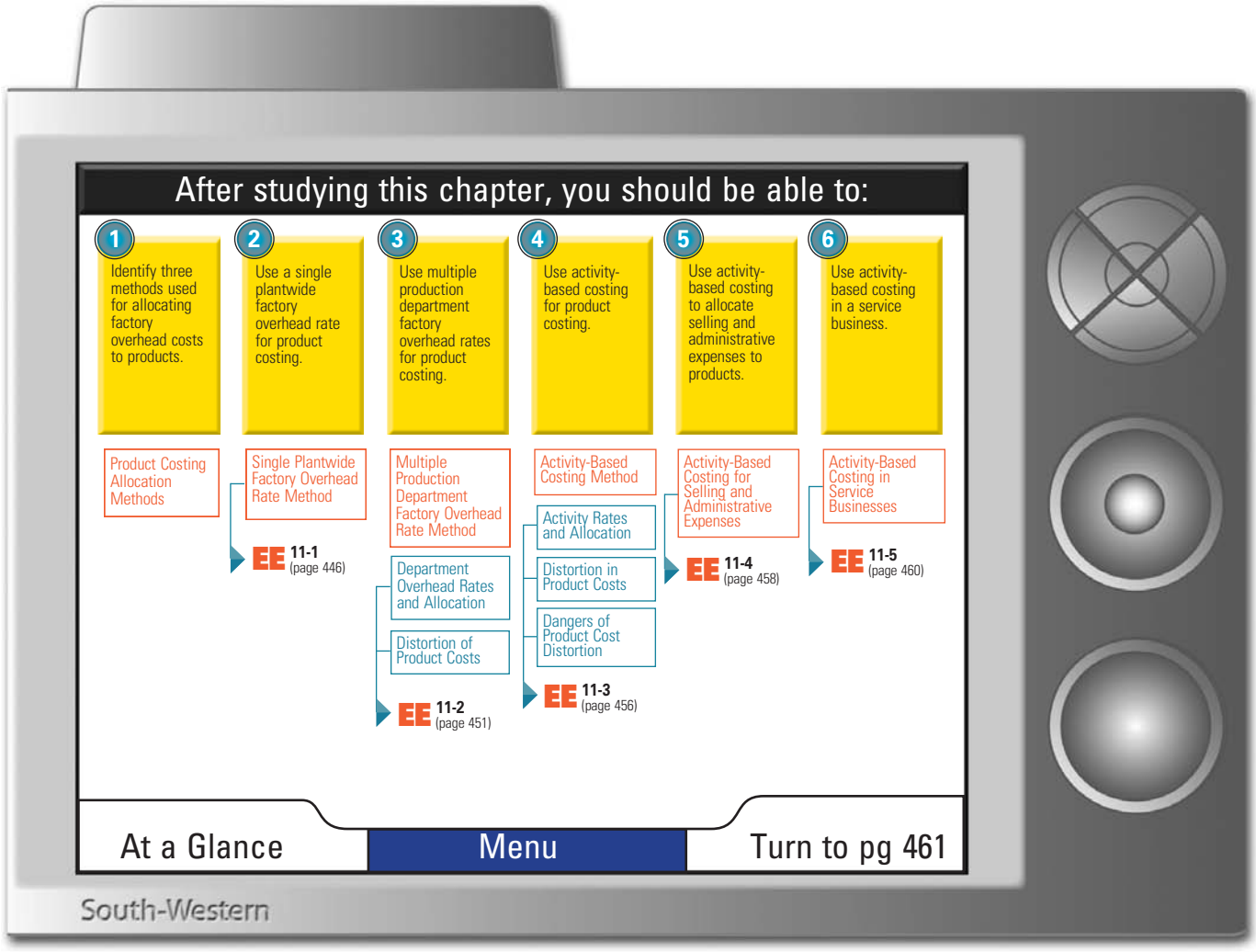
Why might there be a minimum charge for a service call? The answer is that the service person must charge for the time and expense of coming to your house. In a sense, the bill reflects two elements of service: (1) the cost of coming to your house and (2) the cost of the repair. The first portion of the bill reflects the time required to "set up" the job. The second part of the bill reflects the cost of performing the repair. The setup charge will be the same, whether the repairs take five minutes or five hours. In contrast, the actual repair charge will vary with the time on the job.

Like the repair person, companies must be careful that the cost of their products and services accurately reflect the different activities involved in producing the product or service. Otherwise, the cost of products and services may be distorted and lead to improper management decisions.

To illustrate, Cold Stone Creamery, a chain of super premium ice cream shops, uses activity-based costing to determine the cost of its ice cream products, such as cones, mixings, cakes, frozen yogurt, smoothies, and sorbets. The costs of activities, such as scooping and mixing, are added to the cost of the ingredients to determine the total cost of each product. As stated by Cold Stone's president:

"…it only makes sense to have the price you pay for the product be reflective of the activities involved in making it for you."

In this chapter, three different methods of allocating factory overhead to products are described and illustrated. In addition, how product cost distortions can result from improper factory overhead allocations is discussed. The chapter concludes by describing activity-based costing for selling and administrative expenses and its use in service businesses.



1 Identify three methods used for allocating factory overhead costs to products.

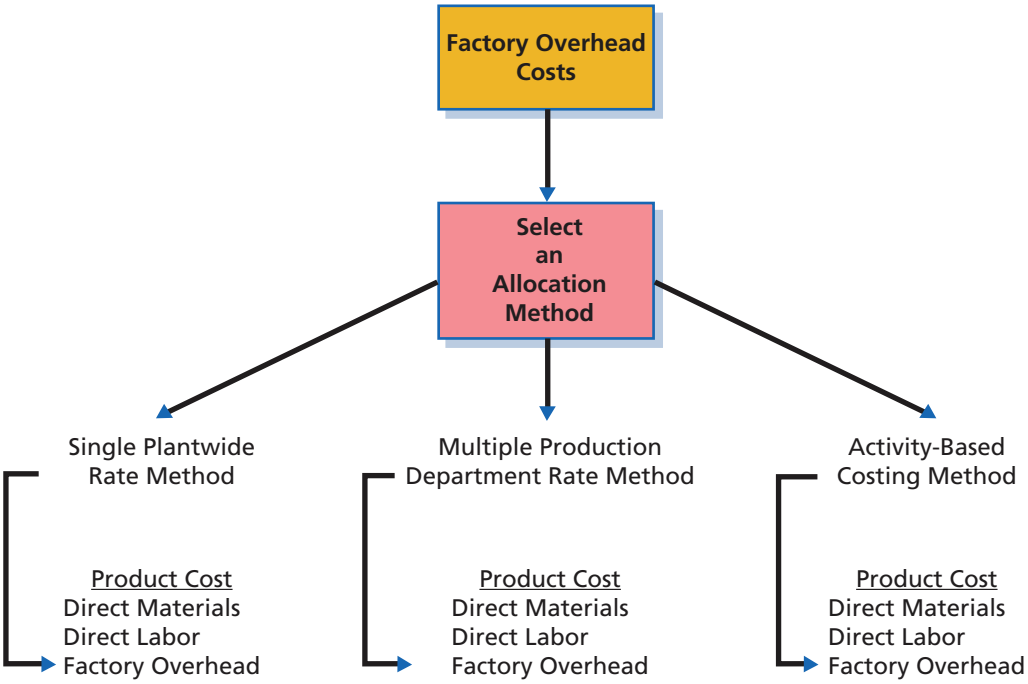
Product Costing Allocation Methods

Determining the cost of a product is termed **product costing**. Product costs consist of direct materials, direct labor, and factory overhead. The direct materials and direct labor are direct costs that can be traced to the product. However, factory overhead includes indirect costs that must be allocated to the product.

Three different methods of allocating factory overhead costs are as follows:

1. Single plantwide factory overhead rate method
2. Multiple production department factory overhead rate method
3. Activity-based costing method

Managers are concerned about allocating factory overhead because the allocation affects the accuracy of product costs. In turn, product costs are used for decisions such as determining product mix, establishing product price, and determining whether or not to discontinue a product line.



2 Use a single plantwide factory overhead rate for product costing.

Single Plantwide Factory Overhead Rate Method

A company may use a predetermined factory overhead rate to allocate factory overhead costs to products. Under the **single plantwide factory overhead rate method**, factory overhead costs are allocated to products using only one rate.

To illustrate, assume the following data for Ruiz Company, which manufactures snowmobiles and lawnmowers in a single factory.

Total budgeted factory overhead costs for the year	$1,600,000
Total budgeted direct labor hours (as computed below)	20,000 hours

	Snowmobiles	Lawnmowers	Total
Planned production for the year . . .	1,000 units	1,000 units	
Direct labor hours per unit	× 10 hours	× 10 hours	
Budgeted direct labor hours	10,000 hours	10,000 hours	20,000 hours

Under the single plantwide factory overhead rate method, the $1,600,000 budgeted factory overhead is applied to all products by using one rate. This rate is computed as follows:

$$\text{Single Plantwide Factory Overhead Rate} = \frac{\text{Total Budgeted Factory Overhead}}{\text{Total Budgeted Plantwide Allocation Base}}$$

The budgeted allocation base is a measure of operating activity in the factory. Common allocation bases would include direct labor hours, direct labor dollars, and machine hours. Ruiz Company allocates factory overhead using budgeted direct labor hours as the plantwide allocation base. Thus, Ruiz's single plantwide factory overhead rate is $80 per direct labor hour, computed as follows:

$$\text{Single Plantwide Factory Overhead Rate} = \frac{\$1,600,000}{20,000 \text{ direct labor hours}}$$

$$\text{Single Plantwide Factory Overhead Rate} = \$80 \text{ per direct labor hour}$$

Many professional service companies use a single overhead rate in determining their prices and job profitability. For example, medical, legal, and accounting services develop hourly rates that will provide a profit after covering labor and overhead.

Ruiz uses the plantwide rate of $80 per direct labor hour to allocate factory overhead to snowmobiles and lawnmowers as shown below.

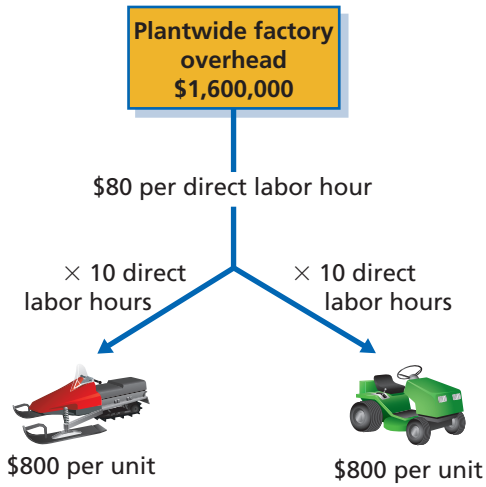
	Single Plantwide Factory Overhead Rate	×	Direct Labor Hours per Unit	=	Factory Overhead Cost per Unit
Snowmobile	$80 per direct labor hour	×	10 direct labor hours	=	$800
Lawnmower	$80 per direct labor hour	×	10 direct labor hours	=	$800

As shown above, the factory overhead allocated to each product is $800. This is because each product uses the same number of direct labor hours.

The effects of Ruiz Company using the single plantwide factory overhead rate method are summarized in Exhibit 1.

Exhibit 1

Single Plantwide Factory Overhead Rate Method—Ruiz Company



Many military contractors use a single plantwide rate for allocating factory overhead costs to products, such as jet fighters. However, cost distortions can occur. This is one reason why government contractors sometimes make "$200 flashlights" that could be purchased at the local hardware store for $5.

The primary advantage of using the single plantwide overhead rate method is that it is simple and inexpensive to use. However, the single plantwide rate assumes that the factory overhead costs are consumed in the same way by all products. For example, in the preceding illustration Ruiz Company assumes that factory overhead costs are consumed as each direct labor hour is incurred.

The preceding assumption may be valid for companies that manufacture one or a few products. If, however, a company manufactures products that consume factory overhead costs in different ways, a single plantwide rate may not accurately allocate factory overhead costs to the products.

Example Exercise 11-1 Single Plantwide Overhead Rate

2

The total factory overhead for Morris Company is budgeted for the year at $650,000. Morris manufactures two office furniture products: a credenza and desk. The credenza and desk each require four direct labor hours (d/h) to manufacture. Each product is budgeted for 5,000 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year, (b) the single plantwide factory overhead rate, and (c) the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.

Follow My Example 11-1

a. Credenza: 5,000 units × 4 direct labor hours = 20,000 direct labor hours
Desk: 5,000 units × 4 direct labor hours = 20,000
40,000 direct labor hours

b. Single plantwide factory overhead rate: $650,000/40,000 dlh = $16.25 per dlh

c. Credenza: $16.25 per direct labor hour × 4 dlh per unit = $65 per unit
Desk: $16.25 per direct labor hour × 4 dlh per unit = $65 per unit

For Practice: PE 11-1A, PE 11-1B

Integrity, Objectivity, and Ethics in Business

FRAUD AGAINST YOU AND ME

The U.S. government makes a wide variety of purchases. Two of the largest are health care purchases under Medicare and military equipment. The purchase price for these and other items is often determined by the cost plus some profit. The cost is often the sum of direct costs plus allocated overhead. Due to the complexity of determining cost, government agencies review the amount charged for products and services. In the event of disagreement between the contractor and the government, the U.S. government may sue the contractor under the False Claims Act, which provides for three times the government's damages plus civil penalties. For example, Walgreen's and CVS paid a total of $72 million to settle an allegation under the False Claims Act that they defrauded Medicaid by switching prescriptions.

3 Use multiple production department factory overhead rates for product costing.

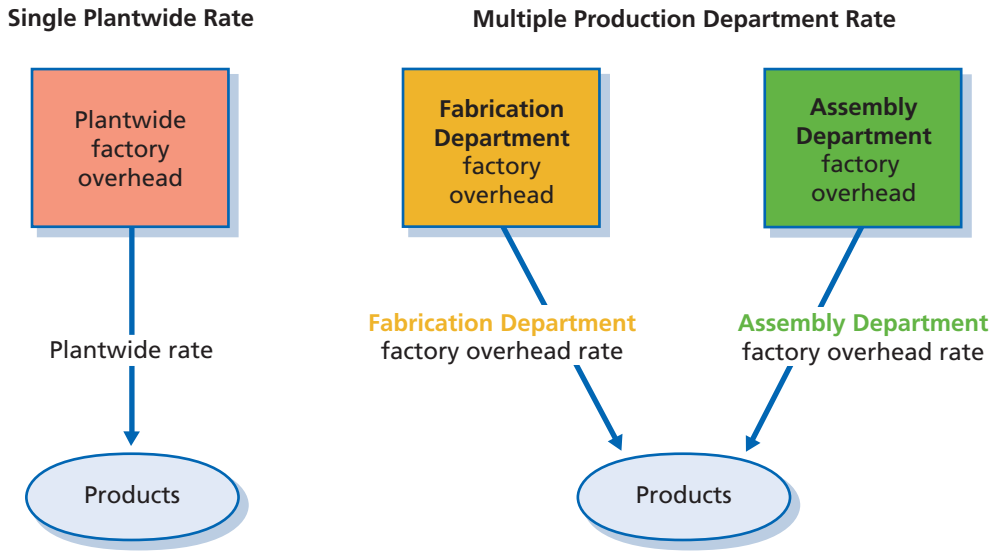
Multiple Production Department Factory Overhead Rate Method

When production departments *differ significantly* in their manufacturing processes, factory overhead costs are normally incurred differently in each department. In such cases, factory overhead costs may be more accurately allocated using multiple production department factory overhead rates.

The **multiple production department factory overhead rate method** uses different rates for each production department to allocate factory overhead costs to products. In contrast, the single plantwide rate method uses only one rate to allocate factory overhead costs. Exhibit 2 illustrates how these two methods differ.

Exhibit 2

Comparison of Single Plantwide Rate and Multiple Production Department Rate Methods



To illustrate the multiple production department factory overhead rate method, the prior illustration for Ruiz Company is used. In doing so, assume that Ruiz uses the following two production departments in the manufacture of snowmobiles and lawnmowers:

1. Fabrication Department, which cuts metal to the shape of the product.
2. Assembly Department, which manually assembles machined pieces into a final product.

A company may use different allocation bases for different departments. For example, a machine-intensive department may use machine hours as an allocation base, and a labor-intensive department may use labor hours as an allocation base.

The total budgeted factory overhead for Ruiz Co. is $1,600,000 divided into the Fabrication and Assembly departments as follows:[1]

	Budgeted Factory Overhead Costs
Fabrication Department	$1,030,000
Assembly Department	570,000
Total budgeted factory overhead costs	$1,600,000

As shown above, the Fabrication Department incurs nearly twice the factory overhead of the Assembly Department. This is because the Fabrication Department has more machinery and equipment that uses more power, incurs equipment depreciation, and uses factory supplies.

Department Overhead Rates and Allocation

Each **production department factory overhead rate** is computed as follows:

$$\text{Production Department Factory Overhead Rate} = \frac{\text{Budgeted Department Factory Overhead}}{\text{Budgeted Department Allocation Base}}$$

To illustrate, assume that Ruiz Company uses direct labor hours as the allocation base for the Fabrication and Assembly departments. Each department uses 10,000 direct labor hours. Thus, the factory overhead rates are as follows:

$$\text{Fabrication Department Factory Overhead Rate} = \frac{\$1,030,000}{10,000 \text{ direct labor hours}} = \$103 \text{ per direct labor hour}$$

$$\text{Assembly Department Factory Overhead Rate} = \frac{\$570,000}{10,000 \text{ direct labor hours}} = \$57 \text{ per direct labor hour}$$

Ten direct labor hours are required for the manufacture of each snowmobile and lawnmower. These 10 hours are consumed in the Fabrication and Assembly departments as follows:

	Snowmobile	Lawnmower
Fabrication Department	8 hours	2 hours
Assembly Department	2	8
Total direct labor hours	10 hours	10 hours

The factory overhead allocated to each snowmobile and lawnmower is shown in Exhibit 3. As shown in Exhibit 3, each snowmobile is allocated $938 of total factory overhead costs. In contrast, each lawnmower is allocated $662 of factory overhead costs.

Exhibit 4 summarizes the multiple production department rate allocation method for Ruiz Company. Exhibit 4 indicates that the Fabrication Department factory overhead rate is $103 per direct labor hour while the Assembly Department rate is $57 per direct labor hour. Since the snowmobile uses more Fabrication Department direct labor hours than does the lawnmower, the total overhead allocated to each snowmobile is $276 greater ($938 − $662) than each lawnmower.

[1] Factory overhead costs are assigned to production departments using methods discussed in advanced cost accounting textbooks.

Exhibit 3

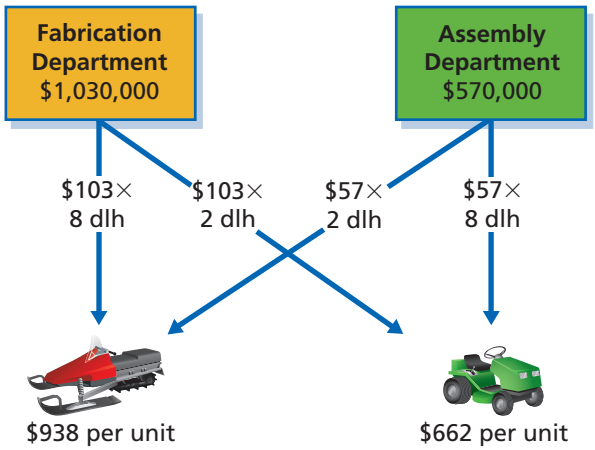
Allocating Factory Overhead to Products—Ruiz Company

	Allocation Base Usage per Unit	×	Production Department Factory Overhead Rate	=	Allocated Factory Overhead per Unit of Product
Snowmobile					
Fabrication Department	8 direct labor hours	×	$103 per dlh	=	$824
Assembly Department	2 direct labor hours	×	$ 57 per dlh	=	114
Total factory overhead cost per snowmobile					$938

Lawnmower					
Fabrication Department	2 direct labor hours	×	$103 per dlh	=	$206
Assembly Department	8 direct labor hours	×	$ 57 per dlh	=	456
Total factory overhead cost per lawnmower					$662

Exhibit 4

Multiple Production Department Rate Method—Ruiz Company



Distortion of Product Costs

The differences in the factory overhead for each snowmobile and lawnmower using the single plantwide and the multiple production department factory overhead rate methods are shown below.

	Factory Overhead Cost per Unit		
	Single Plantwide Method	Multiple Production Department Method	Difference
Snowmobile	$800	$938	$(138)
Lawnmower	800	662	138

The single plantwide factory overhead rate distorts product cost by averaging high and low factory overhead costs.

The single plantwide factory overhead rate distorts the product cost of both the snowmobile and lawnmower. That is, the snowmobile is not allocated enough cost and thus, is undercosted by $138. In contrast, the lawnmower is allocated too much cost and is overcosted by $138 ($800 − $662).

The preceding cost distortions are caused by averaging the differences between the high factory overhead costs in the Fabrication Department and the low factory overhead costs in

the Assembly Department. Using the single plantwide rate, it is assumed that all factory overhead is directly related to a single allocation base for the entire plant. This assumption is not realistic for Ruiz Company. Thus, using a single plantwide rate distorted the product costs of snowmobiles and lawnmowers.

The following conditions indicate that a single plantwide factory overhead rate may cause product cost distortions:

Condition 1: *Differences in production department factory overhead rates*. Some departments have high rates, whereas others have low rates.

Condition 2: *Differences among products in the ratios of allocation base usage within a department and across departments*. Some products have a high ratio of allocation base usage within departments, whereas other products have a low ratio of allocation base usage within the same departments.

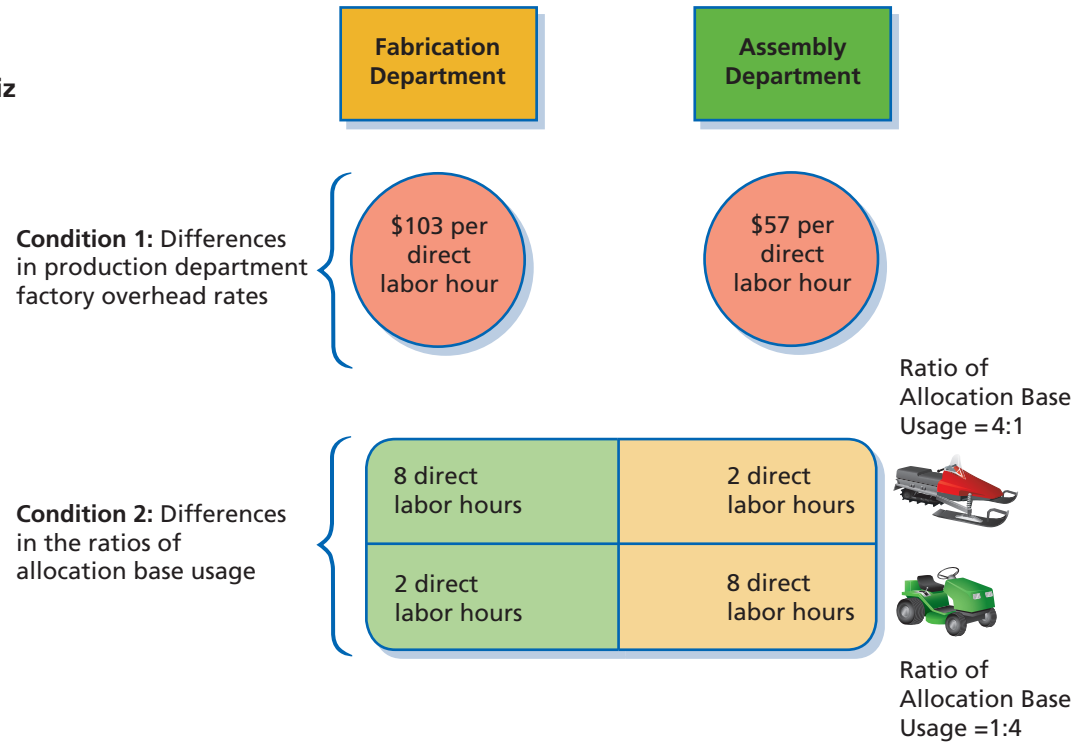
To illustrate, Condition 1 exists for Ruiz Company because the factory overhead rate for the Fabrication Department is $103 per direct labor hour, whereas the rate for the Assembly Department is only $57 per direct labor hour. However, this condition by itself will not cause product cost distortions.

Condition 2 also exists for Ruiz Company. The snowmobile consumes eight direct labor hours in the Fabrication Department, whereas the lawnmower consumes only two direct labor hours. Thus, the ratio of allocation base usage is 4:1 in the Fabrication Department, as computed below.[2]

$$\text{Ratio of Allocation Base Usage in the Fabrication Department} = \frac{\text{Direct Labor Hours for snowmobiles}}{\text{Direct Labor Hours for lawnmowers}} = \frac{8 \text{ hours}}{2 \text{ hours}} = 4:1$$

Exhibit 5

Conditions for Product Cost Distortion—Ruiz Company



[2] The numerator and denominator could be switched as long as the ratio is computed the same for each department. This is because the objective is to compare whether differences exist in the ratio of allocation base usage across products and departments.

In contrast, the ratio of allocation base usage is 1:4 in the Assembly Department, as computed below.

$$\text{Ratio of Allocation Base Usage in the Fabrication Department} = \frac{\text{Direct Labor Hours for snowmobiles}}{\text{Direct Labor Hours for lawnmowers}} = \frac{2 \text{ hours}}{8 \text{ hours}} = 1{:}4$$

Because both conditions exist for Ruiz Company, the product costs from using the single plantwide factory overhead rate are distorted. The preceding conditions and the resulting product cost distortions are summarized in Exhibit 5.

Example Exercise 11-2 Multiple Production Department Overhead Rates

3

The total factory overhead for Morris Company is budgeted for the year at $600,000 and divided into two departments: Fabrication, $420,000 and Assembly, $180,000. Morris manufactures two office furniture products: credenzas and desks. Each credenza requires one direct labor hour (d/h) in Fabrication and three direct labor hours in Assembly. Each desk requires three direct labor hours in Fabrication and one direct labor hour in Assembly. Each product is budgeted for 5,000 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year in each department, (b) the departmental factory overhead rates for both departments, and (c) the factory overhead allocated per unit for each product, using the department factory overhead allocation rates.

Follow My Example 11-2

a. Fabrication: (5,000 credenzas × 1 dlh) + (5,000 desks × 3 dlh) = 20,000 direct labor hours
   Assembly: (5,000 credenzas × 3 dlh) + (5,000 desks × 1 dlh) = 20,000 direct labor hours
b. Fabrication Department rate: $420,000/20,000 direct labor hours = $21.00 per dlh
   Assembly Department rate: $180,000/20,000 direct labor hours = $9.00 per dlh

c. Credenza:

Fabrication Department	1 dlh × $21.00 =	$21.00
Assembly Department	3 dlh × $ 9.00 =	27.00
Total factory overhead per credenza		$48.00

Desk:

Fabrication Department	3 dlh × $21.00 =	$63.00
Assembly Department	1 dlh × $ 9.00 =	9.00
Total factory overhead per desk		$72.00

For Practice: PE 11-2A, PE 11-2B

4 Use activity-based costing for product costing.

Activity-Based Costing Method

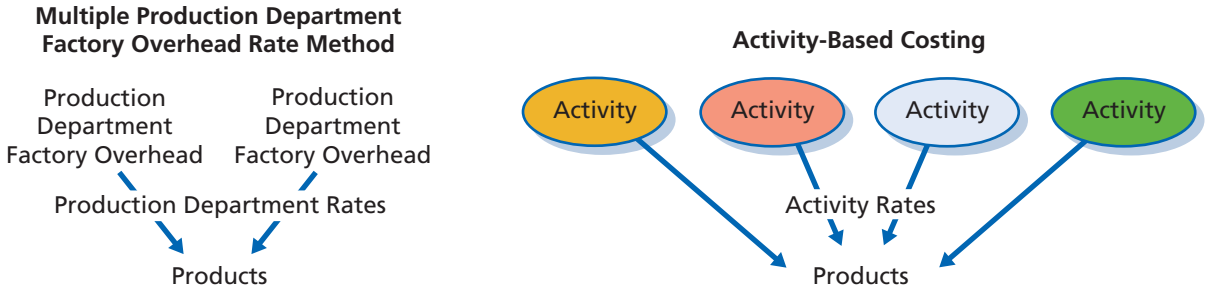
As illustrated in the preceding section, product costs may be distorted when a single plantwide factory overhead rate is used. However, product costs may also be distorted when multiple production department factory overhead rates are used. Activity-based costing further reduces the possibility of product cost distortions.

The **activity-based costing (ABC) method** focuses on the cost of activities and then allocates these costs to products using a variety of activity bases. Under activity-based costing, factory overhead costs are initially accounted for in **activity cost pools**. These cost pools are related to a given activity, such as machine usage, inspections, moving, production setups, and engineering activities. In contrast, when multiple production department factory overhead rates are used, factory overhead costs are first accounted for in production departments.

Exhibit 6 illustrates how activity-based costing differs from the multiple production department method.

Exhibit 6

Multiple Production Department Factory Overhead Rate Method vs. Activity-Based Costing



Another term for "setup" is "changeover." This term is often used in continuous process industries.

To illustrate the activity-based costing method, the prior illustration for Ruiz Company is used. Assume that the following activities have been identified for producing snowmobiles and lawnmowers:

1. *Fabrication*, which consists of cutting metal to shape the product. This activity is machine-intensive.
2. *Assembly*, which consists of manually assembling machined pieces into a final product. This activity is labor-intensive.
3. *Setup*, which consists of changing tooling in machines in preparation for making a new product. Each production run requires a **setup**.
4. *Quality-control inspections*, which consist of inspecting the product for conformance to specifications. Inspection requires product tear down and reassembly.
5. *Engineering changes*, which consist of processing changes in design or process specifications for a product. The document that initiates changing a product or process is called an **engineering change order (ECO)**.

Fabrication and assembly are now identified as *activities* rather than *departments*. As a result, the setup, quality-control inspections, and engineering change functions that were previously allocated to the fabrication and assembly departments are now classified as separate activities.

The budgeted factory overhead for each activity cost pool is as follows:

Activity Cost Pool	Budgeted Factory Overhead Costs
Fabrication	$ 530,000
Assembly	70,000
Setup	480,000
Quality-control inspections	312,000
Engineering changes	208,000
Total budgeted factory overhead costs	$1,600,000

The costs for the fabrication and assembly pools shown above are less than the costs shown in the preceding section where these activities were identified as production departments. This is because the costs of setup, quality-control inspections, and engineering changes, which total $1,000,000 ($480,000 + $312,000 + $208,000), have now been separated into their own activity cost pools.

Activity Rates and Allocation

The activity cost pools are assigned to products using factory overhead rates for each activity. These rates are called **activity rates** because they are related to activities. Activity rates are determined as follows:

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Activity Base}}$$

Activity rates are determined by dividing the budgeted activity cost pool by the total estimated activity base.

The term **activity base**, rather than *allocation base*, is used because the base is related to an activity cost pool.

To illustrate, it is assumed that snowmobiles are a new product for Ruiz Company, and engineers are still making minor design changes. Lawnmowers have been produced by Ruiz Company for many years. Additional data about the two products include:

The U.S. Postal Service has initiated a new activity-based costing system, called PostalOne!, which will track the real costs associated with processing and delivering each class of mail.

	Snowmobile	Lawnmower
Estimated units of total production	1,000 units	1,000 units
Estimated engineering change orders	12 change orders	4 change orders
Estimated setups	100 setups	20 setups
Units per production run	10 units (1,000/100 setups)	50 units (1,000/20 setups)
Quality-control inspections	100 inspections (10%)	4 inspections (.4%)

The number of direct labor hours used by each product is 10,000 hours as shown below.

	Direct Labor Hours per Unit	Number of Units of Production	Total Direct Labor Hours
Snowmobile:			
Fabrication Department	8 hours	1,000 units	8,000 hours
Assembly Department	2 hours	1,000 units	2,000 hours
Total			10,000 hours
Lawnmower:			
Fabrication Department	2 hours	1,000 units	2,000 hours
Assembly Department	8 hours	1,000 units	8,000 hours
Total			10,000 hours

The activity bases for each product are summarized in Exhibit 7.

Exhibit 7

Activity Bases—Ruiz Company

	Activity Base				
Products	Fabrication	Assembly	Setup	Quality-Control Inspections	Engineering Changes
Snowmobile	8,000 dlh	2,000 dlh	100 setups	100 inspections	12 ECOs
Lawnmower	2,000	8,000	20	4	4
Total activity base	10,000 dlh	10,000 dlh	120 setups	104 inspections	16 ECOs

The activity rates for each activity are determined as follows:

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Activity Base}}$$

The activity rates for Ruiz Company are shown in Exhibit 8.

Exhibit 8

Activity Rates—Ruiz Company

Activity	Budgeted Activity Cost Pool	÷	Activity Base	=	Activity Rate
Fabrication	$530,000	÷	10,000 direct labor hours	=	$53 per direct labor hour
Assembly	$ 70,000	÷	10,000 direct labor hours	=	$7 per direct labor hour
Setup	$480,000	÷	120 setups	=	$4,000 per setup
Quality-control inspections	$312,000	÷	104 inspections	=	$3,000 per inspection
Engineering changes	$208,000	÷	16 engineering changes	=	$13,000 per engineering change order

The factory overhead costs are allocated to the snowmobile and lawnmower by multiplying the activity-base usage by the activity rate. The sum of the costs for each product is the total factory overhead cost for the product. This amount, divided by the total number of units of estimated production, determines the factory overhead cost per unit. These computations are shown in Exhibit 9.

Exhibit 9

Activity-Based Product Cost Calculations

	A	B	C	D	E	F	G	H	I	J	K	L
1		Snowmobile						Lawnmower				
2		Activity		Activity		Activity		Activity		Activity		Activity
3	Activity	Base	×	Rate	=	Cost		Base	×	Rate	=	Cost
4												
5	Fabrication	8,000 dlh		$53/dlh		$ 424,000		2,000 dlh		$53/dlh		$106,000
6	Assembly	2,000 dlh		$7/dlh		14,000		8,000 dlh		$7/dlh		56,000
7	Setup	100 setups		$4,000/setup		400,000		20 setups		$4,000/setup		80,000
8	Quality control											
9	inspections	100 inspections		$3,000/insp.		300,000		4 inspections		$3,000/insp.		12,000
10	Engineering											
11	changes	12 ECOs		$13,000/ECO		156,000		4 ECOs		$13,000/ECO		52,000
12	Total factory											
13	overhead cost					$1,294,000						$306,000
14	Budgeted units											
15	of production					÷ 1,000						÷ 1,000
16	Factory overhead											
17	cost per unit					$ 1,294						$ 306
18												

The activity-based costing method for Ruiz Company is summarized in Exhibit 10.

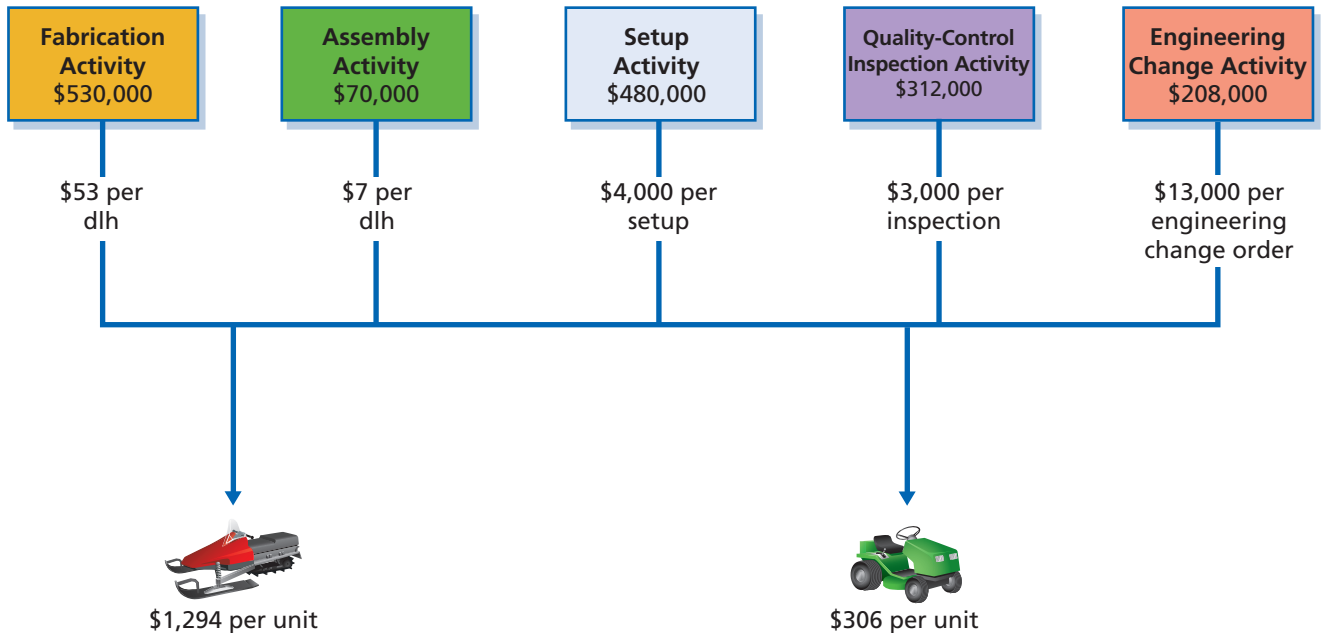
Distortion in Product Costs

The factory overhead costs per unit for Ruiz Company using the three allocation methods are shown below.

	Factory Overhead Cost per Unit—Three Cost Allocation Methods		
	Single Plantwide Rate	Multiple Production Department Rates	Activity-Based Costing
Snowmobile	$800	$938	$1,294
Lawnmower	800	662	306

Exhibit 10

Activity-Based Costing Method—Ruiz Company



The activity-based costing method produces different factory overhead costs per unit (product costs) than the multiple department factory overhead rate method. This difference is caused by how the $1,000,000 of setup, quality control, and engineering change activities are allocated.

Under the multiple production department factory overhead rate method, setup, quality control, and engineering change costs were allocated using departmental rates based on direct labor hours. However, snowmobiles and lawnmowers did *not* consume these *activities* in proportion to direct labor hours. That is, each snowmobile consumed a larger portion of the setup, quality-control inspection, and engineering change activities. This was true even though each product consumed 10,000 direct labor hours. As a result, activity-based costing allocated more of the cost of these activities to the snowmobile. Only under the activity-based approach were these differences reflected in the factory overhead cost allocations and thus, in the product costs.

Dangers of Product Cost Distortion

If Ruiz Company used the $800 factory overhead cost allocation (single plantwide rate) instead of activity-based costing for pricing snowmobiles and lawnmowers, the following would likely result:

1. The snowmobile would be *underpriced* because its factory overhead cost is understated by $494 ($1,294 − $800).
2. The lawnmower would be *overpriced* because its factory overhead cost is overstated by $494 ($800 − $306).

As a result, Ruiz would likely lose sales of lawnmowers because they are overpriced. In contrast, sale of snowmobiles would increase because they are underpriced. Due to these pricing errors, Ruiz might incorrectly decide to expand production of snowmobiles and discontinue making lawnmowers.

If Ruiz uses the activity-based costing method, its product costs would be more accurate. Thus, Ruiz would have a better starting point for making proper pricing decisions. Although the product cost distortions are not as great, similar results would occur if Ruiz had used the multiple production department rate method.

ArvinMeritor, Inc. discovered that incorrect factory overhead cost allocations had "overcosted" some of its products by roughly 20%. As a result, these products were over-priced and began losing market share.

Example Exercise 11-3 Activity-Based Costing: Factory Overhead Costs

4

The total factory overhead for Morris Company is budgeted for the year at $600,000, divided into four activity pools: fabrication, $300,000; assembly, $120,000; setup, $100,000; and material handling, $80,000. Morris manufactures two office furniture products: a credenza and desk. The activity-base usage quantities for each product by each activity are as follows:

	Fabrication	Assembly	Setup	Material Handling
Credenza	5,000 dlh	15,000 dlh	30 setups	50 moves
Desk	15,000	5,000	220	350
	20,000 dlh	20,000 dlh	250 setups	400 moves

Each product is budgeted for 5,000 units of production for the year. Determine (a) the activity rates for each activity and (b) the activity-based factory overhead per unit for each product.

Follow My Example 11-3

a. Fabrication: $300,000/20,000 direct labor hours = $15 per dlh
Assembly: $120,000/20,000 direct labor hours = $6 per dlh
Setup: $100,000/250 setups = $400 per setup
Material handling: $80,000/400 moves = $200 per move

	A	B	C	D	E	F	G	H	I	J	K	L
1		Credenza						Desk				
2		Activity-Base		Activity		Activity		Activity-Base		Activity		Activity
3	Activity	Usage	×	Rate	=	Cost		Usage	×	Rate	=	Cost
4												
5	Fabrication	5,000 dlh		$15 per dlh		$ 75,000		15,000 dlh		$15 per dlh		$225,000
6	Assembly	15,000 dlh		$6 per dlh		90,000		5,000 dlh		$6 per dlh		30,000
7	Setup	30 setups		$400/setup		12,000		220 setups		$400/setup		88,000
8	Material handling	50 moves		$200/move		10,000		350 moves		$200/move		70,000
9	Total					$187,000						$413,000
10	Budgeted units					÷ 5,000						÷ 5,000
11	Factory overhead											
12	per unit					$ 37.40						$ 82.60
13												

For Practice: PE 11-3A, PE 11-3B

5 Use activity-based costing to allocate selling and administrative expenses to products.

Activity-Based Costing for Selling and Administrative Expenses

Generally accepted accounting principles (GAAP) require that selling and administrative expenses be reported as period expenses on the income statement. However, for internal use by management, selling and administrative expenses may be allocated to products. Such allocations are useful in analyzing product profitability.

One method of allocating selling and administrative expenses to the products is based on sales volumes. However, products may consume activities in ways that are unrelated to their sales volumes. When this occurs, activity-based costing may be a more accurate method of allocation.

To illustrate, assume that Abacus Company has two products, Ipso and Facto. Both products have the same total sales volume. However, Ipso and Facto consume selling and administrative activities differently, as shown in Exhibit 11.

If the selling and administrative expenses of Abacus Company are allocated on the basis of sales volumes, the same amount of expense would be allocated to Ipso and Facto. This is because Ipso and Facto have the same sales volume. However, as Exhibit 11 implies, such an allocation would be misleading.

Exhibit 11

Selling and Administrative Activity Product Differences

Selling and Administrative Activities	Ipso	Facto
Post-sale technical support	Product is easy to use by the customer.	Product requires specialized training in order to be used by the customer.
Order writing	Product requires no technical information from the customer.	Product requires detailed technical information from the customer.
Promotional support	Product requires no promotional effort.	Product requires extensive promotional effort.
Order entry	Product is purchased in large volumes per order.	Product is purchased in small volumes per order.
Customer return processing	Product has few customer returns.	Product has many customer returns.
Shipping document preparation	Product is shipped domestically.	Product is shipped internationally, requiring customs and export documents.
Shipping and handling	Product is not hazardous.	Product is hazardous, requiring specialized shipping and handling.
Field service	Product has few warranty claims.	Product has many warranty claims.

ExxonMobil Corporation allocated selling and administrative activities, such as sales, maintenance, engineering calls, distributor calls, order taking, market research, and advertising, to its lubricant products.

The activity-based costing method can be used to allocate the selling and administrative activities to Ipso and Facto. Activity-based costing allocates selling and administrative expenses based on how each product consumes activities.

To illustrate, assume that the field warranty service activity of Abacus Company has a budgeted cost of $150,000. Additionally, assume that 100 warranty claims are estimated for the period. Using warranty claims as an activity base, the warranty claim activity rate is $1,500, as computed below.

$$\text{Warranty Claim Activity Rate} = \frac{\text{Budgeted Warranty Claim Expenses}}{\text{Estimated Warranty Claims}}$$

$$\text{Warranty Claim Activity Rate} = \frac{\$150{,}000}{100 \text{ claims}} = \$1{,}500 \text{ per warranty claim}$$

Assuming that Ipso had 10 warranty claims and Facto had 90 warranty claims, the field service activity expenses would be allocated to each product as follows:

Ipso: $15,000 = 10 warranty claims × $1,500 per warranty claim

Facto: $135,000 = 90 warranty claims × $1,500 per warranty claim

For Abacus Company, allocating selling and administrative expenses using activity-based costing is more accurate than using sales volumes.

In some cases, selling and administrative expenses may be more related to *customer* behaviors than to differences in products. That is, some customers may demand more service and selling activities than other customers. In such cases, activity-based costing would allocate selling and administrative expenses to customers.

Example Exercise 11-4 Activity-Based Costing: Selling and Administrative Expenses 5

Converse Company manufactures and sells LCD display products. Converse uses activity-based costing to determine the cost of the customer return processing and the shipping activity. The customer return processing activity has an activity rate of $90 per return, and the shipping activity has an activity rate of $15 per shipment. Converse shipped 4,000 units of LCD Model A1 in 2,200 shipments (some shipments are more than one unit). There were 200 returns. Determine the (a) total and (b) per-unit customer return processing and shipping activity cost for Model A1.

Follow My Example 11-4

a. Return activity: 200 returns × $90 per return = $18,000
Shipping activity: 2,200 shipments × $15 per shipment = 33,000
Total activity cost $51,000

b. $12.75 per unit ($51,000/4,000 units)

For Practice: PE 11-4A, PE 11-4B

6 Use activity-based costing in a service business.

Activity-Based Costing in Service Businesses

Service companies need to determine the cost of their services so that they can make pricing, promoting, and other decisions. The use of single and multiple department overhead rate methods may lead to distortions similar to those of manufacturing firms. Thus, many service companies use activity-based costing for determining the cost of services.

To illustrate, assume that Hopewell Hospital uses activity-based costing to allocate hospital overhead to patients. Hopewell Hospital applies activity-based costing by

1. Identifying activity cost pools
2. Determining activity rates for each cost pool
3. Allocating overhead costs to patients based upon activity usage

Owens & Minor, a medical distributor, used activity-based costing information to price distribution services to customers, based on the number of orders and the number of items per order.

Hopewell Hospital has identified the following activity cost pools:

1. Admission
2. Radiological testing
3. Operating room
4. Pathological testing
5. Dietary and laundry

Each activity cost pool has an estimated patient activity-base usage. Based on the budgeted costs for each activity and related estimated activity-base usage, the activity rates shown in Exhibit 12 were developed.

To illustrate, assume the following data for radiological testing:

Budgeted costs	$960,000
Total estimated activity-base usage	3,000 images

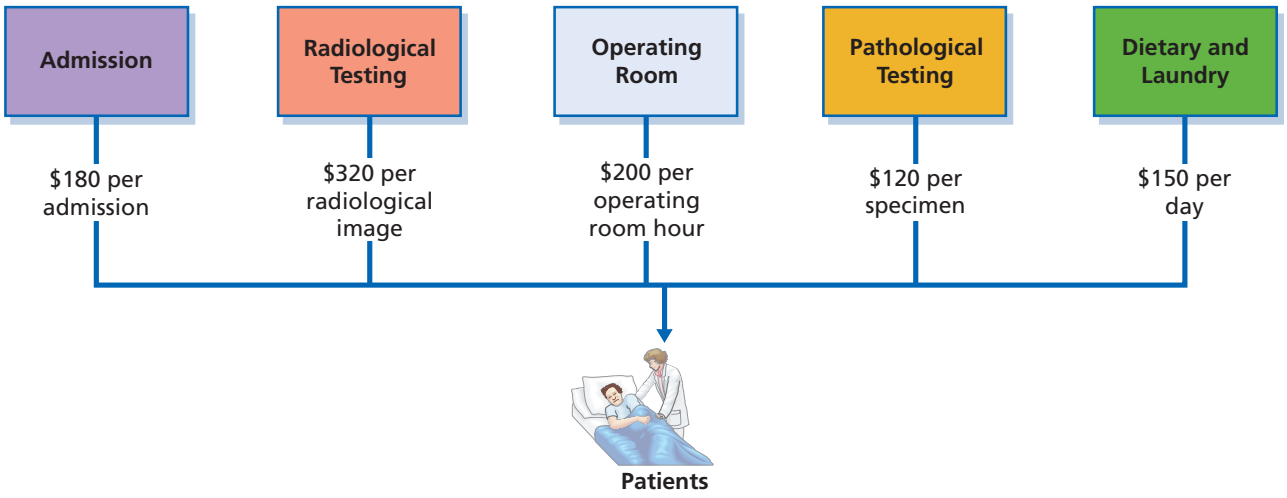
The activity rate of $320 per radiological image is computed as:

$$\text{Radiological Testing Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Activity-Base Usage}}$$

$$= \frac{\$960{,}000}{3{,}000 \text{ images}} = \$320 \text{ per image}$$

Exhibit 12

Activity-Based Costing Method—Hopewell Hospital



The activity rates for the other activities are determined in a similar manner. These activity rates along with the patient activity usage are used to allocate costs to patients as follows:

$$\text{Activity Cost Allocated to Patient} = \text{Patient Activity Usage} \times \text{Activity Rate}$$

To illustrate, assume that Mia Wilson was a patient of the hospital. The hospital overhead services (activities) performed for Mia Wilson are shown below.

	Patient (Mia Wilson) Activity Usage
Admission	1 admission
Radiological testing	2 images
Operating room	4 hours
Pathological testing	1 specimen
Dietary and laundry	7 days

Based on the preceding services (activities), the Hopewell Hospital overhead costs allocated to Mia Wilson total $2,790, as computed on the next page.

Integrity, Objectivity, and Ethics in Business

UNIVERSITY AND COMMUNITY PARTNERSHIP—LEARNING YOUR ABC'S

Students at Harvard's Kennedy School of Government joined with the city of Somerville, Massachusetts, in building an activity-based cost system for the city. The students volunteered several hours a week in four-person teams, interviewing city officials within 18 departments. The students were able to determine activity costs, such as the cost to fill a pothole, processing a building permit, or responding to a four-alarm fire. Their study was used by the city in forming the city budget. As stated by some of the students participating on this project: "It makes sense to use the resources of the university for community building. …Real-world experience is a tremendous thing to have in your back pocket. We learned from the mayor and the fire chief, who are seasoned professionals in their own right."

Source: Kennedy School Bulletin, Spring 2005, "Easy as A-B-C: Students Take on the Somerville Budget Overhaul."

	A	B	C	D	E	F
1	Patient Name: Mia Wilson					
2		Activity-Base		Activity		Activity
3	Activity	Usage	×	Rate	=	Cost
4						
5	Admission	1 admission		$180/admission		$ 180
6	Radiological testing	2 images		$320/image		640
7	Operating room	4 hours		$200/hour		800
8	Pathological testing	1 specimen		$120/specimen		120
9	Dietary and laundry	7 days		$150/day		1,050
10	Total					$2,790
11						

The patient activity costs can be combined with the direct costs, such as drugs and supplies. These costs and the related revenues can be reported for each patient in a patient (customer) profitability report. A partial patient profitability report for Hopewell Hospital is shown in Exhibit 13.

Exhibit 13

Customer Profitability Report

Hopewell Hospital
Patient (Customer) Profitability Report
For the Period Ending December 31, 2010

	Adcock, Kim	Birini, Brian	Conway, Don	Wilson, Mia
Revenues	$9,500	$ 21,400	$5,050	$3,300
Less patient costs:				
Drugs and supplies	$ 400	$ 1,000	$ 300	$ 200
Admission	180	180	180	180
Radiological testing	1,280	2,560	1,280	640
Operating room	2,400	6,400	1,600	800
Pathological testing	240	600	120	120
Dietary and laundry	4,200	14,700	1,050	1,050
Total patient costs	$8,700	$ 25,440	$4,530	$2,990
Income from operations	$ 800	$ (4,040)	$ 520	$ 310

Exhibit 13 can be used by hospital administrators for decisions on pricing or services. For example, there was a large loss on services provided to Brian Birini. Investigation might reveal that some of the services provided to Birini were not reimbursed by insurance. As a result, Hopewell might lobby the insurance company to reimburse these services or request higher insurance reimbursement on other services.

Example Exercise 11-5 Activity-Based Costing: Service Business

6

The Metro Radiology Clinic uses activity-based costing to determine the cost of servicing patients. There are three activity pools: patient administration, imaging, and diagnostic services. The activity rates associated with each activity pool are $45 per patient visit, $320 per X-ray image, and $450 per diagnosis. Julie Campbell went to the clinic and had two X-rays, each of which was read and interpreted by a doctor. Determine the total activity-based cost of Campbell's visit.

Follow My Example 11-5

Imaging	$ 640	(2 images × $320)
Diagnosis	900	(2 diagnoses × $450)
Patient administration	45	(1 visit × $45)
Total activity cost	$1,585	

For Practice: PE 11-5A, PE 11-5B

Business Connection

FINDING THE RIGHT NICHE

Businesses often attempt to divide a market into its unique characteristics, called market segmentation. Once a market segment is identified, product, price, promotion, and location strategies are tailored to fit that market. This is a better approach for many products and services than following a "one size fits all" strategy. Activity-based costing can be used to help tailor organizational effort toward different segments. For example, Fidelity Investments uses activity-based costing to tailor its sales and marketing strategies to different wealth segments. Thus, a higher wealth segment could rely on personal sales activities, while less wealthy segments would rely on less costly sales activities, such as mass mail. The following table lists popular forms of segmentation and their common characteristics:

Form of Segmentation	Characteristics
Demographic	Age, education, gender, income, race
Geographic	Region, city, country
Psychographic	Lifestyle, values, attitudes
Benefit	Benefits provided
Volume	Light vs. heavy use

Examples for each of these forms of segmentation are as follows:

Demographic: Fidelity Investments tailors sales and marketing strategies to different wealth segments.

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Geographic: Pro sports teams offer merchandise in their home cities.

Psychographic: The Body Shop markets all-natural beauty products to consumers who value cosmetic products that have not been animal-tested.

Benefit: Cold Stone Creamery sells a premium ice cream product with customized toppings.

Volume: Delta Air Lines provides additional benefits, such as class upgrades, free air travel, and boarding priority, to its frequent fliers.

At a Glance 11

1 Identify three methods used for allocating factory costs to products.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
There are three basic cost allocation methods used for determining the cost of products: the single plantwide factory overhead rate method, the multiple production department factory overhead rate method, and the activity-based costing method.	• List the three primary methods for allocating factory overhead costs to products.		

2 Use a single plantwide factory overhead rate for product costing.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
A single plantwide factory overhead rate can be used to allocate all plant overhead to all products. The single plantwide factory overhead rate is simple to apply, but it can lead to significant product cost distortions.	• Compute the single plantwide factory overhead rate and use this rate to allocate factory overhead costs to products. • Identify the conditions that favor the use of a single plantwide factory overhead rate for allocating factory overhead costs to products.	**11-1**	11-1A, 11-1B

3 Use multiple production department factory overhead rates for product costing.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Product costing using multiple production department factory overhead rates requires identifying the factory overhead associated with the production departments. Using these rates will result in greater accuracy than using single plantwide factory overhead rates when: 1. There are significant differences in the factory overhead rates across different production departments. and 2. The products require different ratios of allocation-base usage in each production department.	• Compute multiple production department overhead rates and use these rates to allocate factory overhead costs to products. • Identify and describe the two conditions that favor the use of multiple production department factory overhead rates for allocating factory overhead costs to products as compared to the single plantwide factory overhead rate method.	**11-2**	11-2A, 11-2B

4 Use activity-based costing for product costing.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Activity-based costing requires factory overhead to be budgeted to activity cost pools. The activity cost pools are allocated to products by multiplying activity rates by the activity-base quantity consumed for each product. Using activity rates rather than multiple production department factory overhead rates may result in more accurate product costs when products consume activities in ratios that are unrelated to their departmental allocation bases.	• Compute activity rates and use these rates to allocate factory overhead costs to products. • Identify the conditions that favor the use of activity-based rates for allocating factory overhead costs to products, as compared to the other two methods of cost allocation. • Compare the three factory overhead allocation methods and describe the causes of cost allocation distortion.	**11-3**	11-3A, 11-3B

5 Use activity-based costing to allocate selling and administrative expenses to products.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Selling and administrative expenses can be allocated to products for management profit reporting, using activity-based costing. The traditional approach to allocating selling and administrative expenses is by the relative sales volumes of the products. Activity-based costing would be preferred when the products use selling and administrative activities in ratios that are unrelated to their sales volumes.	• Compute selling and administrative activity rates and use these rates to allocate selling and administrative expenses to either a product or customer. • Identify the conditions that would favor the use of activity-based costing for allocating selling and administrative expenses.	**11-4**	11-4A, 11-4B

6 Use activity-based costing in a service business.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Activity-based costing may be applied in service settings to determine the cost of individual service offerings. Service costs are determined by multiplying activity rates by the amount of activity-base quantities consumed by the customer using the service offering. Such information can support service pricing and profitability analysis.	• Compute activity rates for service offerings and use these rates to allocate indirect costs to either a service product line or a customer. • Prepare a customer profitability report using the cost of activities. • Describe how activity-based cost information can be used in a service business for improved decision making.	**11-5**	11-5A, 11-5B

Key Terms

activity base (453)
activity cost pools (451)
activity rate (453)
activity-based costing (ABC) method (451)
engineering change order (ECO) (452)
multiple production department factory overhead rate method (447)
product costing (444)
production department factory overhead rates (448)
setup (452)
single plantwide factory overhead rate method (445)

Illustrative Problem

Hammer Company plans to use activity-based costing to determine its product costs. It presently uses a single plantwide factory overhead rate for allocating factory overhead to products, based on direct labor hours. The total factory overhead cost is as follows:

Department	Factory Overhead
Production Support	$1,225,000
Production (factory overhead only)	175,000
Total cost	$1,400,000

The company determined that it performed four major activities in the Production Support Department. These activities, along with their budgeted costs, are as follows:

Production Support Activities	Budgeted Cost
Setup	$ 428,750
Production control	245,000
Quality control	183,750
Materials management	367,500
Total	$1,225,000

Hammer Company estimated the following activity-base usage and units produced for each of its three products:

Products	Number of Units	Direct Labor Hrs.	Setups	Production Orders	Inspections	Material Requisitions
TV	10,000	25,000	80	80	35	320
Computer	2,000	10,000	40	40	40	400
Cell phone	50,000	140,000	5	5	0	30
Total cost	62,000	175,000	125	125	75	750

Instructions

1. Determine the factory overhead cost per unit for the TV, computer, and cell phone under the single plantwide factory overhead rate method. Use direct labor hours as the activity base.
2. Determine the factory overhead cost per unit for the TV, computer, and cell phone under activity-based costing. Round to whole cents.
3. Which method provides more accurate product costing? Why?

Solution

1. Single Plantwide Factory Overhead Rate $= \dfrac{\$1,400,000}{175,000 \text{ direct labor hours}}$

$= \$8$ per direct labor hour

Factory overhead cost per unit:

	TV	Computer	Cell Phone
Number of direct labor hours	25,000	10,000	140,000
Single plantwide factory overhead rate	× $8/dlh	× $8/dlh	× $8/dlh
Total factory overhead	$200,000	$ 80,000	$ 1,120,000
Number of units	÷ 10,000	÷ 2,000	÷ 50,000
Factory overhead cost per unit	$ 20.00	$ 40.00	$ 22.40

2. Under activity-based costing, an activity rate must be determined for each activity pool:

Activity	Activity Cost Pool Budget	÷	Estimated Activity Base	=	Activity Rate
Setup	$428,750	÷	125 setups	=	$3,430 per setup
Production control	$245,000	÷	125 production orders	=	$1,960 per production order
Quality control	$183,750	÷	75 inspections	=	$2,450 per inspection
Materials management	$367,500	÷	750 requisitions	=	$490 per requisition
Production	$175,000	÷	175,000 direct labor hours	=	$1 per direct labor hour

These activity rates can be used to determine the activity-based factory overhead cost per unit as follows:

TV

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Setup	80 setups	×	$3,430	=	$274,400
Production control	80 production orders	×	$1,960	=	156,800
Quality control	35 inspections	×	$2,450	=	85,750
Materials management	320 requisitions	×	$490	=	156,800
Production	25,000 direct labor hrs.	×	$1	=	25,000
Total factory overhead					$698,750
Unit volume					÷ 10,000
Factory overhead cost per unit					$ 69.88

Computer

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Setup	40 setups	×	$3,430	=	$137,200
Production control	40 production orders	×	$1,960	=	78,400
Quality control	40 inspections	×	$2,450	=	98,000
Materials management	400 requisitions	×	$490	=	196,000
Production	10,000 direct labor hrs.	×	$1	=	10,000
Total factory overhead					$519,600
Unit volume					÷ 2,000
Factory overhead cost per unit					$ 259.80

Cell phone

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Setup	5 setups	×	$3,430	=	$ 17,150
Production control	5 production orders	×	$1,960	=	9,800
Quality control	0 inspections	×	$2,450	=	0
Materials management	30 requisitions	×	$490	=	14,700
Production	140,000 direct labor hrs.	×	$1	=	140,000
Total factory overhead					$181,650
Unit volume					÷ 50,000
Factory overhead cost per unit					$ 3.63

3. Activity-based costing is more accurate, compared to the single plantwide factory overhead rate method. Activity-based costing properly shows that the cell phone is actually less expensive to make, while the other two products are more expensive to make. The reason is that the single plantwide factory overhead rate method fails to account for activity costs correctly. The setup, production control, quality-control, and materials management activities are all performed on products in rates that are different from their volumes. For example, the computer requires many of these activities relative to its actual unit volume. The computer requires 40 setups over a volume of 2,000 units (average production run size = 50 units), while the cell phone has only 5 setups over 50,000 units (average production run size = 10,000 units). Thus, the computer requires greater support costs relative to the cell phone.

   The cell phone requires minimum activity support because it is scheduled in large batches and requires no inspections (has high quality) and few requisitions. The other two products exhibit the opposite characteristics.

Self-Examination Questions (Answers at End of Chapter)

1. Which of the following statements is most accurate?
   A. The single plantwide factory overhead rate method will usually provide management with accurate product costs.
   B. Activity-based costing can be used by management to determine accurate profitability for each product.
   C. The multiple production department factory overhead rate method will usually result in more product cost distortion than the single plantwide factory overhead rate method.
   D. Generally accepted accounting principles require activity-based costing methods for inventory valuation.

2. San Madeo Company had the following factory overhead costs:

Power	$120,000
Indirect labor	60,000
Equipment depreciation	500,000

   The factory is budgeted to work 20,000 direct labor hours in the upcoming period. San Madeo uses a single plantwide factory overhead rate based on direct labor hours. What is the overhead cost per unit associated with Product M, if Product M uses 6 direct labor hours per unit in the factory?
   A. $34 C. $204
   B. $54 D. $150

3. Which of the following activity bases would best be used to allocate setup activity to products?
   A. Number of inspections
   B. Direct labor hours
   C. Direct machine hours
   D. Number of production runs

4. Production Department 1 (PD1) and Production Department 2 (PD2) had factory overhead budgets of $26,000 and $48,000, respectively. Each department was budgeted for 5,000 direct labor hours of production activity. Product T required 5 direct labor hours in PD1 and 2 direct labor hours in PD2. What is the factory overhead cost associated with a unit of Product T, assuming that factory overhead is allocated using the multiple production department rate method?
   A. $26.00 C. $45.20
   B. $40.40 D. $58.40

5. The following activity rates are associated with moving rail cars by train:
   $4 per gross ton mile
   $50 per rail car switch
   $200 per rail car

   A train with 20 rail cars traveled 100 miles. Each rail car carried 10 tons of product. Each rail car was switched 2 times. What is the total cost of moving this train?
   A. $5,400 C. $44,100
   B. $10,000 D. $86,000

Eye Openers

1. How does a company use product costing?
2. Why would it be appropriate for a company that builds aircraft carriers for the Navy to use a single overhead rate?
3. Why would management be concerned about the accuracy of product costs?
4. Why is the sum of product costs under alternative factory overhead cost allocation methods equal?
5. Why would a manufacturing company with multiple production departments still prefer to use a single plantwide overhead rate?
6. How do the multiple production department and the single plantwide factory overhead rate methods differ?
7. How are multiple production department factory overhead rates determined?
8. How is the allocation base for a production department selected?
9. Under what two conditions would the multiple production department factory overhead rate method provide more accurate product costs than the single plantwide factory overhead rate method?
10. How does activity-based costing differ from the multiple production department factory overhead rate method?
11. Shipping, selling, marketing, sales order processing, return processing, and advertising activities can be related to products by using activity-based costing. Would allocating these activities to products for financial statement reporting be acceptable according to GAAP?
12. What would happen to net income if the activities noted in Eye Opener 11 were allocated to products for financial statement reporting and the inventory increased?
13. Under what circumstances might the activity-based costing method provide more accurate product costs than the multiple production department factory overhead rate method?
14. When might activity-based costing be preferred over using a relative amount of product sales in allocating selling and administrative expenses to products?
15. How can activity-based costing be used in service companies?
16. How would a telecommunications company use activity-based costing in conducting profit analysis?

Practice Exercises

PE 11-1A
Single plantwide overhead rate

obj. 2

EE 11-1 p. 446

The total factory overhead for Aqua-Sport Marine Company is budgeted for the year at $900,000. Aqua-Sport manufactures two types of boats: a speedboat and bass boat. The speedboat and bass boat each require 10 direct labor hours for manufacture. Each product is budgeted for 250 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year, (b) the single plantwide factory overhead rate, and (c) the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.

PE 11-1B
Single plantwide overhead rate

obj. 2

EE 11-1 p. 446

The total factory overhead for Continental Styles, Inc., is budgeted for the year at $360,000. Continental manufactures two types of men's pants: jeans and khakis. The jeans and khakis each require 0.15 direct labor hour for manufacture. Each product is budgeted for 20,000 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year, (b) the single plantwide factory overhead rate, and (c) the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.

PE 11-2A
Multiple production department overhead rates
obj. 3
EE 11-2 p. 451

The total factory overhead for Aqua-Sport Marine Company is budgeted for the year at $900,000, divided into two departments: Fabrication, $600,000, and Assembly, $300,000. Aqua-Sport manufactures two types of boats: speedboats and bass boats. The speedboats require 4 direct labor hours in Fabrication and 6 direct labor hours in Assembly. The bass boat require 6 direct labor hours in Fabrication and 4 direct labor hours in Assembly. Each product is budgeted for 250 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year in each department, (b) the departmental factory overhead rates for both departments, and (c) the factory overhead allocated per unit for each product using the department factory overhead allocation rates.

PE 11-2B
Multiple production department overhead rates
obj. 3
EE 11-2 p. 451

The total factory overhead for Continental Styles, Inc., is budgeted for the year at $360,000, divided into two departments: Cutting, $120,000, and Sewing, $240,000. Continental manufactures two types of men's pants: jeans and khakis. The jeans require 0.05 direct labor hour in Cutting and 0.10 direct labor hour in Sewing. The khakis require 0.10 direct labor hour in Cutting and 0.05 direct labor hour in Sewing. Each product is budgeted for 20,000 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year in each department, (b) the departmental factory overhead rates for both departments, and (c) the factory overhead allocated per unit for each product using the department factory overhead allocation rates.

PE 11-3A
Activity-based costing: factory overhead costs
obj. 4
EE 11-3 p. 456

The total factory overhead for Aqua-Sport Marine Company is budgeted for the year at $900,000, divided into four activity pools: fabrication, $330,000; assembly, $180,000; setup, $140,000; and inspection, $250,000. Aqua-Sport manufactures two types of boats: a speedboat and bass boat. The activity-base usage quantities for each product by each activity are as follows:

	Fabrication	Assembly	Setup	Inspection
Speedboat	1,000 dlh	1,500 dlh	50 setups	100 inspections
Bass boat	1,500	1,000	90	400
	2,500 dlh	2,500 dlh	140 setups	500 inspections

Each product is budgeted for 250 units of production for the year. Determine (a) the activity rates for each activity and (b) the activity-based factory overhead per unit for each product.

PE 11-3B
Activity-based costing: factory overhead costs
obj. 4
EE 11-3 p. 456

The total factory overhead for Continental Styles, Inc., is budgeted for the year at $360,000, divided into four activity pools: cutting, $120,000; sewing, $60,000; setup, $100,000; and inspection, $80,000. Continental manufactures two types of men's pants: jeans and khakis. The activity-base usage quantities for each product by each activity are as follows:

	Cutting	Sewing	Setup	Inspection
Jeans	1,000 dlh	2,000 dlh	1,600 setups	3,500 inspections
Khakis	2,000	1,000	400	500
	3,000 dlh	3,000 dlh	2,000 setups	4,000 inspections

Each product is budgeted for 20,000 units of production for the year. Determine (a) the activity rates for each activity and (b) the activity-based factory overhead per unit for each product.

PE 11-4A
Activity-based costing: selling and administrative expenses
obj. 5
EE 11-4 p. 458

Mini-Gym Company manufactures and sells outdoor play equipment. Mini-Gym uses activity-based costing to determine the cost of the sales order processing and the customer return activity. The sales order processing activity has an activity rate of $28 per sales order, and the customer return activity has an activity rate of $125 per return. Mini-Gym sold 2,000 swing sets, which consisted of 700 orders and 60 returns. Determine (a) the total and (b) the per-unit sales order processing and customer return activity cost for swing sets.

PE 11-4B
Activity-based costing: selling and administrative expenses
obj. 5
EE 11-4 p. 458

Step Rite Company manufactures and sells shoes. Step Rite uses activity-based costing to determine the cost of the sales order processing and the shipping activity. The sales order processing activity has an activity rate of $14 per sales order, and the shipping activity has an activity rate of $19 per shipment. Step Rite sold 25,000 units of walking shoes, which consisted of 3,000 orders and 2,000 shipments. Determine (a) the total and (b) the per-unit sales order processing and shipping activity cost for walking shoes.

PE 11-5A
Activity-based costing: service business
obj. 6
EE 11-5 p. 460

Gold Crest Hotel uses activity-based costing to determine the cost of servicing customers. There are three activity pools: guest check-in, room cleaning, and meal service. The activity rates associated with each activity pool are $6.90 per guest check-in, $16.40 per room cleaning, and $3.10 per served meal (not including food). Brandi Adams visited the hotel for a 4-night stay. Adams had three meals in the hotel during her visit. Determine the total activity-based cost for servicing Adams for this visit.

PE 11-5B
Activity-based costing: service business
obj. 6
EE 11-5 p. 460

First Horizon Trust Bank uses activity-based costing to determine the cost of servicing customers. There are three activity pools: teller transaction processing, check processing, and ATM transaction processing. The activity rates associated with each activity pool are $2.80 per teller transaction, $0.15 per canceled check, and $0.75 per ATM transaction. London Griffey had 4 teller transactions, 45 canceled checks, and 10 ATM transactions during the month. Determine the total monthly activity-based cost for servicing Griffey during the month.

Exercises

EX 11-1
Single plantwide factory overhead rate
obj. 2

Spacely Sprocket and Gear Company's Fabrication Department incurred $150,000 of factory overhead cost in producing gears and sprockets. The two products consumed a total of 5,000 direct machine hours. Of that amount, sprockets consumed 2,200 direct machine hours.

Determine the total amount of factory overhead that should be allocated to sprockets.

EX 11-2
Single plantwide factory overhead rate
obj. 2
✔ a. $38 per direct labor hour

River City Band Instruments Inc. makes three musical instruments: trumpets, tubas, and trombones. The budgeted factory overhead cost is $140,220. Factory overhead is allocated to the three products on the basis of direct labor hours. The products have the following budgeted production volume and direct labor hours per unit:

	Budgeted Production Volume	Direct Labor Hours per Unit
Trumpets	2,500 units	0.5
Tubas	800	1.4
Trombones	1,200	1.1

a. Determine the single plantwide factory overhead rate.
b. Use the factory overhead rate in (a) to determine the amount of total and per-unit factory overhead allocated to each of the three products.

EX 11-3
Single plantwide factory overhead rate

obj. 2

✔ a. $50 per processing hour

Texas Pete Snack Food Company manufactures three types of snack foods: tortilla chips, potato chips, and pretzels. The company has budgeted the following costs for the upcoming period:

Factory depreciation	$12,900
Indirect labor	30,200
Factory electricity	3,500
Indirect materials	6,650
Selling expenses	17,025
Administrative expenses	9,600
Total costs	$79,875

Factory overhead is allocated to the three products on the basis of processing hours. The products had the following production budget and processing hours per case:

	Budgeted Processing Volume (Cases)	Production Hours per Case
Tortilla chips	3,000	0.12
Potato chips	4,800	0.10
Pretzels	1,500	0.15
Total	9,300	

a. Determine the single plantwide factory overhead rate.
b. Use the factory overhead rate in (a) to determine the amount of total and per-case factory overhead allocated to each of the three products under generally accepted accounting principles.

EX 11-4
Product costs and product profitability reports, using a single plantwide factory overhead rate

obj. 2

✔ c. Pistons gross profit, $70,200

Saginaw Engine Parts Inc. (SEP) produces three products—pistons, valves, and cams—for the heavy equipment industry. SEP has a very simple production process and product line and uses a single plantwide factory overhead rate to allocate overhead to the three products. The factory overhead rate is based on direct labor hours. Information about the three products for 2010 is as follows:

	Budgeted Volume (Units)	Direct Labor Hours per Unit	Price per Unit	Direct Materials per Unit
Pistons	6,000	0.20	$42.00	$20.50
Valves	24,000	0.15	10.50	3.25
Cams	1,000	0.32	56.00	24.00

The estimated direct labor rate is $24 per direct labor hour. Beginning and ending inventories are negligible and are, thus, assumed to be zero. The budgeted factory overhead for SEP is $128,000.

a. Determine the plantwide factory overhead rate.
b. Determine the factory overhead and direct labor cost per unit for each product.
c. Use the information above to construct a budgeted gross profit report by product line for the year ended December 31, 2010. Include the gross profit as a percent of sales in the last line of your report, rounded to one decimal place.
d. What does the report in (c) indicate to you?

EX 11-5
Multiple production department factory overhead rate method

obj. 3

✔ b. Small glove, $8.60 per unit

Sure Grip Glove Company produces three types of gloves: small, medium, and large. A glove pattern is first stenciled onto leather in the Pattern Department. The stenciled patterns are then sent to the Cut and Sew Department, where the final glove is cut and sewed together. Sure Grip uses the multiple production department factory overhead rate method of allocating factory overhead costs. Its factory overhead costs were budgeted as follows:

Pattern Department overhead	$120,000
Cut and Sew Department overhead	200,000
Total	$320,000

The direct labor estimated for each production department was as follows:

Pattern Department	2,000 direct labor hours
Cut and Sew Department	2,500
Total	4,500 direct labor hours

Direct labor hours are used to allocate the production department overhead to the products. The direct labor hours per unit for each product for each production department were obtained from the engineering records as follows:

Production Departments	Small Glove	Medium Glove	Large Glove
Pattern Department	0.05	0.06	0.07
Cut and Sew Department	0.07	0.09	0.11
Direct labor hours per unit	0.12	0.15	0.18

a. Determine the two production department factory overhead rates.
b. Use the two production department factory overhead rates to determine the factory overhead per unit for each product.

EX 11-6
Single plantwide and multiple production department factory overhead rate methods and product cost distortion

objs. 2, 3

✔ b. Portable computer, $240 per unit

Pear Computer Company manufactures a desktop and portable computer through two production departments, Assembly and Testing. Presently, the company uses a single plantwide factory overhead rate for allocating factory overhead to the two products. However, management is considering using the multiple production department factory overhead rate method. The following factory overhead was budgeted for Pear:

Assembly Department	$200,000
Testing Department	760,000
Total	$960,000

Direct machine hours were estimated as follows:

Assembly Department	4,000 hours
Testing Department	8,000
Total	12,000 hours

In addition, the direct machine hours (dmh) used to produce a unit of each product in each department were determined from engineering records, as follows:

	Desktop	Portable
Assembly Department	0.50 dmh	1.00 dmh
Testing Department	1.00	2.00
Total machine hours per unit	1.50 dmh	3.00 dmh

a. Determine the per-unit factory overhead allocated to the desktop and portable computers under the single plantwide factory overhead rate method, using direct machine hours as the allocation base.
b. Determine the per-unit factory overhead allocated to the desktop and portable computers under the multiple production department factory overhead rate method, using direct machine hours as the allocation base for each department.
c. Recommend to management a product costing approach, based on your analyses in (a) and (b). Support your recommendation.

EX 11-7
Single plantwide and multiple production department factory overhead rate methods and product cost distortion

objs. 2, 3

✔ b. Diesel engine, $356 per unit

The management of Hercules Engines Inc. manufactures gasoline and diesel engines through two production departments, Fabrication and Assembly. Management needs accurate product cost information in order to guide product strategy. Presently, the company uses a single plantwide factory overhead rate for allocating factory overhead to the two products. However, management is considering using the multiple production department factory overhead rate method. The following factory overhead was budgeted for Power Torque:

Fabrication Department factory overhead	$560,000
Assembly Department factory overhead	240,000
Total	$800,000

Direct labor hours were estimated as follows:

Fabrication Department	4,000 hours
Assembly Department	4,000
Total	8,000 hours

In addition, the direct labor hours (dlh) used to produce a unit of each product in each department were determined from engineering records, as follows:

Production Departments	Gasoline Engine	Diesel Engine
Fabrication Department	0.8 dlh	2.2 dlh
Assembly Department	2.2	0.8
Direct labor hours per unit	3.0 dlh	3.0 dlh

a. Determine the per-unit factory overhead allocated to the gasoline and diesel engines under the single plantwide factory overhead rate method, using direct labor hours as the activity base.
b. Determine the per-unit factory overhead allocated to the gasoline and diesel engines under the multiple production department factory overhead rate method, using direct labor hours as the activity base for each department.
c. Recommend to management a product costing approach, based on your analyses in (a) and (b). Support your recommendation.

EX 11-8
Identifying activity bases in an activity-based cost system

obj. 4

Choice Foods Inc. uses activity-based costing to determine product costs. For each activity listed in the left column, match an appropriate activity base from the right column. You may use items in the activity base list more than once or not at all.

Activity	Activity Base
Accounting reports	Engineering change orders
Customer return processing	Kilowatt hours used
Electric power	Number of accounting reports
Human resources	Number of customers
Inventory control	Number of customer orders
Invoice and collecting	Number of customer returns
Machine depreciation	Number of employees
Materials handling	Number of inspections
Order shipping	Number of inventory transactions
Payroll	Number of machine hours
Production control	Number of material moves
Production setup	Number of payroll checks processed
Purchasing	Number of production orders
Quality control	Number of purchase orders
	Number of setups

EX 11-9
Product costs using activity rates

obj. 4

✔ b. $90,200

Dinnerware.com sells china and flatware over the Internet. For the next period, the budgeted cost of the sales order processing activity is $156,200, and 14,200 sales orders are estimated to be processed.

a. Determine the activity rate of the sales order processing activity.
b. Determine the amount of sales order processing cost that china would receive if it had 8,200 sales orders.

EX 11-10
Product costs using activity rates

obj. 4

✔ Treadmill activity cost per unit, $215.40

HealthTek Equipment Company manufactures stationary bicycles and treadmills. The products are produced in its Fabrication and Assembly production departments. In addition to production activities, several other activities are required to produce the two products. These activities and their associated activity rates are as follows:

Activity	Activity Rate
Fabrication	$24 per machine hour
Assembly	$10 per direct labor hour
Setup	$50 per setup
Inspecting	$24 per inspection
Production scheduling	$11 per production order
Purchasing	$ 8 per purchase order

The activity-base usage quantities and units produced for each product were as follows:

Activity Base	Stationary Bicycle	Treadmill
Machine hours	1,820	1,070
Direct labor hours	443	172
Setups	52	16
Inspections	663	395
Production orders	60	12
Purchase orders	196	120
Units produced	270	180

Use the activity rate and usage information to calculate the total activity cost and activity cost per unit for each product.

EX 11-11
Activity rates and product costs using activity-based costing

obj. 4

✔ b. Dining room lighting fixtures, $50.48 per unit

Aglow Inc. manufactures entry and dining room lighting fixtures. Five activities are used in manufacturing the fixtures. These activities and their associated activity cost pools and activity bases are as follows:

Activity	Activity Cost Pool (Budgeted)	Activity Base
Casting	$266,000	Machine hours
Assembly	172,800	Direct labor hours
Inspecting	29,400	Number of inspections
Setup	37,800	Number of setups
Materials handling	39,900	Number of loads

Corporate records were obtained to estimate the amount of activity to be used by the two products. The estimated activity-base usage quantities and units produced are provided in the table below.

Activity Base	Entry	Dining	Total
Machine hours	5,000	4,500	9,500
Direct labor hours	4,300	6,500	10,800
Number of inspections	1,600	500	2,100
Number of setups	220	50	270
Number of loads	750	200	950
Units produced	10,000	5,000	15,000

a. Determine the activity rate for each activity.
b. Use the activity rates in (a) to determine the total and per-unit activity costs associated with each product.

EX 11-12
Activity cost pools, activity rates, and product costs using activity-based costing

obj. 4

Top Chef Inc. is estimating the activity cost associated with producing ovens and refrigerators. The indirect labor can be traced into four separate activity pools, based on time records provided by the employees. The budgeted activity cost and activity-base information are provided as follows:

✔ b. Oven, $62.35 per unit

Activity	Activity Pool Cost	Activity Base
Procurement	$138,000	Number of purchase orders
Scheduling	9,300	Number of production orders
Materials handling	25,900	Number of moves
Product development	23,800	Number of engineering changes
Total cost	$197,000	

The estimated activity-base usage and unit information for Top Chef's two product lines was determined from corporate records as follows:

	Number of Purchase Orders	Number of Production Orders	Number of Moves	Number of Engineering Changes	Units
Ovens	750	250	440	120	2,000
Refrigerators	450	122	300	50	1,500
Totals	1,200	372	740	170	3,500

a. Determine the activity rate for each activity cost pool.
b. Determine the activity-based cost per unit of each product.

EX 11-13
Activity-based costing and product cost distortion

objs. 2, 4

✔ c. CDs, $2.38

Memory Media Inc. is considering a change to activity-based product costing. The company produces two products, CDs and DVDs, in a single production department. The production department is estimated to require 4,000 direct labor hours. The total indirect labor is budgeted to be $420,000.

Time records from indirect labor employees revealed that they spent 40% of their time setting up production runs and 60% of their time supporting actual production.

The following information about CDs and DVDs was determined from the corporate records:

	Number of Setups	Direct Labor Hours	Units
CDs	500	2,000	75,000
DVDs	1,100	2,000	75,000
Total	1,600	4,000	150,000

a. Determine the indirect labor cost per unit allocated to CDs and DVDs under a single plantwide factory overhead rate system using the direct labor hours as the allocation base.
b. Determine the activity pools and activity rates for the indirect labor under activity-based costing. Assume two activity pools—one for setup and the other for production support.
c. Determine the activity cost per unit for indirect labor allocated to each product under activity-based costing.
d. Why are the per-unit allocated costs in (a) different from the per-unit activity cost assigned to the products in (c)?

EX 11-14
Multiple production department factory overhead rate method

obj. 3

✔ b. Blender, $14.30 per unit

Kitchen Kraft Appliance Company manufactures small kitchen appliances. The product line consists of blenders and toaster ovens. Kitchen Kraft presently uses the multiple production department factory overhead rate method. The factory overhead is as follows:

Assembly Department	$ 94,000
Test and Pack Department	64,000
Total	$158,000

The direct labor information for the production of 5,000 units of each product is as follows:

	Assembly Department	Test and Pack Department
Blender	500 dlh	1,500 dlh
Toaster oven	1,500	500
Total	2,000 dlh	2,000 dlh

Kitchen Kraft used direct labor hours to allocate production department factory overhead to products.

a. Determine the two production department factory overhead rates.
b. Determine the total factory overhead and the factory overhead per unit allocated to each product.

EX 11-15
Activity-based costing and product cost distortion

obj. 4

✔ b. Blender, $17.30 per unit

The management of Kitchen Kraft Appliance Company in Exercise 11-14 has asked you to use activity-based costing to allocate factory overhead costs to the two products. You have determined that $45,000 of factory overhead from each of the production departments can be associated with setup activity ($90,000 in total). Company records indicate that blenders required 120 setups, while the toaster ovens required only 60 setups. Each product has a production volume of 5,000 units.

a. Determine the three activity rates (assembly, test and pack, and setup).
b. Determine the total factory overhead and factory overhead per unit allocated to each product.

EX 11-16
Single plantwide rate and activity-based costing

objs. 2, 4

✔ a. Low, Col. C., 110.0%

Whirlpool Corporation conducted an activity-based costing study of its Evansville, Indiana, plant in order to identify its most profitable products. Assume that we select three representative refrigerators (out of 333): one low-, one medium-, and one high-volume refrigerator. Additionally, we assume the following activity-base information for each of the three refrigerators:

Three Representative Refrigerators	Number of Machine Hours	Number of Setups	Number of Sales Orders	Number of Units
Refrigerator—Low Volume	30	15	45	150
Refrigerator—Medium Volume	280	14	100	1,400
Refrigerator—High Volume	1,000	10	150	5,000

Prior to conducting the study, the factory overhead allocation was based on a single machine hour rate. The machine hour rate was $150 per hour. After conducting the activity-based costing study, assume that three activities were used to allocate the factory overhead. The new activity rate information is assumed to be as follows:

	Machining Activity	Setup Activity	Sales Order Processing Activity
Activity rate	$130	$220	$50

a. Complete the following table, using the single machine hour rate to determine the per-unit factory overhead for each refrigerator (Column A) and the three activity-based rates to determine the activity-based factory overhead per unit (Column B). Finally, compute the percent change in per-unit allocation from the single to activity-based rate methods (Column C). Round whole percents to one decimal place.

Product Volume Class	Column A Single Rate Overhead Allocation per Unit	Column B ABC Overhead Allocation per Unit	Column C Percent Change in Allocation (Col. B − Col. A)/Col. A
Low			
Medium			
High			

b. Why is the traditional overhead rate per machine hour greater under the single rate method than under the activity-based method?
c. Interpret Column C in your table from part (a).

EX 11-17
Evaluating selling and administrative cost allocations

obj. 5

Office Comfort Furniture Company has two major product lines with the following characteristics:

Commercial office furniture: Few large orders, little advertising support, shipments in full truckloads, and low handling complexity
Home office furniture: Many small orders, large advertising support, shipments in partial truckloads, and high handling complexity

The company produced the following profitability report for management:

Office Comfort Furniture Company
Product Profitability Report
For the Year Ended December 31, 2010

	Commercial Office Furniture	Home Office Furniture	Total
Revenue	$3,600,000	$1,800,000	$5,400,000
Cost of goods sold	1,500,000	700,000	2,200,000
Gross profit	$2,100,000	$1,100,000	$3,200,000
Selling and administrative expenses	1,200,000	600,000	1,800,000
Income from operations	$ 900,000	$ 500,000	$1,400,000

The selling and administrative expenses are allocated to the products on the basis of relative sales dollars.

Evaluate the accuracy of this report and recommend an alternative approach.

EX 11-18
Construct and interpret a product profitability report, allocating selling and administrative expenses

obj. 5

✔ b. Generators operating profit-to-sales, 22%

On-Site Power, Inc. manufactures power equipment. On-Site Power has two primary products—generators and air compressors. The following report was prepared by the controller for On-Site's senior marketing management:

	Generators	Air Compressors	Total
Revenue	$1,420,000	$840,000	$2,260,000
Cost of goods sold	1,065,000	630,000	1,695,000
Gross profit	$ 355,000	$210,000	$ 565,000
Selling and administrative expenses			193,800
Income from operations			$ 371,200

The marketing management team was concerned that the selling and administrative expenses were not traced to the products. Marketing management believed that some products consumed larger amounts of selling and administrative expense than did other products. To verify this, the controller was asked to prepare a complete product profitability report, using activity-based costing.

The controller determined that selling and administrative expenses consisted of two activities: sales order processing and post-sale customer service. The controller was able to determine the activity base and activity rate for each activity, as shown below.

Activity	Activity Base	Activity Rate
Sales order processing	Sales orders	$ 60 per sales order
Post-sale customer service	Service requests	$250 per customer service request

The controller determined the following additional information about each product:

	Generators	Air Compressors
Number of sales orders	385	770
Number of service requests	78	420

a. Determine the activity cost of each product for sales order processing and post-sale customer service activities.

b. Use the information in (a) to prepare a complete product profitability report dated for the year ended December 31, 2010. Calculate the gross profit to sales and the income from operations to sales percentages for each product.
c. Interpret the product profitability report. How should management respond to the report?

EX 11-19
Activity-based costing and customer profitability

obj. 5

✔ a. Customer 1, $2,346

Schneider Electric manufactures power distribution equipment for commercial customers, such as hospitals and manufacturers. Activity-based costing was used to determine customer profitability. Customer service activities were assigned to individual customers, using the following assumed customer service activities, activity base, and activity rate:

Customer Service Activity	Activity Base	Activity Rate
Bid preparation	Number of bid requests	$220/request
Shipment	Number of shipments	$18/shipment
Support standard items	Number of standard items ordered	$24/std. item
Support nonstandard items	Number of nonstandard items ordered	$82/nonstd. item

Assume that the company had the following gross profit information for three representative customers:

	Customer 1	Customer 2	Customer 3
Revenue	$24,250	$18,000	$40,000
Cost of goods sold	11,640	9,360	24,800
Gross profit	$12,610	$ 8,640	$15,200
Gross profit as a percent of sales	52%	48%	38%

The administrative records indicated that the activity-base usage quantities for each customer were as follows:

Activity Base	Customer 1	Customer 2	Customer 3
Number of bid requests	20	6	8
Number of shipments	34	22	16
Number of standard items ordered	48	35	52
Number of nonstandard items ordered	50	25	15

a. Prepare a customer profitability report dated for the year ended December 31, 2010, showing (1) the income from operations after customer service activities, (2) the gross profit as a percent of sales, and (3) the income from operations after customer service activities as a percent of sales. Prepare the report with a column for each customer. Round percentages to the nearest whole percent.
b. Interpret the report in part (a).

EX 11-20
Activity-based costing for a hospital

obj. 6

✔ a. Patient Lawson, $2,380

St. Luke Hospital plans to use activity-based costing to assign hospital indirect costs to the care of patients. The hospital has identified the following activities and activity rates for the hospital indirect costs:

Activity	Activity Rate
Room and meals	$170 per day
Radiology	$240 per image
Pharmacy	$40 per physician order
Chemistry lab	$75 per test
Operating room	$720 per operating room hour

The records of two representative patients were analyzed, using the activity rates. The activity information associated with the two patients is as follows:

	Patient Lawson	Patient Masters
Number of days	3 days	8 days
Number of images	2 images	5 images
Number of physician orders	4 orders	6 orders
Number of tests	2 tests	5 tests
Number of operating room hours	1.5 hours	5.5 hours

a. Determine the activity cost associated with each patient.
b. Why is the total activity cost different for the two patients?

EX 11-21
Activity-based costing in an insurance company

objs. 5, 6

✔ a. Auto, $1,000,500

Shield Insurance Company carries three major lines of insurance: auto, workers' compensation, and homeowners. The company has prepared the following report for 2011:

Shield Insurance Company
Product Profitability Report
For the Year Ended December 31, 2011

	Auto	Workers' Compensation	Homeowners
Premium revenue	$5,600,000	$4,800,000	$7,200,000
Less estimated claims	3,920,000	3,360,000	5,040,000
Underwriting income	$1,680,000	$1,440,000	$2,160,000
Underwriting income as a percent of premium revenue	30%	30%	30%

Management is concerned that the administrative expenses may make some of the insurance lines unprofitable. However, the administrative expenses have not been allocated to the insurance lines. The controller has suggested that the administrative expenses could be assigned to the insurance lines using activity-based costing. The administrative expenses are comprised of five activities. The activities and their rates are as follows:

	Activity Rates
New policy processing	$160 per new policy
Cancellation processing	$240 per cancellation
Claim audits	$500 per claim audit
Claim disbursements processing	$120 per disbursement
Premium collection processing	$ 25 per premium collected

Activity-base usage data for each line of insurance was retrieved from the corporate records and is shown below.

	Auto	Workers' Comp.	Homeowners
Number of new policies	1,100	1,250	3,200
Number of canceled policies	450	200	1,600
Number of audited claims	320	100	700
Number of claim disbursements	400	180	750
Number of premiums collected	7,500	1,500	12,000

a. Complete the product profitability report through the administrative activities. Determine the income from operations as a percent of premium revenue, rounded to the nearest whole percent.
b. Interpret the report.

Problems Series A

PR 11-1A
Single plantwide factory overhead rate

obj. 2

✔ 1. b. $90 per machine hour

Spring Meadow Dairy Company manufactures three products—whole milk, skim milk, and cream—in two production departments, Blending and Packing. The factory overhead for Spring Meadow Dairy is $270,000.

The three products consume both machine hours and direct labor hours in the two production departments as follows:

	Direct Labor Hours	Machine Hours
Blending Department		
Whole milk	270	790
Skim milk	290	720
Cream	240	290
	800	1,800
Packing Department		
Whole milk	330	460
Skim milk	520	560
Cream	150	180
	1,000	1,200
Total	1,800	3,000

Instructions

1. Determine the single plantwide factory overhead rate, using each of the following allocation bases: (a) direct labor hours and (b) machine hours.
2. Determine the product factory overhead costs, using (a) the direct labor hour plantwide factory overhead rate and (b) the machine hour plantwide factory overhead rate.

PR 11-2A
Multiple production department factory overhead rates

obj. 3

✔ 2. Cream, $42,900

The management of Spring Meadow Dairy Company, described in Problem 11-1A, now plans to use the multiple production department factory overhead rate method. The total factory overhead associated with each department is as follows:

Blending Department	$216,000
Packing Department	54,000
Total	$270,000

Instructions

1. Determine the multiple production department factory overhead rates, using machine hours for the Blending Department and direct labor hours for the Packing Department.
2. Determine the product factory overhead costs, using the multiple production department rates in (1).

PR 11-3A
Activity-based department rate product costing and product cost distortions

objs. 3, 4

✔ 4. CD players, $154,000 and $30.80

Harmony Audio Inc. manufactures two products: receivers and CD players. The factory overhead incurred is as follows:

Indirect labor	$210,000
Subassembly Department	145,000
Final Assembly Department	95,000
Total	$450,000

The activity base associated with the two production departments is direct labor hours. The indirect labor can be assigned to two different activities as follows:

Activity	Activity Cost Pool	Activity Base
Setup	$ 90,000	Number of setups
Quality control	120,000	Number of inspections
Total	$210,000	

The activity-base usage quantities and units produced for the two products are shown below.

	Number of Setups	Number of Inspections	Direct Labor Hours—Subassembly	Direct Labor Hours—Final Assembly	Units Produced
Receivers	200	1,000	600	400	5,000
CD Players	40	250	400	600	5,000
Total	240	1,250	1,000	1,000	10,000

Instructions

1. Determine the factory overhead rates under the multiple production department rate method. Assume that indirect labor is associated with the production departments, so that the total factory overhead is $250,000 and $200,000 for the Subassembly and Final Assembly departments, respectively.
2. Determine the total and per-unit factory overhead costs allocated to each product, using the multiple production department overhead rates in (1).
3. Determine the activity rates, assuming that the indirect labor is associated with activities rather than with the production departments.

(*continued*)

4. Determine the total and per-unit cost assigned to each product under activity-based costing.
5. Explain the difference in the per-unit overhead allocated to each product under the multiple production department factory overhead rate and activity-based costing methods.

PR 11-4A
Activity-based product costing

obj. 4

✔ 2. Brown sugar total activity cost, $328,950

Hawaiian Sugar Company manufactures three products (white sugar, brown sugar, and powdered sugar) in a continuous production process. Senior management has asked the controller to conduct an activity-based costing study. The controller identified the amount of factory overhead required by the critical activities of the organization as follows:

Activity	Activity Cost Pool
Production	$468,000
Setup	168,000
Inspection	85,000
Shipping	144,000
Customer service	50,000
Total	$915,000

The activity bases identified for each activity are as follows:

Activity	Activity Base
Production	Machine hours
Setup	Number of setups
Inspection	Number of inspections
Shipping	Number of customer orders
Customer service	Number of customer service requests

The activity-base usage quantities and units produced for the three products were determined from corporate records and are as follows:

	Machine Hours	Number of Setups	Number of Inspections	Number of Customer Orders	Number of Customer Service Requests	Units
White sugar	3,200	100	200	800	40	8,000
Brown sugar	2,000	150	300	2,200	250	5,000
Powdered sugar	2,000	150	500	1,000	110	5,000
Total	7,200	400	1,000	4,000	400	18,000

Each product requires 0.4 machine hour per unit.

Instructions

1. Determine the activity rate for each activity.
2. Determine the total and per-unit activity cost for all three products. Round to the nearest cent.
3. Why aren't the activity unit costs equal across all three products since they require the same machine time per unit?

PR 11-5A
Allocating selling and administrative expenses using activity-based costing

obj. 5

✔ 3. Office Warehouse, income from operations, $133,530

Z-Rox Inc. manufactures office copiers, which are sold to retailers. The price and cost of goods sold for each copier are as follows:

Price	$680 per unit
Cost of goods sold	410
Gross profit	$270 per unit

In addition, the company incurs selling and administrative expenses of $254,880. The company wishes to assign these costs to its three major retail customers, Office Warehouse, General Office Supply, and Office Universe. These expenses are related to its three major nonmanufacturing activities: customer service, sales order processing, and advertising support. The advertising support is in the form of advertisements that are placed by Z-Rox Inc. to support the retailer's sale of Z-Rox copiers to consumers. The activity cost pool and activity bases associated with these activities are:

Activity	Activity Cost Pool	Activity Base
Customer service	$ 34,800	Number of service requests
Sales order processing	24,080	Number of sales orders
Advertising support	196,000	Number of ads placed
Total activity cost	$254,880	

Activity-base usage and unit volume information for the three customers is as follows:

	Office Warehouse	General Office Supply	Office Universe	Total
Number of service requests	50	10	180	240
Number of sales orders	240	100	520	860
Number of ads placed	20	15	105	140
Unit volume	650	650	650	1,950

Instructions

1. Determine the activity rates for each of the three nonmanufacturing activity pools.
2. Determine the activity costs allocated to the three customers, using the activity rates in (1).
3. Construct customer profitability reports for the three customers, dated for the year ended December 31, 2010, using the activity costs in (2). The reports should disclose the gross profit and income from operations associated with each customer.
4. Provide recommendations to management, based on the profitability reports in (3).

PR 11-6A

Product costing and decision analysis for a passenger airline

obj. 6

✔ 3. Flight 102 income from operations, $7,115

True Blue Airline provides passenger airline service, using small jets. The airline connects four major cities: Atlanta, Cincinnati, Chicago, and Los Angeles. The company expects to fly 125,000 miles during a month. The following costs are budgeted for a month:

Fuel	$ 950,000
Ground personnel	714,300
Crew salaries	628,000
Depreciation	172,000
Total costs	$2,464,300

True Blue management wishes to assign these costs to individual flights in order to gauge the profitability of its service offerings. The following activity bases were identified with the budgeted costs:

Airline Cost	Activity Base
Fuel, crew, and depreciation costs	Number of miles flown
Ground personnel	Number of arrivals and departures at an airport

The size of the company's ground operation in each city is determined by the size of the workforce. The following monthly data are available from corporate records for each terminal operation:

Terminal City	Ground Personnel Cost	Number of Arrivals/Departures
Atlanta	$248,000	320
Cincinnati	91,000	130
Chicago	123,000	150
Los Angeles	252,300	290
Total	$714,300	890

Three recent representative flights have been selected for the profitability study. Their characteristics are as follows:

	Description	Miles Flown	Number of Passengers	Ticket Price per Passenger
Flight 101	Atlanta to LA	1,850	23	$1,375
Flight 102	Chicago to Atlanta	600	29	590
Flight 103	Atlanta to Cincinnati	350	14	425

Instructions

1. Determine the fuel, crew, and depreciation cost per mile flown.
2. Determine the cost per arrival or departure by terminal city.
3. Use the information in (1) and (2) to construct a profitability report for the three flights.
4. Evaluate flight profitability by determining the break-even number of passengers required for each flight assuming all the costs of a flight are fixed. Round to the nearest whole number.

Problems Series B

PR 11-1B
Single plantwide factory overhead rate

obj. 2

✔ 1. b. $75 per machine hour

Classic Car Accessory Company manufactures three chrome-plated products—automobile bumpers, valve covers, and wheels. These products are manufactured in two production departments (Stamping and Plating). The factory overhead for Classic Car is $423,000.

The three products consume both machine hours and direct labor hours in the two production departments as follows:

	Direct Labor Hours	Machine Hours
Stamping Department		
Automobile bumpers	420	720
Valve covers	380	680
Wheels	700	940
	1,500	2,340
Plating Department		
Automobile bumpers	205	950
Valve covers	210	890
Wheels	200	1,460
	615	3,300
Total	2,115	5,640

Instructions

1. Determine the single plantwide factory overhead rate, using each of the following allocation bases: (a) direct labor hours and (b) machine hours.
2. Determine the product factory overhead costs, using (a) the direct labor hour plantwide factory overhead rate and (b) the machine hour plantwide factory overhead rate.

PR 11-2B
Multiple production department factor overhead rates

obj. 3

✔ 2. Wheels, $195,000

The management of Classic Car Accessory Company, described in Problem 11-1B, now plans to use the multiple production department factory overhead rate method. The total factory overhead associated with each department is as follows:

Stamping Department	$324,000
Plating Department	99,000
Total	$423,000

Instructions

1. Determine the multiple production department factory overhead rates, using direct labor hours for the Stamping Department and machine hours for the Plating Department.
2. Determine the product factory overhead costs, using the multiple production department rates in (1).

PR 11-3B
Activity-based and department rate product costing and product cost distortions

Alpine Extreme Sports Inc. manufactures two products: snowboards and skis. The factory overhead incurred is as follows:

Indirect labor	$160,000
Cutting Department	95,000
Finishing Department	85,000
Total	$340,000

objs. 3, 4

✔ 4. Snowboards, $133,600 and $33.40

The activity base associated with the two production departments is direct labor hours. The indirect labor can be assigned to two different activities as follows:

Activity	Activity Cost Pool	Activity Base
Production control	$ 90,000	Number of production runs
Materials handling	70,000	Number of moves
Total	$160,000	

The activity-base usage quantities and units produced for the two products are shown below.

	Number of Production Runs	Number of Moves	Direct Labor Hours—Cutting	Direct Labor Hours—Finishing	Units Produced
Snowboards	60	2,000	3,500	1,500	4,000
Skis	340	4,000	1,500	3,500	4,000
Total	400	6,000	5,000	5,000	8,000

Instructions

1. Determine the factory overhead rates under the multiple production department rate method. Assume that indirect labor is associated with the production departments, so that the total factory overhead is $185,000 and $155,000 for the Cutting and Finishing departments, respectively.
2. Determine the total and per-unit factory overhead costs allocated to each product, using the multiple production department overhead rates in (1).
3. Determine the activity rates, assuming that the indirect labor is associated with activities rather than with the production departments.
4. Determine the total and per-unit cost assigned to each product under activity-based costing.
5. Explain the difference in the per-unit overhead allocated to each product under the multiple production department factory overhead rate and activity-based costing methods.

PR 11-4B Activity-based product costing

obj. 4

✔ 2. Newsprint total activity cost, $282,725

Gwinnett Paper Company manufactures three products (computer paper, newsprint, and specialty paper) in a continuous production process. Senior management has asked the controller to conduct an activity-based costing study. The controller identified the amount of factory overhead required by the critical activities of the organization as follows:

Activity	Activity Cost Pool
Production	$ 495,000
Setup	225,000
Moving	29,750
Shipping	126,000
Product engineering	150,000
Total	$1,025,750

The activity bases identified for each activity are as follows:

Activity	Activity Base
Production	Machine hours
Setup	Number of setups
Moving	Number of moves
Shipping	Number of customer orders
Product engineering	Number of test runs

The activity-base usage quantities and units produced for the three products were determined from corporate records and are as follows:

	Machine Hours	Number of Setups	Number of Moves	Number of Customer Orders	Number of Test Runs	Units
Computer paper	900	130	290	440	90	1,000
Newsprint	1,125	60	130	135	20	1,250
Specialty paper	450	310	430	625	140	500
Total	2,475	500	850	1,200	250	2,750

Each product requires 0.9 machine hour per unit.

Instructions

1. Determine the activity rate for each activity.
2. Determine the total and per-unit activity cost for all three products.
3. Why aren't the activity unit costs equal across all three products since they require the same machine time per unit?

PR 11-5B
Allocating selling and administrative expenses using activity-based costing

obj. 5

✔ 3. Coastal Atlantic University loss from operations, ($7,000)

Fridge King Inc. manufactures cooling units for commercial buildings. The price and cost of goods sold for each unit are as follows:

Price	$40,500 per unit
Cost of goods sold	25,500
Gross profit	$15,000 per unit

In addition, the company incurs selling and administrative expenses of $160,400. The company wishes to assign these costs to its three major customers, Coastal Atlantic University, Celebrity Arena, and Hope Hospital. These expenses are related to three major nonmanufacturing activities: customer service, project bidding, and engineering support. The engineering support is in the form of engineering changes that are placed by the customer to change the design of a product. The activity cost pool and activity bases associated with these activities are:

Activity	Activity Cost Pool	Activity Base
Customer service	$ 66,500	Number of service requests
Project bidding	34,500	Number of bids
Engineering support	59,400	Number of customer design changes
Total costs	$160,400	

Activity-base usage and unit volume information for the three customers is as follows:

	Coastal Atlantic University	Celebrity Arena	Hope Hospital	Total
Number of service requests	110	35	45	190
Number of bids	14	12	20	46
Number of customer design changes	75	25	35	135
Unit volume	5	10	15	30

Instructions

1. Determine the activity rates for each of the three nonmanufacturing activity pools.
2. Determine the activity costs allocated to the three customers, using the activity rates in (1).
3. Construct customer profitability reports for the three customers dated for the year ended December 31, 2011, using the activity costs in (2). The reports should disclose the gross profit and income from operations associated with each customer.
4. Provide recommendations to management, based on the profitability reports in (3).

PR 11-6B
Product costing and decision analysis for a hospital

obj. 6

✔ 3. Procedure B excess, $344,000

Gilead Healthcare Inc. wishes to determine its product costs. Gilead offers a variety of medical procedures (operations) that are considered its "products." The overhead has been separated into three major activities. The annual estimated activity costs and activity bases are provided below.

Activity	Activity Pool Cost	Activity Base
Scheduling and admitting	$ 230,000	Number of patients
Housekeeping	2,150,000	Number of patient days
Nursing	2,520,000	Weighted care unit
Total costs	$4,900,000	

Total "patient days" are determined by multiplying the number of patients by the average length of stay in the hospital. A weighted care unit (wcu) is a measure of

nursing effort used to care for patients. There were 140,000 weighted care units estimated for the year. In addition, Gilead estimated 4,600 patients and 17,200 patient days for the year. (The average patient is expected to have a a little less than a four-day stay in the hospital.)

During a portion of the year, Gilead collected patient information for three selected procedures, as shown below.

	Activity-Base Usage
Procedure A	
Number of patients	210
Average length of stay	× 5 days
Patient days	1,050
Weighted care units	15,000
Procedure B	
Number of patients	500
Average length of stay	× 4 days
Patient days	2,000
Weighted care units	4,500
Procedure C	
Number of patients	900
Average length of stay	× 3 days
Patient days	2,700
Weighted care units	19,000

Private insurance reimburses the hospital for these activities at a fixed daily rate of $350 per patient day for all three procedures.

Instructions

1. Determine the activity rates.
2. Determine the activity cost for each procedure.
3. Determine the excess or deficiency of reimbursements over activity cost.
4. Interpret your results.

Special Activities

SA 11-1
Ethics and professional conduct in business

The controller of Accent Systems Inc. devised a new costing system based on tracing the cost of activities to products. The controller was able to measure post-manufacturing activities, such as selling, promotional, and distribution activities, and allocate these activities to products in order to have a more complete view of the company's product costs. This effort produced better strategic information about the relative profitability of product lines. In addition, the controller used the same product cost information for inventory valuation on the financial statements. Surprisingly, the controller discovered that the company's reported net income was larger under this scheme than under the traditional costing approach.

Why was the net income larger, and how would you react to the controller's action?

SA 11-2
Identifying product cost distortion

Atlanta Beverage Company manufactures soft drinks. Information about two products is as follows:

	Volume	Sales Price per Case	Gross Profit per Case
Jamaican Punch	10,000 cases	$30	$12
King Kola	800,000 cases	30	12

It is known that both products have the same direct materials and direct labor costs per case. Atlanta Beverage allocates factory overhead to products by using a single plantwide factory overhead rate, based on direct labor cost. Additional information about the two products is as follows:

Jamaican Punch: Requires extensive process preparation and sterilization prior to processing. The ingredients are from Jamaica, requiring complex import controls. The formulation is complex, and it is thus difficult to maintain quality. Lastly, the product is sold in small (less than full truckload) orders.

King Kola: Requires minor process preparation and sterilization prior to processing. The ingredients are acquired locally. The formulation is simple, and it is easy to maintain quality. Lastly, the product is sold in large bulk (full truckload) orders.

Explain the product profitability report in light of the additional data.

SA 11-3
Activity-based costing

Wells Fargo Insurance Services (WFIS) is an insurance brokerage company that classified insurance products as either "easy" or "difficult." Easy and difficult products were defined as follows:

Easy: Electronic claims, few inquiries, mature product

Difficult: Paper claims, complex claims to process, many inquiries, a new product with complex options

The company originally allocated processing and service expenses on the basis of revenue. Under this traditional allocation approach, the product profitability report revealed the following:

	Easy Product	Difficult Product	Total
Revenue	$600	$400	$1,000
Processing and service expenses	420	280	700
Income from operations	$180	$120	$ 300
Operating income margin	30%	30%	30%

WFIS decided to use activity-based costing to allocate the processing and service expenses. The following activity-based costing analysis of the same data illustrates a much different profit picture for the two types of products.

	Easy Product	Difficult Product	Total
Revenue	$600	$ 400	$1,000
Processing and service expenses	183	517	700
Income from operations	$417	$(117)	$ 300
Operating income margin	70%	(29%)	30%

Explain why the activity-based profitability report reveals different information from the traditional sales allocation report.

Source: Dan Patras and Kevin Clancy, "ABC in the Service Industry: Product Line Profitability at Acordia, Inc." As Easy as ABC Newsletter, Issue 12, Spring 1993.

SA 11-4
Using a product profitability report to guide strategic decisions

The controller of Wave Audio Inc. prepared the following product profitability report for management, using activity-based costing methods for allocating both the factory overhead and the marketing expenses. As such, the controller has confidence in the accuracy of this report. In addition, the controller interviewed the vice president of marketing, who indicated that the floor loudspeakers were an older product that was highly recognized in the

marketplace. The ribbon loudspeakers were a new product that was recently launched. The ribbon loudspeakers are a new technology that have no competition in the marketplace, and it is hoped that they will become an important future addition to the company's product portfolio. Initial indications are that the product is well received by customers. The controller believes that the manufacturing costs for all three products are in line with expectations.

	Floor Loudspeakers	Bookshelf Loudspeakers	Ribbon Loudspeakers	Totals
Sales	$1,000,000	$750,000	$500,000	$2,250,000
Less cost of goods sold	700,000	412,500	450,000	1,562,500
Gross profit	$ 300,000	$337,500	$ 50,000	$ 687,500
Less marketing expenses	380,000	75,000	40,000	495,000
Income from operations	$ (80,000)	$262,500	$ 10,000	$ 192,500

1. Calculate the gross profit and income from operations to sales ratios for each product.
2. Write a memo using the product profitability report and the calculations in (1) to make recommendations to management with respect to strategies for the three products.

SA 11-5
Product cost distortion

Tony Lopez, president of Touch Tech Inc., was reviewing the product profitability reports with the controller, Rhamel Rucker. The following conversation took place:

Tony: I've been reviewing the product profitability reports. Our high-volume calculator, the T-100, appears to be unprofitable, while some of our lower-volume specialty calculators in the T-900 series appear to be very profitable. These results do not make sense to me. How are the product profits determined?

Rhamel: First, we identify the revenues associated with each product line. This information comes directly from our sales order system and is very accurate. Next, we identify the direct materials and direct labor associated with making each of the calculators. Again, this information is very accurate. The final cost that must be considered is the factory overhead. Factory overhead is allocated to the products, based on the direct labor hours used to assemble the calculator.

Tony: What about distribution, promotion, and other post-manufacturing costs that can be associated with the product?

Rhamel: According to generally accepted accounting principles, we expense them in the period that they are incurred and do not treat them as product costs.

Tony: Another thing, you say that you allocate factory overhead according to direct labor hours. Yet I know that the T-900 series specialty products have very low volumes but require extensive engineering, testing, and materials management effort. They are our newer, more complex products. It seems that these sources of factory overhead will end up being allocated to the T-100 line because it is the high-volume and therefore high direct labor hour product. Yet the T-100 line is easy to make and requires very little support from our engineering, testing, and materials management personnel.

Rhamel: I'm not too sure. I do know that our product costing approach is similar to that used by many different types of companies. I don't think we could all be wrong.

Is Tony Lopez's concern valid, and how might Rhamel Rucker redesign the cost allocation system to address Tony's concern?

SA 11-6
Allocating bank administrative costs

Banks have a variety of products, such as savings accounts, checking accounts, certificates of deposit (CDs), and loans. Assume that you were assigned the task of determining the administrative costs of "savings accounts" as a complete product line. What are some of the activities associated with savings accounts? In answering this question, consider the activities that you might perform with your savings account. For each activity, what would be an activity base that could be used to allocate the activity cost to the savings account product line?

Answers to Self-Examination Questions

1. **B** Activity-based costing provides accurate product costs, which can be used for strategic product profitability analysis. The single plantwide factory overhead rate method (answer A) can distort the individual product costs under a variety of reasonable conditions. The multiple production department factory overhead rate method will lead to less (not more) distortion than the single plantwide factory overhead rate method (answer C). Generally accepted accounting principles do not require activity-based costing for inventory valuation (answer D).

2. **C** The single plantwide factory overhead rate is $34 per hour (answer A), determined as $680,000/20,000 hours. This rate is multiplied by 6 direct labor hours per unit of Product M to determine the correct overhead per unit of $204. The total overhead should be used in the numerator in determining the overhead rate, not just power and indirect labor (answer B) or equipment depreciation (answer D).

3. **D** The number of production runs best relates the activity cost of setup to the products. Number of inspections, direct labor hours, and direct machine hours (answers A , B, and C) will likely have very little logical association with the costs incurred in setting up production runs.

4. **C** PD1 rate: $26,000/5,000 dlh = $5.20 per dlh
PD2 rate: $48,000/5,000 dlh = $9.60 per dlh
Product T: (5 dlh × $5.20) + (2 dlh × $9.60) = $45.20

5. **D** (100 miles × 20 cars × 10 tons × $4) + ($200 × 20 cars) + (20 cars × 2 switches × $50) = $80,000 + $4,000 + $2,000 = $86,000

CHAPTER 12

Cost Management for Just-in-Time Environments

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PRECOR

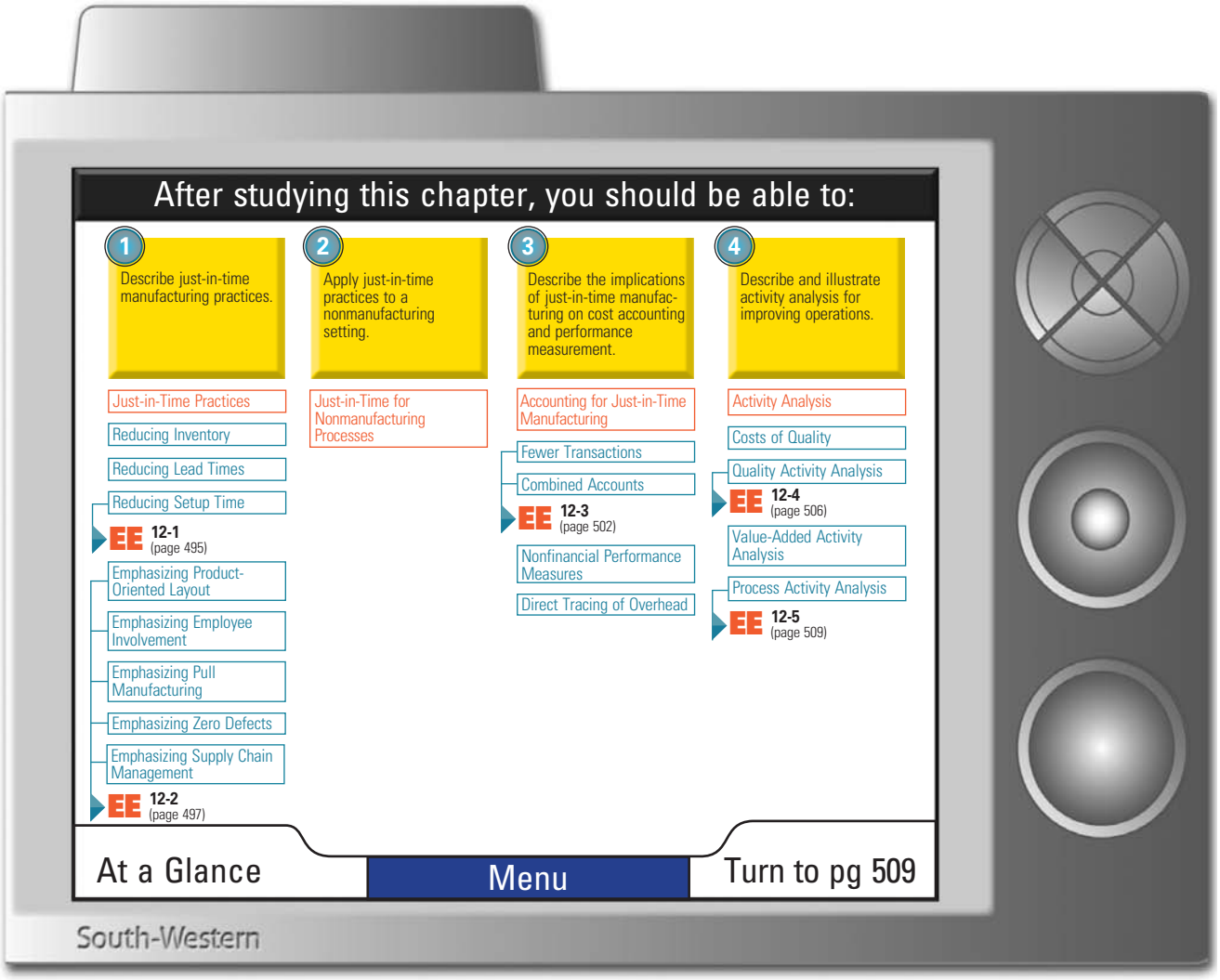
When you order the salad bar at the local restaurant, you are able to serve yourself at your own pace. There is no waiting for the waitress to take the order or for the cook to prepare the meal. You are able to move directly to the salad bar and select from various offerings. You might wish to have salad with lettuce, cole slaw, bacon bits, croutons, and salad dressing. The offerings are arranged in a row so that you can build your salad as you move down the salad bar.

Many manufacturers are producing products, in much the same way that the salad bar is designed to satisfy each customer's needs. Like customers at the salad bar, products move through a production process as they are built for each customer. Such a process eliminates many sources of waste, which is why it is termed *just in time*.

Using just-in-time practices can improve performance. For example, when Precor, a manufacturer of fitness equipment, used just-in-time principles, it improved its manufacturing operations with the following results:

1. Increased on-time shipments from near 40% to above 90%.
2. Decreased direct labor costs by 30%.
3. Reduced the number of suppliers from 3,000 to under 250.
4. Reduced inventory by 40%.
5. Reduced warranty claims by almost 60%.

In this chapter, the just-in-time practices are described and illustrated. The chapter concludes by describing and illustrating the accounting for quality costs and activity analysis.



1 Describe just-in-time manufacturing practices.

Just-in-Time Practices

The objective of most manufacturers is to produce products with high quality, low cost, and instant availability. In attempting to achieve this objective, many manufacturers have implemented just-in-time processing. **Just-in-time processing (JIT)**, sometimes called *lean manufacturing*, is a philosophy that focuses on reducing time and cost, and eliminating poor quality.

Exhibit 1 lists just-in-time manufacturing and the traditional manufacturing practices. Each of the just-in-time practices is discussed in this section.

Reducing Inventory

Just-in-time (JIT) manufacturing views inventory as wasteful and unnecessary. As a result, JIT emphasizes reducing or eliminating inventory.

Under traditional manufacturing, inventory often hides underlying production problems. For example, if machine breakdowns occur, work in process inventories can be used to keep production running in other departments while the machines are being repaired. Likewise, inventories can be used to hide problems caused by a shortage of trained employees, unreliable suppliers, or poor quality.

In contrast, just-in-time manufacturing attempts to solve and remove production problems. In this way, raw materials, work in process, and finished goods inventories are reduced or eliminated.

Exhibit 1

Operating Principles of Just-in-Time versus Traditional Manufacturing

Issue	Just-in-Time Manufacturing	Traditional Manufacturing
Inventory	Reduces inventory.	Increases inventory to protect against process problems.
Lead time	Reduces lead time.	Increases lead time to protect against uncertainty.
Setup time	Reduces setup time.	Disregards setup time as an improvement priority.
Production layout	Emphasizes product-oriented layout.	Emphasizes process-oriented layout.
Role of the employee	Emphasizes team-oriented employee involvement.	Emphasizes work of individuals, following manager instructions.
Production scheduling policy	Emphasizes pull manufacturing.	Emphasizes push manufacturing.
Quality	Emphasizes zero defects.	Tolerates defects.
Suppliers and customers	Emphasizes supply chain management.	Treats suppliers and customers as "arm's-length," independent entities.

The role of inventory in manufacturing can be illustrated using a river. Inventory is the water in a river. The rocks at the bottom of the river are production problems. When the water level (inventory) is high, the rocks (production problems) at the bottom of the river are hidden. As the water level (inventory) level drops, the rocks (production problems) become visible, one by one. JIT manufacturing reduces the water level (inventory), exposes the rocks (production problems), and removes the rocks so that the river can flow smoothly.

Integrity, Objectivity, and Ethics in Business

THE INVENTORY SHIFT

Some managers take a shortcut to reducing inventory by shifting inventory to their suppliers. With this tactic, the hard work of improving processes is avoided. Enlightened managers realize that such tactics often have short-lived savings. Suppliers will eventually increase their prices to compensate for the additional inventory holding costs, thus resulting in no savings. Therefore, shifting a problem doesn't eliminate a problem.

Reducing Lead Times

Lead time, sometimes called *throughput time*, measures the time between when a product enters production (is started) and when it is completed (finished). In other words, lead time measures how long it takes to manufacture a product. For example, if a product enters production at 1:00 P.M. and is completed at 5:00 P.M., the lead time is four hours.

The lead time can be classified as one of the following:

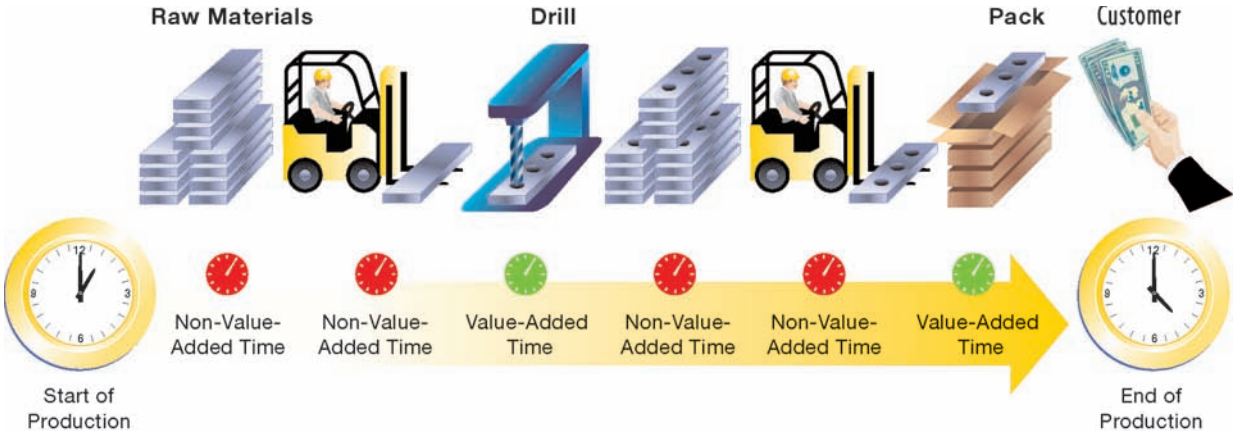
1. **Value-added lead time**, which is the time spent in converting raw materials into a finished unit of product

2. **Non-value-added lead time**, which is the time spent while the unit of product is waiting to enter the next production process or is moved from one process to another

Exhibit 2 illustrates value-added and non-value-added lead time.

Exhibit 2

Components of Lead Time



The time spent drilling and packing the unit of product is value-added time. The time spent waiting to enter the next process or the time spent moving the unit of product from one process to another is non-valued-added time.

The **value-added ratio** is computed as follows:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}}$$

To illustrate, assume that the lead time to manufacture a unit product is as follows:

Move raw materials to machining	5 minutes
Machining	**35**
Move time to assembly	10
Assembly	**20**
Move time to packing	15
Wait time for packing	30
Packing	**10**
Total lead time	125 minutes

The value-added ratio for the preceding product is 52%, as computed below:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}}$$

$$= \frac{(35 + 20 + 10)\text{ minutes}}{125\text{ minutes}} = \frac{65\text{ minutes}}{125\text{ minutes}} = 52\%$$

Crown Audio reduced the lead time between receiving a customer order and delivering it from 30 days to 12 hours by using just-in-time principles.

A low value-added ratio indicates a poor manufacturing process. A good manufacturing process will reduce non-value-added lead time to a minimum and thus, have a high value-added ratio.

Just-in-time manufacturing reduces or eliminates non-value-added time. In contrast, traditional manufacturing processes may have a value-added ratio as small as 5%.

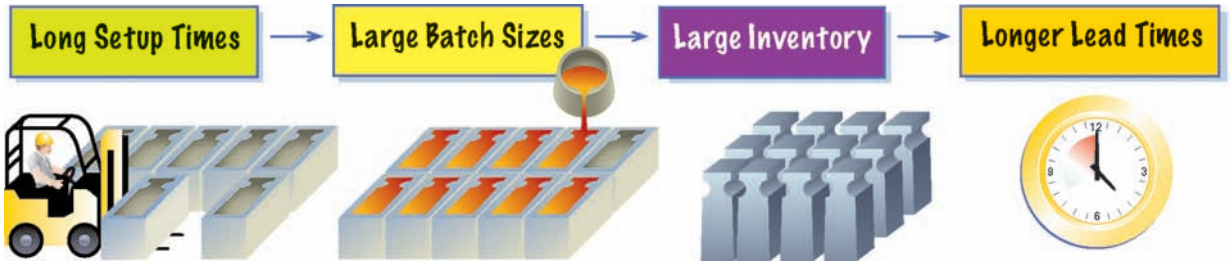
Reducing Setup Time

A *setup* is the effort spent preparing an operation or process for a production run. If setups are long and costly, the batch size (number of units) for the related production run is normally large. Large batch sizes allow setup costs to be spread over more units and thus, reduce the cost per unit. However, large batch sizes increase inventory and lead time.

Exhibit 3 shows the relationship between setup times and lead time.

Exhibit 3

Relationship between Setup Times and Lead Time



The cost that a beverage company incurs in cleaning its processes between flavor changes is an example of a setup cost.

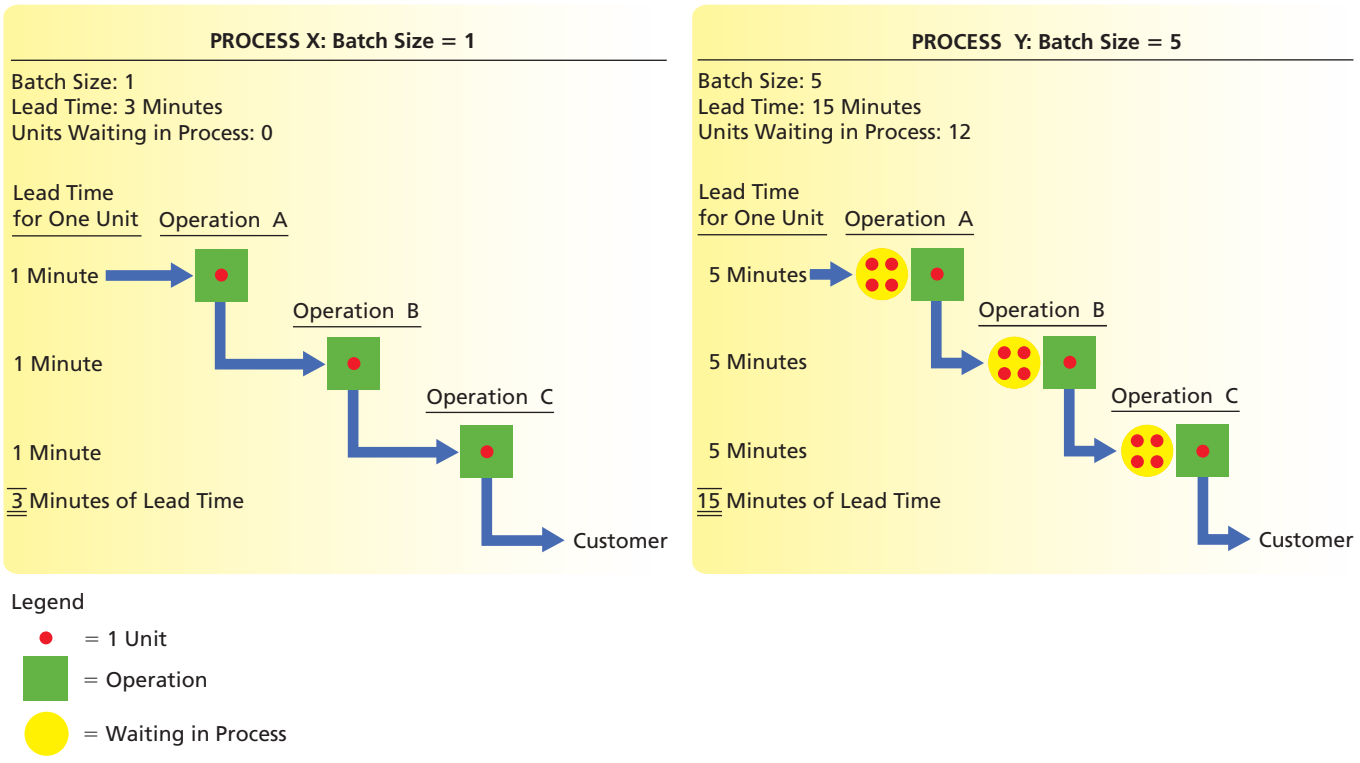
To illustrate, assume that a product can be manufactured in Process X or Process Y as follows:

	Process X	Process Y
Operation A	1 minute	1 minute
Operation B	1	1
Operation C	1	1
Total	3 minutes	3 minutes
Batch size	1 unit	5 units

Exhibit 4 shows that the lead time for Process X is three minutes. In contrast, the lead time for Process Y is 15 minutes.

Exhibit 4

Impact of Batch Sizes on Lead Times



The lead time for Process Y is longer because while three units are being produced in Operations A, B, and C, 12 other units are waiting to be processed. In other words, in Process Y each unit has to wait its "turn" while other units in the batch are processed. Thus, it takes a unit five minutes for each operation—four minutes waiting its "turn" and one minute in production.

The four minutes that each part "waits its turn" at each operation is called *within-batch wait time*. The total within-batch wait time is computed as follows:

$$\text{Total Within-Batch Wait Time} = (\text{Total Time to Perform Operations}) \times (\text{Batch Size} - 1)$$

The total within-batch wait time for Process Y is 12 minutes, as computed below.

$$\text{Total Within-Batch Wait Time} = (1 + 1 + 1) \text{ minutes} \times (5 - 1) = 3 \text{ minutes} \times 4 = 12 \text{ minutes}$$

The value-added ratio for Process Y is 20%, as computed below.

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}} = \frac{(1 + 1 + 1) \text{ minutes}}{(3 + 12) \text{ minutes}} = \frac{3 \text{ minutes}}{15 \text{ minutes}} = 20\%$$

Thus, 80% (100% − 20%) of the lead time in Process Y is non-value-added time.

Just-in-time manufacturing emphasizes decreasing setup times in order to reduce the batch size. By reducing batch sizes, work in process and wait time are decreased, thus reducing total lead time and increasing the value-added ratio.

To illustrate, assume that Automotive Components Inc. manufactures engine starters as follows:

Operations	Processing Time per Unit
Move raw materials to Machining	5 minutes
Machining	**7**
Move time to Assembly	10
Assembly	**9**
Move time to Testing	10
Testing	**8**
Total	49 minutes
Batch size	40 units

The total within-batch wait time is 936 minutes, as computed below:

$$\text{Total Within-Batch Wait Time} = (\text{Total Time to Perform Operations}) \times (\text{Batch Size} - 1)$$
$$\text{Total Within-Batch Wait Time} = (7 + 9 + 8) \text{ minutes} \times (40 - 1) = 24 \text{ minutes} \times 39$$
$$\text{Total Within-Batch Wait Time} = 936 \text{ minutes}$$

The total lead time is 985 minutes, as shown below:

Operations (7 + 9 + 8)	24 minutes
Move time (5 + 10 + 10)	25
Total within-batch wait time	936
Total time	985 minutes

Tech Industries required five hours and 84 separate steps to set up a large injection molding machine. An improvement team reorganized the setup so that the number of process steps was reduced from 84 to 19 and the setup time was reduced from five hours to one hour.

Of the total lead time of 985 minutes, 24 minutes is value-added time and 961 minutes (985 − 24) is non-valued added time. The total non-value-added time of 961 minutes can also be determined as the sum of the total within-batch time of 936 minutes plus the move time of 25 minutes.

Based on the preceding data, the value-added ratio is approximately 2.4%, as computed below:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}} = \frac{(7 + 9 + 8) \text{ minutes}}{985 \text{ minutes}} = \frac{24 \text{ minutes}}{985 \text{ minutes}} = 2.4\% \text{ (rounded)}$$

Thus, the non-value added time for Automotive Components Inc. is approximately 97.6% (100% − 2.4%).

Automotive Components can increase its valued-added ratio by reducing setups so that the batch size is one unit, termed *one-piece flow*. Automotive Components could also move the Machining, Assembly, and Testing operations closer to each other so that the move time could be reduced. With these changes, Automotive Components' value-added ratio would increase.

Business Connection

P&G'S "PIT STOPS"

What do Procter & Gamble and Formula One racing have in common? The answer begins with P&G's Packing Department, which is where detergents and other products are filled on a "pack line." Containers move down the pack line and are filled with products from a packing machine. When it was time to change from a 36-oz. to a 54-oz. *Tide* box, for example, the changeover involved stopping the line, adjusting guide rails, retrieving items from the tool room, placing items back in the tool room, changing and cleaning the pack heads, and performing routine maintenance. Changing the pack line could be a very difficult process and typically took up to several hours.

Management realized that it was important to reduce this time significantly in order to become more flexible and cost efficient in packing products. Where could they learn how to do setups faster? They turned to Formula One racing, reasoning that a pit stop was much like a setup. As a result, P&G videotaped actual Formula One pit stops. These videos were used to form the following principles for conducting a fast setup:

- Position the tools near their point of use on the line prior to stopping the line, to reduce time going back and forth to the tool room.
- Arrange the tools in the exact order of work, so that no time is wasted looking for a tool.
- Have each employee perform a very specific task during the setup.
- Design the workflow so that employees don't interfere with each other.
- Have each employee in position at the moment the line is stopped.
- Train each employee, and practice, practice, practice.
- Put a stop watch on the setup process.
- Plot improvements over time on a visible chart.

As a result of these changes, P&G was able to reduce pack-line setup time from several hours to 20 minutes. This allowed it to reduce lead time and to improve the cost performance of the Packing Department.

Example Exercise 12-1 Lead Time

1

The Helping Hands glove company manufactures gloves in the cutting and assembly process. Gloves are manufactured in 50-glove batch sizes. The cutting time is 4 minutes per glove. The assembly time is 6 minutes per glove. It takes 12 minutes to move a batch of gloves from cutting to assembly.

a. Compute the value-added, non-value-added, and total lead time of this process.
b. Compute the value-added ratio. Round to one decimal.

Follow My Example 12-1

a. Value-added lead time: 10 min. = (4 min. + 6 min.)
Non-value-added lead time:
Total within-batch wait time 490 = (4 + 6) minutes × (50 − 1)
Move time 12
Total lead time 512 min.

b. Value-added ratio: $\frac{10 \text{ min.}}{512 \text{ min.}} = 2.0\%$

For Practice: PE 12-1A, PE 12-1B

Emphasizing Product-Oriented Layout

Manufacturing processes can be organized around a product, which is called a **product-oriented layout** (or *product cells*). Alternatively, manufacturing processes can be organized around a process, which is called a **process-oriented layout**.

Yamaha manufactures musical instruments such as trumpets, horns, saxophones, clarinets, and flutes using product-oriented layouts.

Just-in-time normally organizes manufacturing around products rather than processes. Organizing work around products reduces:

1. Moving materials and products between processes
2. Work in process inventory
3. Lead time
4. Production costs

In addition, a product-oriented layout improves coordination among operations.

Emphasizing Employee Involvement

Sony has organized a small team of four employees to completely assemble a camcorder, doing everything from soldering to testing. The new line reduces assembly time from 70 minutes to 15 minutes per camera.

Employee involvement is a management approach that grants employees the responsibility and authority to make decisions about operations. Employee involvement is often applied in a just-in-time operation by organizing employees into *product cells*. Within each product cell, employees are organized as teams where the employees are *cross-trained* to perform any operation within the product cell.

To illustrate, employees learn how to operate several different machines within their product cell. In addition, team members are trained to perform functions traditionally performed by centralized service departments. For example, product cell employees may perform their own equipment maintenance, quality control, and housekeeping.

Emphasizing Pull Manufacturing

Kenney Manufacturing Company, a manufacturer of window shades, estimated that 50% of its window shade process was non-value-added. By using pull manufacturing and changing the line layout, it was able to reduce inventory by 82% and lead time by 84%.

Pull manufacturing (or *make to order*) is an important just-in-time practice. In pull manufacturing, products are manufactured only as they are needed by the customer. Products can be thought of as being pulled through the manufacturing process. In other words, the status of the next operation determines when products are moved or produced. If the next operation is busy, production stops so that work in process does not pile up in front of the busy operation. When the next operation is ready, the product is moved to that operation.

A system used in pull manufacturing is *kanban*, which is Japanese for "cards." Electronic cards or containers signal production quantities to be filled by the preceding operation. The cards link the customer's order for a product back through each stage of production. In other words, when a consumer orders a product, a kanban card triggers the manufacture of the product.

In contrast, the traditional approach to manufacturing is based on estimated customer demand. This principle is called **push manufacturing** (or make to stock) manufacturing. In push manufacturing, products are manufactured according to a production schedule that is based upon estimated sales. The schedule "pushes" product into inventory before customer orders are received. As a result, push-manufacturers normally have more inventory than pull-manufacturers.

Emphasizing Zero Defects

Just-in-time manufacturing attempts to eliminate poor quality. Poor quality creates:

1. Scrap
2. Rework, which is fixing product made wrong the first time
3. Disruption in the production process
4. Dissatisfied customers
5. Warranty costs and expenses

Motorola has claimed over $17 billion in savings from Six Sigma.

One way to improve product quality and manufacturing processes is Six Sigma. **Six Sigma** was developed by Motorola Corporation and consists of five steps: define, measure, analyze, improve, and control (DMAIC).[1] Since its development, Six Sigma has been adopted by thousands of organizations worldwide.

[1] The term "six-sigma" refers to a statistical property where a process has less than 3.4 defects per one million items.

Toyota Motor often works with supply chain partners to maximize the use of just-in-time.

Emphasizing Supply Chain Management

Supply chain management coordinates and controls the flow of materials, services, information, and finances with suppliers, manufacturers, and customers. Supply chain management partners with suppliers using long-term agreements. These agreements ensure that products are delivered with the right quality, at the right cost, at the right time.

To enhance the interchange of information between suppliers and customers, supply chain management often uses:

1. **Electronic data interchange** (EDI), which uses computers to electronically communicate orders, relay information, and make or receive payments from one organization to another
2. **Radio frequency identification devices** (RFID), which are electronic tags (chips) placed on or embedded within products that can be read by radio waves that allow instant monitoring of product location
3. **Enterprise resource planning** (ERP) systems, which are used to plan and control internal and supply chain operations

Hyundia/Kia Motors Group will use 20 million RFID tags annually to track automative parts through the supply chain.

Example Exercise 12-2 Just-In-Time Features

1

Which of the following are features of a just-in-time manufacturing system?

a. Reduced space
b. Larger inventory
c. Longer lead times
d. Reduced setups

Follow My Example 12-2

a. Reduced space
d. Reduced setups

For Practice: PE 12-2A, PE 12-2B

2 Apply just-in-time practices to a non-manufacturing setting.

Just-in-Time for Nonmanufacturing Processes

Just-in-time practices may also be applied to service businesses or administrative processes. Examples of service businesses that use just-in-time practices include hospitals, banks, insurance companies, and hotels. Examples of administrative processes that use just-in-time practices include processing of insurance applications, product designs, and sales orders. In the case of a service business, the "product" is normally the customer or patient. In the case of administrative processes, the "product" is normally information.

To illustrate, a traditional process used by a hospital to treat patients is illustrated in Exhibit 5.

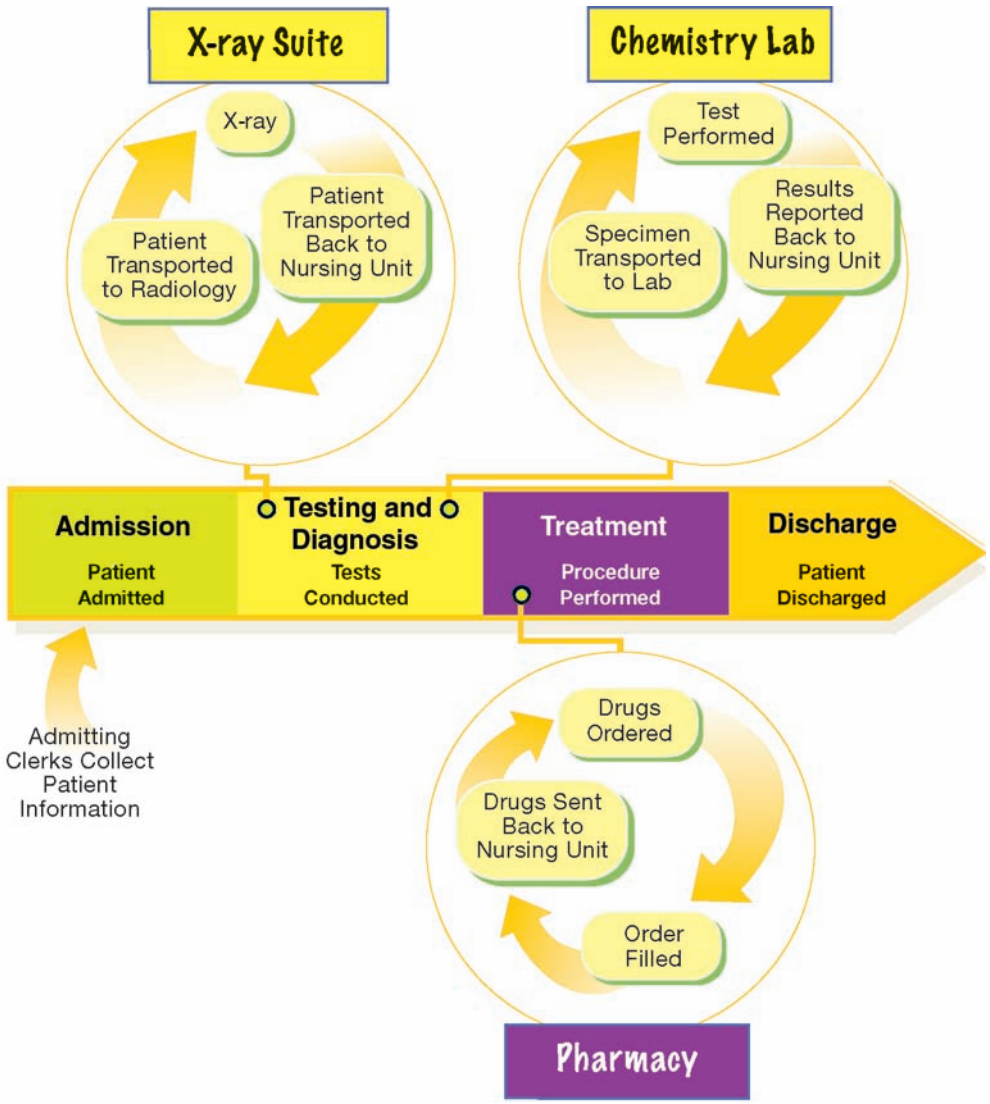
As shown in Exhibit 5, four basic processes used by the hospital include:

1. Admission
2. Testing and Diagnosis
3. Treatment
4. Discharge

ITW Paslode, a manufacturer of specialty tools, used just-in-time principles to reduce steps in the sales order process by 86% and improve delivery time by 80%.

Exhibit 5

Typical Hospital Process Flow



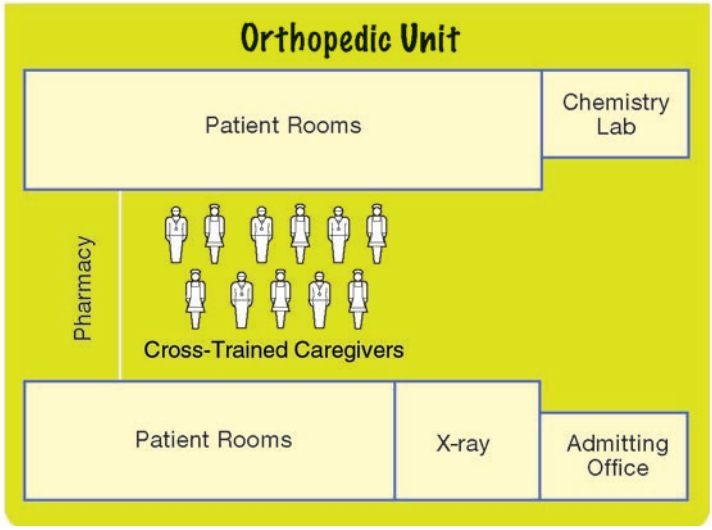
The traditional hospital layout consumes a great deal of time. The patient first spends time in Admission, providing patient and insurance information. Once admitted, the patient is transported (moved) to a room where a variety of tests are performed. These tests often require the patient to be moved to the testing location, such as radiology for an X-ray. If laboratory tests are required, the lab specimens are sent (moved) to a central chemistry lab. If drugs are ordered, they must be dispensed from the central pharmacy and delivered (moved) to the patient's room for nurses to administer.

Each of the prior processes consumes time and movement as the patient, specimen, test results, and drugs are processed. In each of the centralized departments, such as Admission and Radiology or Laboratory, the processing of any one patient requires waiting for other patients to be processed. Again, this also consumes time and is similar to within-batch wait time for a manufacturing business. As a result, an average patient's time in the hospital (lead time) is longer than it needs to be. In addition, the value-added ratio for each patient is low.

Exhibit 6 illustrates a just-in-time hospital layout.

Exhibit 6

Just-in-Time Hospital Unit Layout



As shown in Exhibit 6, patients with common health problems are placed together on one floor of the hospital. Centralized services are distributed to each of the floors, so that each floor has its own minipharmacy, X-ray suite, chemistry lab, and admitting office.

In Exhibit 6, patients are served where they are, rather than moving around the hospital. This is similar to the product-oriented layout in a manufacturing business. Nurses are "cross-trained" to provide X-ray, laboratory, and other services. This provides much greater flexibility and faster treatment of patients.

A just-in-time hospital process reduces the "inventory" of orders, patients, and drugs as compared to that of the traditional hospital shown in Exhibit 5. As a result, the lead time to process orders and tests decreases along with the average stay in the hospital.

In a just-in-time hospital, the quality of the patient's experience should increase. This is because the same group of caregivers serves the patient from admittance to discharge. The caregivers should also have a more rewarding experience because they work as a team in serving each patient. Finally, the overall cost of patient care should decrease as the hospital becomes more efficient.

3 Describe the implications of just-in-time manufacturing on cost accounting and performance measurement.

Accounting for Just-in-Time Manufacturing

In just-in-time manufacturing, the accounting system has the following characteristics:

1. *Fewer transactions*. There are fewer transactions to record, thus simplifying the accounting system.
2. *Combined accounts*. All in-process work is combined with raw materials to form a new account, **Raw and In Process (RIP) Inventory**. Direct labor is also combined with other costs to form a new account titled **Conversion Costs**.
3. *Nonfinancial performance measures*. Nonfinancial performance measures are emphasized.
4. *Direct tracing of overhead*. Indirect labor is directly assigned to product cells, thus less factory overhead is allocated to products.

Fewer Transactions

The traditional process cost accounting system accumulates product costs by department. These costs are transferred from department to department as the product is manufactured. Thus, materials are recorded into and out of work in process inventories as the product moves through the factory.

The recording of product costs by departments facilitates the control of costs. However, this requires that many transactions be recorded, costs accumulated, and reported. This adds cost and complexity to the cost accounting system.

In the just-in-time manufacturing, there is less need for cost control. This is because lower inventory levels make problems more visible. In other words, managers don't need accounting reports to indicate problems because any problems become immediately known.

The accounting system for just-in-time manufacturing is simplified by eliminating the accumulation and transfer of product costs by departments. Instead, costs are transferred from combined material and conversion cost accounts directly to finished goods inventory. Costs are not transferred through intermediate departmental work in process accounts. Such just-in-time accounting is called **backflush accounting**.

GM's Saturn plant has receiving areas all around the perimeter of its factory so that materials can be delivered to the point closest to where they are used on the assembly line.

Combined Accounts

Because just-in-time manufacturing attempts to eliminate inventory, including raw materials, there is no need for a materials account. Materials are received directly by the product cells and enter immediately into production. Thus, there is no central materials inventory location (warehouse) or a materials account. Instead, just-in-time debits all materials and conversion costs to an account titled *Raw and In Process Inventory*. Doing so combines materials and work in process costs into one account.

Just-in-time manufacturing often does not use a separate direct labor cost classification. This is because the employees in product cells perform many tasks. Some of these tasks could be classified as direct, such as performing operations, and some as indirect, such as performing repairs. Thus, labor cost (direct and indirect) is combined with other product cell overhead costs and recorded in an account titled *Conversion Costs*.

To illustrate, assume the following data for Anderson Metal Fabricators, a manufacturer of metal covers for electronic test equipment:

Budgeted conversion cost	$2,400,000
Planned hours of production	1,920 hours

The cell conversion cost rate is determined as follows:

$$\text{Cell Conversion Cost Rate} = \frac{\text{Budgeted Conversion Cost}}{\text{Planned Hours of Production}}$$

$$= \frac{\$2{,}400{,}000}{1{,}920 \text{ hours}} = \$1{,}250 \text{ per hour}$$

The cell conversion rate is similar to a predetermined factory overhead rate, except that it includes all conversion costs in the numerator.

Assume that Anderson Metal's cover product cell is expected to require 0.02 hour of manufacturing time per unit. Thus, the conversion cost for the cover is $25 per unit, as shown below.

$$\text{Conversion Cost for Cover} = \text{Manufacturing Time} \times \text{Cell Conversion Cost Rate}$$
$$\text{Conversion Cost for Cover} = 0.02 \text{ hours} \times \$1{,}250 = \$25 \text{ per unit}$$

The recording of selected just-in-time transactions for Anderson Metal for April is illustrated on the next page.

Transaction	Journal Entry			Comment

1. Steel coil is purchased for producing 8,000 covers. The purchase cost was $120,000, or $15 per unit.	Raw and In Process Inventory
	  Accounts Payable
	  To record materials purchases.
		120,000	120,000	Note that the materials purchased are debited to the combined account, Raw and In Process Inventory. A separate materials account is not used, because materials are received directly in the product cells, rather than in an inventory location.

2. Conversion costs are applied to 8,000 covers at a rate of $25 per cover.	Raw and In Process Inventory
	  Conversion Costs
	  To record applied conversion costs of the medium-cover line.
		200,000	200,000	The raw and in process inventory account is used to accumulate the applied cell conversion costs during the period. The credit to Conversion Costs is similar to the treatment of applied factory overhead.

3. All 8,000 covers were completed in the cell. The raw and in process inventory account is reduced by the $15 per unit materials cost and the $25 per-unit conversion cost.	Finished Goods Inventory
	  Raw and In Process Inventory
	  To transfer the cost of completed units to finished goods.
		320,000	320,000	Materials ($15 × 8,000 units) $120,000
				Conversion ($25 × 8,000 units) 200,000
				Total $320,000
				
				After the cost of the completed units is transferred from the raw and in process inventory account, the account's balance is zero. There are no units left in process within the cell.[2] This is a backflush transaction.

4. Of the 8,000 units completed, 7,800 were sold and shipped to customers at $70 per unit, leaving 200 finished units in stock. Thus, the finished goods inventory account has a balance of $8,000 (200 × $40). Even though AMF is now a just-in-time manufacturer, a small number of customer orders were not shipped at the end of the month.	Accounts Receivable
	  Sales
	  To record sales.
	
	Cost of Goods Sold
	  Finished Goods
	  To record cost of goods sold.
		546,000
		
		312,000
			546,000
			
			312,000
				Units sold 7,800
				Conversion and materials cost per unit × $40
				Transferred to Cost of Goods Sold $312,000

[2] The actual conversion cost per unit may be different from the budgeted conversion cost per unit due to cell inefficiency, improvements in processing methods, or excess scrap. These deviations from the budgeted cost can be accounted for as cost variances, as illustrated in more advanced texts.

Example Exercise 12-3 Just-In-Time Journal Entries 3

The budgeted conversion costs for a just-in-time cell are $142,500 for 1,900 production hours. Each unit produced by the cell requires 10 minutes of cell process time. During the month, 1,050 units are manufactured in the cell. The estimated materials cost is $46 per unit. Provide the following journal entries:

a. Materials are purchased to produce 1,100 units.
b. Conversion costs are applied to 1,050 units of production.
c. 1,030 units are completed and placed into finished goods.

Follow My Example 12-3

a.	Raw and In Process Inventory	50,600*	
	Accounts Payable		50,600

*$46 per unit × 1,100 units

b.	Raw and In Process Inventory	13,125*	
	Conversion Costs		13,125

*[($142,500/1,900 hours) × (10 min./60 min.)] = $12.50 per unit; $12.50 × 1,050 units = $13,125

c.	Finished Goods Inventory	60,255*	
	Raw and In Process Inventory		60,255

*($46.00 + $12.50) × 1,030 units

For Practice: PE 12-3A, PE 12-3B

Nonfinancial Performance Measures

Just-in-time manufacturing normally uses nonfinancial measures to help guide short-term operating performance. A **nonfinancial measure** is operating information not stated in dollar terms. Examples of nonfinancial measures of performance include:

1. Lead time
2. Value-added ratio
3. Setup time
4. Number of production line stops
5. Number of units scrapped
6. Deviations from scheduled production
7. Number failed inspections

Most companies use a combination of financial and nonfinancial operating measures, which are often referred to as *key performance indicators* (or *KPIs*). Nonfinancial measures are often available more quickly than financial measures, which first must be translated into dollars and then summarized. Thus, nonfinancial measures are often used for day-to-day operating decisions that require quick or instant feedback. In contrast, traditional financial accounting measures are often used for longer-term operating decisions.

Direct Tracing of Overhead

In just-in-time manufacturing, many indirect tasks are assigned to a product cell. For example, maintenance department personnel may be assigned to a product cell and cross-trained to perform other operations. Thus, the salary of this person can be traced directly to the product cell.

In traditional manufacturing, maintenance personnel are part of the maintenance department. The cost of the maintenance department is then allocated to products based on service charges. Such allocations are not necessary when maintenance personnel are assigned directly to a product cell and thus, to the product.

4 Describe and illustrate activity analysis for improving operations.

Activity Analysis

This chapter discusses how businesses use just-in-time operating practices to reduce lead time, cost, and poor quality. In doing so, JIT improves operations. Another way to improve operations is by using activity analysis. **Activity analysis** determines the cost of activities. An activity analysis can be used to determine the cost of:

1. Quality
2. Valued-added activities
3. Processes

Costs of Quality

Competition encourages businesses to emphasize high-quality products, services, and processes. In doing so, businesses incur **costs of quality**, which can be classified as follows:

1. **Prevention costs**, which are costs of preventing defects before or during the manufacture of the product or delivery of services

   Examples: Costs of engineering good product design, controlling vendor quality, training equipment operators, maintaining equipment

2. **Appraisal costs**, which are costs of activities that detect, measure, evaluate, and inspect products and processes to ensure that they meet customer needs

   Examples: Costs of inspecting and testing products

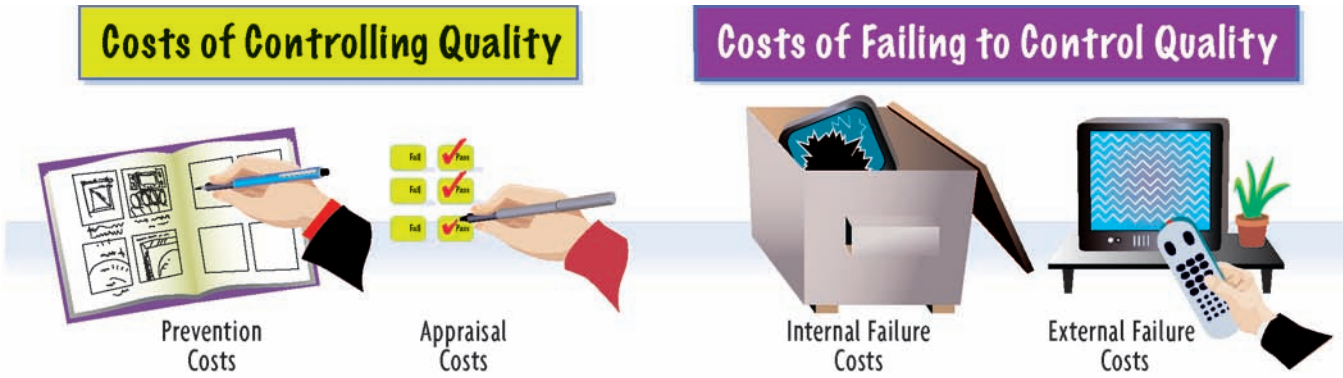
3. **Internal failure costs**, which are costs associated with defects discovered before the product is delivered to the consumer

   Examples: Cost of scrap and rework

4. **External failure costs**, which are costs incurred after defective products have been delivered to consumers

   Examples: Cost of recalls and warranty work

Prevention and appraisal costs can be thought of as costs of controlling quality *before* any products are known to be defective. Internal and external failure costs can be thought of as cost of controlling quality *after* products have become defective. Internal and external failure costs can also be thought of as the costs of "failing to control quality" throught prevention and appraisal efforts.



Prevention and appraisal costs are incurred *before* the product is manufactured or delivered to the customer. Prevention costs are incurred in an attempt to permanently improve product quality. In contrast, appraisal costs are incurred in an attempt to limit the amount of defective products that "slip out the door."

Internal and external failure costs are incurred *after* the defective products have been discovered. In addition to costs of scrap and rework, internal failure costs may be incurred

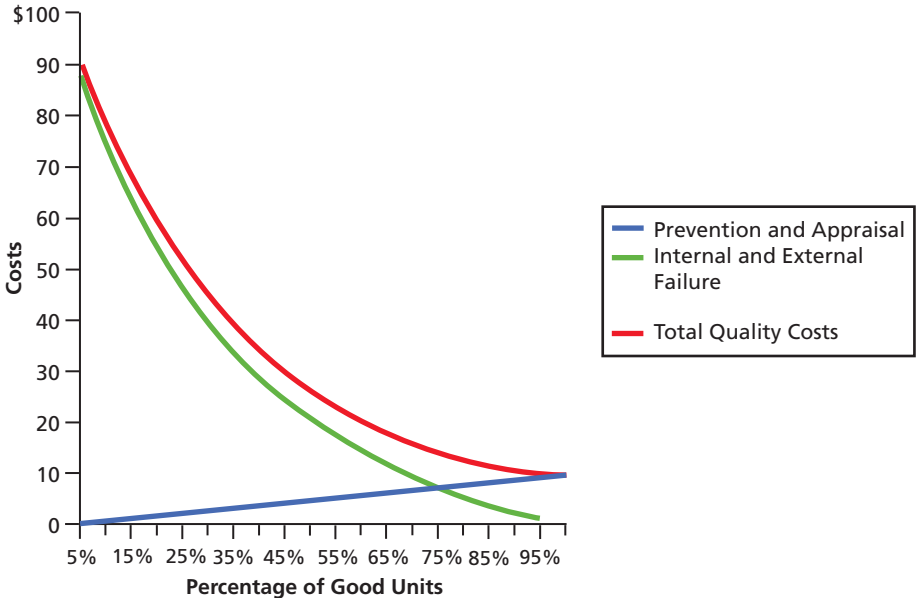
It is said that every dissatisfied customer tells at least ten people about an unhappy experience with a product.

for lost equipment time because of rework and the costs of carrying additional inventory used for reworking. In addition to costs of recall and warranty work, external failure costs include the loss of customer goodwill. Although the loss of customer goodwill is difficult to measure, it may be the largest and most important quality control cost.

The relationship between the costs of quality is shown in Exhibit 7. The graph in Exhibit 7 indicates that as prevention and appraisal costs (blue line) increase, the percent of good units increases. In contrast, as internal and external failure costs (green line) decrease, the percent of good units increases. Total quality cost (red line) is the sum of the prevention/appraisal costs and internal/external failure costs.

Exhibit 7

The Relationship between the Costs of Quality



The optimal level of quality (percent of good units) is the one that minimizes the total quality costs. At this point, prevention and appraisal costs are balanced against internal and external failure costs. Exhibit 7 indicates that the optimal level of quality occurs at (or near) 100% quality. This is because prevention and appraisal costs grow moderately as quality increases. However, the costs of internal and external failure drop dramatically as quality increases.

Quality Activity Analysis

An activity analysis of quality quantifies the costs of quality in dollar terms. To illustrate, the quality control activities, activity costs, and quality cost classifications for Gifford Company, a consumer electronics company, are shown in Exhibit 8.

Exhibit 8

Quality Control Activity Analysis—Gifford Company

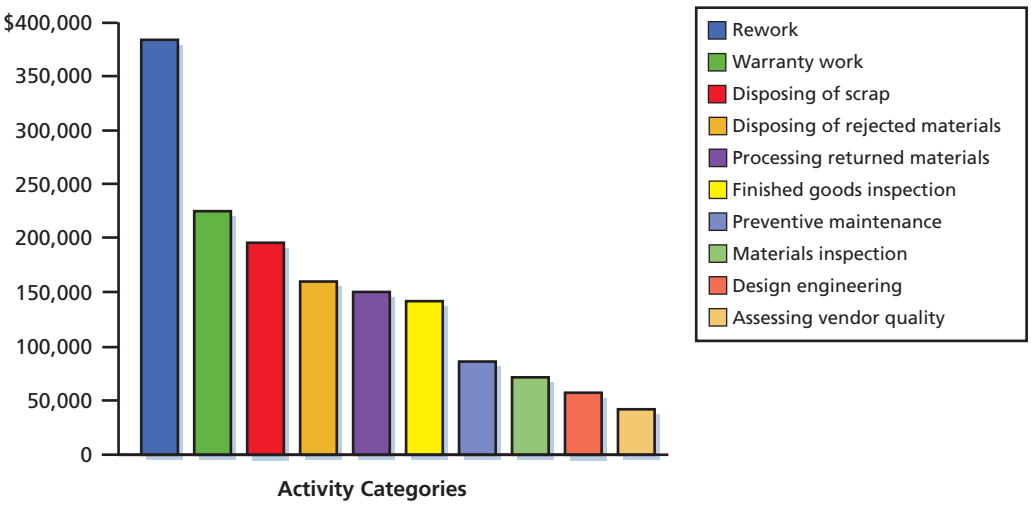
Quality Control Activities	Activity Cost	Quality Cost Classification
Design engineering	$ 55,000	Prevention
Disposing of rejected materials	160,000	Internal Failure
Finished goods inspection	140,000	Appraisal
Materials inspection	70,000	Appraisal
Preventive maintenance	80,000	Prevention
Processing returned materials	150,000	External Failure
Disposing of scrap	195,000	Internal Failure
Assessing vendor quality	45,000	Prevention
Rework	380,000	Internal Failure
Warranty work	225,000	External Failure
Total activity cost	$1,500,000	

Pareto Chart of Quality Costs One method of reporting quality cost information is using a Pareto chart. A **Pareto chart** is a bar chart that shows the totals of an attribute for a number of categories. The categories are ranked and shown left to right, so that the largest total attribute is on the left and the smallest total is on the right.

To illustrate, Exhibit 9 is a Pareto chart for the quality control activities in Exhibit 8.

Exhibit 9

Pareto Chart of Quality Costs



In Exhibit 9, the vertical axis is dollars, which represents quality control costs. The horizontal axis represents activity categories, which are the ten quality control cost activities. The ten quality control cost categories are ranked from the one with the largest total on the left to the one with the smallest total on the right. Thus, the largest bar on the left is rework costs ($380,000), the second bar is warranty work ($225,000), and so on.

The Pareto chart gives managers a quick visual tool for identifying the most important quality control cost categories. Exhibit 9 indicates that Gifford Company should focus efforts on reducing rework and warranty costs.

Cost of Quality Report The costs of quality can also be summarized in a cost of quality report. A **cost of quality report** normally reports the:

1. Total activity cost for each quality cost classification
2. Percent of total quality costs associated with each classification
3. Percent of each quality cost classification to sales

Exhibit 10 is a cost of quality report for Gifford Company, based on assumed sales of $5,000,000. Exhibit 10 indicates that only 12% of the total quality cost is the cost of preventing quality problems while 14% is the cost of appraisal activities. Thus, prevention and appraisal costs make up only 26% of total quality control costs. In contrast, 74% (49% + 25%) of quality control costs are incurred for internal (49%) and external failure (25%) costs. In addition, internal and external failure costs are 22.2% (14.7% + 7.5%) of sales.

Exhibit 10 implies that Gifford Company is not spending enough on prevention and appraisal activities. By spending more on prevention and appraisal, internal and external failure costs will decrease, as was shown in Exhibit 7.

Exhibit 10

Cost of Quality Report—Gifford Company

Gifford Company
Cost of Quality Report

Quality Cost Classification	Quality Cost	Percent of Total Quality Cost	Percent of Total Sales
Prevention	$ 180,000	12.00%	3.6%
Appraisal	210,000	14.00	4.2
Internal failure	735,000	49.00	14.7
External failure	375,000	25.00	7.5
Total	$1,500,000	100.00%	30.0%

Example Exercise 12-4 Cost of Quality Report

4

A quality control activity analysis indicated the following four activity costs of an administrative department:

Verifying the accuracy of a form	$ 50,000
Responding to customer complaints	100,000
Correcting errors in forms	75,000
Redesigning forms to reduce errors	25,000
Total	$250,000

Sales are $2,000,000. Prepare a cost of quality report.

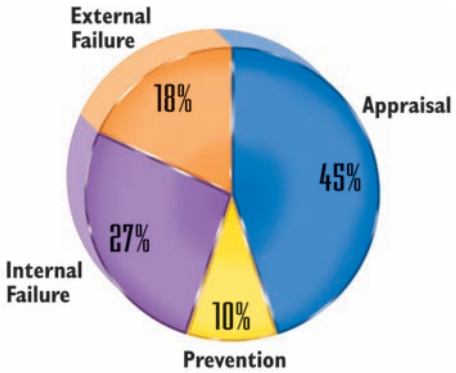
Follow My Example 12-4

Cost of Quality Report

Quality Cost Classification	Quality Cost	Percent of Total Quality Cost	Percent of Total Sales
Prevention	$ 25,000	10%	1.25%
Appraisal	50,000	20	2.50
Internal failure	75,000	30	3.75
External failure	100,000	40	5.00
Total	$250,000	100%	12.50%

For Practice: PE 12-4A, PE 12-4B

A large regional bank performed a quality control activity analysis. The analysis indicated the following percentage of costs allocated to each classification:



As a result of this study, the bank was able to justify greater investments in prevention activities to improve customer service at lower operating costs.

Value-Added Activity Analysis

In the preceding section, the quality control activities of Gifford Company were classified as prevention, appraisal, internal failure, and external failure activities. Activities may also be classified as:

1. Value-added
2. Non-value-added

A **value-added activity** is one that is necessary to meet customer requirements. A **non-value-added activity** is *not* required by the customer, but occurs because of mistakes, errors, omissions, and process failures.

To illustrate, Exhibit 11 shows the value-added and non-value-added classification for the quality control activities for Gifford Company.[3]

[3] We use the quality control activities for illustrating the value-added and non-value-added activities in this section. However, a value-added/non-value-added activity analysis can be done for any activity in a business, not just quality control activities.

Exhibit 11

Value-Added/ Non-Value-Added Quality Control Activities

Quality Control Activities	Activity Cost	Classification
Design engineering	$ 55,000	Value-added
Disposing of rejected materials	160,000	Non-value-added
Finished goods inspection	140,000	Value-added
Materials inspection	70,000	Value-added
Preventive maintenance	80,000	Value-added
Processing returned materials	150,000	Non-value-added
Disposing of scrap	195,000	Non-value-added
Assessing vendor quality	45,000	Value-added
Rework	380,000	Non-value-added
Warranty work	225,000	Non-value-added
Total activity cost	$1,500,000	

Exhibit 11 shows that internal and external failure costs are classified as non-value-added. In contrast, prevention and appraisal costs are classified as value-added.[4]

A summary of the value-added and non-value-added activities is shown below. The summary expresses value-added and non-value-added costs as a percent of total costs.

Classification	Amount	Percent
Value-added	$ 390,000	26%
Non-value-added	1,110,000	74
Total	$1,500,000	100%

The preceding summary indicates that 74% of Gifford Company's quality control activities are non-value-added. This should motivate Gifford Company to make improvements to reduce non-valued-added activities.

Process Activity Analysis

Activity analysis can be used to evaluate business processes. A **process** is a series of activities that converts an input into an output. In other words, a process is a set of activities linked together by inputs and outputs. Common business processes include:

1. Procurement
2. Product development
3. Manufacturing
4. Distribution
5. Sales order fulfillment

Exhibit 12 shows a sales order fulfillment process for Masters Company. This process converts a customer order (the input) into a product received by the customer (the output).

Exhibit 12

Sales Order Fulfillment Process

*Operators driving forklifts receive a list of orders, drive to stacking locations within the warehouse, pick the orders, and then transport them back to an area to prepare for shipment.

[4] Some believe that appraisal costs are non-value-added. They argue that if the product had been made correctly, then no inspection would be required. We take a less strict view and assume that appraisal costs are value-added.

Exhibit 12 indicates that Masters Company's sales order fulfillment process has the following four activities:

1. Customer credit check
2. Order entered into computer system
3. Order picked from warehouse
4. Order shipped to customer

A process activity analysis can be used to determine the cost of the preceding activities. To illustrate, assume that a process activity analysis determines that the cost of the four activities is as follows:

Sales Order Fulfillment Activities	Activity Cost	Percent of Total Process Cost
Customer credit check	$14,400	18%
Order entered into computer system	9,600	12
Order picked from warehouse	36,000	45
Order shipped to customer	20,000	25
Total sales order fulfillment process cost	$80,000	100%

If 10,000 sales orders are filled during the current period, the per unit process cost is $8 per order ($80,000/10,000 orders).

Management can use process activity analysis to improve a process. To illustrate, assume that Masters Company sets a cost improvement target of $6 per order. A $2 reduction per order ($8 − $6) requires improving efficiency or eliminating unnecessary activities.

Masters Company determines that only *new* customers need to have a credit check. If this change is made, it is estimated that only 25% of sales orders would require credit checks. In addition, by revising the warehouse product layout, it is estimated that the cost of picking orders can be reduced by 35%.

Assuming that 10,000 orders will be filled, the cost savings from these two improvements are as follows:

Sales Order Fulfillment Activities	Activity Cost Prior to Improvement	Activity Cost After Improvement	Activity Cost Savings
Customer credit check	$14,400	$ 3,600[1]	$10,800
Order entered in computer system	9,600	9,600	0
Order picked from warehouse	36,000	23,400[2]	12,600
Order shipped	20,000	20,000	0
Total sales order fulfillment process cost	$80,000	$56,600	$23,400
Cost per order (Total cost divided by 10,000 orders)	$8.00	$5.66	

[1] $14,400 × 25%
[2] $36,000 − ($36,000 × 35%)

As shown above, the activity changes generate a savings of $23,400.[5] In addition, the cost per order is reduced to $5.66, which is less than the $6.00 per order targeted cost.[6]

[5] This analysis assumes that the activity costs are variable to the inputs and outputs of the process. While this is likely true for processes primarily using labor, such as a sales order fulfillment process, other types of processes may have significant fixed costs that would not change with changes of inputs and outputs.

[6] Process activity analysis can also be integrated into a company's budgeting system using flexible budgets. Process activity analysis used in this way is discussed in advanced texts.

Example Exercise 12-5 Process Activity Analysis

4

Mason Company incurred an activity cost of $120,000 for inspecting 50,000 units of production. Management determined that the inspecting objectives could be met without inspecting every unit. Therefore, rather than inspecting 50,000 units of production, the inspection activity was limited to 20% of the production. Determine the inspection activity cost per unit on 50,000 units of total production both before and after the improvement.

Follow My Example 12-5

Inspection activity before improvement: $120,000/50,000 units = $2.40 per unit
Inspection activity after improvement: ($120,000 × 20%)/50,000 units = $0.48 per unit

For Practice: PE 12-5A, PE 12-5B

At a Glance 12

1 Describe just-in-time (JIT) manufacturing practices.

Key Points

Just-in-time emphasizes reduced lead time, a product-oriented production layout, a team-oriented work environment, setup time reduction, pull manufacturing, high quality, and supplier and customer partnering in order to improve the supply chain.

Key Learning Outcomes

Key Learning Outcomes	Example Exercises	Practice Exercises
• Describe the relationships among setup time, batch size, inventory, and lead time.		
• Compute lead time and the value-added ratio.	12-1	12-1A, 12-1B
• Identify the characteristics of a just-in-time manufacturing environment and compare it to traditional approaches.	12-2	12-2A, 12-2B

2 Apply just-in-time practices to a nonmanufacturing setting.

Key Points

Just-in-time principles can be used in service businesses and administrative processes. For example, hospitals are removing delays in serving patients by improving admission, testing, and recovery processes. This is accomplished by designing product-focused hospital units that use cross-trained caregivers in the delivery of hospital care.

Key Learning Outcomes

Key Learning Outcomes	Example Exercises	Practice Exercises
• Illustrate the use of just-in-time principles in a nonmanufacturing setting, such as a hospital.		

3 Describe the implications of a just-in-time manufacturing on cost accounting and performance measurement.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The just-in-time philosophy has implications for cost accounting. The cost accounting system will have fewer transactions, will combine the materials and work in process accounts, and will account for direct labor as a part of cell conversion cost. Just-in-time will use nonfinancial reporting measures and result in more direct tracing of factory overhead to product cells.	• Identify the implications of the just-in-time philosophy for cost accounting. • Prepare just-in-time journal entries for material purchases, application of cell conversion cost, and transfer of cell costs to finished goods. • Describe nonfinancial performance measures.	**12-3**	12-3A, 12-3B

4 Describe and illustrate activity analysis for improving operations.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Companies use activity analysis to identify the costs of quality, which include prevention, appraisal, internal failure, and external failure costs. The quality cost activities may be reported on a Pareto chart, which visually highlights the most expensive quality cost categories. In addition, the quality costs can be summarized in a quality cost report by each of the four major classifications. An alternative method for categorizing activities is by value-added and non-value-added classifications. An activity analysis can also be used to determine the cost of processes. Process costs can be improved by either improving processing methods or eliminating unnecessary or wasteful work.	• Define the costs of quality. • Define and prepare a Pareto chart. • Prepare a cost of quality report. • Identify value-added and non-value-added activity costs.	**12-4**	12-4A, 12-4B
	• Use process activity analysis to measure process improvement.	**12-5**	12-5A, 12-5B

Key Terms

activity analysis (503)
appraisal costs (503)
Conversion Costs (499)
backflush accounting (500)
cost of quality report (505)
costs of quality (503)
electronic data interchange (EDI) (497)
employee involvement (496)
enterprise resource planning (ERP) (497)
external failure costs (503)
internal failure costs (503)
just-in-time (JIT) processing (490)
lead time (491)
nonfinancial measure (502)
non-value-added activity (506)
non-value-added lead time (492)
Pareto chart (505)
prevention costs (503)
process (507)
process-oriented layout (495)
product-oriented layout (495)
pull manufacturing (496)
push manufacturing (496)
radio frequency identification devices (RFID) (497)
Raw and In Process (RIP) Inventory (499)
Six-Sigma (496)
supply chain management (497)
value-added activity (506)
value-added lead time (491)
value-added ratio (492)

Illustrative Problem

Krisco Company operates under the just-in-time philosophy. As such, it has a production cell for its microwave ovens. The conversion cost for 2,400 hours of production is budgeted for the year at $4,800,000.

During January, 2,000 microwave ovens were started and completed. Each oven requires six minutes of cell processing time. The materials cost for each oven is $100.

Instructions

1. Determine the budgeted cell conversion cost per hour.
2. Determine the manufacturing cost per unit.
3. Journalize the entry to record the costs charged to the production cell in January.
4. Journalize the entry to record the costs transferred to finished goods.

Solution

1. $$\text{Budgeted Cell Conversion Cost Rate} = \frac{\$4{,}800{,}000}{2{,}400 \text{ hours}} = \$2{,}000 \text{ per cell hour}$$

2.

Materials	$100 per unit
Conversion cost [($2,000 per hour/60 min.) × 6 min.]	200
Total	$300 per unit

3.

		Raw and In Process Inventory	200,000	
		Accounts Payable		200,000
		To record materials costs.		
		(2,000 units × $100 per unit).		
		Raw and In Process Inventory	400,000	
		Conversion Costs		400,000
		To record conversion costs.		
		(2,000 units × $200 per unit).		

4.

		Finished Goods (2,000 × $300 per unit)	600,000	
		Raw and In Process Inventory		600,000
		To record finished production.		

Self-Examination Questions (Answers at End of Chapter)

1. Which of the following is not a characteristic of the just-in-time philosophy?
   A. Product-oriented layout
   B. Push manufacturing (make to stock)
   C. Short lead times
   D. Reducing setup time as a critical improvement priority

2. Accounting in a just-in-time environment is best described as:
   A. more complex.
   B. focused on direct labor.
   C. providing detailed variance reports.
   D. providing less transaction control.

3. The product cell for Dynah Company has budgeted conversion costs of $420,000 for the year. The cell is planned to be available 2,100 hours for production. Each unit requires $12.50 of materials cost. The cell started and completed 700 units. The cell process time for the product is 15 minutes per unit. What is the cost debited to finished goods for the period?
   A. $8,750
   B. $35,000
   C. $43,750
   D. $140,000

4. In-process inspection activities are an example of what type of quality cost?
   A. Prevention
   B. Appraisal
   C. Internal failure
   D. External failure

5. A Pareto chart is used to display:
   A. a ranking of attribute totals, by category, in the form of a bar chart.
   B. important trends in the form of a line chart.
   C. percentage information in the form of a pie chart.
   D. a listing of attribute totals, by category, in a table.

Eye Openers

1. What is the benefit of just-in-time processing?
2. What are some examples of non-value-added lead time?
3. Why is a product-oriented layout preferred by just-in-time manufacturers over a process-oriented layout?
4. How is setup time related to lead time?
5. Why do just-in-time manufacturers favor pull or "make to order" manufacturing?
6. Why would a just-in-time manufacturer strive to produce zero defects?
7. How is supply chain management different from traditional supplier and customer relationships?
8. What just-in-time principles might a hospital use?
9. Why does accounting in a just-in-time environment result in fewer transactions?
10. Why is a "raw and in process inventory" account used by just-in-time manufacturers, rather than separately reporting materials and work in process?
11. Why is the direct labor cost category eliminated in many just-in-time environments?
12. How does accounting under a just-in-time environment provide less transaction control?
13. What are some possible explanations for the actual conversion cost per unit being greater than the budgeted cost per unit in a just-in-time production cell?
14. What is the benefit of an activity analysis?
15. How does a Pareto chart assist management?
16. What is the benefit of identifying non-value-added activities?
17. What ways can the cost of a process be improved?

Practice Exercises

PE 12-1A
Lead time
obj. 1
EE 12-1 p. 495

The Hip Fit Jean Company manufactures jeans in the cutting and sewing process. Jeans are manufactured in 75-jean batch sizes. The cutting time is 7 minutes per jean. The sewing time is 12 minutes per jean. It takes 15 minutes to move a batch of jeans from cutting to sewing.

a. Compute the value-added, non-value-added, and total lead time of this process.
b. Compute the value-added ratio. Round to one decimal.

PE 12-1B
Lead time
obj. 1
EE 12-1 p. 495

The White Wonder Ski Company manufactures skis in the finishing and assembly process. Skis are manufactured in 40-ski batch sizes. The finishing time is 20 minutes per ski. The assembly time is 14 minutes per ski. It takes 8 minutes to move a batch of skis from finishing to assembly.

a. Compute the value-added, non-value-added, and total lead time of this process.
b. Compute the value-added ratio. Round to one decimal.

PE 12-2A
Just-in-time features
obj. 1
EE 12-2 p. 497

Which of the following are features of a just-in-time manufacturing system?

a. Centralized work in process inventory locations
b. Production pace matches demand
c. Receive raw materials directly to manufacturing cells
d. Less wasted movement of material and people

PE 12-2B
Just-in-time features
obj. 1
EE 12-2 p. 497

Which of the following are features of a just-in-time manufacturing system?

a. Smaller batch sizes
b. Centralized maintenance areas
c. Push scheduling
d. Employee involvement

PE 12-3A
Just-in-time journal entries
obj. 3
EE 12-3 p. 502

The budgeted conversion costs for a just-in-time cell are $225,000 for 1,800 production hours. Each unit produced by the cell requires 24 minutes of cell process time. During the month, 400 units are manufactured in the cell. The estimated materials cost are $105 per unit. Provide the following journal entries:

a. Materials are purchased to produce 415 units.
b. Conversion costs are applied to 380 units of production.
c. 365 units are completed and placed into finished goods.

PE 12-3B
Just-in-time journal entries
obj. 3
EE 12-3 p. 502

The budgeted conversion costs for a just-in-time cell are $1,462,500 for 1,950 production hours. Each unit produced by the cell requires 12 minutes of cell process time. During the month, 720 units are manufactured in the cell. The estimated materials cost are $1,300 per unit. Provide the following journal entries:

a. Materials are purchased to produce 750 units.
b. Conversion costs are applied to 720 units of production.
c. 705 units are completed and placed into finished goods.

PE 12-4A
Cost of quality report
objs. 2, 4
EE 12-4 p. 506

A quality control activity analysis indicated the following four activity costs of a hotel:

Inspecting cleanliness of rooms	$ 96,000
Processing lost customer reservations	416,000
Rework incorrectly prepared room service meal	64,000
Employee training	224,000
Total	$800,000

Sales are $4,000,000. Prepare a cost of quality report.

PE 12-4B
Cost of quality report
objs. 2, 4
EE 12-4 p. 506

A quality control activity analysis indicated the following four activity costs of a manufacturing department:

Rework	$ 20,000
Inspecting incoming raw materials	36,000
Warranty work	8,000
Process improvement effort	136,000
Total	$200,000

Sales are $2,000,000. Prepare a cost of quality report.

PE 12-5A
Process activity analysis
obj. 4
EE 12-5 p. 509

Woods Company incurred an activity cost of $55,000 for inspecting 5,000 units of production. Management determined that the inspecting objectives could be met without inspecting every unit. Therefore, rather than inspecting 5,000 units of production, the inspection activity was limited to a random selection of 1,000 units out of the 5,000 units of production. Determine the inspection activity cost per unit on 5,000 units of total production both before and after the improvement.

PE 12-5B
Process activity analysis
obj. 4
EE 12-5 p. 509

Metcalf Company incurred an activity cost of $300,000 for inspecting 60,000 units of production. Management determined that the inspecting objectives could be met without inspecting every unit. Therefore, rather than inspecting 60,000 units of production, the inspection activity was limited to 25% of the production. Determine the inspection activity cost per unit on 60,000 units of total production both before and after the improvement.

Exercises

EX 12-1
Just-in-time principles
obj. 1

The chief executive officer (CEO) of Gemini Inc. has just returned from a management seminar describing the benefits of the just-in-time philosophy. The CEO issued the following statement after returning from the conference:

This company will become a just-in-time manufacturing company. Presently, we have too much inventory. To become just-in-time, we need to eliminate the excess inventory. Therefore, I want all employees to begin reducing inventories until we are just-in-time. Thank you for your cooperation.

How would you respond to the CEO's statement?

EX 12-2
Just-in-time as a strategy
obj. 1

The American textile industry has moved much of its operations offshore in the pursuit of lower labor costs. Textile imports have risen from 2% of all textile production in 1962 to over 70% in 2008. Offshore manufacturers make long runs of standard mass-market apparel items. These are then brought to the United States in container ships, requiring significant time between original order and delivery. As a result, retail customers must accurately forecast market demands for imported apparel items.

Assuming that you work for a U.S.-based textile company, how would you recommend responding to the low-cost imports?

EX 12-3
Just-in-time principles
obj. 1

Galaxy Shirt Company manufactures various styles of men's casual wear. Shirts are cut and assembled by a workforce that is paid by piece rate. This means that they are paid according to the amount of work completed during a period of time. To illustrate, if the piece rate is $0.10 per sleeve assembled, and the worker assembles 700 sleeves during the day, then the worker would be paid $70 (700 × $0.10) for the day's work.

The company is considering adopting a just-in-time manufacturing philosophy by organizing work cells around various types of products and employing pull manufacturing. However, no change is expected in the compensation policy. On this point, the manufacturing manager stated the following:

"Piecework compensation provides an incentive to work fast. Without it, the workers will just goof off and expect a full day's pay. We can't pay straight hourly wages—at least not in this industry."

How would you respond to the manufacturing manager's comments?

EX 12-4
Lead time analysis
obj. 1

Plush Pals Inc. manufactures toy stuffed animals. The direct labor time required to cut, sew, and stuff a toy is 8 minutes per unit. The company makes two types of stuffed toys—a lion and a bear. The lion is assembled in lot sizes of 50 units per batch, while the bear is assembled in lot sizes of 5 units per batch. Since each product has direct labor time of 8 minutes per unit, management has determined that the lead time for each product is 8 minutes.

Is management correct? What are the lead times for each product?

EX 12-5
Reduce setup time
obj. 1

Jackson Inc. has analyzed the setup time on its computer-controlled lathe. The setup requires changing the type of fixture that holds a part. The average setup time has been 135 minutes, consisting of the following steps:

Turn off machine and remove fixture from lathe	10 minutes
Go to tool room with fixture	20
Record replacement of fixture to tool room	18
Return to lathe	20
Clean lathe	15
Return to tool room	20
Record withdrawal of new fixture from tool room	12
Return to lathe	20
Install new fixture and turn on machine	10
Total setup time	145 minutes

a. Why should management be concerned about improving setup time?
b. What do you recommend to Jackson Inc. for improving setup time?
c. How much time would be required for a setup, using your suggestion in (b)?

EX 12-6
Calculate lead time
obj. 1

Monroe Machining Company machines metal parts for the automotive industry. Under the traditional manufacturing approach, the parts are machined through two processes: milling and finishing. Parts are produced in batch sizes of 70 parts. A part requires 3 minutes in milling and 7 minutes in finishing. The move time between the two operations for a complete batch is 8 minutes.

Under the just-in-time philosophy, the part is produced in a cell that includes both the milling and finishing operations. The operating time is unchanged; however, the batch size is reduced to 4 parts and the move time is eliminated.

Determine the value-added, non-value-added, total lead time, and the value-added ratio under the traditional and just-in-time manufacturing methods. Round whole percentages to one decimal place.

EX 12-7
Calculate lead time
obj. 1

RAD Technologies Inc. is considering a new just-in-time product cell. The present manufacturing approach produces a product in four separate steps. The production batch sizes are 50 units. The process time for each step is as follows:

Process Step 1	4 minutes
Process Step 2	7 minutes
Process Step 3	9 minutes
Process Step 4	5 minutes

The time required to move each batch between steps is 12 minutes. In addition, the time to move raw materials to Process Step 1 is also 12 minutes, and the time to move completed units from Process Step 4 to finished goods inventory is 12 minutes.

The new just-in-time layout will allow the company to reduce the batch sizes from 50 units to 3 units. The time required to move each batch between steps and the inventory locations will be reduced to 2 minutes. The processing time in each step will stay the same.

Determine the value-added, non-value-added, total lead times, and the value-added ratio under the present and proposed production approaches. Round whole percentages to one decimal place.

EX 12-8
Lead time calculation—doctor's office

objs. 1, 2

✔ b. 110 minutes

LaBron Harris caught the flu and needed to see the doctor. Harris called to set up an appointment and was told to come in at 1:00 P.M. Harris arrived at the doctor's office promptly at 1:00 P.M. The waiting room had 9 other people in it. Patients were admitted from the waiting room in FIFO (first-in, first-out) order at a rate of 5 minutes per patient. After waiting until his turn, a nurse finally invited Harris to an examining room. Once in the examining room, Harris waited another 15 minutes before a nurse arrived to take some basic readings (temperature, blood pressure). The nurse needed five minutes to collect the clinical information. After the nurse left, Harris waited 15 additional minutes before the doctor arrived. The doctor arrived and diagnosed the flu and provided a prescription for antibiotics. This took the doctor 10 minutes. Before leaving the doctor's office, Harris waited 15 minutes at the business office to pay for the office visit.

Harris spent 5 minutes walking next door to fill the prescription at the pharmacy. There were 4 people in front of Harris, each person requiring 5 minutes to fill and purchase a prescription. Harris finally arrived home 20 minutes after paying for his prescription.

a. What time does Harris arrive home?
b. How much of the total elapsed time from 1:00 p.m. until when Harris arrived home was non-value-added time?
c. What is the value-added ratio?
d. Why does the doctor require patients to wait so long for service?

EX 12-9
Suppy chain management

obj. 1

The following is an excerpt from a recent article discussing supplier relationships with the Big Three North American automakers.

"The Big Three select suppliers on the basis of lowest price and annual price reductions," said Neil De Koker, president of the Original Equipment Suppliers Association. "They look globally for the lowest parts prices from the lowest cost countries," De Koker said. "There is little trust and respect. Collaboration is missing." Japanese auto makers want long-term supplier relationships. They select suppliers as a person would a mate. The Big Three are quick to beat down prices with methods such as electronic auctions or rebidding work to a competitor. The Japanese are equally tough on price but are committed to maintaining supplier continuity. "They work with you to arrive at a competitive price, and they are willing to pay because they want long-term partnering," said Carl Code, a vice president at Ernie Green Industries. "They [Honda and Toyota] want suppliers to make enough money to stay in business, grow, and bring them innovation." The Big Three's supply chain model is not much different from the one set by Henry Ford. In 1913, he set up the system of independent supplier firms operating at arm's length on short-term contracts. One consequence of the Big Three's low-price-at-all-costs mentality is that suppliers are reluctant to offer them their cutting-edge technology out of fear the contract will be resourced before the research and development costs are recouped.

a. Contrast the Japanese supply chain model with that of the Big Three.
b. Why might a supplier prefer the Japanese model?
c. What benefits might accrue to the Big Three by adopting the Japanese supply chain practices?

Source: Robert Sherefkin and Amy Wilson, "Suppliers Prefer Japanese Business Model," *Rubber & Plastics News*, March 17, 2003, Vol. 24, No. 11.

EX 12-10
Employee involvement

obj. 1

Quickie Designs Inc. uses teams in the manufacture of lightweight wheelchairs. Two features of its team approach are team hiring and peer reviews. Under team hiring, the team recruits, interviews, and hires new team members from within the organization. Using peer reviews, the team evaluates each member of the team with regard to quality, knowledge, teamwork, goal performance, attendance, and safety. These reviews provide feedback to the team member for improvement.

How do these two team approaches differ from using managers to hire and evaluate employees?

EX 12-11
Lead time reduction—service company

objs. 1, 2

Shield Insurance Company takes ten days to make payments on insurance claims. Claims are processed through three departments: Data Input, Claims Audit, and Claims Adjustment. The three departments are on different floors, approximately one hour apart from each other. Claims are processed in batches of 100. Each batch of 100 claims moves through the three departments on a wheeled cart. Management is concerned about customer dissatisfaction caused by the long lead time for claim payments.

How might this process be changed so that the lead time could be reduced significantly?

EX 12-12
Just-in-time—fast-food restaurant

obj. 2

The management of Burgermeister fast-food franchise wants to provide hamburgers quickly to customers. It has been using a process by which precooked hamburgers are prepared and placed under hot lamps. These hamburgers are then sold to customers. In this process, every customer receives the same type of hamburger and dressing (ketchup, onions, mustard). If a customer wants something different, then a "special order" must be cooked to the customer's requirements. This requires the customer to wait several minutes, which often slows down the service line. Burgermeister has been receiving more and more special orders from customers, which has been slowing service down considerably.

a. How would you describe the present Burgermeister service delivery system?
b. How might you use just-in-time principles to provide customers quick service, yet still allow them to custom order their burgers?

EX 12-13
Accounting issues in a just-in-time environment

obj. 3

Orion Company has recently implemented a just-in-time manufacturing approach. A production department manager has approached the controller with the following comments:

I am very upset with our accounting system now that we have implemented our new just-in-time manufacturing methods. It seems as if all I'm doing is paperwork. Our product is moving so fast through the manufacturing process that the paperwork can hardly keep up. For example, it just doesn't make sense to me to fill out daily labor reports. The employees are assigned to complete cells, performing many different tasks. I can't keep up with direct labor reports on each individual task. I thought we were trying to eliminate waste. Yet the information requirements of the accounting system are slowing us down and adding to overall lead time. Moreover, I'm still getting my monthly variance reports. I don't think that these are necessary. I have nonfinancial performance measures that are more timely than these reports. Besides, the employees don't really understand accounting variances. How about giving some information that I can really use?

What accounting system changes would you suggest in light of the production department manager's criticisms?

EX 12-14
Just-in-time journal entries

obj. 3

✔ b. $90

Red Ray Media Inc. uses a just-in-time strategy to manufacture DVD players. The company manufactures DVDs through a single product cell. The budgeted conversion cost for the year is $904,500 for 2,010 production hours. Each unit requires 12 minutes of cell process time. During March, 900 DVDs are manufactured in the cell. The materials cost per unit is $65. The following summary transactions took place during March:

1. Materials are purchased for March production.
2. Conversion costs were applied to production.
3. 900 DVDs are assembled and placed in finished goods.
4. 860 DVDs are sold for $275 per unit.

a. Determine the budgeted cell conversion cost per hour.
b. Determine the budgeted cell conversion cost per unit.
c. Journalize the summary transactions (1)–(4) for March.

EX 12-15
Just-in-time journal entries

obj. 3

✔ a. $50

Home-Bright Inc. manufactures lighting fixtures, using just-in-time manufacturing methods. Style BB-01 has a materials cost per unit of $26. The budgeted conversion cost for the year is $100,000 for 2,000 production hours. A unit of Style BB-01 requires 15 minutes of cell production time. The following transactions took place during July:

1. Materials were acquired to assemble 800 Style BB-01 units for July.
2. Conversion costs were applied to 800 Style BB-01 units of production.
3. 750 units of Style BB-01 were completed in July.
4. 700 units of Style BB-01 were sold in June for $75 per unit.

a. Determine the budgeted cell conversion cost per hour.
b. Determine the budgeted cell conversion cost per unit.
c. Journalize the summary transactions (1)–(4) for July.

EX 12-16
Just-in-time journal entries

obj. 3

✔ b. Finished goods, $3,075

Acoustic Systems, Inc. manufactures audio speakers. Each speaker requires $115 per unit of direct materials. The speaker manufacturing assembly cell includes the following estimated costs for the period:

Speaker assembly cell estimated costs:	
Cell labor	$43,100
Cell depreciation	5,900
Cell supplies	2,200
Cell power	1,300
Total cell costs for the period	$52,500

The operating plan calls for 175 operating hours for the period. Each speaker requires 18 minutes of cell process time. The unit selling price for each speaker is $310. During the period, the following transactions occurred:

1. Purchased materials to produce 400 speaker units.
2. Applied conversion costs to production of 380 speaker units.
3. Completed and transferred 365 speaker units to finished goods.
4. Sold 350 speaker units.

There were no inventories at the beginning of the period.

a. Journalize the summary transactions (1)–(4) for the period.
b. Determine the ending balance for raw and in-process inventory and finished goods inventory.

EX 12-17
Pareto chart

obj. 4

Advanced Memory Technologies Inc. manufactures RAM memory chips for personal computers. An activity analysis was conducted, and the following activity costs were identified with the manufacture and sale of memory chips:

Activities	Activity Cost
Correct shipment errors	$ 90,000
Disposing of scrap	97,500
Emergency equipment maintenance	75,000
Employee training	30,000
Final inspection	82,500
Inspecting incoming materials	22,500
Preventive equipment maintenance	15,000
Processing customer returns	75,000
Scrap reporting	37,500
Supplier development	15,000
Warranty claims	210,000
Total	$750,000

Prepare a Pareto chart of these activities.

EX 12-18
Cost of quality report

obj. 4

✔ a. Appraisal, 14% of total costs

a. Using the information in Exercise 12-17, prepare a cost of quality report. Assume that the sales for the period were $5,000,000.

b. Interpret the cost of quality report.

EX 12-19
Pareto chart for a service company

objs. 2, 4

Quest Cable Company provides cable TV and Internet service to the local community. The activities and activity costs of Quest Cable are identified as follows:

Activities	Activity Cost
Billing error correction	$ 30,000
Cable signal testing	80,000
Reinstalling service (installed incorrectly the first time)	65,000
Repairing satellite equipment	20,000
Repairing underground cable connections to the customer	20,000
Replacing old technology cable with higher quality cable	105,000
Replacing old technology signal switches with higher quality switches	120,000
Responding to customer home repair requests	35,000
Training employees	25,000
Total	$500,000

Prepare a Pareto chart of these activities.

EX 12-20
Cost of quality and value-added/non-value-added reports

objs. 2, 4

✔ a. External failure, 30% of total costs

a. Using the activity data in Exercise 12-19, prepare a cost of quality report. Assume that sales are $2,500,000. Round percentages to one decimal place.

b. Using the activity data in Exercise 12-19, prepare a value-added/non-value-added analysis.

c. Interpret the information in (a) and (b).

EX 12-21
Process activity analysis

obj. 4

✔ a. $0.08 per can

The Mr. Fizz Beverage Company bottles soft drinks into aluminum cans. The manufacturing process consists of three activities:

1. **Mixing**: water, sugar, and beverage concentrate are mixed.
2. **Filling**: mixed beverage is filled into 12 oz. cans.
3. **Packaging**: filled cans are boxed into "fridge packs."

The activity costs associated with these activities for the period are as follows:

	Activity Cost
Mixing	$336,000
Filling	304,000
Packaging	160,000
Total	$800,000

Each can is expected to contain 12 ozs. of beverage. Thus, after being filled, each can is automatically weighed. If a can is too light, it is rejected, or "kicked," from the filling line prior to being packaged. The primary cause of kicks is heat expansion. With heat expansion, the beverage overflows during filling, resulting in underweight cans.

This process begins by mixing and filling 10,400,000 cans during the period, of which only 10,000,000 cans are actually packaged. Four hundred thousand cans are rejected due to underweight kicks.

A process improvement team has determined that cooling the cans prior to filling them will reduce the amount of overflows due to expansion. After this improvement, the number of kicks is expected to decline from 400,000 cans to 100,000 cans.

a. Determine the activity cost per can under present operations.
b. Determine the amount of increased packaging costs from the expected improvements.
c. Determine the expected activity cost per can after improvements. Round to the nearest tenth of a cent.

EX 12-22
Process activity analysis

objs. 2, 4

✔ b. $50 per claim payment

Safe Hands Insurance Company has a process for making payments on insurance claims as follows:

An activity analysis revealed that the cost of these activities was as follows:

Receiving claim	$ 45,000
Adjusting claim	195,000
Paying claim	60,000
Total	$300,000

This process includes only the cost of processing the claim payments, not the actual amount of the claim payments. The adjusting activity involves verifying and estimating the amount of the claim.

The process received, adjusted, and paid 6,000 claims during the period. All claims were treated identically in this process.

To improve the cost of this process, management has determined that claims should be segregated into two categories. Claims under $1,000 and claims greater than $1,000: claims under $1,000 would not be adjusted but would be accepted upon the insured's evidence of claim. Claims above $1,000 would be adjusted. It is estimated that 70% of the claims are under $1,000 and would thus be paid without adjustment. It is also estimated that the additional effort to segregate claims would add 10% to the "receiving claim" activity cost.

a. Develop a table showing the percent of activity cost to the total process cost for the claim payment activities.
b. Determine the average total process cost per claim payment, assuming 6,000 total claims.
c. Prepare a table showing the changes in the activity costs as a result of the changes proposed by management.
d. Estimate the average cost per claim payment, assuming that the changes proposed by management are enacted for 6,000 total claims.

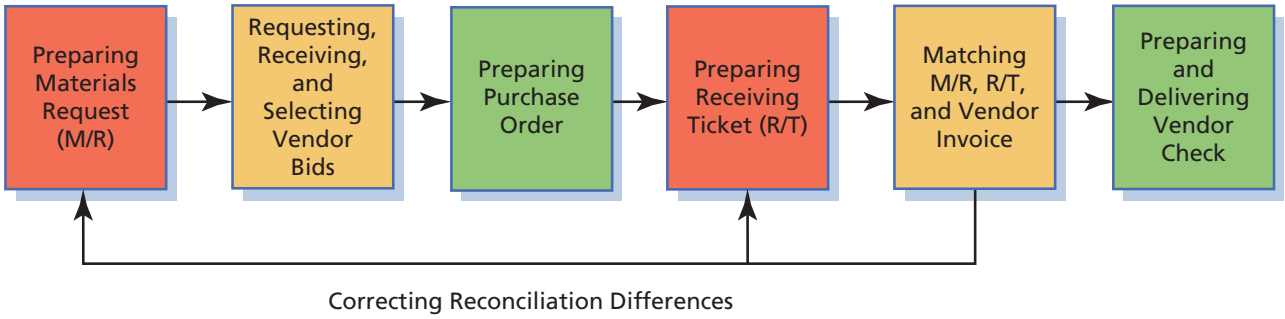
EX 12-23
Process activity analysis

objs. 2, 4

✔ b. $8 per payment

The procurement process for Li Wholesale Company includes a series of activities that transforms a materials requisition into a vendor check. The process begins with a request for materials. The requesting department prepares and sends a materials request form to the Purchasing Department. The Purchasing Department then places a request for a quote to vendors. Vendors prepare bids in response to the request for a quote. A vendor is selected based on the lowest bid. A purchase order to the low-bid vendor is prepared. The vendor delivers the materials to the company, whereupon a receiving ticket is prepared. Payment to the vendor is authorized if the materials request form, receiving ticket, and vendor invoice are in agreement. These three documents fail to

agree 50% of the time, initiating effort to reconcile the differences. Once the three documents agree, a check is issued. The process can be diagrammed as follows:



An activity analysis indicated the following activity costs with this process:

Preparing materials request	$ 19,200
Requesting, receiving, and selecting vendor bids	60,000
Preparing purchase order	12,000
Preparing receiving ticket	16,800
Matching M/R, R/T, and invoice	24,000
Correcting reconciliation differences	84,000
Preparing and delivering vendor payment	24,000
Total process activity cost	$240,000

On average, the process handles 30,000 individual requests for materials that result in 30,000 individual payments to vendors.

Management proposes to improve this process in two ways. First, the Purchasing Department will develop a preapproved vendor list for which orders can be placed without a request for quote. It is expected that this will reduce the need for requesting and receiving vendor bids by 75%. Second, additional training and standardization will be provided to reduce errors introduced into the materials requisition form and receiving tickets. It is expected that this will reduce the number of reconciliation differences from 50% to 20%, over an average of 30,000 payments.

a. Develop a table showing the percent of individual activity cost to the total process cost for the procurement activities.
b. Determine the average total process cost per vendor payment, assuming 30,000 payments.
c. Prepare a table showing the improvements in the activity costs as a result of the changes proposed by management.
d. Estimate the average cost per vendor payment, assuming that the changes proposed by management are enacted for 30,000 total payments.

Problems Series A

PR 12-1A
Just-in-time principles

obj. 1

Comet Motorcycle Company manufactures a variety of motorcycles. Comet's purchasing policy requires that the purchasing agents place each quarter's purchasing requirements out for bid. This is because the Purchasing Department is evaluated solely by its ability to get the lowest purchase prices. The lowest cost bidder receives the order for the next quarter (90 days). To make its motorcycles, Comet requires 5,400 frames per quarter. Comet received two frame bids for the third quarter, as follows:

- *Famous Frames, Inc.:* $322 per frame. Delivery schedule: 60 frames per working day (90 days in the quarter).
- *Iron Horse Frames Inc.:* $320 per frame. Delivery schedule: 5,400 (60 frames × 90 days) frames at the beginning of July to last for three months.

Comet accepted Iron Horse Frames Inc.'s bid because it was the low-cost bid.

Instructions

1. Comment on Comet's purchasing policy.
2. What are the additional (hidden) costs, beyond price, of Iron Horse Frames Inc.'s bid? Why weren't these costs considered?
3. Considering just inventory financing costs, what is the additional cost per frame of Iron Horse Frames Inc.'s bid if the cost of money is 10%? (*Hint:* Determine the average value of frame inventory held for the quarter and multiply by the quarterly interest charge.)

PR 12-2A
Lead time

obj. 1

✔ 1. Total wait time, 2,926 minutes

Gourmet Helper Appliance Company manufactures home kitchen appliances. The manufacturing process includes stamping, final assembly, testing, and shipping. In the stamping operation, a number of individuals are responsible for stamping the steel outer surface of the appliance. The stamping operation is set up prior to each run. A run of 75 stampings is completed after each setup. A setup requires 40 minutes. The parts wait for the setup to be completed before stamping begins. Each stamping requires 5 minutes of operating time. After each batch is completed, the operator moves the stamped covers to the final assembly area. This move takes 10 minutes to complete.

The final assembly for each appliance unit requires 18 minutes and is also done in batches of 75 appliance units. The batch of 75 appliance units is moved into the test building, which is across the street. The move takes 25 minutes. In the final test, the 75-unit batch is tested one at a time. Each test requires 6 minutes. The completed units are sent to shipping for packaging and final shipment to customers. A complete batch of 75 units is sent from final assembly to shipping. The Shipping Department is located next to final assembly. Thus, there is no move time between these two operations. Packaging and shipment labeling requires 10 minutes per unit.

Instructions

1. Determine the amount of value-added and non-value-added lead time and the value-added ratio in this process for an average kitchen appliance in a batch of 75 units. Round percentages to one decimal place. Categorize the non-value-added time into wait and move time.
2. How could this process be improved so as to reduce the amount of waste in the process?

PR 12-3A
Just-in-time accounting

obj. 3

✔ 4. Raw and In Process Inventory, $26,125

My-Phone Inc. manufactures and assembles two major types of telephone assemblies—a desk phone and a cellular phone. The process consists of a just-in-time cell for each product. The data that follow concern only the cellular phone just-in-time cell.

For the year, My-Phone Inc. budgeted the following costs for the cellular phone production cell:

Conversion Cost Categories	Budget
Labor	$120,000
Supplies	45,000
Utilities	15,000
Total	$180,000

My-Phone plans 2,400 hours of production for the cellular phone cell for the year. The materials cost is $65 per unit. Each assembly requires 18 minutes of cell assembly time. There was no March 1 inventory for either Raw and In Process Inventory or Finished Goods Inventory.

The following summary events took place in the cellular phone cell during March:

a. Electronic parts were purchased to produce 8,200 cellular phone assemblies in March.
b. Conversion costs were applied for 8,000 units of production in March.

c. 7,850 units were completed and transferred to finished goods in March.
d. 7,680 units were shipped to customers at a price of $300 per unit.

Instructions

1. Determine the budgeted cell conversion cost per hour.
2. Determine the budgeted cell conversion cost per unit.
3. Journalize the summary transactions (a) through (d).
4. Determine the ending balance in Raw and In Process Inventory and Finished Goods Inventory.
5. How does the accounting in a JIT environment differ from traditional accounting?

PR 12-4A
Pareto chart and cost of quality report—manufacturing company

obj. 4

✔ 3. Non-value-added, 39%

The president of Healthy Heart Exercise Equipment Co. has been concerned about the growth in costs over the last several years. The president asked the controller to perform an activity analysis to gain a better insight into these costs. The activity analysis revealed the following:

Activity	Activity Cost
Correcting invoice errors	$ 15,000
Disposing of incoming materials with poor quality	12,000
Disposing of scrap	39,000
Expediting late production	33,000
Final inspection	24,000
Inspecting incoming materials	6,000
Inspecting work in process	30,000
Preventive machine maintenance	18,000
Producing product	105,000
Responding to customer quality complaints	18,000
Total	$300,000

The production process is complicated by quality problems, requiring the production manager to expedite production and dispose of scrap.

Instructions

1. Prepare a Pareto chart of the company activities.
2. Use the activity cost information to determine the percentages of total costs that are prevention, appraisal, internal failure, external failure, and not costs of quality.
3. Determine the percentages of total costs that are value- and non-value-added.
4. Interpret the information.

Problems Series B

PR 12-1B
Just-in-time principles

obj. 1

Ready-Light Co. manufactures light bulbs. Ready-Light's purchasing policy requires that the purchasing agents place each quarter's purchasing requirements out for bid. This is because the Purchasing Department is evaluated solely by its ability to get the lowest purchase prices. The lowest cost bidder receives the order for the next quarter (90 working days).

To make its bulb products, Ready-Light requires 36,000 pounds of glass per quarter. Ready-Light received two glass bids for the third quarter, as follows:

- *Mid-States Glass Company:* $25.00 per pound of glass. Delivery schedule: 36,000 (400 lbs. × 90 days) pounds at the beginning of July to last for 3 months.
- *Akron Glass Company:* $25.15 per pound of glass. Delivery schedule: 400 pounds per working day (90 days in the quarter).

Ready-Light accepted Mid-States Glass Company's bid because it was the low-cost bid.

Instructions

1. Comment on Ready-Light's purchasing policy.
2. What are the additional (hidden) costs, beyond price, of Mid-States Glass Company's bid? Why weren't these costs considered?
3. Considering just inventory financing costs, what is the additional cost per pound of Mid-States Glass Company's bid if the cost of money is 8%? (*Hint:* Determine the average value of glass inventory held for the quarter and multiply by the quarterly interest charge.)

PR 12-2B
Lead time

obj. 1

✔ 1. Total wait time, 1,800 minutes

Fidelity Electronics Company manufactures electronic stereo equipment. The manufacturing process includes printed circuit (PC) card assembly, final assembly, testing, and shipping. In the PC card assembly operation, a number of individuals are responsible for assembling electronic components into printed circuit boards. Each operator is responsible for soldering components according to a given set of instructions. Operators work on batches of 60 printed circuit boards. Each board requires 6 minutes of assembly time. After each batch is completed, the operator moves the assembled cards to the final assembly area. This move takes 10 minutes to complete.

The final assembly for each stereo unit requires 12 minutes and is also done in batches of 60 units. A batch of 60 stereos is moved into the test building, which is across the street. The move takes 20 minutes. Before conducting the test, the test equipment must be set up for the particular stereo model. The test setup requires 30 minutes. The units wait while the setup is performed. In the final test, the 60-unit batch is tested one at a time. Each test requires 5 minutes. The completed batch, after all testing, is sent to shipping for packaging and final shipment to customers. A complete batch of 60 units is sent from final assembly to shipping. The Shipping Department is located next to final assembly. Thus, there is no move time between these two operations. Packaging and labeling requires 7 minutes per unit.

Instructions

1. Determine the amount of value-added and non-value-added lead time and the value-added ratio in this process for an average stereo unit in a batch of 60 units. Round percentages to one decimal place. Categorize the non-value-added time into wait and move time.
2. How could this process be improved so as to reduce the amount of waste in the process?

PR 12-3B
Just-in-time accounting

obj. 3

✔ 4. Raw and In Process Inventory, $30,820

First Display Inc. manufactures and assembles automobile instrument panels for both Yokohama Motors and Detroit Motors. The process consists of a just-in-time product cell for each customer's instrument assembly. The data that follow concern only the Yokohama just-in-time cell.

For the year, First Display Inc. budgeted the following costs for the Yokohama production cell:

Conversion Cost Categories	Budget
Labor	$642,000
Supplies	112,000
Utilities	26,000
Total	$780,000

First Display Inc. plans 3,000 hours of production for the Yokohama cell for the year. The materials cost is $125 per instrument assembly. Each assembly requires 24 minutes of cell assembly time. There was no October 1 inventory for either Raw and In Process Inventory or Finished Goods Inventory.

The following summary events took place in the Yokohama cell during October:

a. Electronic parts and wiring were purchased to produce 7,600 instrument assemblies in October.
b. Conversion costs were applied for the production of 7,500 units in October.
c. 7,420 units were started, completed, and transferred to finished goods in October.
d. 7,300 units were shipped to customers at a price of $400 per unit.

Instructions

1. Determine the budgeted cell conversion cost per hour.
2. Determine the budgeted cell conversion cost per unit.
3. Journalize the summary transactions (a) through (d).
4. Determine the ending balance in Raw and In Process Inventory and Finished Goods Inventory.
5. How does the accounting in a JIT environment differ from traditional accounting?

PR 12-4B
Pareto chart and cost of quality report—municipality

objs. 2, 4

✔ 3. Non-value-added, 62.5%

The administrator of elections for the city of Sweetwater has been asked to perform an activity analysis of its optical scanning center. The optical scanning center reads voter forms into the computer. The result of the activity analysis is summarized as follows:

Activities	Activity Cost
Correcting errors identified by election commission	$ 96,000
Correcting jams	84,000
Correcting scan errors	48,000
Loading	24,000
Logging-in control codes (for later reconciliation)	18,000
Program scanner	24,000
Rerunning job due to scan reading errors	22,000
Scanning	52,000
Verifying scan accuracy via reconciling totals	20,000
Verifying scanner accuracy with test run	12,000
Total	$400,000

Instructions

1. Prepare a Pareto chart of the department activities.
2. Use the activity cost information to determine the percentages of total department costs that are prevention, appraisal, internal failure, external failure, and not costs of quality. Round percentages to one decimal place.
3. Determine the percentages of the total department costs that are value- and non-value-added. Round percentages to one decimal place.
4. Interpret the information.

Special Activities

SA 12-1
Ethics and professional conduct in business

In August, Zeus Company introduced a new performance measurement system in manufacturing operations. One of the new performance measures was lead time. The lead time was determined by tagging a random sample of items with a log sheet throughout the month. This log sheet recorded the time that the item started and the time that it ended production, as well as all steps in between. The controller collected the log sheets and calculated the average lead time of the tagged products. This number was reported to central management and was used to evaluate the performance of the plant manager. The plant was under extreme pressure to reduce lead time because of poor lead time results reported in June.

The following memo was intercepted by the controller.

> Date: September 1
> To: Hourly Employees
> From: Plant Manager
>
> During last month, you noticed that some of the products were tagged with a log sheet. This sheet records the time that a product enters production and the time that it leaves production. The difference between these two times is termed the "lead time." Our plant is evaluated on improving lead time. From now on, I ask all of you to keep an eye out for the tagged items. When you receive a tagged item, it is to receive special attention. Work on that item first, and then immediately move it to the next operation. Under no circumstances should tagged items wait on any other work that you have. Naturally, report accurate information. I insist that you record the correct times on the log sheet as the product goes through your operations.

How should the controller respond to this discovery?

SA 12-2
Just-in-time principles

Hilton Inc. manufactures electric space heaters. While the CEO, Azra Khan, is visiting the production facility, the following conversation takes place with the plant manager, Paul Lopez:

Azra: As I walk around the facility, I can't help noticing all the materials inventories. What's going on?

Paul: I have found our suppliers to be very unreliable in meeting their delivery commitments. Thus, I keep a lot of materials on hand so as to not risk running out and shutting down production.

Azra: Not only do I see a lot of materials inventory, but there also seems to be a lot of finished goods inventory on hand. Why is this?

Paul: As you know, I am evaluated on maintaining a low cost per unit. The one way that I am able to reduce my unit costs is by producing as many space heaters as possible. This allows me to spread my fixed costs over a larger base. When orders are down, the excess production builds up as inventory, as we are seeing now. But don't worry—I'm really keeping our unit costs down this way.

Azra: I'm not so sure. It seems that this inventory must cost us something.

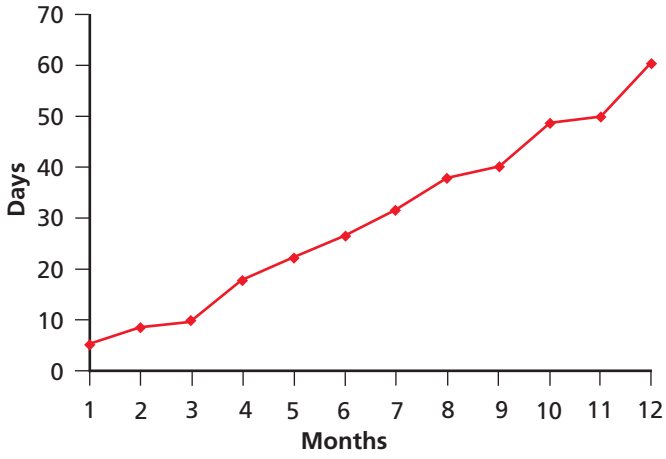
Paul: Not really. I'll eventually use the materials and we'll eventually sell the finished goods. By keeping the plant busy, I'm using our plant assets wisely. This is reflected in the low unit costs that I'm able to maintain.

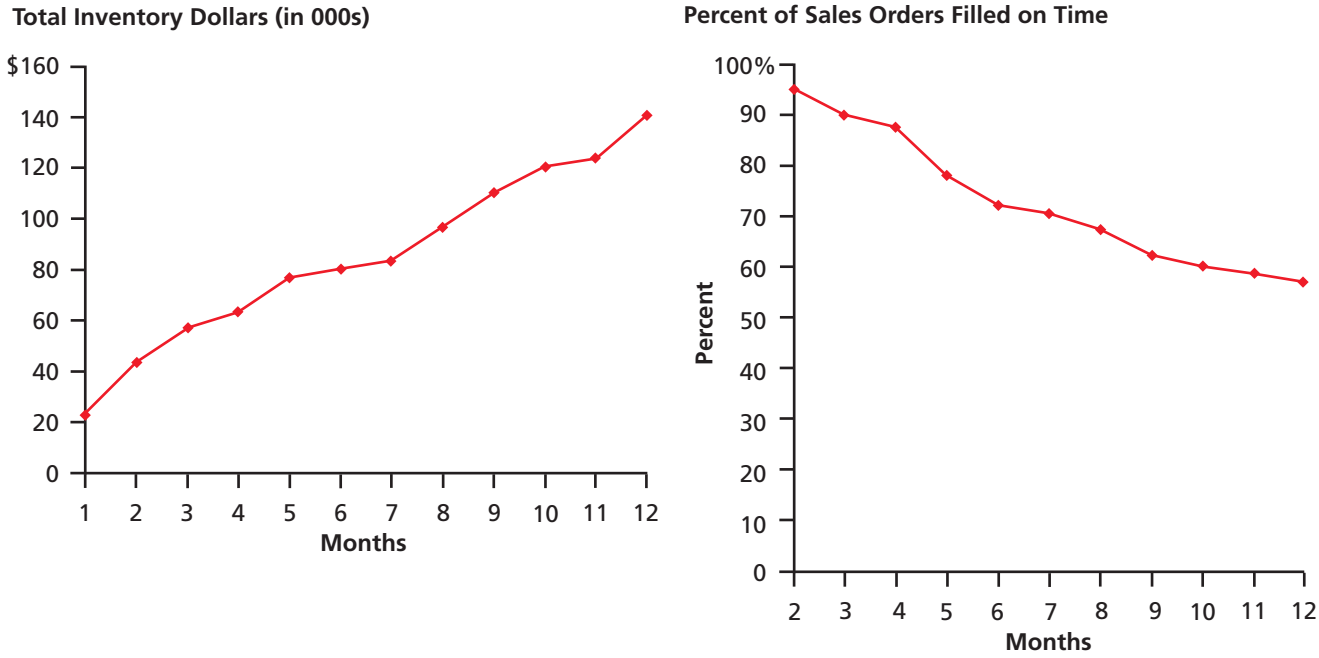
If you were Azra Kahn, how would you respond to Paul Lopez? What recommendations would you provide Paul Lopez?

SA 12-3
Just-in-time principles

Apex Concepts Inc. prepared the following performance graphs for the prior year:

Total Manufacturing Lead Time





What do these appear to indicate?

SA 12-4
Value-added and non-value-added activity costs

Taft Company prepared the following factory overhead report from its general ledger:

Indirect labor	$300,000
Fringe benefits	30,000
Supplies	70,000
Depreciation	100,000
Total	$500,000

The management of Taft Company was dissatisfied with this report and asked the controller to prepare an activity analysis of the same information. This activity analysis was as follows:

Processing sales orders	$105,000	21%
Disposing scrap	100,000	20
Expediting work orders	90,000	18
Producing parts	70,000	14
Resolving supplier quality problems	65,000	13
Reissuing corrected purchase orders	50,000	10
Expediting customer orders	20,000	4
Total	$500,000	100%

Interpret the activity analysis by identifying value-added and non-value-added activity costs. How does the activity cost report differ from the general ledger report?

SA 12-5
Lead time

Group Project

In groups of two to four people, visit a sit-down restaurant and do a lead time study. If more than one group chooses to visit the same restaurant, choose different times for your visits. Note the time when you walk in the door of the restaurant and the time when you walk out the door after you have eaten. The difference between these two times is the total lead time of your restaurant experience. While in the restaurant, determine the time spent on non-value-added time, such as wait time, and the time spent on value-added eating time. Note the various activities and the time required to perform each activity during your visit to the restaurant. Compare your analyses, identifying possible reasons for differences in the times recorded by groups that visited the same restaurant.

Answers to Self-Examination Questions

1. **B** The just-in-time philosophy embraces a product-oriented layout (answer A), making lead times short (answer C), and reducing setup times (answer D). Pull manufacturing, the opposite of push manufacturing (answer B), is also a just-in-time principle.

2. **D** Accounting in a just-in-time environment should not be complex (answer A), not focus on direct labor (answer B) because it is combined with other conversion costs, and not provide detailed variance reporting (answer C) because of a higher reliance on nonfinancial performance measures. However, the just-in-time accounting environment will have fewer transaction control features than the traditional system (answer D).

3. **C** $\$420{,}000 \div 2{,}100 \text{ hours} = \$200 \text{ per hour}$
$\$200 \text{ per hour} \times 0.25 \text{ hour} = \$50 \text{ per unit}$
$700 \text{ units} \times (\$50 + \$12.50) = \$43{,}750$

4. **B** Appraisal costs (answer B) are the costs of inspecting and testing activities, which include detecting, measuring, evaluating, and auditing products and processes. Prevention (answer A) activities are incurred to prevent defects from occurring during the design and delivery of products or services. Internal failure costs (answer C) are associated with defects that are discovered by the organization before the product or service is delivered to the consumer. External failure costs (answer D) are the costs incurred after defective units or service have been delivered to consumers.

5. **A** A Pareto chart is a bar chart that ranks attribute totals by category (answer A). A line chart (answer B), a pie chart (answer C), and a table listing (answer D) are other ways of displaying information, but they are not Pareto charts.

CHAPTER 13

Statement of Cash Flows

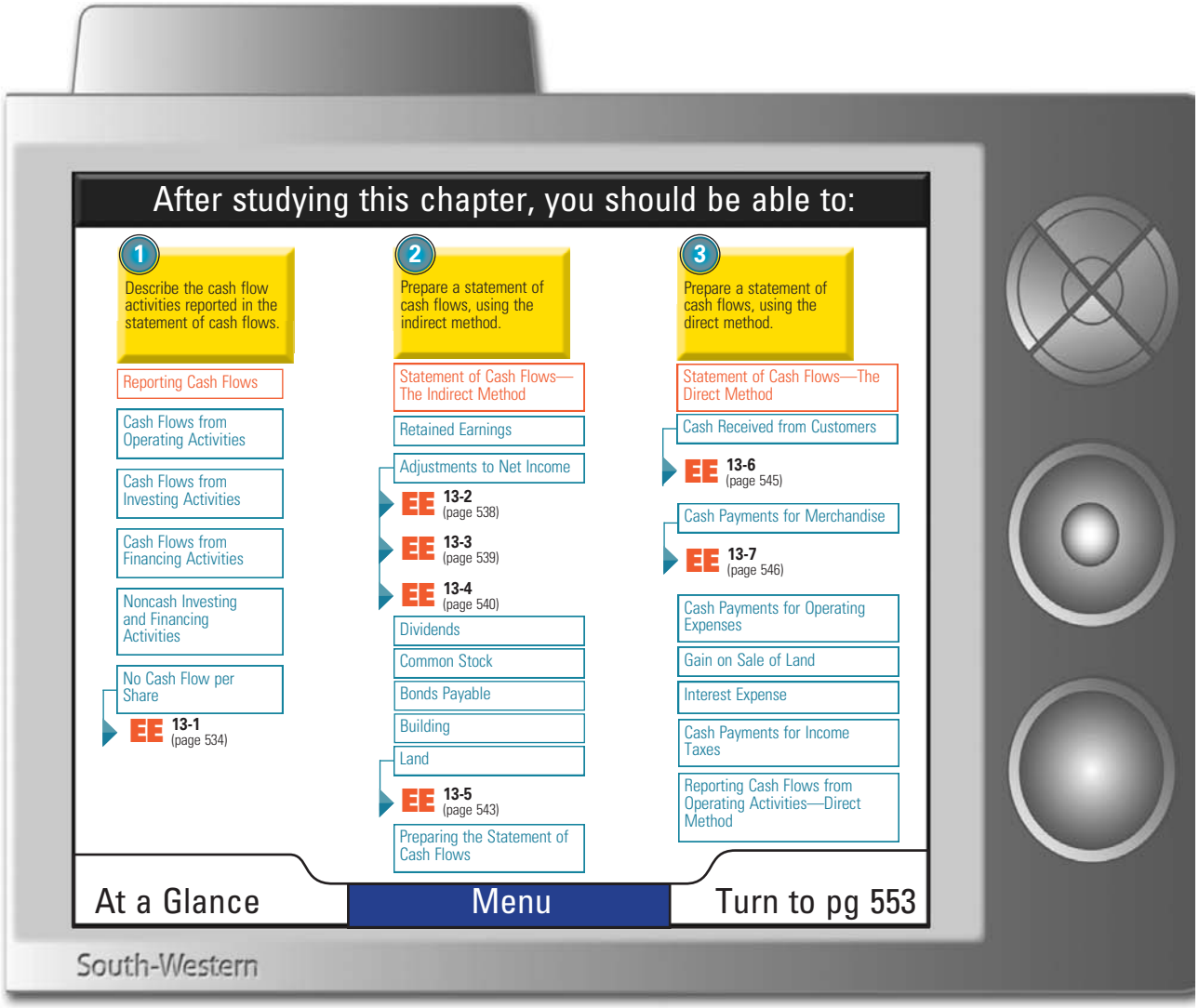
© AP Photo/Elaine Thompson

JONES SODA CO.

Suppose you were to receive $100 as a result of some event. Would it make a difference what the event was? Yes, it would! If you received $100 for your birthday, then it's a gift. If you received $100 as a result of working part time for a week, then it's the result of your effort. If you received $100 as a loan, then it's money that you will have to pay back in the future. If you received $100 as a result of selling your iPod, then it's the result of giving up something tangible. Thus, the same $100 received can be associated with different types of events, and these events have different meanings to you. You would much rather receive a $100 gift than take out a $100 loan. Likewise, company stakeholders would also view events such as these differently.

Companies are required to report information about the events causing a change in cash over a period of time. This information is reported in the statement of cash flows. One such company is Jones Soda Co. Jones began in the late 1980s as an alternative beverage company, known for its customer-provided labels, unique flavors, and support for extreme sports. You have probably seen Jones Soda at Barnes & Noble, Panera Bread, or Starbucks, or maybe sampled some of its unique flavors, such as Fufu Berry®, Blue Bubblegum®, or Lemon Drop®. As with any company, cash is important to Jones Soda. Without cash, Jones would be unable to expand its brands, distribute its product, support extreme sports, or provide a return for its owners. Thus, its managers are concerned about the sources and uses of cash.

In previous chapters, we have used the income statement, balance sheet, retained earnings statement, and other information to analyze the effects of management decisions on a business's financial position and operating performance. In this chapter, we focus on the events causing a change in cash by presenting the preparation and use of the statement of cash flows.



1 Describe the cash flow activities reported in the statement of cash flows.

Reporting Cash Flows

The **statement of cash flows** reports a company's cash inflows and outflows for a period.[1] The statement of cash flows provides useful information about a company's ability to do the following:

1. Generate cash from operations
2. Maintain and expand its operating capacity
3. Meet its financial obligations
4. Pay dividends

The statement of cash flows is used by managers in evaluating past operations and in planning future investing and financing activities. It is also used by external users such as investors and creditors to assess a company's profit potential and ability to pay its debt and pay dividends.

The statement of cash flows reports three types of cash flow activities as follows:

1. **Cash flows from operating activities** are cash flows from transactions that affect the net income of the company.

   Example: Purchase and sale of merchandise by a retailer.

1 As used in this chapter, *cash* refers to cash and cash equivalents. Examples of cash equivalents include short-term, highly liquid investments, such as money market accounts, bank certificates of deposit, and U.S. Treasury bills.

2. **Cash flows from investing activities** are cash flows from transactions that affect investments in noncurrent assets of the company.

   Example: Sale and purchase of fixed assets, such as equipment and buildings.

3. **Cash flows from financing activities** are cash flows from transactions that affect the debt and equity of the company.

   Example: Issuing or retiring equity and debt securities.

The cash flows are reported in the statement of cash flows as follows:

Cash flows from operating activities	$XXX
Cash flows from investing activities	XXX
Cash flows from financing activities	XXX
Net increase or decrease in cash for the period	$XXX
Cash at the beginning of the period	XXX
Cash at the end of the period	$XXX

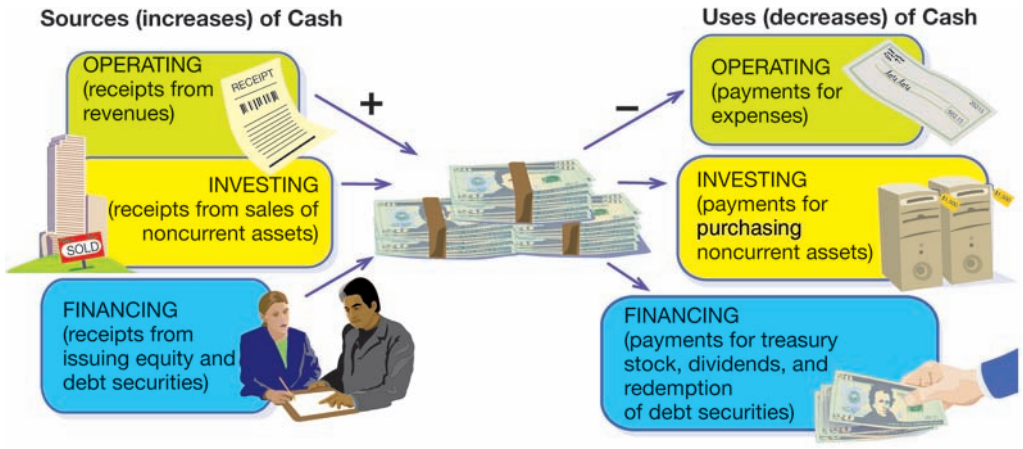
The ending cash on the statement of cash flows equals the cash reported on the company's balance sheet.

The statement of cash flows reports cash flows from operating, investing, and financing activities.

Exhibit 1 illustrates the sources (increases) and uses (decreases) of cash by each of the three cash flow activities. A *source* of cash causes the cash flow to increase and is called a *cash inflow*. A *use* of cash causes cash flow to decrease and is called *cash outflow*.

Exhibit 1

Cash Flows



Cash Flows from Operating Activities

There are two methods for reporting cash flows from operating activities in the statement of cash flows. These methods are as follows:

1. Direct method
2. Indirect method

The **direct method** reports operating cash inflows (receipts) and cash outflows (payments) as follows:

Cash flows from operating activities:		
Cash received from customers		$XXX
Less: Cash payments for merchandise	$XXX	
Cash payments for operating expenses	XXX	
Cash payments for interest	XXX	
Cash payments for income taxes	XXX	XXX
Net cash flows from operating activities		$XXX

The primary operating cash inflow is cash received from customers. The primary operating cash outflows are cash payments for merchandise, operating expenses, interest, and income tax payments. The cash received less the cash payments is the net cash flow from operating activities.

The primary advantage of the direct method is that it *directly* reports cash receipts and payments in the statement of cash flows. Its primary disadvantage is that these data may not be readily available in the accounting records. Thus, the direct method is normally more costly to use and, as a result, is used by less than 1% of companies.[2]

The **indirect method** reports operating cash flows by beginning with net income and adjusting it for revenues and expenses that do not involve the receipt or payment of cash as follows:

Cash flows from operating activities:		
Net income	$XXX	
Adjustments to reconcile net income to net cash flow from operating activities	XXX	
Net cash flow from operating activities		$XXX

The adjustments to reconcile net income to net cash flow from operating activities include such items as depreciation and gains (or losses) on fixed assets. Changes in current operating assets and liabilities such as accounts receivable or accounts payable are also added or deducted depending on their effect on cash flows. In effect, these additions and deductions adjust net income, which is reported on an accrual accounting basis, to cash flows from operating activities, which uses a cash basis.

A primary advantage of the indirect method is that it reconciles the differences between net income and net cash flows from operations. In doing so, it shows how net income is related to the ending cash balance that is reported on the balance sheet.

Because the data are readily available, the indirect method is less costly to use than the direct method. As a result, over 99% of companies use the indirect method of reporting cash flows from operations.

@netsolutions

Exhibit 2 illustrates the Cash Flows from Operating Activities section of the statement of cash flows for **NetSolutions**. Exhibit 2 shows the direct and indirect methods using the **NetSolutions** data from Chapter 1. As Exhibit 2 illustrates, both methods report the same amount of net cash flow from operating activities, $2,900.

Exhibit 2

Cash Flow from Operations: Direct and Indirect Methods—NetSolutions

Direct Method

Cash flows from operating activities:	
Cash received from customers	$7,500
Deduct cash payments for expenses and payments to creditors	4,600
Net cash flow from operating activities	$2,900

Indirect Method

Cash flows from operating activities:	
Net income	$3,050
Add increase in accounts payable	400
	$3,450
Deduct increase in supplies	550
Net cash flow from operating activities	$2,900

the same

2 *Accounting Trends & Techniques*, AICPA, 2007 edition.

The Walt Disney Company recently invested $1.1 billion in parks, resorts, and other properties, including two new cruise ships and new attractions at Disneyland.

Cash Flows from Investing Activities

Cash flows from investing activities are reported on the statement of cash flows as follows:

Cash flows from investing activities:		
Cash inflows from investing activities	$XXX	
Less cash used for investing activities	XXX	
Net cash flows from investing activities		$XXX

Cash inflows from investing activities normally arise from selling fixed assets, investments, and intangible assets. Cash outflows normally include payments to purchase fixed assets, investments, and intangible assets.

Cash Flows from Financing Activities

Cash flows from financing activities are reported on the statement of cash flows as follows:

Cash flows from financing activities:		
Cash inflows from financing activities	$XXX	
Less cash used for financing activities	XXX	
Net cash flows from financing activities		$XXX

Cash inflows from financing activities normally arise from issuing debt or equity securities. For example, issuing bonds, notes payable, preferred stock, and common stock creates cash inflows from financing activities. Cash outflows from financing activities include paying cash dividends, repaying debt, and acquiring treasury stock.

Google disclosed the issuance of over $25 million in common stock for business acquisitions in its statement of cash flows as a noncash investing and financing activity.

Noncash Investing and Financing Activities

A company may enter into transactions involving investing and financing activities that do not *directly* affect cash. For example, a company may issue common stock to retire long-term debt. Although this transaction does not directly affect cash, it does eliminate future cash payments for interest and for paying the bonds when they mature. Because such transactions *indirectly* affect cash flows, they are reported in a separate section of the statement of cash flows. This section usually appears at the bottom of the statement of cash flows.

Business Connection

TOO MUCH CASH!

Is it possible to have too much cash? Clearly, most of us would answer no. However, a business views cash differently than an individual. Naturally, a business needs cash to develop and launch new products, expand markets, purchase plant and equipment, and acquire other businesses. However, some businesses have built up huge cash balances beyond even these needs. For example, both Microsoft Corporation and Dell Inc. have accumulated billions of dollars in cash and temporary investments, totaling in excess of 60% of their total assets. Such large cash balances can lower the return on total assets. As stated by one analyst, "When a company sits on cash (which earns 1% or 2%) and leaves equity outstanding . . ., it is tantamount to taking a loan at 15% and investing in a passbook savings account that earns 2%—it destroys value." So while having too much cash is a good problem to have, companies like Microsoft, Cisco Systems, Inc., IBM, Apple Computer Inc., and Dell are under pressure to pay dividends or repurchase common stock. For example, Microsoft declared a $32 billion special dividend to return cash to its shareholders.

No Cash Flow per Share

Cash flow per share is sometimes reported in the financial press. As reported, cash flow per share is normally computed as *cash flow from operations per share*. However, such reporting may be misleading because of the following:

1. Users may misinterpret cash flow per share as the per-share amount available for dividends. This would not be the case if the cash generated by operations is required for repaying loans or for reinvesting in the business.
2. Users may misinterpret cash flow per share as equivalent to (or better than) earnings per share.

For these reasons, the financial statements, including the statement of cash flows, should not report cash flow per share.

Example Exercise 13-1 Classifying Cash Flows 1

Identify whether each of the following would be reported as an operating, investing, or financing activity in the statement of cash flows.

a. Purchase of patent
b. Payment of cash dividend
c. Disposal of equipment
d. Cash sales
e. Purchase of treasury stock
f. Payment of wages expense

Follow My Example 13-1

a. Investing
b. Financing
c. Investing
d. Operating
e. Financing
f. Operating

For Practice: PE 13-1A, PE 13-1B

2 Prepare a statement of cash flows, using the indirect method.

Statement of Cash Flows—The Indirect Method

The indirect method of reporting cash flows from operating activities uses the logic that a change in any balance sheet account (including cash) can be analyzed in terms of changes in the other balance sheet accounts. Thus, by analyzing changes in noncash balance sheet accounts, any change in the cash account can be *indirectly* determined.

To illustrate, the accounting equation can be solved for cash as shown below.

$$\text{Assets} = \text{Liabilities} + \text{Stockholders' Equity}$$
$$\text{Cash} + \text{Noncash Assets} = \text{Liabilities} + \text{Stockholders' Equity}$$
$$\text{Cash} = \text{Liabilities} + \text{Stockholders' Equity} - \text{Noncash Assets}$$

Therefore, any change in the cash account can be determined by analyzing changes in the liability, stockholders' equity, and noncash asset accounts as shown below.

$$\textit{Change} \text{ in Cash} = \textit{Change} \text{ in Liabilities} + \textit{Change} \text{ in Stockholders' Equity} - \textit{Change} \text{ in Noncash Assets}$$

Under the indirect method, there is no order in which the balance sheet accounts must be analyzed. However, net income (or net loss) is the first amount reported on the statement of cash flows. Since net income (or net loss) is a component of any change in Retained Earnings, the first account normally analyzed is Retained Earnings.

To illustrate the indirect method, the income statement and comparative balance sheets for Rundell Inc. shown in Exhibit 3 are used. Ledger accounts and

Exhibit 3

Income Statement and Comparative Balance Sheet

Rundell Inc.
Income Statement
For the Year Ended December 31, 2010

Sales		$1,180,000
Cost of merchandise sold		790,000
Gross profit		$ 390,000
Operating expenses:		
Depreciation expense	$ 7,000	
Other operating expenses	196,000	
Total operating expenses		203,000
Income from operations		$ 187,000
Other income:		
Gain on sale of land	$ 12,000	
Other expense:		
Interest expense	8,000	4,000
Income before income tax		$ 191,000
Income tax expense		83,000
Net income		$ 108,000

Rundell Inc.
Comparative Balance Sheet
December 31, 2010 and 2009

	2010	2009	Increase Decrease*
Assets			
Cash	$ 97,500	$ 26,000	$ 71,500
Accounts receivable (net)	74,000	65,000	9,000
Inventories	172,000	180,000	8,000*
Land	80,000	125,000	45,000*
Building	260,000	200,000	60,000
Accumulated depreciation—building	(65,300)	(58,300)	7,000
Total assets	$618,200	$537,700	$ 80,500
Liabilities			
Accounts payable (merchandise creditors)	$ 43,500	$ 46,700	$ 3,200*
Accrued expenses payable (operating expenses)	26,500	24,300	2,200
Income taxes payable	7,900	8,400	500*
Dividends payable	14,000	10,000	4,000
Bonds payable	100,000	150,000	50,000*
Total liabilities	$191,900	$239,400	$ 47,500*
Stockholders' Equity			
Common stock ($2 par)	$ 24,000	$ 16,000	$ 8,000
Paid-in capital in excess of par	120,000	80,000	40,000
Retained earnings	282,300	202,300	80,000
Total stockholders' equity	$426,300	$298,300	$128,000
Total liabilities and stockholders' equity	$618,200	$537,700	$ 80,500

other data supporting the income statement and balance sheet are presented as needed.[3]

Retained Earnings

The comparative balance sheet for Rundell Inc. shows that retained earnings increased $80,000 during the year. The retained earnings account shown below indicates how this change occurred.

Account *Retained Earnings* Account No.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
2010						
Jan.	1	Balance				202,300
Dec.	31	Net income		108,000		310,300
	31	Cash dividends	28,000			282,300

The retained earnings account indicates that the $80,000 ($108,000 − $28,000) change resulted from net income of $108,000 and cash dividends of $28,000. The net income of $108,000 is the first amount reported in the Cash Flows from Operating Activities section.

Adjustments to Net Income

The net income of $108,000 reported by Rundell Inc. does not equal the cash flows from operating activities for the period. This is because net income is determined using the accrual method of accounting.

Under the accrual method of accounting, revenues and expenses are recorded at different times from when cash is received or paid. For example, merchandise may be sold on account and the cash received at a later date. Likewise, insurance premiums may be paid in the current period, but expensed in a following period.

Thus, under the indirect method, adjustments to net income must be made to determine cash flows from operating activities. The typical adjustments to net income are shown in Exhibit 4.[4]

Net income is normally adjusted to cash flows from operating activities using the following steps:

Step 1. Expenses that do not affect cash are added. Such expenses decrease net income, but did not involve cash payments and, thus, are added to net income.

Examples: *Depreciation* of fixed assets and *amortization* of intangible assets are added to net income.

3 An appendix that discusses using a spreadsheet (work sheet) as an aid in assembling data for the statement of cash flows is presented at the end of this chapter. This appendix illustrates the use of this spreadsheet in reporting cash flows from operating activities using the indirect method.

4 Other items that also require adjustments to net income to obtain cash flows from operating activities include amortization of bonds payable discounts (add), losses on debt retirement (add), amortization of bonds payable premiums (deduct), and gains on retirement of debt (deduct).

Exhibit 4

Adjustments to Net Income (Loss) Using the Indirect Method

	Increase (Decrease)
Net income (loss)	$ XXX
Adjustments to reconcile net income to net cash flow from operating activities:	
Step 1 → Depreciation of fixed assets	XXX
Amortization of intangible assets	XXX
Step 2 → Losses on disposal of assets	XXX
Gains on disposal of assets	(XXX)
Step 3 → Changes in current operating assets and liabilities:	
Increases in noncash current operating assets	(XXX)
Decreases in noncash current operating assets	XXX
Increases in current operating liabilities	XXX
Decreases in current operating liabilities	(XXX)
Net cash flow from operating activities	$ XXX or $(XXX)

Subtract	Add
Increases in accounts receivable	Decreases in accounts receivable
Increases in inventory	Decreases in inventory
Increases in prepaid expenses	Decreases in prepaid expenses
Decreases in accounts payable	Increases in accounts payable
Decreases in accrued expenses payable	Increases in accrued expenses payable
Decreases in income taxes payable	Increases in income taxes payable

Step 2. Losses and gains on disposal of assets are added or deducted. The disposal (sale) of assets is an investing activity rather than an operating activity. However, such losses and gains are reported as part of net income. As a result, any *losses* on disposal of assets are *added* back to net income. Likewise, any *gains* on disposal of assets are *deducted* from net income.

Example: Land costing $100,000 is sold for $90,000. The loss of $10,000 is added back to net income.

Step 3. Changes in current operating assets and liabilities are added or deducted as follows:

Increases in noncash current operating assets are deducted.
Decreases in noncash current operating assets are added.
Increases in current operating liabilities are added.
Decreases in current operating liabilities are deducted.

Example: A sale of $10,000 on account increases accounts receivable by $10,000. However, cash is not affected. Thus, an increase in accounts receivable of $10,000 is deducted. Similar adjustments are required for the changes in the other current asset and liability accounts such as inventory, prepaid expenses, accounts payable, accrued expenses payable, and income taxes payable as shown in Exhibit 4.

Example Exercise 13-2 Adjustments to Net Income—Indirect Method

2

Omni Corporation's accumulated depreciation increased by $12,000, while, $3,400 of patents were amortized between balance sheet dates. There were no purchases or sales of depreciable or intangible assets during the year. In addition, the income statement showed a gain of $4,100 from the sale of land. Reconcile a net income of $50,000 to net cash flow from operating activities.

Follow My Example 13-2

Net income	$50,000
Adjustments to reconcile net income to net cash flow from operating activities:	
Depreciation	12,000
Amortization of patents	3,400
Gain from sale of land	(4,100)
Net cash flow from operating activities	$61,300

For Practice: PE 13-2A, PE 13-2B

To illustrate, the Cash Flows from Operating Activities section of Rundell's statement of cash flows is shown in Exhibit 5. Rundell's net income of $108,000 is converted to cash flows from operating activities of $100,500 as follows:

Exhibit 5

Cash Flows from Operating Activities—Indirect Method

	Cash flows from operating activities:		
	Net income	$108,000	
	Adjustments to reconcile net income to net cash flow from operating activities:		
Step 1 →	Depreciation	7,000	
Step 2 →	Gain on sale of land	(12,000)	
	Changes in current operating assets and liabilities:		
	Increase in accounts receivable	(9,000)	
	Decrease in inventory	8,000	
Step 3 →	Decrease in accounts payable	(3,200)	
	Increase in accrued expenses payable	2,200	
	Decrease in income taxes payable	(500)	
	Net cash flow from operating activities		$100,500

Step 1. Add depreciation of $7,000.

Analysis: The comparative balance sheet in Exhibit 3 indicates that Accumulated Depreciation—Building increased by $7,000. The account, shown below, indicates that depreciation for the year was $7,000 for the building.

Account *Accumulated Depreciation—Building* Account No.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
2010						
Jan.	1	Balance				58,300
Dec.	31	Depreciation for year		7,000		65,300

Step 2. Deduct the gain on the sale of land of $12,000.

Analysis: The income statement in Exhibit 3 reports a gain from the sale of land of $12,000. The proceeds, which include the gain, are reported in the Investing section of the statement of cash flows.[5] Thus, the gain of $12,000 is deducted from net income in determining cash flows from operating activities.

Step 3. Add and deduct changes in current operating assets and liabilities.

Analysis: The increases and decreases in the current operating asset and current liability accounts are shown below.

Accounts	December 31 2010	December 31 2009	Increase Decrease*
Accounts Receivable (net)	$ 74,000	$ 65,000	$9,000
Inventories	172,000	180,000	8,000*
Accounts Payable (merchandise creditors)	43,500	46,700	3,200*
Accrued Expenses Payable (operating expenses)	26,500	24,300	2,200
Income Taxes Payable	7,900	8,400	500*

Accounts receivable (net): The $9,000 increase is deducted from net income. This is because the $9,000 increase in accounts receivable indicates that sales on account were $9,000 more than the cash received from customers. Thus, sales (and net income) includes $9,000 that was not received in cash during the year.

Inventories: The $8,000 decrease is added to net income. This is because the $8,000 decrease in inventories indicates that the cost of merchandise *sold* exceeds the cost of the merchandise *purchased* during the year by $8,000. In other words, cost of merchandise sold includes $8,000 that was not purchased (used cash) during the year.

Ford Motor Company had a net loss of $12.6 billion but a positive cash flow from operating activities of $3.3 billion. This difference was mostly due to $16.5 billion of depreciation expenses.

Accounts payable (merchandise creditors): The $3,200 decrease is deducted from net income. This is because a decrease in accounts payable indicates that the cash *payments* to merchandise creditors exceeds the merchandise *purchased on account* by $3,200. Therefore, cost of merchandise sold is $3,200 less than the cash paid to merchandise creditors during the year.

Accrued expenses payable (operating expenses): The $2,200 increase is added to net income. This is because an increase in accrued expenses payable indicates that operating expenses exceed the cash payments for operating expenses by $2,200. In other words, operating expenses reported on the income statement include $2,200 that did not require a cash outflow during the year.

Income taxes payable: The $500 decrease is deducted from net income. This is because a decrease in income taxes payable indicates that taxes paid exceed the amount of taxes incurred during the year by $500. In other words, the amount reported on the income statement for income tax expense is less than the amount paid by $500.

Example Exercise 13-3 Changes in Current Operating Assets and Liabilities—Indirect Method

2

Victor Corporation's comparative balance sheet for current assets and liabilities was as follows:

	Dec. 31, 2011	Dec. 31, 2010
Accounts receivable	$ 6,500	$ 4,900
Inventory	12,300	15,000
Accounts payable	4,800	5,200
Dividends payable	5,000	4,000

Adjust net income of $70,000 for changes in operating assets and liabilities to arrive at cash flows from operating activities.

(continued)

5 The reporting of the proceeds (cash flows) from the sale of land as part of investing activities is discussed later in this chapter.

Follow My Example 13-3

Net income	$70,000
Adjustments to reconcile net income to net cash flow from operating activities:	
Changes in current operating assets and liabilities:	
Increase in accounts receivable	(1,600)
Decrease in inventory	2,700
Decrease in accounts payable	(400)
Net cash flow from operating activities	$70,700

For Practice: PE 13-3A, PE 13-3B

Using the preceding analyses, Rundell's net income of $108,000 is converted to cash flows from operating activities of $100,500 as shown in Exhibit 5, on page 538.

Exercise 13-4 Cash Flows from Operating Activities—Indirect Method

2

Omicron Inc. reported the following data:

Net income	$120,000
Depreciation expense	12,000
Loss on disposal of equipment	15,000
Increase in accounts receivable	5,000
Decrease in accounts payable	2,000

Prepare the Cash Flows from Operating Activities section of the statement of cash flows using the indirect method.

Follow My Example 13-4

Cash flows from operating activities:		
Net income	$120,000	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation expense	12,000	
Loss on disposal of equipment	15,000	
Changes in current operating assets and liabilities:		
Increase in accounts receivable	(5,000)	
Decrease in accounts payable	(2,000)	
Net cash flow from operating activities		$140,000

Note: The change in dividends payable impacts the cash paid for dividends, which is disclosed under financing activities.

For Practice: PE 13-4A, PE 13-4B

Integrity, Objectivity, and Ethics in Business

CREDIT POLICY AND CASH FLOW

One would expect customers to pay for products and services sold on account. Unfortunately, that is not always the case. Collecting accounts receivable efficiently is the key to turning a current asset into positive cash flow. Most entrepreneurs would rather think about the exciting aspects of their business—such as product development, marketing, sales, and advertising—rather than credit collection. This can be a mistake. Hugh McHugh of Overhill Flowers, Inc., decided that he would have no more trade accounts after dealing with Christmas orders that weren't paid for until late February, or sometimes not paid at all. As stated by one collection service, "One thing business owners always tell me is that they never thought about [collections] when they started their own business." To the small business owner, the collection of accounts receivable may mean the difference between succeeding and failing.

Source: Paulette Thomas, "Making Them Pay: The Last Thing Most Entrepreneurs Want to Think About Is Bill Collection; It Should Be One of the First Things," *The Wall Street Journal*, September 19, 2005, p. R6.

Dividends

The retained earnings account of Rundell Inc., shown on page 536, indicates cash dividends of $28,000 during the year. However, the dividends payable account, shown below, indicates that only $24,000 of the dividends was paid during the year.

Account *Dividends Payable* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				10,000
	10	Cash paid	10,000		—	—
June	20	Dividends declared		14,000		14,000
July	10	Cash paid	14,000		—	—
Dec.	20	Dividends declared		14,000		14,000

Since dividend payments are a financing activity, the dividend payment of $24,000 is reported in the Financing Activities section of the statement of cash flows, as shown below.

Cash flows from financing activities:
Cash paid for dividends $24,000

XM Satellite Radio has had negative cash flows from operations for most of its young corporate life. However, it has been able to grow by obtaining cash from the sale of common stock and issuing debt.

Common Stock

The common stock account increased by $8,000, and the paid-in capital in excess of par—common stock account increased by $40,000, as shown below. These increases were from issuing 4,000 shares of common stock for $12 per share.

Account *Common Stock* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				16,000
Nov.	1	4,000 shares issued for cash		8,000		24,000

Account *Paid-In Capital in Excess of Par—Common Stock* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				80,000
Nov.	1	4,000 shares issued for cash		40,000		120,000

This cash inflow is reported in the Financing Activities section as follows:

Cash flows from financing activities:
Cash received from sale of common stock $48,000

Bonds Payable

The bonds payable account decreased by $50,000, as shown below. This decrease is from retiring the bonds by a cash payment for their face amount.

Account *Bonds Payable* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				150,000
June	30	Retired by payment of cash at face amount	50,000			100,000

This cash outflow is reported in the Financing Activities section as follows:

Cash flows from financing activities:
Cash paid to retire bonds payable $50,000

Building

The building account increased by $60,000, and the accumulated depreciation—building account increased by $7,000, as shown below.

Account *Building* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			200,000	
Dec.	27	Purchased for cash	60,000		260,000	

Account *Accumulated Depreciation—Building* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				58,300
Dec.	31	Depreciation for the year		7,000		65,300

The purchase of a building for cash of $60,000 is reported as an outflow of cash in the Investing Activities section as follows:

Cash flows from investing activities:
Cash paid for purchase of building $60,000

The credit in the accumulated depreciation—building account represents depreciation expense for the year. This depreciation expense of $7,000 on the building was added to net income in determining cash flows from operating activities, as reported in Exhibit 5, on page 538.

Land

The $45,000 decline in the land account was from two transactions, as shown below.

Account *Land* Account No.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			125,000	
June	8	Sold for $72,000 cash		60,000	65,000	
Oct.	12	Purchased for $15,000 cash	15,000		80,000	

The June 8 transaction is the sale of land with a cost of $60,000 for $72,000 in cash. The $72,000 proceeds from the sale are reported in the Investing Activities section, as follows:

Cash flows from investing activities:
Cash received from sale of land $72,000

The proceeds of $72,000 include the $12,000 gain on the sale of land and the $60,000 cost (book value) of the land. As shown in Exhibit 5, on page 538, the $12,000 gain is deducted from net income in the Cash Flows from Operating Activities section. This is so that the $12,000 cash inflow related to the gain is not included twice as a cash inflow.

The October 12 transaction is the purchase of land for cash of $15,000. This transaction is reported as an outflow of cash in the Investing Activities section, as follows:

Cash flows from investing activities:
Cash paid for purchase of land $15,000

Example Exercise 13-5 Land Transactions on the Statement of Cash Flows 2

Alpha Corporation purchased land for $125,000. Later in the year, the company sold land with a book value of $165,000 for $200,000. How are the effects of these transactions reported on the statement of cash flows?

Follow My Example 13-5

The gain on sale of land is deducted from net income as shown below.
Gain on sale of land . . . . . $ (35,000)

The purchase and sale of land is reported as part of cash flows from investing activities as shown below.
Cash received for sale of land 200,000
Cash paid for purchase of land . . . . . (125,000)

For Practice: PE 13-5A, PE 13-5B

Preparing the Statement of Cash Flows

The statement of cash flows for Rundell Inc. using the indirect method is shown in Exhibit 6. The statement of cash flows indicates that cash increased by $71,500 during the year. The most significant increase in net cash flows ($100,500) was from operating activities. The most significant use of cash ($26,000) was for financing activities. The ending balance of cash on December 31, 2010, is $97,500. This ending cash balance is also reported on the December 31, 2010, balance sheet shown in Exhibit 3, on page 535.

Exhibit 6

Statement of Cash Flows—Indirect Method

Rundell Inc.
Statement of Cash Flows
For the Year Ended December 31, 2010

Cash flows from operating activities:			
Net income		$108,000	
Adjustments to reconcile net income to net cash flow from operating activities:			
Depreciation		7,000	
Gain on sale of land		(12,000)	
Changes in current operating assets and liabilities:			
Increase in accounts receivable		(9,000)	
Decrease in inventory		8,000	
Decrease in accounts payable		(3,200)	
Increase in accrued expenses payable		2,200	
Decrease in income taxes payable		(500)	
Net cash flow from operating activities			$100,500
Cash flows from investing activities:			
Cash from sale of land		$ 72,000	
Less: Cash paid to purchase land	$15,000		
Cash paid for purchase of building	60,000	75,000	
Net cash flow used for investing activities			(3,000)
Cash flows from financing activities:			
Cash received from sale of common stock		$ 48,000	
Less: Cash paid to retire bonds payable	$50,000		
Cash paid for dividends	24,000	74,000	
Net cash flow used for financing activities			(26,000)
Increase in cash			$ 71,500
Cash at the beginning of the year			26,000
Cash at the end of the year			$ 97,500

3 Prepare a statement of cash flows, using the direct method.

Statement of Cash Flows—The Direct Method

The direct method reports cash flows from operating activities as follows:

Cash flows from operating activities:		
Cash received from customers		$XXX
Less: Cash payments for merchandise	$XXX	
Cash payments for operating expenses	XXX	
Cash payments for interest	XXX	
Cash payments for income taxes	XXX	XXX
Net cash flows from operating activities		$XXX

The Cash Flows from Investing and Financing Activities sections of the statement of cash flows are the same under the direct and indirect methods. The amount of cash flows from operating activities is also the same.

Under the direct method, the income statement is adjusted to cash flows from operating activities as follows:

Income Statement	Adjusted to	Cash Flows from Operating Activities
Sales	→	Cash received from customers
Cost of merchandise sold	→	Cash payments for merchandise
Operating expenses:		
Depreciation expense	N/A	N/A
Other operating expenses	→	Cash payments for operating expenses
Gain on sale of land	N/A	N/A
Interest expense	→	Cash payments for interest
Income tax expense	→	Cash payments for income taxes
Net income	→	Cash flows from operating activities

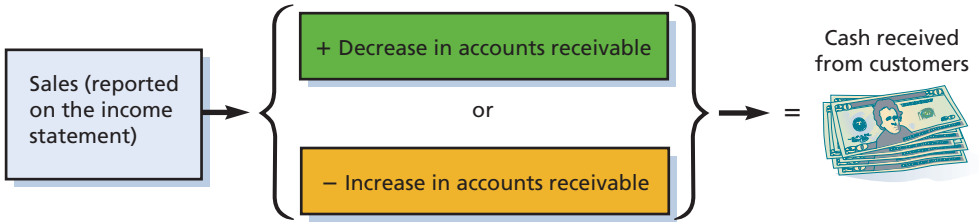
N/A—Not applicable

As shown above, depreciation expense is not adjusted or reported as part of cash flows from operating activities. This is because depreciation expense does not involve a cash outflow. The gain on sale of land is also not adjusted or reported as part of cash flows from operating activities. This is because the sale of land is reported as an investing activity rather than an operating activity.

To illustrate the direct method, the income statement and comparative balance sheet for Rundell Inc. shown in Exhibit 3, on page 535, are used.

Cash Received from Customers

The income statement (shown in Exhibit 3) of Rundell Inc. reports sales of $1,180,000. To determine the *cash received from customers*, the $1,180,000 is adjusted for any increase or decrease in accounts receivable. The adjustment is summarized below.



The cash received from customers is $1,171,000, computed as follows:

Sales	$1,180,000
Less increase in accounts receivable	9,000
Cash received from customers	$1,171,000

The increase of $9,000 in accounts receivable (shown in Exhibit 3) during 2010 indicates that sales on account exceeded cash received from customers by $9,000. In other words, sales include $9,000 that did not result in a cash inflow during the year. Thus, $9,000 is deducted from sales to determine the *cash received from customers*.

Example Exercise 13-6 Cash Received from Customers—Direct Method 3

Sales reported on the income statement were $350,000. The accounts receivable balance declined $8,000 over the year. Determine the amount of cash received from customers.

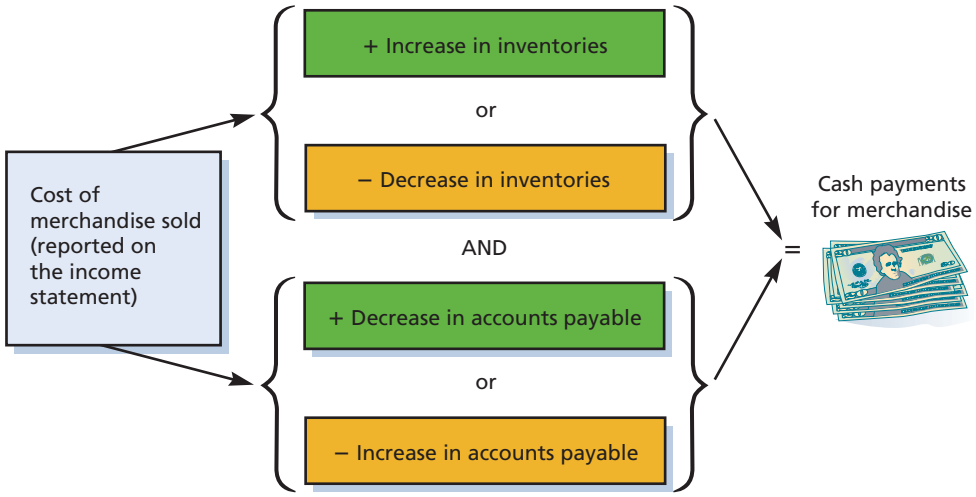
Follow My Example 13-6

Sales	$350,000
Add decrease in accounts receivable	8,000
Cash received from customers	$358,000

For Practice: PE 13-6A, PE 13-6B

Cash Payments for Merchandise

The income statement (shown in Exhibit 3) for Rundell Inc. reports cost of merchandise sold of $790,000. To determine the *cash payments for merchandise*, the $790,000 is adjusted for any increases or decreases in inventories and accounts payable. Assuming the accounts payable are owed to merchandise suppliers, the adjustment is summarized below.



The cash payments for merchandise are $785,200, computed as follows:

Cost of merchandise sold	$790,000
Deduct decrease in inventories	(8,000)
Add decrease in accounts payable	3,200
Cash payments for merchandise	$785,200

The $8,000 decrease in inventories (from Exhibit 3) indicates that the merchandise sold exceeded the cost of the merchandise purchased by $8,000. In other words, cost of merchandise sold includes $8,000 that did not require a cash outflow during the year. Thus, $8,000 is deducted from the cost of merchandise sold in determining the *cash payments for merchandise*.

The $3,200 decrease in accounts payable (from Exhibit 3) indicates that cash payments for merchandise were $3,200 more than the purchases on account during 2010. Therefore, $3,200 is added to the cost of merchandise sold in determining the *cash payments for merchandise*.

Example Exercise 13-7 Cash Payments for Merchandise—Direct Method 3

Cost of merchandise sold reported on the income statement was $145,000. The accounts payable balance increased $4,000, and the inventory balance increased by $9,000 over the year. Determine the amount of cash paid for merchandise.

Follow My Example 13-7

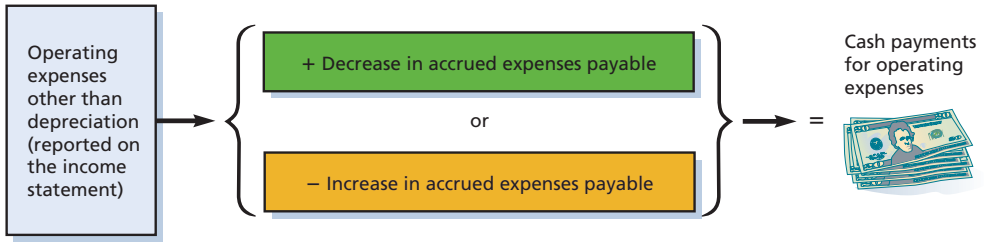
Cost of merchandise sold	$145,000
Add increase in inventories	9,000
Deduct increase in accounts payable	(4,000)
Cash paid for merchandise	$150,000

For Practice: PE 13-7A, PE 13-7B

Cash Payments for Operating Expenses

The income statement (from Exhibit 3) for Rundell Inc. reports total operating expenses of $203,000, which includes depreciation expense of $7,000. Since depreciation expense does not require a cash outflow, it is omitted from *cash payments for operating expenses*.

To determine the *cash payments for operating expenses*, the other operating expenses (excluding depreciation) of $196,000 ($203,000 − $7,000) are adjusted for any increase or decrease in accrued expenses payable. Assuming that the accrued expenses payable are all operating expenses, this adjustment is summarized below.



The cash payments for operating expenses is $193,800, computed as follows:

Operating expenses other than depreciation	$196,000
Deduct increase in accrued expenses payable	(2,200)
Cash payments for operating expenses	$193,800

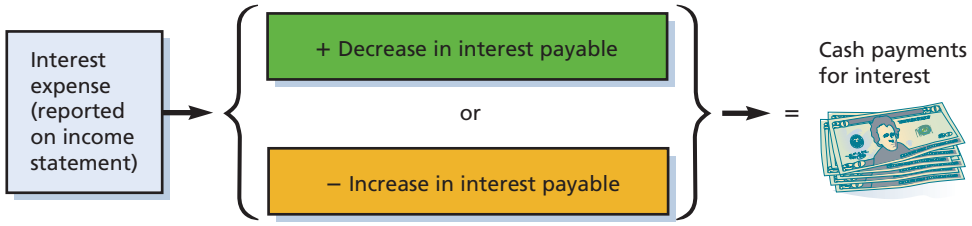
The increase in accrued expenses payable (from Exhibit 3) indicates that the cash payments for operating expenses were $2,200 less than the amount reported for operating expenses during the year. Thus, $2,200 is deducted from the operating expenses in determining the *cash payments for operating expenses*.

Gain on Sale of Land

The income statement for Rundell Inc. (from Exhibit 3) reports a gain of $12,000 on the sale of land. The sale of land is an investing activity. Thus, the proceeds from the sale, which include the gain, are reported as part of the cash flows from investing activities.

Interest Expense

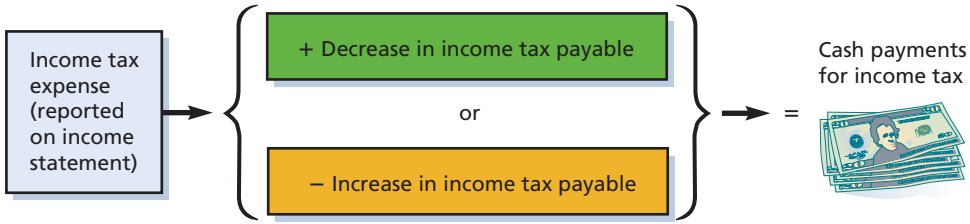
The income statement (from Exhibit 3) for Rundell Inc. reports interest expense of $8,000. To determine the *cash payments for interest*, the $8,000 is adjusted for any increases or decreases in interest payable. The adjustment is summarized below.



The comparative balance sheet of Rundell Inc. in Exhibit 3 indicates no interest payable. This is because the interest expense on the bonds payable is paid on June 1 and December 31. Since there is no interest payable, no adjustment of the interest expense of $8,000 is necessary.

Cash Payments for Income Taxes

The income statement (from Exhibit 3) for Rundell Inc. reports income tax expense of $83,000. To determine the *Cash payments for income taxes*, the $83,000 is adjusted for any increases or decreases in income taxes payable. The adjustment is summarized below.



The cash payments for income taxes are $83,500, computed as follows:

Income tax expense	$83,000
Add decrease in income taxes payable	500
Cash payments for income taxes	$83,500

The $500 decrease in income taxes payable (from Exhibit 3) indicates that the cash payments for income taxes were $500 more than the amount reported for income tax expense during 2010. Thus, $500 is added to the income tax expense in determining the *cash payments for income taxes*.

Reporting Cash Flows from Operating Activities—Direct Method

The statement of cash flows for Rundell Inc. using the direct method for reporting cash flows from operating activities is shown in Exhibit 7. The portions of the

Exhibit 7

Statement of Cash Flows—Direct Method

Rundell Inc.
Statement of Cash Flows
For the Year Ended December 31, 2010

Cash flows from operating activities:			
Cash received from customers		$1,171,000	
Deduct: Cash payments for merchandise	$785,200		
Cash payments for operating expenses	193,800		
Cash payments for interest	8,000		
Cash payments for income taxes	83,500	1,070,500	
Net cash flow from operating activities			$100,500
Cash flows from investing activities:			
Cash from sale of land		$ 72,000	
Less: Cash paid to purchase land	$ 15,000		
Cash paid for purchase of building	60,000	75,000	
Net cash flow used for investing activities			(3,000)
Cash flows from financing activities:			
Cash received from sale of common stock		$ 48,000	
Less: Cash paid to retire bonds payable	$ 50,000		
Cash paid for dividends	24,000	74,000	
Net cash flow used for financing activities			(26,000)
Increase in cash			$ 71,500
Cash at the beginning of the year			26,000
Cash at the end of the year			$ 97,500

(continued)

Exhibit 7
(concluded)

Schedule Reconciling Net Income with Cash Flows from Operating Activities:	
Cash flows from operating activities:	
Net income	$108,000
Adjustments to reconcile net income to net cash flow from operating activities:	
Depreciation	7,000
Gain on sale of land	(12,000)
Changes in current operating assets and liabilities:	
Increase in accounts receivable	(9,000)
Decrease in inventory	8,000
Decrease in accounts payable	(3,200)
Increase in accrued expenses payable	2,200
Decrease in income taxes payable	(500)
Net cash flow from operating activities	$100,500

statement that differ from those prepared under the indirect method are highlighted in color.

Exhibit 7 also includes the separate schedule reconciling net income and net cash flow from operating activities. This schedule is included in the statement of cash flows when the direct method is used. This schedule is similar to the Cash Flows from Operating Activities section prepared under the indirect method.

Financial Analysis and Interpretation

A valuable tool for evaluating the cash flows of a business is free cash flow. **Free cash flow** is a measure of operating cash flow available for corporate purposes after providing sufficient fixed asset additions to maintain current productive capacity. Thus, free cash flow can be calculated as follows:

Cash flow from operating activities	$XXX
Less: Investments in fixed assets to maintain current production	XXX
Free cash flow	$XXX

Analysts often use free cash flow, rather than cash flows from operating activities, to measure the financial strength of a business. Many high-technology firms must aggressively reinvest in new technology to remain competitive. This can reduce free cash flow. For example, Verizon Communications Inc.'s free cash flow is less than 30% of the cash flow from operating activities. In contrast, The Coca-Cola Company's free cash flow is approximately 75% of the cash flow from operating activities. Three nonfinancial companies with large free cash flows for a recent year were as follows:

	Free Cash Flow (in millions)
General Electric Company	$13,996
ExxonMobil Corporation	33,824
Microsoft Corporation	15,532

To illustrate, the cash flow from operating activities for Intuit Inc., the developer of TurboTax®, was $727 million in a recent fiscal year. The statement of cash flows indicated that the cash invested in property, plant, and equipment was $105 million. Assuming that the amount invested in property, plant, and equipment maintained existing operations, free cash flow would be calculated as follows (in millions):

Cash flow from operating activities	$727
Less: Investments in fixed assets to maintain current production	105
Free cash flow	$622

During this period, Intuit generated free cash flow in excess of $600 million, which was 86% of cash flows from operations and over 23% of sales.

Positive free cash flow is considered favorable. A company that has free cash flow is able to fund internal growth, retire debt, pay dividends, and enjoy financial flexibility. A company with no free cash flow is unable to maintain current productive capacity. Lack of free cash flow can be an early indicator of liquidity problems. As stated by one analyst, "Free cash flow gives the company firepower to reduce debt and ultimately generate consistent, actual income."[6]

Source: "CFO Free Cash Flow Scorecard," *CFO Magazine*, January 1, 2005.

6 Jill Krutick, *Fortune*, March 30, 1998, p. 106.

APPENDIX

Spreadsheet (Work Sheet) for Statement of Cash Flows—The Indirect Method

A spreadsheet (work sheet) may be used in preparing the statement of cash flows. However, whether or not a spreadsheet (work sheet) is used, the concepts presented in this chapter are not affected.

The data for Rundell Inc., presented in Exhibit 3, are used as a basis for illustrating the spreadsheet (work sheet) for the indirect method. The steps in preparing this spreadsheet (work sheet), shown in Exhibit 8, are as follows:

Step 1. List the title of each balance sheet account in the Accounts column.

Step 2. For each balance sheet account, enter its balance as of December 31, 2009, in the first column and its balance as of December 31, 2010, in the last column. Place the credit balances in parentheses.

Step 3. Add the December 31, 2009 and 2010 column totals, which should total to zero.

Step 4. Analyze the change during the year in each noncash account to determine its net increase (decrease) and classify the change as affecting cash flows from operating activities, investing activities, financing activities, or noncash investing and financing activities.

Step 5. Indicate the effect of the change on cash flows by making entries in the Transactions columns.

Step 6. After all noncash accounts have been analyzed, enter the net increase (decrease) in cash during the period.

Step 7. Add the Debit and Credit Transactions columns. The totals should be equal.

Analyzing Accounts

In analyzing the noncash accounts (Step 4), try to determine the type of cash flow activity (operating, investing, or financing) that led to the change in account. As each noncash account is analyzed, an entry (Step 5) is made on the spreadsheet (work sheet) for the type of cash flow activity that caused the change. After all noncash accounts have been analyzed, an entry (Step 6) is made for the increase (decrease) in cash during the period.

The entries made on the spreadsheet are not posted to the ledger. They are only used in preparing and summarizing the data on the spreadsheet.

The order in which the accounts are analyzed is not important. However, it is more efficient to begin with Retained Earnings and proceed upward in the account listing.

Retained Earnings

The spreadsheet (work sheet) shows a Retained Earnings balance of $202,300 at December 31, 2009, and $282,300 at December 31, 2010. Thus, Retained Earnings increased $80,000 during the year. This increase is from the following:

1. Net income of $108,000
2. Declaring cash dividends of $28,000

To identify the cash flows from these activities, two entries are made on the spreadsheet.

The $108,000 is reported on the statement of cash flows as part of "cash flows from operating activities." Thus, an entry is made in the Transactions columns on the spreadsheet as follows:

(a) Operating Activities—Net Income 108,000
Retained Earnings 108,000

The preceding entry accounts for the net income portion of the change to Retained Earnings. It also identifies the cash flow in the bottom portion of the spreadsheet as related to operating activities.

Exhibit 8

End-of-Period Spreadsheet (Work Sheet) for Statement of Cash Flows—Indirect Method

Step 2

	A	B	C	D	E	F	G
1	Rundell Inc.						
2	End-of-Period Spreadsheet (Work Sheet) for Statement of Cash Flows						
3	For the Year Ended December 31, 2010						
4	Accounts	Balance,	Transactions				Balance,
5		Dec. 31, 2009	Debit		Credit		Dec. 31, 2010
6	Cash	26,000	(o)	71,500			97,500
7	Accounts receivable (net)	65,000	(n)	9,000			74,000
8	Inventories	180,000			(m)	8,000	172,000
9	Land	125,000	(k)	15,000	(l)	60,000	80,000
10	Building	200,000	(j)	60,000			260,000
11	Accumulated depreciation—building	(58,300)			(i)	7,000	(65,300)
12	Accounts payable (merchandise creditors)	(46,700)	(h)	3,200			(43,500)
13	Accrued expenses payable (operating expenses)	(24,300)			(g)	2,200	(26,500)
14	Income taxes payable	(8,400)	(f)	500			(7,900)
15	Dividends payable	(10,000)			(e)	4,000	(14,000)
16	Bonds payable	(150,000)	(d)	50,000			(100,000)
17	Common stock	(16,000)			(c)	8,000	(24,000)
18	Paid-in capital in excess of par	(80,000)			(c)	40,000	(120,000)
19	Retained earnings	(202,300)	(b)	28,000	(a)	108,000	(282,300)
20	Totals	0		237,200		237,200	0
21	Operating activities:						
22	Net income		(a)	108,000			
23	Depreciation of building		(i)	7,000			
24	Gain on sale of land				(l)	12,000	
25	Increase in accounts receivable				(n)	9,000	
26	Decrease in inventories		(m)	8,000			
27	Decrease in accounts payable				(h)	3,200	
28	Increase in accrued expenses payable		(g)	2,200			
29	Decrease in income taxes payable				(f)	500	
30	Investing activities:						
31	Sale of land		(l)	72,000			
32	Purchase of land				(k)	15,000	
33	Purchase of building				(j)	60,000	
34	Financing activities:						
35	Issued common stock		(c)	48,000			
36	Retired bonds payable				(d)	50,000	
37	Declared cash dividends				(b)	28,000	
38	Increase in dividends payable		(e)	4,000			
39	Net increase in cash				(o)	71,500	
40	Totals			249,200		249,200	

Step 1

Step 3

Step 3

Steps 4–7

The $28,000 of dividends is reported as a financing activity on the statement of cash flows. Thus, an entry is made in the Transactions columns on the spreadsheet as follows:

(b)	Retained Earnings	28,000	
	Financing Activities—Declared Cash Dividends		28,000

The preceding entry accounts for the dividends portion of the change to Retained Earnings. It also identifies the cash flow in the bottom portion of the spreadsheet as related to financing activities. The $28,000 of declared dividends will be adjusted later for the actual amount of cash dividends paid during the year.

Other Accounts

The entries for the other noncash accounts are made in the spreadsheet in a manner similar to entries (a) and (b). A summary of these entries is as follows:

(c)	Financing Activities—Issued Common Stock	48,000	
	Common Stock		8,000
	Paid-In Capital in Excess of Par—Common Stock		40,000
(d)	Bonds Payable	50,000	
	Financing Activities—Retired Bonds Payable		50,000
(e)	Financing Activities—Increase in Dividends Payable	4,000	
	Dividends Payable		4,000
(f)	Income Taxes Payable	500	
	Operating Activities—Decrease in Income Taxes Payable		500
(g)	Operating Activities—Increase in Accrued Expenses Payable	2,200	
	Accrued Expenses Payable		2,200
(h)	Accounts Payable	3,200	
	Operating Activities—Decrease in Accounts Payable		3,200
(i)	Operating Activities—Depreciation of Building	7,000	
	Accumulated Depreciation—Building		7,000
(j)	Building	60,000	
	Investing Activities—Purchase of Building		60,000
(k)	Land	15,000	
	Investing Activities—Purchase of Land		15,000
(l)	Investing Activities—Sale of Land	72,000	
	Operating Activities—Gain on Sale of Land		12,000
	Land		60,000
(m)	Operating Activities—Decrease in Inventories	8,000	
	Inventories		8,000
(n)	Accounts Receivable	9,000	
	Operating Activities—Increase in Accounts Receivable		9,000
(o)	Cash	71,500	
	Net Increase in Cash		71,500

After all the balance sheet accounts are analyzed and the entries made on the spreadsheet (work sheet), all the operating, investing, and financing activities are identified in the bottom portion of the spreadsheet. The accuracy of the entries is verified by totaling the Debit and Credit Transactions columns. The totals of the columns should be equal.

Preparing the Statement of Cash Flows

The statement of cash flows prepared from the spreadsheet is identical to the statement in Exhibit 6. The data for the three sections of the statement are obtained from the bottom portion of the spreadsheet.

1 Describe the cash flow activities reported in the statement of cash flows.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The statement of cash flows reports cash receipts and cash payments by three types of activities: operating activities, investing activities, and financing activities. Investing and financing for a business may be affected by transactions that do not involve cash. The effect of such transactions should be reported in a separate schedule accompanying the statement of cash flows.	• Classify transactions that either provide or use cash into either operating, investing, or financing activities.	**13-1**	13-1A, 13-1B

2 Prepare a statement of cash flows, using the indirect method.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The changes in the noncash balance sheet accounts are used to develop the statement of cash flows, beginning with the cash flows from operating activities.			
Determine the cash flows from operating activities using the indirect method by adjusting net income for expenses that do not require cash and for gains and losses from disposal of fixed assets.	• Adjust net income for noncash expenses and gains and losses from asset disposals under the indirect method.	**13-2**	13-2A, 13-2B
Determine the cash flows from operating activities using the indirect method by adjusting net income for changes in current operating assets and liabilities.	• Adjust net income for changes in current operating assets and liabilities under the indirect method.	**13-3**	13-3A, 13-3B
Report cash flows from operating activities under the indirect method.	• Prepare the cash flows from operating activities under the indirect method in proper form.	**13-4**	13-4A, 13-4B
Report investing and financing activities on the statement of cash flows.	• Prepare the remainder of the statement of cash flows by reporting investing and financing activities.	**13-5**	13-5A, 13-5B

3 Prepare a statement of cash flows, using the direct method.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
The direct method reports cash flows from operating activities by major classes of operating cash receipts and cash payments. The difference between the major classes of total operating cash receipts and total operating cash payments is the net cash flow from operating activities. The investing and financing activities sections of the statement are the same as under the indirect method.	• Prepare the cash flows from operating activities and the remainder of the statement of cash flows under the direct method.	**13-6** **13-7**	13-6A, 13-6B 13-7A, 13-7B

Key Terms

cash flow per share (534)
cash flows from financing activities (531)
cash flows from investing activities (531)
cash flows from operating activities (530)
direct method (531)
free cash flow (549)
indirect method (532)
statement of cash flows (530)

Illustrative Problem

The comparative balance sheet of Dowling Company for December 31, 2010 and 2009, is as follows:

Dowling Company
Comparative Balance Sheet
December 31, 2010 and 2009

	2010	2009
Assets		
Cash	$ 140,350	$ 95,900
Accounts receivable (net)	95,300	102,300
Inventories	165,200	157,900
Prepaid expenses	6,240	5,860
Investments (long-term)	35,700	84,700
Land	75,000	90,000
Buildings	375,000	260,000
Accumulated depreciation—buildings	(71,300)	(58,300)
Machinery and equipment	428,300	428,300
Accumulated depreciation—machinery and equipment	(148,500)	(138,000)
Patents	58,000	65,000
Total assets	$1,159,290	$1,093,660
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 43,500	$ 46,700
Accrued expenses payable (operating expenses)	14,000	12,500
Income taxes payable	7,900	8,400
Dividends payable	14,000	10,000
Mortgage note payable, due 2021	40,000	0
Bonds payable	150,000	250,000
Common stock, $30 par	450,000	375,000
Excess of issue price over par—common stock	66,250	41,250
Retained earnings	373,640	349,810
Total liabilities and stockholders' equity	$1,159,290	$1,093,660

The income statement for Dowling Company is shown here.

Dowling Company
Income Statement
For the Year Ended December 31, 2010

Sales		$1,100,000
Cost of merchandise sold		710,000
Gross profit		$ 390,000
Operating expenses:		
Depreciation expense	$ 23,500	
Patent amortization	7,000	
Other operating expenses	196,000	
Total operating expenses		226,500
Income from operations		$ 163,500
Other income:		
Gain on sale of investments	$ 11,000	
Other expense:		
Interest expense	26,000	(15,000)
Income before income tax		$ 148,500
Income tax expense		50,000
Net income		$ 98,500

An examination of the accounting records revealed the following additional information applicable to 2010:

a. Land costing $15,000 was sold for $15,000.
b. A mortgage note was issued for $40,000.
c. A building costing $115,000 was constructed.
d. 2,500 shares of common stock were issued at 40 in exchange for the bonds payable.
e. Cash dividends declared were $74,670.

Instructions

1. Prepare a statement of cash flows, using the indirect method of reporting cash flows from operating activities.
2. Prepare a statement of cash flows, using the direct method of reporting cash flows from operating activities.

Solution

1.

Dowling Company
Statement of Cash Flows—Indirect Method
For the Year Ended December 31, 2010

Cash flows from operating activities:			
Net income		$ 98,500	
Adjustments to reconcile net income to net cash flow from operating activities:			
Depreciation		23,500	
Amortization of patents		7,000	
Gain on sale of investments		(11,000)	
Changes in current operating assets and liabilities:			
Decrease in accounts receivable		7,000	
Increase in inventories		(7,300)	
Increase in prepaid expenses		(380)	
Decrease in accounts payable		(3,200)	
Increase in accrued expenses payable		1,500	
Decrease in income taxes payable		(500)	
Net cash flow from operating activities			$115,120
Cash flows from investing activities:			
Cash received from sale of:			
Investments	$60,000		
Land	15,000	$ 75,000	
Less: Cash paid for construction of building		115,000	
Net cash flow used for investing activities			(40,000)
Cash flows from financing activities:			
Cash received from issuing mortgage note payable		$ 40,000	
Less: Cash paid for dividends		70,670*	
Net cash flow used for financing activities			(30,670)
Increase in cash			$ 44,450
Cash at the beginning of the year			95,900
Cash at the end of the year			$140,350
Schedule of Noncash Investing and Financing Activities:			
Issued common stock to retire bonds payable			$100,000

*$70,670 = $74,670 − $4,000 (increase in dividends)

2.

Dowling Company
Statement of Cash Flows—Direct Method
For the Year Ended December 31, 2010

Cash flows from operating activities:			
Cash received from customers[1]		$1,107,000	
Deduct: Cash paid for merchandise[2]	$720,500		
Cash paid for operating expenses[3]	194,880		
Cash paid for interest expense	26,000		
Cash paid for income tax[4]	50,500	991,880	
Net cash flow from operating activities			$115,120
Cash flows from investing activities:			
Cash received from sale of:			
Investments	$ 60,000		
Land	15,000	$ 75,000	
Less: Cash paid for construction of building		115,000	
Net cash flow used for investing activities			(40,000)
Cash flows from financing activities:			
Cash received from issuing mortgage note payable		$ 40,000	
Less: Cash paid for dividends[5]		70,670	
Net cash flow used for financing activities			(30,670)
Increase in cash			$ 44,450
Cash at the beginning of the year			95,900
Cash at the end of the year			$140,350
Schedule of Noncash Investing and Financing Activities:			
Issued common stock to retire bonds payable			$100,000
Schedule Reconciling Net Income with Cash Flows from Operating Activities[6]			

Computations:

[1]$1,100,000 + $7,000 = $1,107,000
[2]$710,000 + $3,200 + $7,300 = $720,500
[3]$196,000 + $380 – $1,500 = $194,880
[4]$50,000 + $500 = $50,500
[5]$74,670 + $10,000 – $14,000 = $70,670
[6]The content of this schedule is the same as the Operating Activities section of part (1) of this solution and is not reproduced here for the sake of brevity.

Self-Examination Questions (Answers at End of Chapter)

1. An example of a cash flow from an operating activity is:
   A. receipt of cash from the sale of stock.
   B. receipt of cash from the sale of bonds.
   C. payment of cash for dividends.
   D. receipt of cash from customers on account.
2. An example of a cash flow from an investing activity is:
   A. receipt of cash from the sale of equipment.
   B. receipt of cash from the sale of stock.
   C. payment of cash for dividends.
   D. payment of cash to acquire treasury stock.
3. An example of a cash flow from a financing activity is:
   A. receipt of cash from customers on account.
   B. receipt of cash from the sale of equipment.
   C. payment of cash for dividends.
   D. payment of cash to acquire land.
4. Which of the following methods of reporting cash flows from operating activities adjusts net income for revenues and expenses not involving the receipt or payment of cash?
   A. Direct method
   B. Purchase method
   C. Reciprocal method
   D. Indirect method

5. The net income reported on the income statement for the year was $55,000, and depreciation of fixed assets for the year was $22,000. The balances of the current asset and current liability accounts at the beginning and end of the year are shown below.

	End	Beginning
Cash	$ 65,000	$ 70,000
Accounts receivable	100,000	90,000
Inventories	145,000	150,000
Prepaid expenses	7,500	8,000
Accounts payable (merchandise creditors)	51,000	58,000

The total amount reported for cash flows from operating activities in the statement of cash flows, using the indirect method, is:

A. $33,000.
B. $55,000.
C. $65,500.
D. $77,000.

Eye Openers

1. What is the principal disadvantage of the direct method of reporting cash flows from operating activities?
2. What are the major advantages of the indirect method of reporting cash flows from operating activities?
3. A corporation issued $500,000 of common stock in exchange for $500,000 of fixed assets. Where would this transaction be reported on the statement of cash flows?
4. A retail business, using the accrual method of accounting, owed merchandise creditors (accounts payable) $300,000 at the beginning of the year and $340,000 at the end of the year. How would the $40,000 increase be used to adjust net income in determining the amount of cash flows from operating activities by the indirect method? Explain.
5. If salaries payable was $90,000 at the beginning of the year and $70,000 at the end of the year, should $20,000 be added to or deducted from income to determine the amount of cash flows from operating activities by the indirect method? Explain.
6. A long-term investment in bonds with a cost of $60,000 was sold for $72,000 cash. (a) What was the gain or loss on the sale? (b) What was the effect of the transaction on cash flows? (c) How should the transaction be reported in the statement of cash flows if cash flows from operating activities are reported by the indirect method?
7. A corporation issued $6,000,000 of 20-year bonds for cash at 104. How would the transaction be reported on the statement of cash flows?
8. Fully depreciated equipment costing $100,000 was discarded. What was the effect of the transaction on cash flows if (a) $24,000 cash is received, (b) no cash is received?
9. For the current year, Bearings Company decided to switch from the indirect method to the direct method for reporting cash flows from operating activities on the statement of cash flows. Will the change cause the amount of net cash flow from operating activities to be (a) larger, (b) smaller, or (c) the same as if the indirect method had been used? Explain.
10. Name five common major classes of operating cash receipts or operating cash payments presented on the statement of cash flows when the cash flows from operating activities are reported by the direct method.
11. In a recent annual report, eBay Inc. reported that during the year it issued stock of $128 million for acquisitions. How would this be reported on the statement of cash flows?

Practice Exercises

PE 13-1A
Classifying cash flows
obj. 1
EE 13-1 p. 534

Identify whether each of the following would be reported as an operating, investing, or financing activity in the statement of cash flows.

a. Issuance of common stock
b. Purchase of land
c. Payment of accounts payable
d. Retirement of bonds payable
e. Payment for administrative expenses
f. Cash received from customers

PE 13-1B
Classifying cash flows
obj. 1
EE 13-1 p. 534

Identify whether each of the following would be reported as an operating, investing, or financing activity in the statement of cash flows.

a. Payment for selling expenses
b. Issuance of bonds payable
c. Disposal of equipment
d. Cash sales
e. Purchase of investments
f. Collection of accounts receivable

PE 13-2A
Adjustments to net income—indirect method
obj. 2
EE 13-2 p. 538

Choi Corporation's accumulated depreciation—furniture increased by $7,000, while $2,600 of patents were amortized between balance sheet dates. There were no purchases or sales of depreciable or intangible assets during the year. In addition, the income statement showed a gain of $15,000 from the sale of land. Reconcile a net income of $140,000 to net cash flow from operating activities.

PE 13-2B
Adjustments to net income—indirect method
obj. 2
EE 13-2 p. 538

Singh Corporation's accumulated depreciation—equipment increased by $6,000, while $2,200 of patents were amortized between balance sheet dates. There were no purchases or sales of depreciable or intangible assets during the year. In addition, the income statement showed a loss of $3,200 from the sale of investments. Reconcile a net income of $86,000 to net cash flow from operating activities.

PE 13-3A
Changes in current operating assets and liabilities—indirect method
obj. 2
EE 13-3 p. 539

Watson Corporation's comparative balance sheet for current assets and liabilities was as follows:

	Dec. 31, 2010	Dec. 31, 2009
Accounts receivable	$30,000	$24,000
Inventory	58,000	49,500
Accounts payable	46,000	34,500
Dividends payable	14,000	18,000

Adjust net income of $320,000 for changes in operating assets and liabilities to arrive at net cash flow from operating activities.

PE 13-3B
Changes in current operating assets and liabilities—indirect method
obj. 2
EE 13-3 p. 539

Chopra Corporation's comparative balance sheet for current assets and liabilities was as follows:

	Dec. 31, 2010	Dec. 31, 2009
Accounts receivable	$15,000	$18,000
Inventory	10,000	8,600
Accounts payable	9,000	7,900
Dividends payable	27,500	29,500

Adjust net income of $115,000 for changes in operating assets and liabilities to arrive at net cash flow from operating activities.

PE 13-4A
Cash flows from operating activities—indirect method
obj. 2
EE 13-4 p. 540

Trahan Inc. reported the following data:

Net income	$175,000
Depreciation expense	30,000
Loss on disposal of equipment	12,200
Increase in accounts receivable	10,800
Increase in accounts payable	5,600

Prepare the Cash Flows from Operating Activities section of the statement of cash flows using the indirect method.

PE 13-4B
Cash flows from operating activities—indirect method
obj. 2
EE 13-4 p. 540

Daly Inc. reported the following data:

Net income	$225,000
Depreciation expense	25,000
Gain on disposal of equipment	20,500
Decrease in accounts receivable	14,000
Decrease in accounts payable	3,600

Prepare the Cash Flows from Operating Activities section of the statement of cash flows using the indirect method.

PE 13-5A
Land transactions on the statement of cash flows
obj. 2
EE 13-5 p. 543

Slocum Corporation purchased land for $600,000. Later in the year, the company sold land with a book value of $360,000 for $410,000. How are the effects of these transactions reported on the statement of cash flows?

PE 13-5B
Land transactions on the statement of cash flows
obj. 2
EE 13-5 p. 543

Verplank Corporation purchased land for $340,000. Later in the year, the company sold land with a book value of $145,000 for $110,000. How are the effects of these transactions reported on the statement of cash flows?

PE 13-6A
Cash received from customers—direct method
obj. 3
EE 13-6 p. 545

Sales reported on the income statement were $46,200. The accounts receivable balance decreased $3,400 over the year. Determine the amount of cash received from customers.

PE 13-6B
Cash received from customers—direct method
obj. 3
EE 13-6 p. 545

Sales reported on the income statement were $521,000. The accounts receivable balance increased $56,000 over the year. Determine the amount of cash received from customers.

PE 13-7A
Cash payments for merchandise—direct method
obj. 3
EE 13-7 p. 546

Cost of merchandise sold reported on the income statement was $130,000. The accounts payable balance increased $6,200, and the inventory balance increased by $11,400 over the year. Determine the amount of cash paid for merchandise.

PE 13-7B
Cash payments for merchandise—direct method

obj. 3

EE 13-7 p. 546

Cost of merchandise sold reported on the income statement was $420,000. The accounts payable balance decreased $22,500, and the inventory balance decreased by $26,000 over the year. Determine the amount of cash paid for merchandise.

Exercises

EX 13-1
Cash flows from operating activities—net loss

obj. 1

On its income statement for a recent year, Continental Airlines, Inc. reported a net *loss* of $68 million from operations. On its statement of cash flows, it reported $457 million of cash flows from operating activities.

Explain this apparent contradiction between the loss and the positive cash flows.

EX 13-2
Effect of transactions on cash flows

obj. 1

✔ c. Cash receipt, $500,000

State the effect (cash receipt or payment and amount) of each of the following transactions, considered individually, on cash flows:

a. Sold a new issue of $200,000 of bonds at 99.
b. Purchased 4,000 shares of $35 par common stock as treasury stock at $70 per share.
c. Sold 10,000 shares of $20 par common stock for $50 per share.
d. Purchased a building by paying $60,000 cash and issuing a $100,000 mortgage note payable.
e. Retired $250,000 of bonds, on which there was $2,500 of unamortized discount, for $260,000.
f. Purchased land for $320,000 cash.
g. Paid dividends of $2.00 per share. There were 25,000 shares issued and 4,000 shares of treasury stock.
h. Sold equipment with a book value of $50,000 for $72,000.

EX 13-3
Classifying cash flows

obj. 1

Identify the type of cash flow activity for each of the following events (operating, investing, or financing):

a. Issued common stock.
b. Redeemed bonds.
c. Issued preferred stock.
d. Purchased patents.
e. Net income.
f. Paid cash dividends.
g. Purchased treasury stock.
h. Sold long-term investments.
i. Sold equipment.
j. Purchased buildings.
k. Issued bonds.

EX 13-4
Cash flows from operating activities—indirect method

obj. 2

Indicate whether each of the following would be added to or deducted from net income in determining net cash flow from operating activities by the indirect method:

a. Decrease in accounts receivable
b. Increase in notes payable due in 90 days to vendors
c. Decrease in salaries payable
d. Decrease in prepaid expenses
e. Gain on retirement of long-term debt
f. Decrease in accounts payable
g. Increase in notes receivable due in 90 days from customers
h. Depreciation of fixed assets
i. Increase in merchandise inventory
j. Amortization of patent
k. Loss on disposal of fixed assets

EX 13-5
Cash flows from operating activities—indirect method

obj. 2

✔ Net cash flow from operating activities, $153,920

The net income reported on the income statement for the current year was $132,000. Depreciation recorded on store equipment for the year amounted to $21,800. Balances of the current asset and current liability accounts at the beginning and end of the year are as follows:

	End of Year	Beginning of Year
Cash	$52,300	$48,200
Accounts receivable (net)	37,500	35,600
Merchandise inventory	51,200	54,220
Prepaid expenses	6,000	4,600
Accounts payable (merchandise creditors)	49,000	45,600
Wages payable	26,800	29,800

Prepare the Cash Flows from Operating Activities section of the statement of cash flows, using the indirect method.

EX 13-6
Net cash flow from operating activities—indirect method

objs. 1, 2

✔ Cash flows from operating activities, $258,950

The net income reported on the income statement for the current year was $210,000. Depreciation recorded on equipment and a building amounted to $62,500 for the year. Balances of the current asset and current liability accounts at the beginning and end of the year are as follows:

	End of Year	Beginning of Year
Cash	$ 56,000	$ 59,500
Accounts receivable (net)	71,000	73,400
Inventories	140,000	126,500
Prepaid expenses	7,800	8,400
Accounts payable (merchandise creditors)	62,600	66,400
Salaries payable	9,000	8,250

a. Prepare the Cash Flows from Operating Activities section of the statement of cash flows, using the indirect method.
b. If the direct method had been used, would the net cash flow from operating activities have been the same? Explain.

EX 13-7
Net cash flow from operating activities—indirect method

objs. 1, 2

✔ Cash flows from operating activities, $328,700

The income statement disclosed the following items for 2010:

Depreciation expense	$ 36,000
Gain on disposal of equipment	21,000
Net income	317,500

Balances of the current assets and current liability accounts changed between December 31, 2009, and December 31, 2010, as follows:

Accounts receivable	$5,600
Inventory	3,200*
Prepaid insurance	1,200*
Accounts payable	3,800*
Income taxes payable	1,200
Dividends payable	850

*Decrease

Prepare the Cash Flows from Operating Activities section of the statement of cash flows, using the indirect method.

EX 13-8
Determining cash payments to stockholders

obj. 2

The board of directors declared cash dividends totaling $152,000 during the current year. The comparative balance sheet indicates dividends payable of $42,000 at the beginning of the year and $38,000 at the end of the year. What was the amount of cash payments to stockholders during the year?

EX 13-9
Reporting changes in equipment on statement of cash flows

obj. 2

An analysis of the general ledger accounts indicates that office equipment, which cost $67,000 and on which accumulated depreciation totaled $22,500 on the date of sale, was sold for $38,600 during the year. Using this information, indicate the items to be reported on the statement of cash flows.

EX 13-10
Reporting changes in equipment on statement of cash flows

obj. 2

An analysis of the general ledger accounts indicates that delivery equipment, which cost $96,000 and on which accumulated depreciation totaled $42,100 on the date of sale, was sold for $46,500 during the year. Using this information, indicate the items to be reported on the statement of cash flows.

EX 13-11
Reporting land transactions on statement of cash flows

obj. 2

On the basis of the details of the following fixed asset account, indicate the items to be reported on the statement of cash flows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			1,200,000	
Feb.	5	Purchased for cash	380,000		1,580,000	
Oct.	30	Sold for $210,000		180,000	1,400,000	

EX 13-12
Reporting stockholders' equity items on statement of cash flows

obj. 2

On the basis of the following stockholders' equity accounts, indicate the items, exclusive of net income, to be reported on the statement of cash flows. There were no unpaid dividends at either the beginning or the end of the year.

ACCOUNT *Common Stock, $10 par* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance, 60,000 shares				1,200,000
Feb.	11	15,000 shares issued for cash		300,000		1,500,000
June	30	2,200-share stock dividend		44,000		1,544,000

ACCOUNT *Paid-In Capital in Excess of Par—Common Stock* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				200,000
Feb.	11	15,000 shares issued for cash		480,000		680,000
June	30	Stock dividend		79,200		759,200

ACCOUNT *Retained Earnings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				1,000,000
June	30	Stock dividend	123,200			876,800
Dec.	30	Cash dividend	115,800			761,000
	31	Net income		720,000		1,481,000

EX 13-13
Reporting land acquisition for cash and mortgage note on statement of cash flows

obj. 2

On the basis of the details of the following fixed asset account, indicate the items to be reported on the statement of cash flows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			260,000	
Feb.	10	Purchased for cash	410,000		670,000	
Nov.	20	Purchased with long-term mortgage note	540,000		1,210,000	

EX 13-14
Reporting issuance and retirement of long-term debt

obj. 2

On the basis of the details of the following bonds payable and related discount accounts, indicate the items to be reported in the Financing section of the statement of cash flows, assuming no gain or loss on retiring the bonds:

ACCOUNT *Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				500,000
	3	Retire bonds	100,000			400,000
July	30	Issue bonds		300,000		700,000

ACCOUNT *Discount on Bond Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			22,500	
	3	Retire bonds		8,000	14,500	
July	30	Issue bonds	20,000		34,500	
Dec.	31	Amortize discount		1,750	32,750	

EX 13-15
Determining net income from net cash flow from operating activities

obj. 2

✔ Net income, $155,350

Sanhueza, Inc., reported a net cash flow from operating activities of $162,500 on its statement of cash flows for the year ended December 31, 2010. The following information was reported in the Cash Flows from Operating Activities section of the statement of cash flows, using the indirect method:

Decrease in income taxes payable	$ 3,500
Decrease in inventories	8,700
Depreciation	13,400
Gain on sale of investments	6,000
Increase in accounts payable	2,400
Increase in prepaid expenses	1,350
Increase in accounts receivable	6,500

Determine the net income reported by Sanhueza, Inc., for the year ended December 31, 2010.

EX 13-16
Cash flows from operating activities—indirect method

obj. 2

✔ Net cash flow from operating activities, $3,048

Selected data derived from the income statement and balance sheet of Jones Soda Co. for a recent year are as follows:

Income statement data (in thousands):	
Net earnings	$4,574
Depreciation expense	256
Stock-based compensation expense (noncash)	1,196
Balance sheet data (in thousands):	
Increase in accounts receivable	$3,214
Increase in inventory	1,089
Increase in prepaid expenses	566
Increase in accounts payable	1,891

a. Prepare the Cash Flows from Operating Activities section of the statement of cash flows using the indirect method for Jones Soda Co. for the year.
b. Interpret your results in part (a).

EX 13-17
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, $30

The comparative balance sheet of Tru-Built Construction Inc. for December 31, 2010 and 2009, is as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 98	$ 32
Accounts receivable (net)	56	40
Inventories	35	22
Land	80	90
Equipment	45	35
Accumulated depreciation—equipment	(12)	(6)
Total	$302	$213
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 35	$ 32
Dividends payable	6	—
Common stock, $1 par	20	10
Paid-in capital in excess of par—common stock	50	25
Retained earnings	191	146
Total	$302	$213

The following additional information is taken from the records:

a. Land was sold for $25.
b. Equipment was acquired for cash.
c. There were no disposals of equipment during the year.
d. The common stock was issued for cash.
e. There was a $65 credit to Retained Earnings for net income.
f. There was a $20 debit to Retained Earnings for cash dividends declared.

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

EX 13-18
Statement of cash flows—indirect method

obj. 2

List the errors you find in the following statement of cash flows. The cash balance at the beginning of the year was $100,320. All other amounts are correct, except the cash balance at the end of the year.

Devon Inc.
Statement of Cash Flows
For the Year Ended December 31, 2010

Cash flows from operating activities:			
Net income		$148,080	
Adjustments to reconcile net income to net cash flow from operating activities:			
Depreciation		42,000	
Gain on sale of investements		7,200	
Changes in current operating assets and liabilities:			
Increase in accounts receivable		11,400	
Increase in inventories		(14,760)	
Increase in accounts payable		(4,440)	
Decrease in accrued expenses payable		(1,080)	
Net cash flow from operating activities			$188,400
Cash flows from investing activities:			
Cash received from sale of investments		$102,000	
Less: Cash paid for purchase of land	$108,000		
Cash paid for purchase of equipment	180,200	288,200	
Net cash flow used for investing activities			(186,200)
Cash flows from financing activities:			
Cash received from sale of common stock		$128,400	
Cash paid for dividends		54,000	
Net cash flow provided by financing activities			182,400
Increase in cash			$184,600
Cash at the end of the year			126,300
Cash at the beginning of the year			$310,900

EX 13-19
Cash flows from operating activities—direct method

obj. 3

✔ a. $728,500

The cash flows from operating activities are reported by the direct method on the statement of cash flows. Determine the following:

a. If sales for the current year were $685,000 and accounts receivable decreased by $43,500 during the year, what was the amount of cash received from customers?
b. If income tax expense for the current year was $46,000 and income tax payable decreased by $5,200 during the year, what was the amount of cash payments for income tax?

EX 13-20
Cash paid for merchandise purchases

obj. 3

The cost of merchandise sold for Kohl's Corporation for a recent year was $9,891 million. The balance sheet showed the following current account balances (in millions):

	Balance, End of Year	Balance, Beginning of Year
Merchandise inventories	$2,588	$2,238
Accounts payable	934	830

Determine the amount of cash payments for merchandise.

EX 13-21
Determining selected amounts for cash flows from operating activities—direct method

obj. 3

✔ b. $77,870

Selected data taken from the accounting records of Lachgar Inc. for the current year ended December 31 are as follows:

	Balance, December 31	Balance, January 1
Accrued expenses payable (operating expenses)	$ 5,590	$ 6,110
Accounts payable (merchandise creditors)	41,730	46,020
Inventories	77,350	84,110
Prepaid expenses	3,250	3,900

During the current year, the cost of merchandise sold was $448,500, and the operating expenses other than depreciation were $78,000. The direct method is used for presenting the cash flows from operating activities on the statement of cash flows.

Determine the amount reported on the statement of cash flows for (a) cash payments for merchandise and (b) cash payments for operating expenses.

EX 13-22
Cash flows from operating activities—direct method

obj. 3

✔ Net cash flow from operating activities, $69,760

The income statement of Kodiak Industries Inc. for the current year ended June 30 is as follows:

Sales		$364,800
Cost of merchandise sold		207,200
Gross profit		$157,600
Operating expenses:		
Depreciation expense	$28,000	
Other operating expenses	73,920	
Total operating expenses		101,920
Income before income tax		$ 55,680
Income tax expense		15,440
Net income		$ 40,240

Changes in the balances of selected accounts from the beginning to the end of the current year are as follows:

	Increase Decrease*
Accounts receivable (net)	$8,400*
Inventories	2,800
Prepaid expenses	2,720*
Accounts payable (merchandise creditors)	5,760*
Accrued expenses payable (operating expenses)	880
Income taxes payable	1,920*

Prepare the Cash Flows from Operating Activities section of the statement of cash flows, using the direct method.

EX 13-23
Cash flows from operating activities—direct method

obj. 3

✔ Net cash flow from operating activities, $56,490

The income statement for M2 Pizza Pie Company for the current year ended June 30 and balances of selected accounts at the beginning and the end of the year are as follows:

Sales		$202,400
Cost of merchandise sold		70,000
Gross profit		$132,400
Operating expenses:		
Depreciation expense	$17,500	
Other operating expenses	52,400	
Total operating expenses		69,900
Income before income tax		$ 62,500
Income tax expense		18,000
Net income		$ 44,500

	End of Year	Beginning of Year
Accounts receivable (net)	$16,300	$14,190
Inventories	41,900	36,410
Prepaid expenses	6,600	7,260
Accounts payable (merchandise creditors)	30,690	28,490
Accrued expenses payable (operating expenses)	8,690	9,460
Income taxes payable	1,650	1,650

Prepare the Cash Flows from Operating Activities section of the statement of cash flows, using the direct method.

EX 13-24
Free cash flow

Morrocan Marble Company has cash flows from operating activities of $300,000. Cash flows used for investments in property, plant, and equipment totaled $65,000, of which 75% of this investment was used to replace existing capacity.

Determine the free cash flow for Morrocan Marble Company.

EX 13-25
Free cash flow

The financial statements for Nike, Inc., are provided in Appendix B at the end of the text.

Determine the free cash flow for the year ended May 31, 2007. Assume that 90% of additions to property, plant and equipment were used to maintain productive capacity.

Problems Series A

PR 13-1A
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, $49,520

The comparative balance sheet of Mavenir Technologies Inc. for December 31, 2010 and 2009, is shown as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 312,880	$ 292,960
Accounts receivable (net)	113,920	104,480
Inventories	320,880	308,560
Investments	0	120,000
Land	164,000	0
Equipment	352,560	276,560
Accumulated depreciation—equipment	(83,200)	(74,000)
	$1,181,040	$1,028,560
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 214,240	$ 202,480
Accrued expenses payable (operating expenses)	21,120	26,320
Dividends payable	12,000	9,600
Common stock, $10 par	64,000	48,000
Paid-in capital in excess of par—common stock	240,000	140,000
Retained earnings	629,680	602,160
	$1,181,040	$1,028,560

The following additional information was taken from the records:

a. The investments were sold for $140,000 cash.
b. Equipment and land were acquired for cash.
c. There were no disposals of equipment during the year.
d. The common stock was issued for cash.
e. There was a $75,520 credit to Retained Earnings for net income.
f. There was a $48,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 13-2A
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, $169,600

The comparative balance sheet of Amelia Enterprises, Inc. at December 31, 2010 and 2009, is as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 73,300	$ 89,900
Accounts receivable (net)	112,300	121,000
Merchandise inventory	160,800	149,600
Prepaid expenses	6,700	4,800
Equipment	327,500	268,500
Accumulated depreciation—equipment	(85,400)	(66,100)
	$595,200	$567,700
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$125,100	$118,800
Mortgage note payable	0	168,000
Common stock, $1 par	24,000	12,000
Paid-in capital in excess of par—common stock	288,000	160,000
Retained earnings	158,100	108,900
	$595,200	$567,700

Additional data obtained from the income statement and from an examination of the accounts in the ledger for 2010 are as follows:

a. Net income, $126,000.
b. Depreciation reported on the income statement, $41,700.
c. Equipment was purchased at a cost of $81,400, and fully depreciated equipment costing $22,400 was discarded, with no salvage realized.
d. The mortgage note payable was not due until 2013, but the terms permitted earlier payment without penalty.
e. 7,000 shares of common stock were issued at $20 for cash.
f. Cash dividends declared and paid, $76,800.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 13-3A
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, ($92,000)

The comparative balance sheet of Putnam Cycle Co. at December 31, 2010 and 2009, is as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 510,000	$ 536,000
Accounts receivable (net)	460,500	423,300
Inventories	704,700	646,100
Prepaid expenses	16,300	19,500
Land	175,500	266,500
Buildings	812,500	500,500
Accumulated depreciation—buildings	(227,000)	(212,400)
Equipment	284,600	252,600
Accumulated depreciation—equipment	(78,500)	(88,200)
	$2,658,600	$2,343,900
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 512,500	$ 532,400
Bonds payable	150,000	0
Common stock, $1 par	75,000	65,000
Paid-in capital in excess of par—common stock	520,000	310,000
Retained earnings	1,401,100	1,436,500
	$2,658,600	$2,343,900

The noncurrent asset, noncurrent liability, and stockholders' equity accounts for 2010 are as follows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			266,500	
Apr.	20	Realized $84,000 cash from sale		91,000	175,500	

ACCOUNT *Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			500,500	
Apr.	20	Acquired for cash	312,000		812,500	

ACCOUNT *Accumulated Depreciation—Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				212,400
Dec.	31	Depreciation for year		14,600		227,000

ACCOUNT *Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			252,600	
	26	Discarded, no salvage		26,000	226,600	
Aug.	11	Purchased for cash	58,000		284,600	

ACCOUNT *Accumulated Depreciation—Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				88,200
	26	Equipment discarded	26,000			62,200
Dec.	31	Depreciation for year		16,300		78,500

ACCOUNT *Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
2010						
May	1	Issued 20-year bonds		150,000		150,000

ACCOUNT *Common Stock, $1 par* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
2010						
Jan.	1	Balance				65,000
Dec.	7	Issued 10,000 shares of common stock for $22 per share		10,000		75,000

ACCOUNT *Paid-In Capital in Excess of Par—Common Stock* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
2010						
Jan.	1	Balance				310,000
Dec.	7	Issued 10,000 shares of common stock for $22 per share		210,000		520,000

ACCOUNT *Retained Earnings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance Debit	Balance Credit
2010						
Jan.	1	Balance				1,436,500
Dec.	31	Net loss	17,400			1,419,100
	31	Cash dividends	18,000			1,401,100

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 13-4A
Statement of cash flows—direct method

obj. 3

✔ Net cash flow from operating activities, $146,800

The comparative balance sheet of Rucker Photography Products Inc. for December 31, 2011 and 2010, is as follows:

	Dec. 31, 2011	Dec. 31, 2010
Assets		
Cash	$ 321,700	$ 339,700
Accounts receivable (net)	283,400	273,700
Inventories	505,500	491,400
Investments	0	120,000
Land	260,000	0
Equipment	440,000	340,000
Accumulated depreciation	(122,200)	(100,200)
	$1,688,400	$1,464,600

Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 385,900	$ 374,200
Accrued expenses payable (operating expenses)	31,700	35,400
Dividends payable	4,400	3,200
Common stock, $1 par	20,000	16,000
Paid-in capital in excess of par—common stock	208,000	96,000
Retained earnings	1,038,400	939,800
	$1,688,400	$1,464,600

The income statement for the year ended December 31, 2011, is as follows:

Sales		$2,990,000
Cost of merchandise sold		1,226,000
Gross profit		$1,764,000
Operating expenses:		
Depreciation expense	$ 22,000	
Other operating expenses	1,550,000	
Total operating expenses		1,572,000
Operating income		$ 192,000
Other expense:		
Loss on sale of investments		(32,000)
Income before income tax		$ 160,000
Income tax expense		51,400
Net income		$ 108,600

The following additional information was taken from the records:

a. Equipment and land were acquired for cash.
b. There were no disposals of equipment during the year.
c. The investments were sold for $88,000 cash.
d. The common stock was issued for cash.
e. There was a $10,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

PR 13-5A

Statement of cash flows—direct method applied to PR 13-1A

obj. 3

✔ Net cash flow from operating activities, $49,520

The comparative balance sheet of Mavenir Technologies Inc. for December 31, 2010 and 2009, is as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 312,880	$ 292,960
Accounts receivable (net)	113,920	104,480
Inventories	320,880	308,560
Investments	0	120,000
Land	164,000	0
Equipment	352,560	276,560
Accumulated depreciation—equipment	(83,200)	(74,000)
	$1,181,040	$1,028,560
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 214,240	$ 202,480
Accrued expenses payable (operating expenses)	21,120	26,320
Dividends payable	12,000	9,600
Common stock, $10 par	64,000	48,000
Paid-in capital in excess of par—common stock	240,000	140,000
Retained earnings	629,680	602,160
	$1,181,040	$1,028,560

The income statement for the year ended December 31, 2010, is as follows:

Sales		$1,950,699
Cost of merchandise sold		1,200,430
Gross profit		$ 750,269
Operating expenses:		
Depreciation expense	$ 9,200	
Other operating expenses	635,202	
Total operating expenses		644,402
Operating income		$ 105,867
Other income:		
Gain on sale of investments		20,000
Income before income tax		$ 125,867
Income tax expense		50,347
Net income		$ 75,520

The following additional information was taken from the records:

a. The investments were sold for $140,000 cash.
b. Equipment and land were acquired for cash.
c. There were no disposals of equipment during the year.
d. The common stock was issued for cash.
e. There was a $48,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

Problems Series B

PR 13-1B
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, $86,600

The comparative balance sheet of House Construction Co. for June 30, 2010 and 2009, is as follows:

	June 30, 2010	June 30, 2009
Assets		
Cash	$ 41,600	$ 28,200
Accounts receivable (net)	121,900	110,700
Inventories	175,600	170,500
Investments	0	60,000
Land	174,000	0
Equipment	258,000	210,600
Accumulated depreciation	(58,300)	(49,600)
	$712,800	$530,400
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$121,000	$114,200
Accrued expenses payable (operating expenses)	18,000	15,800
Dividends payable	15,000	12,000
Common stock, $1 par	67,200	60,000
Paid-in capital in excess of par—common stock	264,000	120,000
Retained earnings	227,600	208,400
	$712,800	$530,400

The following additional information was taken from the records of House Construction Co.:

a. Equipment and land were acquired for cash.
b. There were no disposals of equipment during the year.
c. The investments were sold for $54,000 cash.
d. The common stock was issued for cash.
e. There was a $79,200 credit to Retained Earnings for net income.
f. There was a $60,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 13-2B
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, $200,500

The comparative balance sheet of TorMax Technology, Inc. at December 31, 2010 and 2009, is as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 158,300	$ 128,900
Accounts receivable (net)	237,600	211,500
Inventories	317,100	365,200
Prepaid expenses	11,300	9,000
Land	108,000	108,000
Buildings	612,000	405,000
Accumulated depreciation—buildings	(166,500)	(148,050)
Machinery and equipment	279,000	279,000
Accumulated depreciation—machinery & equipment	(76,500)	(68,400)
Patents	38,200	43,200
	$1,518,500	$1,333,350
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 299,100	$ 331,100
Dividends payable	11,700	9,000
Salaries payable	28,200	31,100
Mortgage note payable, due 2017	80,000	—
Bonds payable	—	140,000
Common stock, $1 par	23,000	18,000
Paid-in capital in excess of par—common stock	180,000	45,000
Retained earnings	896,500	759,150
	$1,518,500	$1,333,350

An examination of the income statement and the accounting records revealed the following additional information applicable to 2010:

a. Net income, $184,150.
b. Depreciation expense reported on the income statement: buildings, $18,450; machinery and equipment, $8,100.
c. Patent amortization reported on the income statement, $5,000.
d. A building was constructed for $207,000.
e. A mortgage note for $80,000 was issued for cash.
f. 5,000 shares of common stock were issued at $28 in exchange for the bonds payable.
g. Cash dividends declared, $46,800.

Instructions Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 13-3B
Statement of cash flows—indirect method

obj. 2

✔ Net cash flow from operating activities, $7,800

The comparative balance sheet of Cantor Industries, Inc. at December 31, 2010 and 2009, is as follows:

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Cash	$ 50,100	$ 56,300
Accounts receivable (net)	117,400	101,600
Inventories	153,100	144,300
Prepaid expenses	3,100	4,400
Land	165,000	231,000
Buildings	330,000	165,000
Accumulated depreciation—buildings	(66,200)	(61,000)
Equipment	110,100	88,300
Accumulated depreciation—equipment	(22,200)	(27,000)
	$840,400	$702,900
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 99,000	$105,200
Income taxes payable	4,400	3,600
Bonds payable	55,000	0
Common stock, $1 par	36,000	30,000
Paid-in capital in excess of par—common stock	195,000	135,000
Retained earnings	451,000	429,100
	$840,400	$702,900

The noncurrent asset, noncurrent liability, and stockholders' equity accounts for 2010 are as follows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			231,000	
Apr.	20	Realized $76,000 cash from sale		66,000	165,000	

ACCOUNT *Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			165,000	
Apr.	20	Acquired for cash	165,000		330,000	

ACCOUNT *Accumulated Depreciation—Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				61,000
Dec.	31	Depreciation for year		5,200		66,200

ACCOUNT *Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance			88,300	
	26	Discarded, no salvage		11,000	77,300	
Aug.	11	Purchased for cash	32,800		110,100	

ACCOUNT *Accumulated Depreciation—Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				27,000
	26	Equipment discarded	11,000			16,000
Dec.	31	Depreciation for year		6,200		22,200

ACCOUNT *Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
May	1	Issued 20-year bonds		55,000		55,000

ACCOUNT *Common Stock, $1 par* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				30,000
Dec.	7	Issued 6,000 shares of common stock for $11 per share		6,000		36,000

ACCOUNT *Paid-In Capital in Excess of Par—Common Stock* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				135,000
Dec.	7	Issued 6,000 shares of common stock for $11 per share		60,000		195,000

ACCOUNT *Retained Earnings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
2010						
Jan.	1	Balance				429,100
Dec.	31	Net income		35,100		464,200
	31	Cash dividends	13,200			451,000

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 13-4B
Statement of cash flows—direct method

obj. 3

✔ Net cash flow from operating activities, $169,740

The comparative balance sheet of Lim Garden Supplies Inc. for December 31, 2010 and 2011, is as follows:

	Dec. 31, 2011	Dec. 31, 2010
Assets		
Cash	$ 220,640	$ 227,700
Accounts receivable (net)	330,880	304,800
Inventories	464,800	454,600
Investments	0	144,000
Land	320,000	0
Equipment	408,000	328,000
Accumulated depreciation	(160,500)	(122,800)
	$1,583,820	$1,336,300
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 360,000	$ 322,200
Accrued expenses payable (operating expenses)	22,600	26,400
Dividends payable	33,600	30,400
Common stock,	16,000	8,000
Paid-in capital in excess of par—common stock	320,000	160,000
Retained earnings	831,620	789,300
	$1,583,820	$1,336,300

The income statement for the year ended December 31, 2011, is as follows:

Sales		$1,504,000
Cost of merchandise sold		784,000
Gross profit		$ 720,000
Operating expenses:		
Depreciation expense	$ 37,700	
Other operating expenses	448,280	
Total operating expenses		485,980
Operating income		$ 234,020
Other income:		
Gain on sale of investments		52,000
Income before income tax		$ 286,020
Income tax expense		99,700
Net income		$ 186,320

The following additional information was taken from the records:

a. Equipment and land were acquired for cash.
b. There were no disposals of equipment during the year.
c. The investments were sold for $196,000 cash.
d. The common stock was issued for cash.
e. There was a $144,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

PR 13-5B
Statement of cash flows—direct method applied to PR 13-1B

obj. 3

✔ Net cash flow from operating activities, $86,600

The comparative balance sheet of House Construction Co. for June 30, 2010 and 2009, is as follows:

	June 30, 2010	June 30, 2009
Assets		
Cash	$ 41,600	$ 28,200
Accounts receivable (net)	121,900	110,700
Inventories	175,600	170,500
Investments	0	60,000
Land	174,000	0
Equipment	258,000	210,600
Accumulated depreciation	(58,300)	(49,600)
	$712,800	$530,400
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$121,000	$114,200
Accrued expenses payable (operating expenses)	18,000	15,800
Dividends payable	15,000	12,000
Common stock, $1 par	67,200	60,000
Paid-in capital in excess of par—common stock	264,000	120,000
Retained earnings	227,600	208,400
	$712,800	$530,400

The income statement for the year ended June 30, 2010, is as follows:

Sales		$1,134,900
Cost of merchandise sold		698,400
Gross profit		$ 436,500
Operating expenses:		
Depreciation expense	$ 8,700	
Other operating expenses	289,800	
Total operating expenses		298,500
Operating income		$ 138,000
Other expenses:		
Loss on sale of investments		(6,000)
Income before income tax		$ 132,000
Income tax expense		52,800
Net income		$ 79,200

The following additional information was taken from the records:

a. Equipment and land were acquired for cash.
b. There were no disposals of equipment during the year.
c. The investments were sold for $54,000 cash.
d. The common stock was issued for cash.
e. There was a $60,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

Special Activities

SA 13-1
Ethics and professional conduct in business

Kelly Tough, president of Tu-Rock Industries Inc., believes that reporting operating cash flow per share on the income statement would be a useful addition to the company's just completed financial statements. The following discussion took place between Kelly Tough and Tu-Rock controller, Tripp Kelso, in January, after the close of the fiscal year.

Kelly: I have been reviewing our financial statements for the last year. I am disappointed that our net income per share has dropped by 10% from last year. This is not going to look good to our shareholders. Isn't there anything we can do about this?

Tripp: What do you mean? The past is the past, and the numbers are in. There isn't much that can be done about it. Our financial statements were prepared according to generally accepted accounting principles, and I don't see much leeway for significant change at this point.

Kelly: No, no. I'm not suggesting that we "cook the books." But look at the cash flow from operating activities on the statement of cash flows. The cash flow from operating activities has increased by 20%. This is very good news—and, I might add, useful information. The higher cash flow from operating activities will give our creditors comfort.

Tripp: Well, the cash flow from operating activities is on the statement of cash flows, so I guess users will be able to see the improved cash flow figures there.

Kelly: This is true, but somehow I feel that this information should be given a much higher profile. I don't like this information being "buried" in the statement of cash flows. You know as well as I do that many users will focus on the income statement. Therefore, I think we ought to include an operating cash flow per share number on the face of the income statement—someplace under the earnings per share number. In this way, users will get the complete picture of our operating performance. Yes, our earnings per share dropped this year, but our cash flow from operating activities improved! And all the information is in one place where users can see and compare the figures. What do you think?

Tripp: I've never really thought about it like that before. I guess we could put the operating cash flow per share on the income statement, under the earnings per share. Users would really benefit from this disclosure. Thanks for the idea—I'll start working on it.

Kelly: Glad to be of service.

How would you interpret this situation? Is Tripp behaving in an ethical and professional manner?

SA 13-2
Using the statement of cash flows

You are considering an investment in a new start-up company, Steamboat IQ Inc., an Internet service provider. A review of the company's financial statements reveals a negative retained earnings. In addition, it appears as though the company has been running a negative cash flow from operating activities since the company's inception.

How is the company staying in business under these circumstances? Could this be a good investment?

SA 13-3
Analysis of statement of cash flows

Jim Walker is the president and majority shareholder of Tech Trends Inc., a small retail store chain. Recently, Walker submitted a loan application for Tech Trends Inc. to Yadkin National Bank. It called for a $200,000, 9%, 10-year loan to help finance the construction of a building and the purchase of store equipment, costing a total of $250,000, to enable Tech Trends Inc. to open a store in Yadkin. Land for this purpose was acquired last year. The bank's loan officer requested a statement of cash flows in addition to the most recent income statement, balance sheet, and retained earnings statement that Walker had submitted with the loan application.

As a close family friend, Walker asked you to prepare a statement of cash flows. From the records provided, you prepared the following statement:

Tech Trends Inc.
Statement of Cash Flows
For the Year Ended December 31, 2010

Cash flows from operating activities:		
Net income	$100,000	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation	28,000	
Gain on sale of investments	(10,000)	
Changes in current operating assets and liabilities:		
Decrease in accounts receivable	7,000	
Increase in inventories	(14,000)	
Increase in accounts payable	10,000	
Decrease in accrued expenses payable	(2,000)	
Net cash flow from operating activities		$119,000
Cash flows from investing activities:		
Cash received from investments sold	$ 60,000	
Less cash paid for purchase of store equipment	(40,000)	
Net cash flow provided by investing activities		20,000
Cash flows from financing activities:		
Cash paid for dividends	$ 42,000	
Net cash flow used for financing activities		(42,000)
Increase in cash		$ 97,000
Cash at the beginning of the year		36,000
Cash at the end of the year		$133,000
Schedule of Noncash Financing and Investing Activities:		
Issued common stock for land		$ 80,000

After reviewing the statement, Walker telephoned you and commented, "Are you sure this statement is right?" Walker then raised the following questions:

1. "How can depreciation be a cash flow?"
2. "Issuing common stock for the land is listed in a separate schedule. This transaction has nothing to do with cash! Shouldn't this transaction be eliminated from the statement?"
3. "How can the gain on sale of investments be a deduction from net income in determining the cash flow from operating activities?"
4. "Why does the bank need this statement anyway? They can compute the increase in cash from the balance sheets for the last two years."

After jotting down Walker's questions, you assured him that this statement was "right." But to alleviate Walker's concern, you arranged a meeting for the following day.

a. How would you respond to each of Walker's questions?
b. Do you think that the statement of cash flows enhances the chances of Tech Trends Inc. receiving the loan? Discuss.

SA 13-4
Analysis of cash flow from operations

The Retailing Division of Most Excellent Purchase Inc. provided the following information on its cash flow from operations:

Net income	$ 540,000
Increase in accounts receivable	(648,000)
Increase in inventory	(720,000)
Decrease in accounts payable	(108,000)
Depreciation	120,000
Cash flow from operating activities	$(816,000)

The manager of the Retailing Division provided the accompanying memo with this report:

From: Senior Vice President, Retailing Division

I am pleased to report that we had earnings of $540,000 over the last period. This resulted in a return on invested capital of 10%, which is near our targets for this division. I have been aggressive in building the revenue volume in the division. As a result, I am happy to report that we have increased the number of new credit card customers as a result of an aggressive marketing campaign. In addition, we have found some excellent merchandise opportunities. Some of our suppliers have made some of their apparel merchandise available at a deep discount. We have purchased as much of these goods as possible in order to improve profitability. I'm also happy to report that our vendor payment problems have improved. We are nearly caught up on our overdue payables balances.

Comment on the senior vice president's memo in light of the cash flow information.

SA 13-5
Statement of cash flows

Group Project

Internet Project

This activity will require two teams to retrieve cash flow statement information from the Internet. One team is to obtain the most recent year's statement of cash flows for Johnson & Johnson, and the other team the most recent year's statement of cash flows for AMR Corp.

The statement of cash flows is included as part of the annual report information that is a required disclosure to the Securities and Exchange Commission (SEC). SEC documents can be retrieved using the EdgarScan™ service at **http://www.sec.gov/edgar/searchedgar/webusers.htm**.

To obtain annual report information, type in a company name in the appropriate space. EdgarScan will list the reports available to you for the company you've selected. Select the most recent annual report filing, identified as a 10-K or 10-K405. EdgarScan provides an outline of the report, including the separate financial statements. You can double-click the income statement and balance sheet for the selected company into an Excel™ spreadsheet for further analysis.

As a group, compare the two statements of cash flows.

a. How are Johnson & Johnson and AMR Corp. similar or different regarding cash flows?
b. Compute and compare the free cash flow for each company, assuming additions to property, plant, and equipment replace current capacity.

Answers to Self-Examination Questions

1. **D** Cash flows from operating activities affect transactions that enter into the determination of net income, such as the receipt of cash from customers on account (answer D). Receipts of cash from the sale of stock (answer A) and the sale of bonds (answer B) and payments of cash for dividends (answer C) are cash flows from financing activities.
2. **A** Cash flows from investing activities include receipts from the sale of noncurrent assets, such as equipment (answer A), and payments to acquire noncurrent assets. Receipts of cash from

the sale of stock (answer B) and payments of cash for dividends (answer C) and to acquire treasury stock (answer D) are cash flows from financing activities.

3. **C** Payment of cash for dividends (answer C) is an example of a financing activity. The receipt of cash from customers on account (answer A) is an operating activity. The receipt of cash from the sale of equipment (answer B) is an investing activity. The payment of cash to acquire land (answer D) is an example of an investing activity.
4. **D** The indirect method (answer D) reports cash flows from operating activities by beginning with net income and adjusting it for revenues and expenses not involving the receipt or payment of cash.
5. **C** The Cash Flows from Operating Activities section of the statement of cash flows would report net cash flow from operating activities of $65,500, determined as follows:

Cash flows from operating activities:		
Net income	$ 55,000	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation	22,000	
Changes in current operating assets and liabilities:		
Increase in accounts receivable	(10,000)	
Decrease in inventories	5,000	
Decrease in prepaid expenses	500	
Decrease in accounts payable	(7,000)	
Net cash flow from operating activities		$65,500

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CHAPTER 14

Financial Statement Analysis

© AP Photo/Matt York

NIKE, INC.

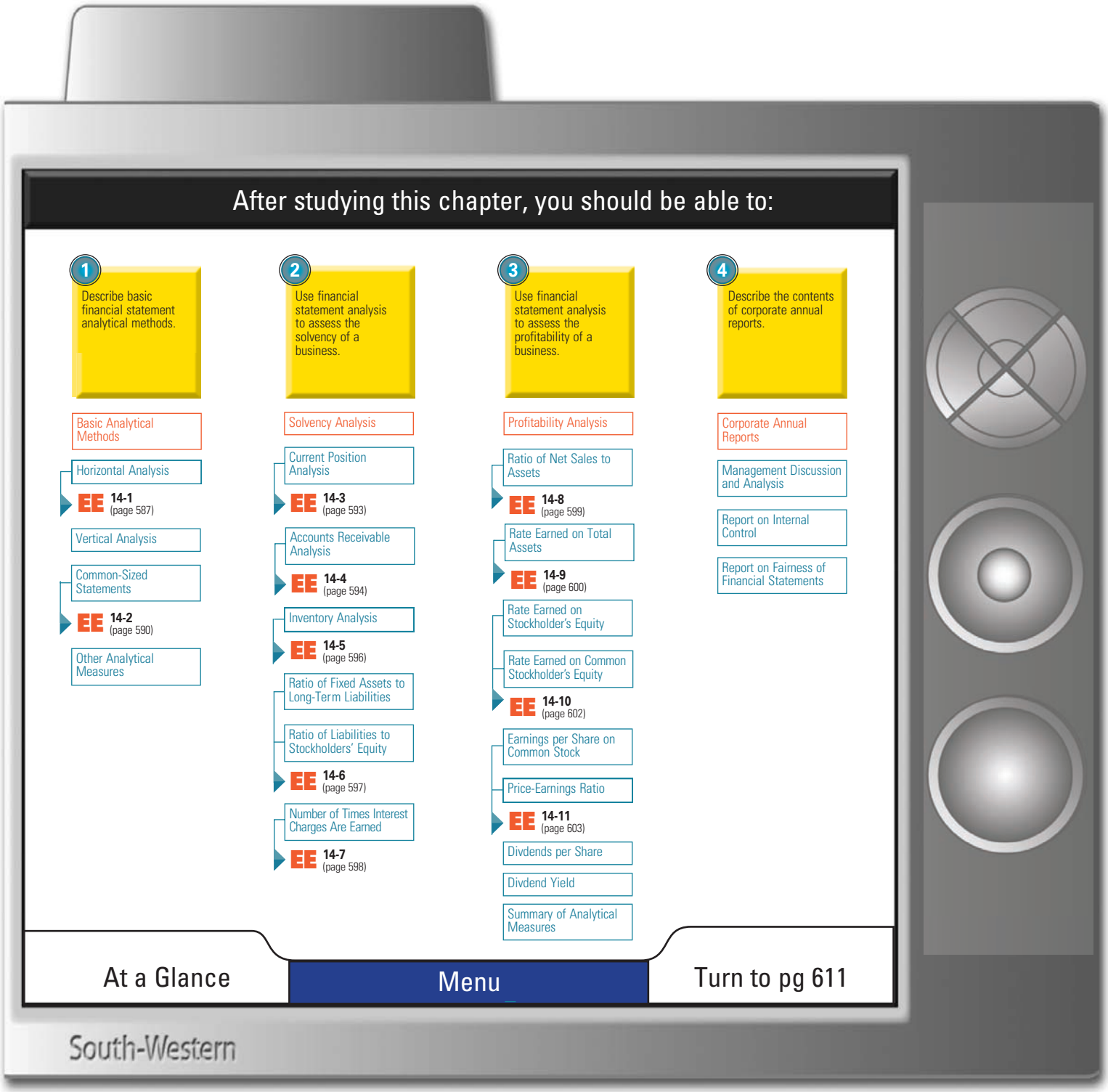
"Just do it." These three words identify one of the most recognizable brands in the world, Nike. While this phrase inspires athletes to "compete and achieve their potential," it also defines the company.

Nike began in 1964 as a partnership between University of Oregon track coach Bill Bowerman and one of his former student-athletes, Phil Knight. The two began by selling shoes imported from Japan out of the back of Knight's car to athletes at track and field events. As sales grew, the company opened retail outlets and began to develop its own shoes. In 1971 the company, originally named Blue Ribbon Sports, commissioned a graphic design student at Portland State University to develop the Nike Swoosh logo for a fee of $35. In 1978 the company changed its name to Nike, and in 1980, it sold its first shares of stock to the public.

Nike would have been a great company in which to have invested. If you had invested in Nike's common stock back in 1990, you would have paid $5.00 per share. Today Nike's stock sells for $56.75 per share. Unfortunately, you can't invest using hindsight.

How then should you select companies to invest in? Like any significant purchase, you should do some research to guide your investment decision. If you were buying a car, for example, you might go to Edmunds.com to obtain reviews, ratings, prices, specifications, options, and fuel economy across a number of vehicles. In deciding whether to invest in a company, you can use financial analysis to gain insight into a company's past performance and future prospects. This chapter describes and illustrates common financial data that can be analyzed to assist you in making investment decisions such as whether or not to invest in Nike's stock.

Source: http://www.nikebiz.com/



1 Describe basic financial statement analytical methods.

Basic Analytical Methods

Users analyze a company's financial statements using a variety of analytical methods. Three such methods are as follows:

1. Horizontal analysis
2. Vertical analysis
3. Common-sized statements

Horizontal Analysis

The percentage analysis of increases and decreases in related items in comparative financial statements is called **horizontal analysis**. Each item on the most recent statement is compared with the related item on one or more earlier statements in terms of the following:

1. *Amount* of increase or decrease.
2. *Percent* of increase or decrease.

When comparing statements, the earlier statement is normally used as the base for computing increases and decreases.

Exhibit 1 illustrates horizontal analysis for the December 31, 2010 and 2009 balance sheets of Lincoln Company. In Exhibit 1, the December 31, 2009 balance sheet (the earliest year presented) is used as the base.

Exhibit 1

Comparative Balance Sheet—Horizontal Analysis

Lincoln Company
Comparative Balance Sheet
December 31, 2010 and 2009

	Dec. 31, 2010	Dec. 31, 2009	Increase (Decrease) Amount	Increase (Decrease) Percent
Assets				
Current assets	$ 550,000	$ 533,000	$ 17,000	3.2%
Long-term investments	95,000	177,500	(82,500)	(46.5%)
Property, plant, and equipment (net)	444,500	470,000	(25,500)	(5.4%)
Intangible assets	50,000	50,000	—	—
Total assets	$1,139,500	$1,230,500	$ (91,000)	(7.4%)
Liabilities				
Current liabilities	$ 210,000	$ 243,000	$ (33,000)	(13.6%)
Long-term liabilities	100,000	200,000	(100,000)	(50.0%)
Total liabilities	$ 310,000	$ 443,000	$(133,000)	(30.0%)
Stockholders' Equity				
Preferred 6% stock, $100 par	$ 150,000	$ 150,000	—	—
Common stock, $10 par	500,000	500,000	—	—
Retained earnings	179,500	137,500	$ 42,000	30.5%
Total stockholders' equity	$ 829,500	$ 787,500	$ 42,000	5.3%
Total liabilities and stockholders' equity	$1,139,500	$1,230,500	$ (91,000)	(7.4%)

Exhibit 1 indicates that total assets decreased by $91,000 (7.4%), liabilities decreased by $133,000 (30.0%), and stockholders' equity increased by $42,000 (5.3%). It appears that most of the decrease in long-term liabilities of $100,000 was achieved through the sale of long-term investments.

The balance sheets in Exhibit 1 may be expanded or supported by a separate schedule that includes the individual asset and liability accounts. For example, Exhibit 2 is a supporting schedule of Lincoln's current asset accounts.

Exhibit 2 indicates that while cash and temporary investments increased, accounts receivable and inventories decreased. The decrease in accounts receivable could be caused by improved collection policies, which would increase cash. The decrease in inventories could be caused by increased sales.

Exhibit 2

Comparative Schedule of Current Assets—Horizontal Analysis

Lincoln Company
Comparative Schedule of Current Assets
December 31, 2010 and 2009

	Dec. 31, 2010	Dec. 31, 2009	Increase (Decrease) Amount	Increase (Decrease) Percent
Cash	$ 90,500	$ 64,700	$ 25,800	39.9%
Temporary investments	75,000	60,000	15,000	25.0%
Accounts receivable (net)	115,000	120,000	(5,000)	(4.2%)
Inventories	264,000	283,000	(19,000)	(6.7%)
Prepaid expenses	5,500	5,300	200	3.8%
Total current assets	$550,000	$533,000	$ 17,000	3.2%

Exhibit 3 illustrates horizontal analysis for the 2010 and 2009 income statements of Lincoln Company. Exhibit 3 indicates an increase in sales of $296,500, or 24.0%. However, the percentage increase in sales of 24.0% was accompanied by an even greater percentage increase in the cost of goods (merchandise) sold of 27.2%.[1] Thus, gross profit increased by only 19.7% rather than by the 24.0% increase in sales.

Exhibit 3

Comparative Income Statement—Horizontal Analysis

Lincoln Company
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009	Increase (Decrease) Amount	Increase (Decrease) Percent
Sales	$1,530,500	$1,234,000	$296,500	24.0%
Sales returns and allowances	32,500	34,000	(1,500)	(4.4%)
Net sales	$1,498,000	$1,200,000	$298,000	24.8%
Cost of goods sold	1,043,000	820,000	223,000	27.2%
Gross profit	$ 455,000	$ 380,000	$ 75,000	19.7%
Selling expenses	$ 191,000	$ 147,000	$ 44,000	29.9%
Administrative expenses	104,000	97,400	6,600	6.8%
Total operating expenses	$ 295,000	$ 244,400	$ 50,600	20.7%
Income from operations	$ 160,000	$ 135,600	$ 24,400	18.0%
Other income	8,500	11,000	(2,500)	(22.7%)
	$ 168,500	$ 146,600	$ 21,900	14.9%
Other expense (interest)	6,000	12,000	(6,000)	(50.0%)
Income before income tax	$ 162,500	$ 134,600	$ 27,900	20.7%
Income tax expense	71,500	58,100	13,400	23.1%
Net income	$ 91,000	$ 76,500	$ 14,500	19.0%

1 The term *cost of goods sold* is often used in practice in place of *cost of merchandise sold*. Such usage is followed in this chapter.

Exhibit 3 also indicates that selling expenses increased by 29.9%. Thus, the 24.0% increases in sales could have been caused by an advertising campaign, which increased selling expenses. Administrative expenses increased by only 6.8%, total operating expenses increased by 20.7%, and income from operations increased by 18.0%. Interest expense decreased by 50.0%. This decrease was probably caused by the 50.0% decrease in long-term liabilities (Exhibit 1). Overall, net income increased by 19.0%, a favorable result.

Exhibit 4 illustrates horizontal analysis for the 2010 and 2009 retained earnings statements of Lincoln Company. Exhibit 4 indicates that retained earnings increased by 30.5% for the year. The increase is due to net income of $91,000 for the year, less dividends of $49,000.

Exhibit 4

Comparative Retained Earnings Statement—Horizontal Analysis

Lincoln Company
Comparative Retained Earnings Statement
For the Years Ended December 31, 2010 and 2009

			Increase (Decrease)	
	2010	2009	Amount	Percent
Retained earnings, January 1	$ 137,500	$100,000	$ 37,500	37.5%
Net income for the year	91,000	76,500	14,500	19.0%
Total	$228,500	$ 176,500	$52,000	29.5%
Dividends:				
On preferred stock	$ 9,000	$ 9,000	—	—
On common stock	40,000	30,000	$10,000	33.3%
Total	$ 49,000	$ 39,000	$10,000	25.6%
Retained earnings, December 31	$179,500	$ 137,500	$42,000	30.5%

Example Exercise 14-1 Horizontal Analysis 1

The comparative cash and accounts receivable balances for a company are provided below.

	Dec. 31, 2010	Dec. 31, 2009
Cash	$62,500	$50,000
Accounts receivable (net)	74,400	80,000

Based on this information, what is the amount and percentage of increase or decrease that would be shown in a balance sheet with horizontal analysis?

Follow My Example 14-1

Cash	$12,500 increase ($62,500 − $50,000), or 25%
Accounts receivable	$5,600 decrease ($74,400 − $80,000), or (7%)

For Practice: PE 14-1A, PE 14-1B

Vertical Analysis

The percentage analysis of the relationship of each component in a financial statement to a total within the statement is called **vertical analysis**. Although vertical analysis is applied to a single statement, it may be applied on the same statement over time. This enhances the analysis by showing how the percentages of each item have changed over time.

In vertical analysis of the balance sheet, the percentages are computed as follows:

1. Each asset item is stated as a percent of the total assets.
2. Each liability and stockholders' equity item is stated as a percent of the total liabilities and stockholders' equity.

Exhibit 5 illustrates the vertical analysis of the December 31, 2010 and 2009 balance sheets of Lincoln Company. Exhibit 5 indicates that current assets have increased from 43.3% to 48.3% of total assets. Long-term investments decreased from 14.4% to 8.3% of total assets. Stockholders' equity increased from 64.0% to 72.8% with a comparable decrease in liabilities.

Exhibit 5

Comparative Balance Sheet—Vertical Analysis

Lincoln Company
Comparative Balance Sheet
December 31, 2010 and 2009

	Dec. 31, 2010		Dec. 31, 2009	
	Amount	Percent	Amount	Percent
Assets				
Current assets	$ 550,000	48.3%	$ 533,000	43.3%
Long-term investments	95,000	8.3	177,500	14.4
Property, plant, and equipment (net)	444,500	39.0	470,000	38.2
Intangible assets	50,000	4.4	50,000	4.1
Total assets	$1,139,500	100.0%	$1,230,500	100.0%
Liabilities				
Current liabilities	$ 210,000	18.4%	$ 243,000	19.7%
Long-term liabilities	100,000	8.8	200,000	16.3
Total liabilities	$ 310,000	27.2%	$ 443,000	36.0%
Stockholders' Equity				
Preferred 6% stock, $100 par	$ 150,000	13.2%	$ 150,000	12.2%
Common stock, $10 par	500,000	43.9	500,000	40.6
Retained earnings	179,500	15.7	137,500	11.2
Total stockholders' equity	$ 829,500	72.8%	$ 787,500	64.0%
Total liabilities and stockholders' equity	$1,139,500	100.0%	$1,230,500	100.0%

In a vertical analysis of the income statement, each item is stated as a percent of net sales. Exhibit 6 illustrates the vertical analysis of the 2010 and 2009 income statements of Lincoln Company.

Exhibit 6 indicates a decrease of the gross profit rate from 31.7% in 2009 to 30.4% in 2010. Although this is only a 1.3 percentage point (31.7% − 30.4%) decrease, in dollars of potential gross profit, it represents a decrease of about $19,500 (1.3% × $1,498,000). Thus, a small percentage decrease can have a large dollar effect.

Common-Sized Statements

In a **common-sized statement**, all items are expressed as percentages with no dollar amounts shown. Common-sized statements are often useful for comparing one company with another or for comparing a company with industry averages.

Exhibit 6

Comparative Income Statement—Vertical Analysis

Lincoln Company
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010		2009	
	Amount	Percent	Amount	Percent
Sales	$1,530,500	102.2%	$1,234,000	102.8%
Sales returns and allowances	32,500	2.2	34,000	2.8
Net sales	$1,498,000	100.0%	$1,200,000	100.0%
Cost of goods sold	1,043,000	69.6	820,000	68.3
Gross profit	$ 455,000	30.4%	$ 380,000	31.7%
Selling expenses	$ 191,000	12.8%	$ 147,000	12.3%
Administrative expenses	104,000	6.9	97,400	8.1
Total operating expenses	$ 295,000	19.7%	$ 244,400	20.4%
Income from operations	$ 160,000	10.7%	$ 135,600	11.3%
Other income	8,500	0.6	11,000	0.9
	$ 168,500	11.3%	$ 146,600	12.2%
Other expense (interest)	6,000	0.4	12,000	1.0
Income before income tax	$ 162,500	10.9%	$ 134,600	11.2%
Income tax expense	71,500	4.8	58,100	4.8
Net income	$ 91,000	6.1%	$ 76,500	6.4%

Exhibit 7 illustrates common-sized income statements for Lincoln Company and Madison Corporation. Exhibit 7 indicates that Lincoln Company has a slightly higher rate of gross profit (30.4%) than Madison Corporation (30.0%). However, Lincoln has a higher percentage of selling expenses (12.8%) and administrative expenses (6.9%) than does Madison (11.5% and 4.1%). As a result, the income from operations of Lincoln (10.7%) is less than that of Madison (14.4%).

The unfavorable difference of 3.7 (14.4% − 10.7%) percentage points in income from operations would concern the managers and other stakeholders of Lincoln. The underlying causes of the difference should be investigated and possibly corrected. For example,

Exhibit 7

Common-Sized Income Statement

	Lincoln Company	Madison Corporation
Sales	102.2%	102.3%
Sales returns and allowances	2.2	2.3
Net sales	100.0%	100.0%
Cost of goods sold	69.6	70.0
Gross profit	30.4%	30.0%
Selling expenses	12.8%	11.5%
Administrative expenses	6.9	4.1
Total operating expenses	19.7%	15.6%
Income from operations	10.7%	14.4%
Other income	0.6	0.6
	11.3%	15.0%
Other expense (interest)	0.4	0.5
Income before income tax	10.9%	14.5%
Income tax expense	4.8	5.5
Net income	6.1%	9.0%

Lincoln Company may decide to outsource some of its administrative duties so that its administrative expenses are more comparative to that of Madison Corporation.

Example Exercise 14-2 Vertical Analysis

1

Income statement information for Lee Corporation is provided below.

Sales	$100,000
Cost of goods sold	65,000
Gross profit	$ 35,000

Prepare a vertical analysis of the income statement for Lee Corporation.

Follow My Example 14-2

	Amount	Percentage	
Sales	$100,000	100%	($100,000 ÷ $100,000)
Cost of goods sold	65,000	65	($65,000 ÷ $100,000)
Gross profit	$ 35,000	35%	($35,000 ÷ $100,000)

For Practice: PE 14-2A, PE 14-2B

The percentages of gross profit and net income to sales for a recent fiscal year for Target and Wal-Mart are shown below.

	Target	Wal-Mart
Gross profit to sales	36.9%	24.8%
Net income to sales	5.1%	3.2%

Wal-Mart has a significantly lower gross profit margin percentage than does Target, which is likely due to Wal-Mart's aggressive pricing strategy. However, Target's gross profit margin advantage shrinks when comparing the net income to sales ratio. Target must have larger selling and administrative expenses to sales than does Wal-Mart. Even so, Target's net income to sales is still 1.9 percentage points better than Wal-Mart's net income to sales.

Other Analytical Measures

Other relationships may be expressed in ratios and percentages. Often, these relationships are compared within the same statement and, thus, are a type of vertical analysis. Comparing these items with items from earlier periods is a type of horizontal analysis.

Analytical measures are not ends in themselves. They are only guides in evaluating financial and operating data. Many other factors, such as trends in the industry and general economic conditions, should also be considered when analyzing a company.

2 Use financial statement analysis to assess the solvency of a business.

Solvency Analysis

All users of financial statements are interested in the ability of a company to do the following:

1. Meet its financial obligations (debts), called **solvency**
2. Earn income, called **profitability**

Solvency analysis focuses on the ability of a business to satisfy its current and noncurrent liabilities.

Solvency and profitability are interrelated. For example, a company that cannot pay its debts will have difficulty obtaining credit. A lack of credit will, in turn, limit the company's ability to purchase merchandise or expand operations, which decreases its profitability.

One popular printed source for industry ratios is *Annual Statement Studies* from Risk Management Association. Online analysis is available from Zacks Investment Research site, which is linked to the text's Web site at **www.cengage.com/accounting/warren**.

Solvency analysis focuses on the ability of a company to pay its liabilities. It is normally assessed using the following:

1. Current position analysis
   - Working capital
   - Current ratio
   - Quick ratio
2. Accounts receivable analysis
   - Accounts receivable turnover
   - Number of days' sales in receivables
3. Inventory analysis
   - Inventory turnover
   - Number of days' sales in inventory
4. The ratio of fixed assets to long-term liabilities
5. The ratio of liabilities to stockholders' equity
6. The number of times interest charges are earned

The Lincoln Company financial statements presented earlier are used to illustrate the preceding analyses.

Current Position Analysis

A company's ability to pay its current liabilities is called **current position analysis**. It is of special interest to short-term creditors and includes the computation and analysis of the following:

1. Working capital
2. Current ratio
3. Quick ratio

Working Capital

A company's **working capital** is computed as follows:

$$\text{Working Capital} = \text{Current Assets} - \text{Current Liabilities}$$

To illustrate, the working capital for Lincoln Company for 2010 and 2009 is computed below.

	2010	2009
Current assets	$550,000	$533,000
Less current liabilities	210,000	243,000
Working capital	$340,000	$290,000

The working capital is used to evaluate a company's ability to pay current liabilities. A company's working capital is often monitored monthly, quarterly, or yearly by creditors and other debtors. However, it is difficult to use working capital to compare companies of different sizes. For example, working capital of $250,000 may be adequate for a local hardware store, but it would be inadequate for The Home Depot.

Current Ratio

The **current ratio**, sometimes called the *working capital ratio or banker's ratio*, is computed as follows:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

To illustrate, the current ratio for Lincoln Company is computed below.

	2010	2009
Current assets	$550,000	$533,000
Current liabilities	$210,000	$243,000
Current ratio	2.6 ($550,000/$210,000)	2.2 ($533,000/$243,000)

The current ratio is a more reliable indicator of the ability to pay current liabilities than is working capital. To illustrate, assume that as of December 31, 2010, the working capital of a competitor is much greater than $340,000, but its current ratio is only 1.3. Considering these facts alone, Lincoln Company, with its current ratio of 2.6, is in a more favorable position to obtain short-term credit than the competitor, which has the greater amount of working capital.

Microsoft Corporation maintains a high quick ratio—1.9 for a recent year. Microsoft's stable and profitable software business has allowed it to develop a strong cash position coupled with no short-term notes payable.

Quick Ratio One limitation of working capital and the current ratio is that they do not consider the makeup of the current assets. Because of this, two companies may have the same working capital and current ratios, but differ significantly in their ability to pay their current liabilities.

To illustrate, the current assets and liabilities for Lincoln Company and Jefferson Corporation as of December 31, 2010, are as follows:

	Lincoln Company	Jefferson Corporation
Current assets:		
Cash	$ 90,500	$ 45,500
Temporary investments	75,000	25,000
Accounts receivable (net)	115,000	90,000
Inventories	264,000	380,000
Prepaid expenses	5,500	9,500
Total current assets	$550,000	$550,000
Total current assets	$550,000	$550,000
Less current liabilities	210,000	210,000
Working capital	$340,000	$340,000
Current ratio ($550,000/$210,000)	2.6	2.6

Lincoln and Jefferson both have a working capital of $340,000 and current ratios of 2.6. Jefferson, however, has more of its current assets in inventories. These inventories must be sold and the receivables collected before all the current liabilities can be paid. This takes time. In addition, if the market for its product declines, Jefferson may have difficulty selling its inventory. This, in turn, could impair its ability to pay its current liabilities.

In contrast, Lincoln's current assets contain more cash, temporary investments, and accounts receivable, which can easily be converted to cash. Thus, Lincoln is in a stronger current position than Jefferson to pay its current liabilities.

A ratio that measures the "instant" debt-paying ability of a company is the **quick ratio**, sometimes called the *acid-test ratio*. The quick ratio is computed as follows:

$$\text{Quick Ratio} = \frac{\text{Quick Assets}}{\text{Current Liabilities}}$$

Quick assets are cash and other current assets that can be easily converted to cash. Quick assets normally include cash, temporary investments, and receivables.

To illustrate, the quick ratio for Lincoln Company is computed below.

	2010	2009
Quick assets:		
Cash	$ 90,500	$ 64,700
Temporary investments	75,000	60,000
Accounts receivable (net)	115,000	120,000
Total quick assets	$280,500	$244,700
Current liabilities	$210,000	$243,000
Quick ratio	1.3*	1.0**

*1.3 = $280,500 ÷ $210,000
**1.0 = $244,700 ÷ $243,000

Example Exercise 14-3 Current Position Analysis 2

The following items are reported on a company's balance sheet:

Cash	$300,000
Temporary investments	100,000
Accounts receivable (net)	200,000
Inventory	200,000
Accounts payable	400,000

Determine (a) the current ratio and (b) the quick ratio.

Follow My Example 14-3

a. Current Ratio = Current Assets ÷ Current Liabilities
Current Ratio = ($300,000 + $100,000 + $200,000 + $200,000) ÷ $400,000
Current Ratio = 2.0

b. Quick Ratio = Quick Assets ÷ Current Liabilities
Quick Ratio = ($300,000 + $100,000 + $200,000) ÷ $400,000
Quick Ratio = 1.5

For Practice: PE 14-3A, PE 14-3B

Accounts Receivable Analysis

A company's ability to collect its accounts receivable is called **accounts receivable analysis**. It includes the computation and analysis of the following:

1. Accounts receivable turnover
2. Number of days' sales in receivables

Collecting accounts receivable as quickly as possible improves a company's solvency. In addition, the cash collected from receivables may be used to improve or expand operations. Quick collection of receivables also reduces the risk of uncollectible accounts.

Accounts Receivable Turnover

The **accounts receivable turnover** is computed as follows:

$$\text{Accounts Receivable Turnover} = \frac{\text{Net Sales}^2}{\text{Average Accounts Receivable}}$$

To illustrate, the accounts receivable turnover for Lincoln Company for 2010 and 2009 is computed below.

	2010	2009
Net sales	$1,498,000	$1,200,000
Accounts receivable (net):		
Beginning of year	$ 120,000	$ 140,000
End of year	115,000	120,000
Total	$ 235,000	$ 260,000
Average accounts receivable	$117,500 ($235,000 ÷ 2)	$130,000 ($260,000 ÷ 2)
Accounts receivable turnover	12.7 ($1,498,000 ÷ $117,500)	9.2 ($1,200,000 ÷ $130,000)

The increase in Lincoln's accounts receivable turnover from 9.2 to 12.7 indicates that the collection of receivables has improved during 2010. This may be due to a change in how credit is granted, collection practices, or both.

For Lincoln Company, the average accounts receivable was computed using the accounts receivable balance at the beginning and the end of the year. When sales are seasonal and, thus, vary throughout the year, monthly balances of receivables are often

2 If known, *credit* sales should be used in the numerator. Because credit sales are not normally known by external users, we use net sales in the numerator.

used. Also, if sales on account include notes receivable as well as accounts receivable, notes and accounts receivables are normally combined for analysis.

Number of Days' Sales in Receivables The **number of days' sales in receivables** is computed as follows:

$$\text{Number of Days' Sales in Receivables} = \frac{\text{Average Accounts Receivable}}{\text{Average Daily Sales}}$$

where

$$\text{Average Daily Sales} = \frac{\text{Net Sales}}{\text{365 days}}$$

To illustrate, the number of days' sales in receivables for Lincoln Company is computed below.

	2010	2009
Average accounts receivable	$117,500 ($235,000 ÷ 2)	$130,000 ($260,000 ÷ 2)
Average daily sales	$4,104 ($1,498,000 ÷ 365)	$3,288 ($1,200,000 ÷ 365)
Number of days' sales in receivables	28.6 ($117,500 ÷ $4,104)	39.5 ($130,000 ÷ $3,288)

The number of days' sales in receivables is an estimate of the time (in days) that the accounts receivable have been outstanding. The number of days' sales in receivables is often compared with a company's credit terms to evaluate the efficiency of the collection of receivables.

To illustrate, if Lincoln's credit terms are 2/10, n/30, then Lincoln was very *inefficient* in collecting receivables in 2009. In other words, receivables should have been collected in 30 days or less, but were being collected in 39.5 days. Although collections improved during 2010 to 28.6 days, there is probably still room for improvement. On the other hand, if Lincoln's credit terms are n/45, then there is probably little room for improving collections.

Example Exercise 14-4 Accounts Receivable Analysis 2

A company reports the following:

Net sales	$960,000
Average accounts receivable (net)	48,000

Determine (a) the accounts receivable turnover and (b) the number of days' sales in receivables. Round to one decimal place.

Follow My Example 14-4

a. Accounts Receivable Turnover = Sales ÷ Average Accounts Receivable
Accounts Receivable Turnover = $960,000 ÷ $48,000
Accounts Receivable Turnover = 20.0

b. Number of Days' Sales in Receivables = Average Accounts Receivable ÷ Average Daily Sales
Number of Days' Sales in Receivables = $48,000 ÷ ($960,000/365) = $48,000 ÷ $2,630
Number of Days' Sales in Receivables = 18.3 days

For Practice: PE 14-4A, PE 14-4B

Inventory Analysis

A company's ability to manage its inventory effectively is evaluated using **inventory analysis**. It includes the computation and analysis of the following:

1. Inventory turnover
2. Number of days' sales in inventory

Excess inventory decreases solvency by tying up funds (cash) in inventory. In addition, excess inventory increases insurance expense, property taxes, storage costs, and other related expenses. These expenses further reduce funds that could be used elsewhere to improve or expand operations.

Excess inventory also increases the risk of losses because of price declines or obsolescence of the inventory. On the other hand, a company should keep enough inventory in stock so that it doesn't lose sales because of lack of inventory.

Inventory Turnover The **inventory turnover** is computed as follows:

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

To illustrate, the inventory turnover for Lincoln Company for 2010 and 2009 is computed below.

	2010	2009
Cost of goods sold	$1,043,000	$820,000
Inventories:		
Beginning of year	$ 283,000	$311,000
End of year	264,000	283,000
Total	$ 547,000	$594,000
Average inventory	$273,500 ($547,000 ÷ 2)	$297,000 ($594,000 ÷ 2)
Inventory turnover	3.8 ($1,043,000 ÷ $273,500)	2.8 ($820,000 ÷ $297,000)

The increase in Lincoln's inventory turnover from 2.8 to 3.8 indicates that the management of inventory has improved in 2010. The inventory turnover improved because of an increase in the cost of goods sold, which indicates more sales, and a decrease in the average inventories.

What is considered a good inventory turnover varies by type of inventory, companies, and industries. For example, grocery stores have a higher inventory turnover than jewelers or furniture stores. Likewise, within a grocery store, perishable foods have a higher turnover than the soaps and cleansers.

Number of Days' Sales in Inventory The **number of days' sales in inventory** is computed as follows:

$$\text{Number of Days' Sales in Inventory} = \frac{\text{Average Inventory}}{\text{Average Daily Cost of Goods Sold}}$$

where

$$\text{Average Daily Cost of Goods Sold} = \frac{\text{Cost of Goods Sold}}{365 \text{ days}}$$

To illustrate, the number of days' sales in inventory for Lincoln Company is computed below.

	2010	2009
Average inventory	$273,500 ($547,000 ÷ 2)	$297,000 ($594,000 ÷ 2)
Average daily cost of goods sold	$2,858 ($1,043,000 ÷ 365)	$2,247 ($820,000 ÷ 365)
Number of days' sales in inventory	95.7 ($273,500 ÷ $2,858)	132.2 ($297,000 ÷ $2,247)

The number of days' sales in inventory is a rough measure of the length of time it takes to purchase, sell, and replace the inventory. Lincoln's number of days' sales in inventory improved from 132.2 days to 95.7 days during 2010. This is a major improvement in managing inventory.

Example Exercise 14-5 Inventory Analysis 2

A company reports the following:

Cost of goods sold	$560,000
Average inventory	112,000

Determine (a) the inventory turnover and (b) the number of days' sales in inventory. Round to one decimal place.

Follow My Example 14-5

a. Inventory Turnover = Cost of Goods Sold ÷ Average Inventory
Inventory Turnover = $560,000 ÷ $112,000
Inventory Turnover = 5.0

b. Number of Days' Sales in Inventory = Average Inventory ÷ Average Daily Cost of Goods Sold
Number of Days' Sales in Inventory = $112,000 ÷ ($560,000/365) = $112,000 ÷ $1,534
Number of Days' Sales in Inventory = 73.0 days

For Practice: PE 14-5A, PE 14-5B

Ratio of Fixed Assets to Long-Term Liabilities

The **ratio of fixed assets to long-term liabilities** provides a measure of whether noteholders or bondholders will be paid. Since fixed assets are often pledged as security for long-term notes and bonds, it is computed as follows:

$$\text{Ratio of Fixed Assets to Long-Term Liabilities} = \frac{\text{Fixed Assets (net)}}{\text{Long-Term Liabilities}}$$

To illustrate, the ratio of fixed assets to long-term liabilities for Lincoln Company is computed below.

	2010	2009
Fixed assets (net)	$444,500	$470,000
Long-term liabilities	$100,000	$200,000
Ratio of fixed assets to long-term liabilities	4.4 ($444,500 ÷ $100,000)	2.4 ($470,000 ÷ $200,000)

During 2010, Lincoln's ratio of fixed assets to long-term liabilities increased from 2.4 to 4.4. This increase was due primarily to Lincoln paying off one-half of its long-term liabilities in 2010.

Ratio of Liabilities to Stockholders' Equity

The ratio of liabilities to stockholders' equity varies across industries as in the following examples:

Continental Airlines	31.6
Procter & Gamble	1.1
Circuit City Stores, Inc.	1.2

The **ratio of liabilities to stockholders' equity** measures how much of the company is financed by debt and equity. It is computed as follows:

$$\text{Ratio of Liabilities to Stockholders' Equity} = \frac{\text{Total Liabilities}}{\text{Total Stockholders' Equity}}$$

To illustrate, the ratio of liabilities to stockholders' equity for Lincoln Company is computed below.

	2010	2009
Total liabilities	$310,000	$443,000
Total stockholders' equity	$829,500	$787,500
Ratio of liabilities to stockholders' equity	0.4 ($310,000 ÷ $829,500)	0.6 ($443,000 ÷ $787,500)

Lincoln's ratio of liabilities to stockholders' equity decreased from 0.6 to 0.4 during 2010. This is an improvement and indicates that Lincoln's creditors have an adequate margin of safety.

Example Exercise 14-6 Long-Term Solvency Analysis 2

The following information was taken from Acme Company's balance sheet:

Fixed assets (net)	$1,400,000
Long-term liabilities	400,000
Total liabilities	560,000
Total stockholders' equity	1,400,000

Determine the company's (a) ratio of fixed assets to long-term liabilities and (b) ratio of liabilities to total stockholders' equity.

Follow My Example 14-6

a. Ratio of Fixed Assets to Long-Term Liabilities = Fixed Assets ÷ Long-Term Liabilities
Ratio of Fixed Assets to Long-Term Liabilities = $1,400,000 ÷ $400,000
Ratio of Fixed Assets to Long-Term Liabilities = 3.5

b. Ratio of Liabilities to Total Stockholders' Equity = Total Liabilities ÷ Total Stockholders' Equity
Ratio of Liabilities to Total Stockholders' Equity = $560,000 ÷ $1,400,000
Ratio of Liabilities to Total Stockholders' Equity = 0.4

For Practice: PE 14-6A, PE 14-6B

Number of Times Interest Charges Are Earned

The **number of times interest charges are earned**, sometimes called the *fixed charge coverage ratio*, measures the risk that interest payments will not be made if earnings decrease. It is computed as follows:

$$\text{Number of Times Interest Charges Are Earned} = \frac{\text{Income Before Income Tax} + \text{Interest Expense}}{\text{Interest Expense}}$$

Interest expense is paid before income taxes. In other words, interest expense is deducted in determining taxable income and, thus, income tax. For this reason, income *before taxes* is used in computing the number of times interest charges are earned.

The *higher* the ratio the more likely interest payments will be paid if earnings decrease. To illustrate, the number of times interest charges are earned for Lincoln Company is computed below.

	2010	2009
Income before income tax	$162,500	$134,600
Add interest expense	6,000	12,000
Amount available to pay interest	$168,500	$146,600
Number of times interest charges earned	28.1 ($168,500 ÷ $6,000)	12.2 ($146,600 ÷ $12,000)

The number of times interest charges are earned improved from 12.2 to 28.1 during 2010. This indicates that Lincoln Company has sufficient earnings to pay interest expense.

The number of times interest charges are earned can be adapted for use with dividends on preferred stock. In this case, the *number of times preferred dividends are earned* is computed as follows:

$$\text{Number of Times Preferred Dividends Are Earned} = \frac{\text{Net Income}}{\text{Preferred Dividends}}$$

Since dividends are paid after taxes, net income is used in computing the number of times preferred dividends are earned. The *higher* the ratio, the more likely preferred dividends payments will be paid if earnings decrease.

Example Exercise 14-7 Times Interest Charges Are Earned 2

A company reports the following:

Income before income tax	$250,000
Interest expense	100,000

Determine the number of times interest charges are earned.

Follow My Example 14-7

Number of Times Interest Charges Are Earned = (Income Before Income Tax + Interest Expense) ÷ Interest Expense
Number of Times Interest Charges Are Earned = ($250,000 + $100,000) ÷ $100,000
Number of Times Interest Charges Are Earned = 3.5

For Practice: PE 14-7A, PE 14-7B

3 Use financial statement analysis to assess the profitability of a business.

Profitability Analysis

Profitability analysis focuses on the ability of a company to earn profits. This ability is reflected in the company's operating results, as reported in its income statement. The ability to earn profits also depends on the assets the company has available for use in its operations, as reported in its balance sheet. Thus, income statement and balance sheet relationships are often used in evaluating profitability.

Common profitability analyses include the following:

1. Ratio of net sales to assets
2. Rate earned on total assets
3. Rate earned on stockholders' equity
4. Rate earned on common stockholders' equity
5. Earnings per share on common stock
6. Price-earnings ratio
7. Dividends per share
8. Dividend yield

Profitability analysis focuses on the relationship between operating results and the resources available to a business.

Ratio of Net Sales to Assets

The **ratio of net sales to assets** measures how effectively a company uses its assets. It is computed as follows:

$$\text{Ratio of Net Sales to Assets} = \frac{\text{Net Sales}}{\text{Average Total Assets (excluding long-term investments)}}$$

As shown above, any long-term investments are excluded in computing the ratio of net sales to assets. This is because long-term investments are unrelated to normal operations and net sales.

To illustrate, the ratio of net sales to assets for Lincoln Company is computed below.

	2010	2009
Net sales	$1,498,000	$1,200,000
Total assets (excluding long-term investments):		
Beginning of year	$1,053,000	$1,010,000
End of year	1,044,500	1,053,000
Total	$2,097,500	$2,063,000
Average total assets	$1,048,750 ($2,097,500 ÷ 2)	$1,031,500 ($2,063,000 ÷ 2)
Ratio of net sales to assets	1.4 ($1,498,000 ÷ $1,048,750)	1.2 ($1,200,000 ÷ $1,031,500)

For Lincoln Company, the average total assets was computed using total assets (excluding long-term investments) at the beginning and the end of the year. The average total assets could also be based on monthly or quarterly averages.

The ratio of net sales to assets indicates that Lincoln's use of its operating assets has improved in 2010. This was due primarily due to the increase in net sales in 2010.

Example Exercise 14-8 Net Sales to Assets 3

A company reports the following:

Net sales	$2,250,000
Average total assets	1,500,000

Determine the ratio of net sales to assets.

Follow My Example 14-8

Ratio of Net Sales to Assets = Net Sales ÷ Average Total Assets
Ratio of Net Sales to Assets = $2,250,000 ÷ $1,500,000
Ratio of Net Sales to Assets = 1.5

For Practice: PE 14-8A, PE 14-8B

Rate Earned on Total Assets

The **rate earned on total assets** measures the profitability of total assets, without considering how the assets are financed. In other words, this rate is not affected by the portion of assets financed by creditors or stockholders. It is computed as follows:

$$\text{Rate Earned on Total Assets} = \frac{\text{Net Income} + \text{Interest Expense}}{\text{Average Total Assets}}$$

The rate earned on total assets is computed by adding interest expense to net income. By adding interest expense to net income, the effect of whether the assets are financed by creditors (debt) or stockholders (equity) is eliminated. Because net income includes any income earned from long-term investments, the average total assets includes long-term investments as well as the net operating assets.

To illustrate, the rate earned on total assets by Lincoln Company is computed below.

	2010	2009
Net income	$ 91,000	$ 76,500
Plus interest expense	6,000	12,000
Total	$ 97,000	$ 88,500
Total assets:		
Beginning of year	$ 1,230,500	$ 1,187,500
End of year	1,139,500	1,230,500
Total	$2,370,000	$2,418,000
Average total assets	$1,185,000 ($2,370,000 ÷ 2)	$1,209,000 ($2,418,000 ÷ 2)
Rate earned on total assets	8.2% ($97,000 ÷ $1,185,000)	7.3% ($88,500 ÷ $1,209,000)

The rate earned on total assets improved from 7.3% to 8.2% during 2010.

The *rate earned on operating assets* is sometimes computed when there are large amounts of nonoperating income and expense. It is computed as follows:

$$\text{Rate Earned on Operating Assets} = \frac{\text{Income from Operations}}{\text{Average Operating Assets}}$$

Since Lincoln Company does not have a significant amount of nonoperating income and expense, the rate earned on operating assets is not illustrated.

Example Exercise 14-9 Rate Earned on Total Assets 3

A company reports the following income statement and balance sheet information for the current year:

Net income	$ 125,000
Interest expense	25,000
Average total assets	2,000,000

Determine the rate earned on total assets.

Follow My Example 14-9

Rate Earned on Total Assets = (Net Income + Interest Expense) ÷ Average Total Assets
Rate Earned on Total Assets = ($125,000 + $25,000) ÷ $2,000,000
Rate Earned on Total Assets = $150,000 ÷ $2,000,000
Rate Earned on Total Assets = 7.5%

For Practice: PE 14-9A, PE 14-9B

Rate Earned on Stockholders' Equity

The **rate earned on stockholders' equity** measures the rate of income earned on the amount invested by the stockholders. It is computed as follows:

$$\text{Rate Earned on Stockholders' Equity} = \frac{\text{Net Income}}{\text{Average Total Stockholders' Equity}}$$

To illustrate, the rate earned on stockholders' equity for Lincoln Company is computed below.

	2010	2009
Net income	$ 91,000	$ 76,500
Stockholders' equity:		
Beginning of year	$ 787,500	$ 750,000
End of year	829,500	787,500
Total	$1,617,000	$1,537,500
Average stockholders' equity	$808,500 ($1,617,000 ÷ 2)	$768,750 ($1,537,500 ÷ 2)
Rate earned on stockholders' equity	11.3% ($91,000 ÷ $808,500)	10.0% ($76,500 ÷ $768,750)

The rate earned on stockholders' equity improved from 10.0% to 11.3% during 2010.

Leverage involves using debt to increase the return on an investment. The rate earned on stockholders' equity is normally higher than the rate earned on total assets. This is because of the effect of leverage.

For Lincoln Company, the effect of leverage for 2010 is 3.1%, computed as follows:

Rate earned on stockholders' equity	11.3%
Less rate earned on total assets	8.2
Effect of leverage	3.1%

Exhibit 8 shows the 2010 and 2009 effects of leverage for Lincoln Company.

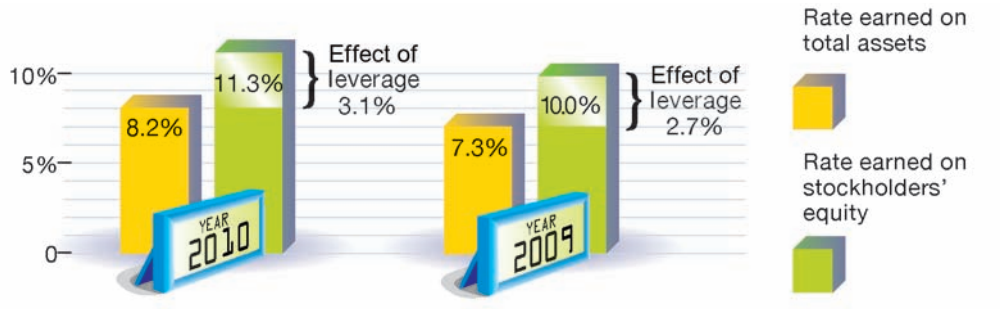
The approximate rates earned on assets and stockholders' equity for Molson Coors Brewing Company and Anheuser-Busch Companies, Inc., for a recent fiscal year are shown below.

	Molson Coors	Anheuser-Busch
Rate earned on assets	4.3%	14.6%
Rate earned on stockholders' equity	6.5%	51.6%

Anheuser-Busch has been more profitable and has benefited from a greater use of leverage than has Molson Coors.

Exhibit 8

Effect of Leverage



Rate Earned on Common Stockholders' Equity

The **rate earned on common stockholders' equity** measures the rate of profits earned on the amount invested by the common stockholders. It is computed as follows:

$$\text{Rate Earned on Common Stockholders' Equity} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Average Common Stockholders' Equity}}$$

Because preferred stockholders rank ahead of the common stockholders in their claim on earnings, any preferred dividends are subtracted from net income in computing the rate earned on common stockholders' equity.

To illustrate, the rate earned on common stockholders' equity for Lincoln Company is computed below.

	2010	2009
Net income	$ 91,000	$ 76,500
Less preferred dividends	9,000	9,000
Total	$ 82,000	$ 67,500
Common stockholders' equity:		
Beginning of year	$ 637,500	$ 600,000
End of year	679,500	637,500
Total	$1,317,000	$1,237,500
Average common stockholders' equity	$ 658,500 ($1,317,000 ÷ 2)	$618,750 ($1,237,500 ÷ 2)
Rate earned on common stockholders' equity	12.5% ($82,000 ÷ $658,500)	10.9% ($67,500 ÷ $ 618,750)

Lincoln Company had $150,000 of 6% preferred stock outstanding on December 31, 2010 and 2009. Thus, preferred dividends of $9,000 ($150,000 × 6%) were deducted from net income. Lincoln's common stockholders' equity was determined as follows:

	December 31		
	2010	2009	2008
Common stock, $10 par	$500,000	$500,000	$500,000
Retained earnings	179,500	137,500	100,000
Common stockholders' equity	$679,500	$637,500	$600,000

The retained earnings on December 31, 2008, of $100,000 is the same as the retained earnings on January 1, 2009, as shown in Lincoln's retained earnings statement in Exhibit 4.

Lincoln Company's rate earned on common stockholders' equity improved from 10.9% to 12.5% in 2010. This rate differs from the rates earned by Lincoln Company on total assets and stockholders' equity as shown below.

	2010	2009
Rate earned on total assets	8.2%	7.3%
Rate earned on stockholders' equity	11.3%	10.0%
Rate earned on common stockholders' equity	12.5%	10.9%

These rates differ because of leverage, as discussed in the preceding section.

Example Exercise 14-10 Common Stockholders' Profitability Analysis 3

A company reports the following:

Net income	$ 125,000
Preferred dividends	5,000
Average stockholders' equity	1,000,000
Average common stockholders' equity	800,000

Determine (a) the rate earned on stockholders' equity and (b) the rate earned on common stockholders' equity.

Follow My Example 14-10

a. Rate Earned on Stockholders' Equity = Net Income ÷ Average Stockholders' Equity
Rate Earned on Stockholders' Equity = $125,000 ÷ $1,000,000
Rate Earned on Stockholders' Equity = 12.5%

b. Rate Earned on Common Stockholders' Equity = (Net Income − Preferred Dividends) ÷ Average Common Stockholders' Equity
Rate Earned on Common Stockholders' Equity = ($125,000 − $5,000) ÷ $800,000
Rate Earned on Common Stockholders' Equity = 15%

For Practice: PE 14-10A, PE 14-10B

Earnings Per Share on Common Stock

Earnings per share (EPS) on common stock measures the share of profits that are earned by a share of common stock. Generally accepted accounting principles (GAAP) require the reporting of earnings per share in the income statement.[3] As a result, earnings per share (EPS) is often reported in the financial press. It is computed as follows:

$$\text{Earnings per Share (EPS) on Common Stock} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Shares of Common Stock Outstanding}}$$

When preferred and common stock are outstanding, preferred dividends are subtracted from net income to determine the income related to the common shares.

To illustrate, the earnings per share (EPS) of common stock for Lincoln Company is computed below.

	2010	2009
Net income	$91,000	$76,500
Preferred dividends	9,000	9,000
Total	$82,000	$67,500
Shares of common stock outstanding	50,000	50,000
Earnings per share on common stock	$1.64 ($82,000 ÷ 50,000)	$1.35 ($67,500 ÷ 50,000)

Lincoln Company had $150,000 of 6% preferred stock outstanding on December 31, 2010 and 2009. Thus, preferred dividends of $9,000 ($150,000 × 6%) are deducted from net income in computing earnings per share on common stock.

Lincoln did not issue any additional shares of common stock in 2010. If Lincoln had issued additional shares in 2010, a weighted average of common shares outstanding during the year would have been used.

3 *Statement of Financial Accounting Standards No. 128*, "Earnings per Share" (Norwalk, CT: Financial Accounting Standards Board, 1997).

As shown on the previous page, Lincoln's earnings per share (EPS) on common stock improved from $1.35 to $1.64 during 2010.

Lincoln Company has a simple capital structure with only common stock and preferred stock outstanding. Many corporations, however, have complex capital structures with various types of equity securities outstanding, such as convertible preferred stock, stock options, and stock warrants. In such cases, the possible effects of such securities on the shares of common stock outstanding are considered in reporting earnings per share. These possible effects are reported separately as *earnings per common share assuming dilution* or *diluted earnings per share*.[4] This topic is described and illustrated in advanced accounting courses and textbooks.

Price-Earnings Ratio

The **price-earnings (P/E) ratio** on common stock measures a company's future earnings prospects. It is often quoted in the financial press and is computed as follows:

$$\text{Price-Earnings (P/E) Ratio} = \frac{\text{Market Price per Share of Common Stock}}{\text{Earnings per Share on Common Stock}}$$

To illustrate, the price-earnings (P/E) ratio for Lincoln Company is computed below.

	2010	2009
Market price per share of common stock	$41.00	$27.00
Earnings per share on common stock	$1.64	$1.35
Price-earnings ratio on common stock	25 ($41 ÷ $1.64)	20 ($27 ÷ $1.35)

The price-earnings ratio improved from 20 to 25 during 2010. In other words, a share of common stock of Lincoln Company was selling for 20 times earnings per share at the end of 2009. At the end of 2010, the common stock was selling for 25 times earnings per share. This indicates that the market expects Lincoln to experience favorable earnings in the future.

Example Exercise 14-11 Earnings per Share and Price-Earnings Ratio

3

A company reports the following:

Net income	$250,000
Preferred dividends	$15,000
Shares of common stock outstanding	20,000
Market price per share of common stock	$35.00

a. Determine the company's earnings per share on common stock.
b. Determine the company's price-earnings ratio. Round to one decimal place.

Follow My Example 14-11

a. Earnings per Share on Common Stock = (Net Income − Preferred Dividends) ÷ Shares of Common Stock Outstanding
Earnings per Share = ($250,000 − $15,000) ÷ 20,000
Earnings per Share = $11.75

b. Price-Earnings Ratio = Market Price per Share of Common Stock ÷ Earnings per Share on Common Stock
Price-Earnings Ratio = $35.00 ÷ $11.75
Price-Earnings Ratio = 3.0

For Practice: PE 14-11A, PE 14-11B

4 Ibid., pars. 11–39.

The dividends per share, dividend yield, and P/E ratio of a common stock are normally quoted on the daily listing of stock prices in *The Wall Street Journal* and on Yahoo!'s finance Web site.

Dividends Per Share

Dividends per share measures the extent to which earnings are being distributed to common shareholders. It is computed as follows:

$$\text{Dividends per Share} = \frac{\text{Dividends}}{\text{Shares of Common Stock Outstanding}}$$

To illustrate, the dividends per share for Lincoln Company are computed below.

	2010	2009
Dividends	$40,000	$30,000
Shares of common stock outstanding	50,000	50,000
Dividends per share of common stock	$0.80 ($40,000 ÷ 50,000)	$0.60 ($30,000 ÷ 50,000)

The dividends per share of common stock increased from $0.60 to $0.80 during 2010.

Dividends per share are often reported with earnings per share. Comparing the two per-share amounts indicates the extent to which earnings are being retained for use in operations. To illustrate, the dividends and earnings per share for Lincoln Company are shown in Exhibit 9.

Exhibit 9

Dividends and Earnings per Share of Common Stock

Dividend Yield

The **dividend yield** on common stock measures the rate of return to common stockholders from cash dividends. It is of special interest to investors whose objective is to earn revenue (dividends) from their investment. It is computed as follows:

$$\text{Dividend Yield} = \frac{\text{Dividends per Share of Common Stock}}{\text{Market Price per Share of Common Stock}}$$

To illustrate, the dividend yield for Lincoln Company is computed below.

	2010	2009
Dividends per share of common stock	$ 0.80	$ 0.60
Market price per share of common stock	$41.00	$27.00
Dividend yield on common stock	2.0% ($0.80 ÷ $41)	2.2% ($0.60 ÷ $27)

The dividend yield declined slightly from 2.2% to 2.0% in 2010. This decline was primarily due to the increase in the market price of Lincoln's common stock.

Summary of Analytical Measures

Exhibit 10 shows a summary of the solvency and profitability measures discussed in this chapter. The type of industry and the company's operations usually affect which measures are used. In many cases, additional measures are used for a specific

Exhibit 10

Summary of Analytical Measures

Solvency measures:	**Method of Computation**	**Use**
Working Capital	Current Assets − Current Liabilities	To indicate the ability to meet currently maturing obligations
Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	
Quick Ratio	$\frac{\text{Quick Assets}}{\text{Current Liabilities}}$	To indicate instant debt-paying ability
Accounts Receivable Turnover	$\frac{\text{Net Sales}}{\text{Average Accounts Receivable}}$	To assess the efficiency in collecting receivables and in the management of credit
Numbers of Days' Sales in Receivables	$\frac{\text{Average Accounts Receivable}}{\text{Average Daily Sales}}$	
Inventory Turnover	$\frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$	To assess the efficiency in the management of inventory
Number of Days' Sales in Inventory	$\frac{\text{Average Inventory}}{\text{Average Daily Cost of Goods Sold}}$	
Ratio of Fixed Assets to Long-Term Liabilities	$\frac{\text{Fixed Assets (net)}}{\text{Long-Term Liabilities}}$	To indicate the margin of safety to long-term creditors
Ratio of Liabilities to Stockholders' Equity	$\frac{\text{Total Liabilities}}{\text{Total Stockholders' Equity}}$	To indicate the margin of safety to creditors
Number of Times Interest Charges are Earned	$\frac{\text{Income Before Income Tax + Interest Expense}}{\text{Interest Expense}}$	To assess the risk to debtholders in terms of number of times interest charges were earned
Profitability measures:		
Ratio of Net Sales to Assets	$\frac{\text{Net Sales}}{\text{Average Total Assets (excluding long-term investments)}}$	To assess the effectiveness in the use of assets
Rate Earned on Total Assets	$\frac{\text{Net Income + Interest Expense}}{\text{Average Total Assets}}$	To assess the profitability of the assets
Rate Earned on Stockholders' Equity	$\frac{\text{Net Income}}{\text{Average Total Stockholders' Equity}}$	To assess the profitability of the investment by stockholders
Rate Earned on Common Stockholders' Equity	$\frac{\text{Net Income − Preferred Dividends}}{\text{Average Common Stockholders' Equity}}$	To assess the profitability of the investment by common stockholders
Earnings per Share on Common Stock	$\frac{\text{Net Income − Preferred Dividends}}{\text{Shares of Common Stock Outstanding}}$	
Price-Earnings Ratio	$\frac{\text{Market Price per Share of Common Stock}}{\text{Earnings per Share on Common Stock}}$	To indicate future earnings prospects, based on the relationship between market value of common stock and earnings
Dividends per Share	$\frac{\text{Dividends}}{\text{Shares of Common Stock Outstanding}}$	To indicate the extent to which earnings are being distributed to common stockholders
Dividend Yield	$\frac{\text{Dividends per Share of Common Stock}}{\text{Market Price per Share of Common Stock}}$	To indicate the rate of return to common stockholders in terms of dividends

industry. For example, airlines use *revenue per passenger mile* and *cost per available seat* as profitability measures. Likewise, hotels use *occupancy rates* as a profitability measure.

The analytical measures shown in Exhibit 10 are a useful starting point for analyzing a company's solvency and profitability. However, they are not a substitute for sound judgment. For example, the general economic and business environment should always be considered in analyzing a company's future prospects. In addition, any trends and interrelationships among the measures should be carefully studied.

Integrity, Objectivity, and Ethics in Business

ONE BAD APPLE

A recent survey by *CFO* magazine reported that 47% of chief financial officers have been pressured by the chief executive officer to use questionable accounting. In addition, only 38% of those surveyed feel less pressure to use aggressive accounting today than in years past, while 20% believe there is more pressure. Perhaps more troublesome is the chief financial officers' confidence in the quality of financial information, with only 27% being "very confident" in the quality of financial information presented by public companies.

Source: D. Durfee, "It's Better (and Worse) Than You Think," *CFO*, May 3, 2004.

4 Describe the contents of corporate annual reports.

Corporate Annual Reports

Public corporations issue annual reports summarizing their operating activities for the past year and plans for the future. Such annual reports include the financial statements and the accompanying notes. In addition, annual reports normally include the following sections:

1. Management discussion and analysis
2. Report on internal control
3. Report on fairness of the financial statements

Management Discussion and Analysis

Management's Discussion and Analysis (MD&A) is required in annual reports filed with the Securities and Exchange Commission. It includes management's analysis of current operations and its plans for the future. Typical items included in the MD&A include the following:

1. Management's analysis and explanations of any significant changes between the current and prior years' financial statements.
2. Important accounting principles or policies that could affect interpretation of the financial statements, including the effect of changes in accounting principles or the adoption of new accounting principles.
3. Management's assessment of the company's liquidity and the availability of capital to the company.
4. Significant risk exposures that might affect the company.
5. Any "off-balance-sheet" arrangements such as leases not included directly in the financial statements. Such arrangements are discussed in advanced accounting courses and textbooks.

Report on Internal Control

The Sarbanes-Oxley Act of 2002 requires a report on internal control by management. The report states management's responsibility for establishing and maintaining internal control. In addition, management's assessment of the effectiveness of internal controls over financial reporting is included in the report.

Sarbanes-Oxley also requires a public accounting firm to verify management's conclusions on internal control. Thus, two reports on internal control, one by management and one by a public accounting firm, are included in the annual report. In some situations, these may be combined into a single report on internal control.

Report on Fairness of the Financial Statements

All publicly held corporations are required to have an independent audit (examination) of their financial statements. The Certified Public Accounting (CPA) firm that conducts the audit renders an opinion, called the *Report of Independent Registered Public Accounting Firm*, on the fairness of the statements.

An opinion stating that the financial statements present fairly the financial position, results of operations, and cash flows of the company is said to be an *unqualified opinion*, sometimes called a *clean opinion*. Any report other than an unqualified opinion raises a "red flag" for financial statement users and requires further investigation as to its cause.

The annual report of Nike Inc. is shown in Appendix B. The Nike report includes the financial statements as well as the MD&A Report on Internal Control and the Report on Fairness of the Financial Statements.

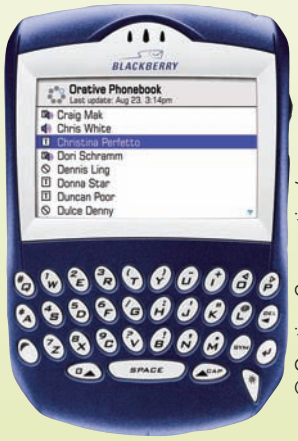
Business Connection

INVESTING STRATEGIES

How do people make investment decisions? Investment decisions, like any major purchase, must meet the needs of the buyer. For example, if you have a family of five and are thinking about buying a new car, you probably wouldn't buy a two-seat sports car. It just wouldn't meet your objectives or fit your lifestyle. Alternatively, if you are a young single person, a minivan might not meet your immediate needs. Investors buy stocks in the same way, buying stocks that match their investment style and their financial needs. Two common approaches are value and growth investing.

VALUE INVESTING

Value investors search for undervalued stocks. That is, the investor tries to find companies whose value is not reflected in their stock price. These are typically quiet, "boring" companies with excellent financial performance that are temporarily out of favor in the stock market. This investment approach assumes that the stock's price will eventually rise to match the company's value. The most successful investor of all time, Warren Buffett, uses this approach almost exclusively. Naturally, the key to successful value investing is to accurately determine a stock's value. This will often include analyzing a company's financial ratios, as discussed in this chapter, compared to target ratios and industry norms. For example, the stock of Deckers Outdoor Corporation, the maker of TEVA sport sandals, was selling for $27.43 on December 27, 2005, a value relative to its earnings per share of $2.58. Over the next two years, the company's stock price increased more than 500%, reaching $166.50 on December 27, 2007.



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GROWTH INVESTING

The growth investor tries to identify companies that have the potential to grow sales and earnings through new products, markets, or opportunities. Growth companies are often newer companies that are still unproven but that possess unique technologies or capabilities. The strategy is to purchase these companies before their potential becomes obvious, hoping to profit from relatively large increases in the company's stock price. This approach, however, carries the risk that the growth may not occur. Growth investors use many of the ratios discussed in this chapter to identify high-potential growth companies. For example, in March 2005, Research in Motion Limited, maker of the popular BlackBerry® handheld mobile device, reported earnings per share of $0.37, and the company's stock price was trading near $62 per share. In the following two years, the company's sales increased by 125%, earnings increased to $1.14 per share, and the company's stock price rose above $135 per share.

APPENDIX

Unusual Items on the Income Statement

Generally accepted accounting principles require that unusual items be reported separately on the income statement. This is because such items do not occur frequently and often are unrelated to current operations. Without separate reporting of these items, users of the financial statements might be misled about current and future operations.

Unusual items on the income statement are classified as one of the following:

1. Affecting the *current period* income statement
2. Affecting a *prior period* income statement

Unusual Items Affecting the Current Period's Income Statement

Unusual items affecting the current period's income statement include the following:

1. Discontinued operations
2. Extraordinary items

Discontinued Operations A company may discontinue a segment of its operations by selling or abandoning the operations. For example, a retailer might decide to sell its product only online and, thus, discontinue selling its merchandise at its retail outlets (stores).

Any gain or loss on discontinued operations is reported on the income statement as a *Gain (or loss) from discontinued operations*. It is reported immediately following *Income from continuing operations*.[5]

To illustrate, assume that Jones Corporation produces and sells electrical products, hardware supplies, and lawn equipment. Because of lack of profits, Jones discontinues its electrical products operation and sells the remaining inventory and other assets at a loss of $100,000. Exhibit 11 illustrates the reporting of the loss on discontinued operations.[6]

In addition, a note accompanying the income statement should describe the operations sold including such details as the date operations were discontinued, the assets sold, and the effect (if any) on current and future operations.

Extraordinary Items An **extraordinary item** is defined as an event or transaction with the following characteristics:

1. Unusual in nature
2. Infrequent in occurrence

Gains and losses from natural disasters such as floods, earthquakes, and fires are normally reported as extraordinary items, provided that they occur infrequently. Gains or losses from land or buildings taken (condemned) for public use are also reported as extraordinary items.

5 *Statement of Financial Accounting Standards No. 144*, "Accounting for the Impairment or Disposal of Long-Lived Assets" (Norwalk, CT: Financial Accounting Standards Board, 2001).

6 The gain or loss on discontinued operations is reported net of any tax effects. To simplify, the tax effects are not specifically identified in Exhibit 11.

Exhibit 11

Unusual Items in the Income Statement

Jones Corporation Income Statement For the Year Ended December 31, 2010	
Net sales	$12,350,000
Cost of merchandise sold	5,800,000
Gross profit	$ 6,550,000
Selling and administrative expenses	5,240,000
Income from continuing operations before income tax	$ 1,310,000
Income tax expense	620,000
Income from continuing operations	$ 690,000
Loss on discontinued operations	100,000
Income before extraordinary items	$ 590,000
Extraordinary items:	
Gain on condemnation of land	150,000
Net income	$ 740,000

Any gain or loss from extraordinary items is reported on the income statement as *Gain (or loss) from extraordinary item*. It is reported immediately following *Income from continuing operations* and any *Gain (or loss) on discontinued operations*.

To illustrate, assume that land owned by Jones Corporation was condemned by the local government. The condemnation of the land resulted in a gain of $150,000. Exhibit 11 illustrates the reporting of the extraordinary gain.[7]

Reporting Earnings per Share Earnings per common share should be reported separately for discontinued operations and extraordinary items. To illustrate, a partial income statement for Jones Corporation is shown in Exhibit 12.

Exhibit 12 reports earnings per common share for income from continuing operations, discontinued operations, and extraordinary items. However, only earnings per share for income from continuing operations and net income are required by generally accepted accounting principles. The other per-share amounts may be presented in the notes to the financial statements.[8]

Exhibit 12

Income Statement with Earnings per Share

Jones Corporation Income Statement For the Year Ended December 31, 2010	
Earnings per common share:	
Income from continuing operations	$3.45
Loss on discontinued operations	0.50
Income before extraordinary items	$2.95
Extraordinary items:	
Gain on condemnation of land	0.75
Net income	$3.70

7 The gain or loss on extraordinary operations is reported net of any tax effects.

8 *Statement of Financial Accounting Standards No. 128*, op. cit., pars. 36 and 37.

Unusual Items Affecting the Prior Period's Income Statement

An unusual item may occur that affects a prior period's income statement. Two such items are as follows:

1. Errors in applying generally accepted accounting principles
2. Changes from one generally accepted accounting principle to another[9]

If an error is discovered in a prior period's financial statement, the prior-period statement and all following statements are restated and thus corrected.

A company may change from one generally accepted accounting principle to another. In this case, the prior-period financial statements are restated as if the new accounting principle had always been used.

For both of the preceding items, the current-period earnings are not affected. That is, only the earnings reported in prior periods are restated. However, because the prior earnings are restated, the beginning balance of Retained Earnings may also have to be restated. This, in turn, may cause the restatement of other balance sheet accounts. Illustrations of these types of adjustments and restatements are provided in advanced accounting courses.

9 *Statement of Finanical Accounting Standards No. 154*, "Accounting Changes and Error Corrections" (Norwalk, CT: Finanical Accounting Standards Board, 2005).

1 Describe basic financial statement analytical methods.

Key Points

The basic financial statements provide much of the information users need to make economic decisions. Analytical procedures are used to compare items on a current financial statement with related items on earlier statements, or to examine relationships within a financial statement.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Prepare a horizontal analysis from a company's financial statements.	**14-1**	14-1A, 14-1B
• Prepare a vertical analysis from a company's financial statements.	**14-2**	14-2A, 14-2B
• Prepare common-sized financial statements.		

2 Use financial statement analysis to assess the solvency of a business.

Key Points

All users of financial statements are interested in the ability of a business to pay its debts (solvency) and earn income (profitability). Solvency and profitability are interrelated. Solvency analysis is normally assessed by examining the following balance sheet relationships: (1) current position analysis, (2) accounts receivable analysis, (3) inventory analysis, (4) the ratio of fixed assets to long-term liabilities, (5) the ratio of liabilities to stockholders' equity, and (6) the number of times interest charges are earned.

Key Learning Outcomes	Example Exercises	Practice Exercises
• Determine working capital.		
• Compute and interpret the current ratio.	**14-3**	14-3A, 14-3B
• Compute and interpret the quick ratio.	**14-3**	14-3A, 14-3B
• Compute and interpret accounts receivable turnover.	**14-4**	14-4A, 14-4B
• Compute and interpret number of days' sales in receivables.	**14-4**	14-4A, 14-4B
• Compute and interpret inventory turnover.	**14-5**	14-5A, 14-5B
• Compute and interpret number of days' sales in inventory.	**14-5**	14-5A, 14-5B
• Compute and interpret the ratio of fixed assets to long-term liabilities.	**14-6**	14-6A, 14-6B
• Compute and interpret the ratio of liabilities to stockholders' equity.	**14-6**	14-6A, 14-6B
• Compute and interpret the number of times interest charges are earned.	**14-7**	14-7A, 14-7B

3 Use financial statement analysis to assess the profitability of a business.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Profitability analysis focuses mainly on the relationship between operating results (income statement) and resources available (balance sheet). Major analyses include (1) the ratio of net sales to assets, (2) the rate earned on total assets, (3) the rate earned on stockholders' equity, (4) the rate earned on common stockholders' equity, (5) earnings per share on common stock, (6) the price-earnings ratio, (7) dividends per share, and (8) dividend yield.	• Compute and interpret the ratio of net sales to assets.	**14-8**	14-8A, 14-8B
	• Compute and interpret the rate earned on total assets.	**14-9**	14-9A, 14-9B
	• Compute and interpret the rate earned on stockholders' equity.	**14-10**	14-10A, 14-10B
	• Compute and interpret the rate earned on common stockholders' equity.	**14-10**	14-10A, 14-10B
	• Compute and interpret the earnings per share on common stock.	**14-11**	14-11A, 14-11B
	• Compute and interpret the price-earnings ratio.	**14-11**	14-11A, 14-11B
	• Compute and interpret the dividends per share and dividend yield.		
	• Describe the uses and limitations of analytical measures.		

4 Describe the contents of corporate annual reports.

Key Points	Key Learning Outcomes	Example Exercises	Practice Exercises
Corporations normally issue annual reports to their stockholders and other interested parties. Such reports summarize the corporation's operating activities for the past year and plans for the future.	• Describe the elements of a corporate annual report.		

Key Terms

accounts receivable analysis (593)
accounts receivable turnover (593)
common-sized statement (588)
current position analysis (591)
current ratio (591)
dividend yield (604)
dividends per share (604)
earnings per share (EPS) on common stock (602)
horizontal analysis (585)
inventory analysis (594)
inventory turnover (595)
Management's Discussion and Analysis (MD&A) (606)
number of days' sales in inventory (595)
number of days' sales in receivables (594)
number of times interest charges are earned (597)
price-earnings (P/E) ratio (603)
profitability (590)
quick assets (592)
quick ratio (592)
rate earned on common stockholders' equity (601)
rate earned on stockholders' equity (600)
rate earned on total assets (599)
ratio of fixed assets to long-term liabilities (596)
ratio of liabilities to stockholders' equity (596)
ratio of net sales to assets (598)
solvency (590)
vertical analysis (587)
working capital (591)

Illustrative Problem

Rainbow Paint Co.'s comparative financial statements for the years ending December 31, 2010 and 2009, are as follows. The market price of Rainbow Paint Co.'s common stock was $30 on December 31, 2009, and $25 on December 31, 2010.

Rainbow Paint Co.
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales	$5,125,000	$ 3,257,600
Sales returns and allowances	125,000	57,600
Net sales	$5,000,000	$3,200,000
Cost of goods sold	3,400,000	2,080,000
Gross profit	$1,600,000	$1,120,000
Selling expenses	$ 650,000	$ 464,000
Administrative expenses	325,000	224,000
Total operating expenses	$ 975,000	$ 688,000
Income from operations	$ 625,000	$ 432,000
Other income	25,000	19,200
	$ 650,000	$ 451,200
Other expense (interest)	105,000	64,000
Income before income tax	$ 545,000	$ 387,200
Income tax expense	300,000	176,000
Net income	$ 245,000	$ 211,200

Rainbow Paint Co.
Comparative Retained Earnings Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Retained earnings, January 1	$723,000	$581,800
Add net income for year	245,000	211,200
Total	$968,000	$793,000
Deduct dividends:		
On preferred stock	$ 40,000	$ 40,000
On common stock	45,000	30,000
Total	$ 85,000	$ 70,000
Retained earnings, December 31	$883,000	$723,000

(*continued*)

Rainbow Paint Co.
Comparative Balance Sheet
December 31, 2010 and 2009

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Current assets:		
Cash	$ 175,000	$ 125,000
Temporary investments	150,000	50,000
Accounts receivable (net)	425,000	325,000
Inventories	720,000	480,000
Prepaid expenses	30,000	20,000
Total current assets	$1,500,000	$1,000,000
Long-term investments	250,000	225,000
Property, plant, and equipment (net)	2,093,000	1,948,000
Total assets	$3,843,000	$3,173,000
Liabilities		
Current liabilities	$ 750,000	$ 650,000
Long-term liabilities:		
Mortgage note payable, 10%, due 2013	$ 410,000	—
Bonds payable, 8%, due 2016	800,000	$ 800,000
Total long-term liabilities	$1,210,000	$ 800,000
Total liabilities	$1,960,000	$1,450,000
Stockholders' Equity		
Preferred 8% stock, $100 par	$ 500,000	$ 500,000
Common stock, $10 par	500,000	500,000
Retained earnings	883,000	723,000
Total stockholders' equity	$1,883,000	$1,723,000
Total liabilities and stockholders' equity	$3,843,000	$3,173,000

Instructions

Determine the following measures for 2010:

1. Working capital
2. Current ratio
3. Quick ratio
4. Accounts receivable turnover
5. Number of days' sales in receivables
6. Inventory turnover
7. Number of days' sales in inventory
8. Ratio of fixed assets to long-term liabilities
9. Ratio of liabilities to stockholders' equity
10. Number of times interest charges are earned
11. Number of times preferred dividends earned
12. Ratio of net sales to assets
13. Rate earned on total assets
14. Rate earned on stockholders' equity
15. Rate earned on common stockholders' equity
16. Earnings per share on common stock
17. Price-earnings ratio
18. Dividends per share
19. Dividend yield

Solution

(Ratios are rounded to the nearest single digit after the decimal point.)

1. Working capital: $750,000
   $1,500,000 − $750,000
2. Current ratio: 2.0
   $1,500,000 ÷ $750,000
3. Quick ratio: 1.0
   $750,000 ÷ $750,000
4. Accounts receivable turnover: 13.3
   $5,000,000 ÷ [($425,000 + $325,000) ÷ 2]
5. Number of days' sales in receivables: 27.4 days
   $5,000,000 ÷ 365 days = $13,699
   $375,000 ÷ $13,699
6. Inventory turnover: 5.7
   $3,400,000 ÷ [($720,000 + $480,000) ÷ 2]
7. Number of days' sales in inventory: 64.4 days
   $3,400,000 ÷ 365 days = $9,315
   $600,000 ÷ $9,315
8. Ratio of fixed assets to long-term liabilities: 1.7
   $2,093,000 ÷ $1,210,000
9. Ratio of liabilities to stockholders' equity: 1.0
   $1,960,000 ÷ $1,883,000
10. Number of times interest charges are earned: 6.2
    ($545,000 + $105,000) ÷ $105,000
11. Number of times preferred dividends earned: 6.1
    $245,000 ÷ $40,000
12. Ratio of net sales to assets: 1.5
    $5,000,000 ÷ [($3,593,000 + $2,948,000) ÷ 2]
13. Rate earned on total assets: 10.0%
    ($245,000 + $105,000) ÷ [($3,843,000 + $3,173,000) ÷ 2]
14. Rate earned on stockholders' equity: 13.6%
    $245,000 ÷ [($1,883,000 + $1,723,000) ÷ 2]
15. Rate earned on common stockholders' equity: 15.7%
    ($245,000 − $40,000) ÷ [($1,383,000 + $1,223,000) ÷ 2]
16. Earnings per share on common stock: $4.10
    ($245,000 − $40,000) ÷ 50,000 shares
17. Price-earnings ratio: 6.1
    $25 ÷ $4.10
18. Dividends per share: $0.90
    $45,000 ÷ 50,000 shares
19. Dividend yield: 3.6%
    $0.90 ÷ $25

Self-Examination Questions (Answers at End of Chapter)

1. What type of analysis is indicated by the following?

	Amount	Percent
Current assets	$100,000	20%
Property, plant, and equipment	400,000	80
Total assets	$500,000	100%

A. Vertical analysis
B. Horizontal analysis
C. Profitability analysis
D. Contribution margin analysis

2. Which of the following measures indicates the ability of a firm to pay its current liabilities?
A. Working capital
B. Current ratio
C. Quick ratio
D. All of the above

3. The ratio determined by dividing total current assets by total current liabilities is the:
A. current ratio.
B. working capital ratio.
C. bankers' ratio.
D. all of the above.

4. The ratio of the quick assets to current liabilities, which indicates the "instant" debt-paying ability of a firm, is the:
   A. current ratio.
   B. working capital ratio.
   C. quick ratio.
   D. bankers' ratio.

5. A measure useful in evaluating efficiency in the management of inventories is the:
   A. working capital ratio.
   B. quick ratio.
   C. number of days' sales in inventory.
   D. ratio of fixed assets to long-term liabilities.

Eye Openers

1. What is the difference between horizontal and vertical analysis of financial statements?
2. What is the advantage of using comparative statements for financial analysis rather than statements for a single date or period?
3. The current year's amount of net income (after income tax) is 20% larger than that of the preceding year. Does this indicate an improved operating performance? Discuss.
4. How would you respond to a horizontal analysis that showed an expense increasing by over 80%?
5. How would the current and quick ratios of a service business compare?
6. For Gray Corporation, the working capital at the end of the current year is $10,000 more than the working capital at the end of the preceding year, reported as follows:

	Current Year	Preceding Year
Current assets:		
Cash, temporary investments, and receivables	$ 80,000	$ 84,000
Inventories	120,000	66,000
Total current assets	$200,000	$150,000
Current liabilities	100,000	60,000
Working capital	$100,000	$ 90,000

Has the current position improved? Explain.

7. Why would the accounts receivable turnover ratio be different between Wal-Mart and Procter & Gamble?
8. A company that grants terms of n/45 on all sales has a yearly accounts receivable turnover, based on monthly averages, of 5. Is this a satisfactory turnover? Discuss.
9. a. Why is it advantageous to have a high inventory turnover?
   b. Is it possible for the inventory turnover to be too high? Discuss.
   c. Is it possible to have a high inventory turnover and a high number of days' sales in inventory? Discuss.
10. What do the following data taken from a comparative balance sheet indicate about the company's ability to borrow additional funds on a long-term basis in the current year as compared to the preceding year?

	Current Year	Preceding Year
Fixed assets (net)	$480,000	$540,000
Total long-term liabilities	120,000	180,000

11. a. How does the rate earned on total assets differ from the rate earned on stockholders' equity?
    b. Which ratio is normally higher? Explain.
12. a. Why is the rate earned on stockholders' equity by a thriving business ordinarily higher than the rate earned on total assets?
    b. Should the rate earned on common stockholders' equity normally be higher or lower than the rate earned on total stockholders' equity? Explain.

13. The net income (after income tax) of McCants Inc. was $20 per common share in the latest year and $80 per common share for the preceding year. At the beginning of the latest year, the number of shares outstanding was doubled by a stock split. There were no other changes in the amount of stock outstanding. What were the earnings per share in the preceding year, adjusted for comparison with the latest year?
14. The price-earnings ratio for the common stock of Breeden Company was 12 at December 31, the end of the current fiscal year. What does the ratio indicate about the selling price of the common stock in relation to current earnings?
15. Why would the dividend yield differ significantly from the rate earned on common stockholders' equity?
16. Favorable business conditions may bring about certain seemingly unfavorable ratios, and unfavorable business operations may result in apparently favorable ratios. For example, Grochoske Company increased its sales and net income substantially for the current year, yet the current ratio at the end of the year is lower than at the beginning of the year. Discuss some possible causes of the apparent weakening of the current position, while sales and net income have increased substantially.
17. Describe two reports provided by independent auditors in the annual report to shareholders.

Practice Exercises

PE 14-1A
Horizontal analysis
obj. 1
EE 14-1 p. 587

The comparative accounts payable and long-term debt balances of a company are provided below.

	2010	2009
Accounts payable	$ 78,400	$70,000
Long-term debt	101,760	96,000

Based on this information, what is the amount and percentage of increase or decrease that would be shown in a balance sheet with horizontal analysis?

PE 14-1B
Horizontal analysis
obj. 1
EE 14-1 p. 587

The comparative temporary investments and inventory balances for a company are provided below.

	2010	2009
Temporary investments	$70,800	$ 60,000
Inventory	99,000	110,000

Based on this information, what is the amount and percentage of increase or decrease that would be shown in a balance sheet with horizontal analysis?

PE 14-2A
Vertical analysis
obj. 1
EE 14-2 p. 590

Income statement information for Sheaf Corporation is provided below.

Sales	$500,000
Gross profit	140,000
Net income	40,000

Prepare a vertical analysis of the income statement for Sheaf Corporation.

PE 14-2B
Vertical analysis
obj. 1
EE 14-2 p. 590

Income statement information for Beowulf Corporation is provided below.

Sales	$600,000
Cost of goods sold	480,000
Gross profit	$120,000

Prepare a vertical analysis of the income statement for Beowulf Corporation.

PE 14-3A
Current position analysis
obj. 2
EE 14-3 p. 593

The following items are reported on a company's balance sheet:

Cash	$190,000
Temporary investments	150,000
Accounts receivable (net)	260,000
Inventory	300,000
Accounts payable	600,000

Determine (a) the current ratio and (b) the quick ratio. Round to one decimal place.

PE 14-3B
Current position analysis
obj. 2
EE 14-3 p. 593

The following items are reported on a company's balance sheet:

Cash	$140,000
Temporary investments	60,000
Accounts receivable (net)	40,000
Inventory	80,000
Accounts payable	160,000

Determine (a) the current ratio and (b) the quick ratio. Round to one decimal place.

PE 14-4A
Accounts receivable analysis
obj. 2
EE 14-4 p. 594

A company reports the following:

Net sales	$560,000
Average accounts receivable (net)	40,000

Determine (a) the accounts receivable turnover and (b) the number of days' sales in receivables. Round to one decimal place.

PE 14-4B
Accounts receivable analysis
obj. 2
EE 14-4 p. 594

A company reports the following:

Net sales	$600,000
Average accounts receivable (net)	60,000

Determine (a) the accounts receivable turnover and (b) the number of days' sales in receivables. Round to one decimal place.

PE 14-5A
Inventory analysis
obj. 2
EE 14-5 p. 596

A company reports the following:

Cost of goods sold	$510,000
Average inventory	60,000

Determine (a) the inventory turnover and (b) the number of days' sales in inventory. Round to one decimal place.

PE 14-5B
Inventory analysis
obj. 2
EE 14-5 p. 596

A company reports the following:

Cost of goods sold	$480,000
Average inventory	80,000

Determine (a) the inventory turnover and (b) the number of days' sales in inventory. Round to one decimal place.

PE 14-6A
Long-term solvency analysis
obj. 2
EE 14-6 p. 597

The following information was taken from Grain Company's balance sheet:

Fixed assets (net)	$600,000
Long-term liabilities	400,000
Total liabilities	600,000
Total stockholders' equity	400,000

Determine the company's (a) ratio of fixed assets to long-term liabilities and (b) ratio of liabilities to stockholders' equity.

PE 14-6B
Long-term solvency analysis
obj. 2
EE 14-6 p. 597

The following information was taken from Shield Company's balance sheet:

Fixed assets (net)	$1,000,000
Long-term liabilities	500,000
Total liabilities	800,000
Total stockholders' equity	800,000

Determine the company's (a) ratio of fixed assets to long-term liabilities and (b) ratio of liabilities to stockholders' equity.

PE 14-7A
Times interest charges are earned
obj. 2
EE 14-7 p. 598

A company reports the following:

Income before income tax	$2,000,000
Interest expense	80,000

Determine the number of times interest charges are earned.

PE 14-7B
Times interest charges are earned
obj. 2
EE 14-7 p. 598

A company reports the following:

Income before income tax	$1,500,000
Interest expense	200,000

Determine the number of times interest charges are earned.

PE 14-8A
Net sales to assets
obj. 3
EE 14-8 p. 599

A company reports the following:

Net sales	$2,400,000
Average total assets	1,600,000

Determine the ratio of net sales to assets.

PE 14-8B
Net sales to assets
obj. 3
EE 14-8 p. 599

A company reports the following:

Net sales	$1,200,000
Average total assets	1,000,000

Determine the ratio of net sales to assets.

PE 14-9A
Rate earned on total assets

obj. 3

EE 14-9 p. 600

A company reports the following income statement and balance sheet information for the current year:

Net income	$ 400,000
Interest expense	20,000
Average total assets	3,500,000

Determine the rate earned on total assets.

PE 14-9B
Rate earned on total assets

obj. 3

EE 14-9 p. 600

A company reports the following income statement and balance sheet information for the current year:

Net income	$ 600,000
Interest expense	75,000
Average total assets	4,500,000

Determine the rate earned on total assets.

PE 14-10A
Common stockholders' profitability analysis

obj. 3

EE 14-10 p. 602

A company reports the following:

Net income	$120,000
Preferred dividends	20,000
Average stockholders' equity	600,000
Average common stockholders' equity	500,000

Determine (a) the rate earned on stockholders' equity and (b) the rate earned on common stockholders' equity. Round to one decimal place.

PE 14-10B
Common stockholders' profitability analysis

obj. 3

EE 14-10 p. 602

A company reports the following:

Net income	$ 180,000
Preferred dividends	12,000
Average stockholders' equity	1,200,000
Average common stockholders' equity	800,000

Determine (a) the rate earned on stockholders' equity and (b) the rate earned on common stockholders' equity. Round to one decimal place.

PE 14-11A
Earnings per share and price-earnings ratio

obj. 3

EE 14-11 p. 603

A company reports the following:

Net income	$340,000
Preferred dividends	$40,000
Shares of common stock outstanding	40,000
Market price per share of common stock	$60.00

a. Determine the company's earnings per share on common stock.
b. Determine the company's price-earnings ratio.

PE 14-11B
Earnings per share and price-earnings ratio

obj. 3

EE 14-11 p. 603

A company reports the following:

Net income	$140,000
Preferred dividends	$20,000
Shares of common stock outstanding	60,000
Market price per share of common stock	$50.00

a. Determine the company's earnings per share on common stock.
b. Determine the company's price-earnings ratio.

Exercises

EX 14-1
Vertical analysis of income statement

obj. 1

✔ a. 2010 net income: $5,000; 1.0% of sales

Revenue and expense data for Rogan Technologies Co. are as follows:

	2010	2009
Sales	$500,000	$440,000
Cost of goods sold	325,000	242,000
Selling expenses	70,000	79,200
Administrative expenses	75,000	70,400
Income tax expense	25,000	26,400

a. Prepare an income statement in comparative form, stating each item for both 2010 and 2009 as a percent of sales. Round to one decimal place.

b. Comment on the significant changes disclosed by the comparative income statement.

EX 14-2
Vertical analysis of income statement

obj. 1

✔ a. Fiscal year 2006 income from continuing operations, 30.7% of revenues

The following comparative income statement (in thousands of dollars) for the fiscal years 2005 and 2006 was adapted from the annual report of Speedway Motorsports, Inc., owner and operator of several major motor speedways, such as the Atlanta, Texas, and Las Vegas Motor Speedways.

	Fiscal Year 2006	Fiscal Year 2005
Revenues:		
Admissions	$175,208	$177,352
Event-related revenue	183,404	168,359
NASCAR broadcasting revenue	162,715	140,956
Other operating revenue	46,038	57,401
Total revenue	$567,365	$544,068
Expenses and other:		
Direct expense of events	$ 95,990	$ 97,042
NASCAR purse and sanction fees	105,826	96,306
Other direct expenses	113,141	102,535
General and administrative	78,070	73,281
Total expenses and other	$393,027	$369,164
Income from continuing operations	$174,338	$174,904

a. Prepare a comparative income statement for fiscal years 2005 and 2006 in vertical form, stating each item as a percent of revenues. Round to one decimal place.

b. Comment on the significant changes.

EX 14-3
Common-sized income statement

obj. 1

✔ a. Sorenson net income: $44,000; 2.2% of sales

Revenue and expense data for the current calendar year for Sorenson Electronics Company and for the electronics industry are as follows. The Sorenson Electronics Company data are expressed in dollars. The electronics industry averages are expressed in percentages.

	Sorenson Electronics Company	Electronics Industry Average
Sales	$2,050,000	102.5%
Sales returns and allowances	50,000	2.5
Net sales	$2,000,000	100.0%
Cost of goods sold	1,100,000	61.0
Gross profit	$ 900,000	39.0%
Selling expenses	$ 560,000	23.0%
Administrative expenses	220,000	10.0
Total operating expenses	$ 780,000	33.0%
Operating income	$ 120,000	6.0%
Other income	44,000	2.2
	$ 164,000	8.2%
Other expense	20,000	1.0
Income before income tax	$ 144,000	7.2%
Income tax	60,000	5.0
Net income	$ 84,000	2.2%

a. Prepare a common-sized income statement comparing the results of operations for Hrothgar Electronics Company with the industry average. Round to one decimal place.
b. As far as the data permit, comment on significant relationships revealed by the comparisons.

EX 14-4
Vertical analysis of balance sheet

obj. 1

✔ Retained earnings, Dec. 31, 2010, 34.0%

Balance sheet data for Hanes Company on December 31, the end of the fiscal year, are shown below.

	2010	2009
Current assets	320,000	200,000
Property, plant, and equipment	560,000	560,000
Intangible assets	120,000	40,000
Current liabilities	210,000	120,000
Long-term liabilities	350,000	300,000
Common stock	100,000	100,000
Retained earnings	340,000	280,000

Prepare a comparative balance sheet for 2010 and 2009, stating each asset as a percent of total assets and each liability and stockholders' equity item as a percent of the total liabilities and stockholders' equity. Round to one decimal place.

EX 14-5
Horizontal analysis of the income statement

obj. 1

✔ a. Net income increase, 95.0%

Income statement data for Grendel Images Company for the years ended December 31, 2010 and 2009, are as follows:

	2010	2009
Sales	$196,000	$160,000
Cost of goods sold	170,100	140,000
Gross profit	$ 25,900	$ 20,000
Selling expenses	$ 12,200	$ 10,000
Administrative expenses	9,750	8,000
Total operating expenses	$ 21,950	$ 18,000
Income before income tax	$ 3,950	$ 2,000
Income tax expenses	2,000	1,000
Net income	$ 1,950	$ 1,000

a. Prepare a comparative income statement with horizontal analysis, indicating the increase (decrease) for 2010 when compared with 2009. Round to one decimal place.
b. What conclusions can be drawn from the horizontal analysis?

EX 14-6
Current position analysis

obj. 2

✔ a. 2010 working capital, $1,000,000

The following data were taken from the balance sheet of Bock Suppliers Company:

	Dec. 31, 2010	Dec. 31, 2009
Cash	$ 295,000	$ 210,000
Temporary investments	315,000	230,000
Accounts and notes receivable (net)	290,000	250,000
Inventories	405,000	309,000
Prepaid expenses	195,000	105,000
Total current assets	$1,500,000	$1,104,000
Accounts and notes payable (short-term)	$ 290,000	$ 320,000
Accrued liabilities	210,000	140,000
Total current liabilities	$ 500,000	$ 460,000

a. Determine for each year (1) the working capital, (2) the current ratio, and (3) the quick ratio. Round ratios to one decimal place.
b. What conclusions can be drawn from these data as to the company's ability to meet its currently maturing debts?

EX 14-7
Current position analysis

obj. 2

✔ a. (1) Dec. 31, 2005 current ratio, 1.1

PepsiCo, Inc., the parent company of Frito-Lay snack foods and Pepsi beverages, had the following current assets and current liabilities at the end of two recent years:

	Dec. 30, 2006 (in millions)	Dec. 31, 2005 (in millions)
Cash and cash equivalents	$1,651	$1,716
Short-term investments, at cost	1,171	3,166
Accounts and notes receivable, net	3,725	3,261
Inventories	1,926	1,693
Prepaid expenses and other current assets	657	618
Short-term obligations	274	2,889
Accounts payable and other current liabilities	6,496	5,971
Income taxes payable	90	546

a. Determine the (1) current ratio and (2) quick ratio for both years. Round to one decimal place.
b. What conclusions can you draw from these data?

EX 14-8
Current position analysis

obj. 2

The bond indenture for the 10-year, 10% debenture bonds dated January 2, 2009, required working capital of $142,000 a current ratio of 1.7, and a quick ratio of 1.2 at the end of each calendar year until the bonds mature. At December 31, 2010, the three measures were computed as follows:

1.	Current assets:		
	Cash	$170,000	
	Temporary investments	80,000	
	Accounts and notes receivable (net)	200,000	
	Inventories	60,000	
	Prepaid expenses	40,000	
	Intangible assets	208,000	
	Property, plant and equipment	92,000	
	Total current assets (net)		$850,000
	Current liabilities:		
	Accounts and short-term notes payable	$160,000	
	Accrued liabilities	340,000	
	Total current liabilities		500,000
	Working capital		$350,000
2.	Current Ratio	1.7	$850,000 ÷ $500,000
3.	Quick Ratio	1.2	$192,000 ÷ $160,000

a. List the errors in the determination of the three measures of current position analysis.
b. Is the company satisfying the terms of the bond indenture?

EX 14-9
Accounts receivable analysis

obj. 2

✔ a. Accounts receivable turnover, 2010, 8.0

The following data are taken from the financial statements of McKee Technology Inc. Terms of all sales are 2/10, n/60.

	2010	2009	2008
Accounts receivable, end of year	$147,500	$158,000	$165,000
Net sales on account	975,000	900,000	

a. Determine for each year (1) the accounts receivable turnover and (2) the number of days' sales in receivables. Round to nearest dollar and one decimal place.
b. What conclusions can be drawn from these data concerning accounts receivable and credit policies?

EX 14-10
Accounts receivable analysis

obj. 2

Xavier Stores Company and Lestrade Stores, Inc., are large retail department stores. Both companies offer credit to their customers through their own credit card operations. Information from the financial statements for both companies for two recent years is as follows (all numbers are in millions):

	Xavier	Lestrade
Merchandise sales	$28,000	$65,000
Credit card receivables—beginning	2,750	15,000
Credit card receviables—ending	2,250	11,000

a. Determine the (1) accounts receivable turnover and (2) the number of days' sales in receivables for both companies. Round to one decimal place.
b. Compare the two companies with regard to their credit card policies.

EX 14-11
Inventory analysis

obj. 2

✔ a. Inventory turnover, current year, 7.4

The following data were extracted from the income statement of Brecca Systems Inc.:

	Current Year	Preceding Year
Sales	$1,139,600	$1,192,320
Beginning inventories	80,000	64,000
Cost of goods sold	569,800	662,400
Ending inventories	74,000	80,000

a. Determine for each year (1) the inventory turnover and (2) the number of days' sales in inventory. Round to nearest dollar and one decimal place.
b. What conclusions can be drawn from these data concerning the inventories?

EX 14-12
Inventory analysis

obj. 2

✔ a. Dell inventory turnover, 76.8

Dell Inc. and Hewlett-Packard Company (HP) compete with each other in the personal computer market. Dell's primary strategy is to assemble computers to customer orders, rather than for inventory. Thus, for example, Dell will build and deliver a computer within four days of a customer entering an order on a Web page. Hewlett-Packard, on the other hand, builds some computers prior to receiving an order, then sells from this inventory once an order is received. Below is selected financial information for both companies from a recent year's financial statements (in millions):

	Dell Inc.	Hewlett-Packard Company
Sales	$57,420	$73,557
Cost of goods sold	47,904	69,427
Inventory, beginning of period	588	6,877
Inventory, end of period	660	7,750

a. Determine for both companies (1) the inventory turnover and (2) the number of days' sales in inventory. Round to one decimal place.
b. Interpret the inventory ratios by considering Dell's and Hewlett-Packard's operating strategies.

EX 14-13
Ratio of liabilities to stockholders' equity and number of times interest charges earned

obj. 2

✔ a. Ratio of liabilities to stockholders' equity, Dec. 31, 2010, 0.6

The following data were taken from the financial statements of Weal Construction Inc. for December 31, 2010 and 2009:

	Dec. 31, 2010	Dec. 31, 2009
Accounts payable	$ 300,000	$ 280,000
Current maturities of serial bonds payable	400,000	400,000
Serial bonds payable, 10%, issued 2005, due 2015	2,000,000	2,400,000
Common stock, $1 par value	100,000	100,000
Paid-in capital in excess of par	1,000,000	1,000,000
Retained earnings	3,400,000	2,750,000

The income before income tax was $720,000 and $560,000 for the years 2010 and 2009, respectively.

a. Determine the ratio of liabilities to stockholders' equity at the end of each year. Round to one decimal place.
b. Determine the number of times the bond interest charges are earned during the year for both years. Round to one decimal place.
c. What conclusions can be drawn from these data as to the company's ability to meet its currently maturing debts?

EX 14-14
Ratio of liabilities to stockholders' equity and number of times interest charges earned

obj. 2

✔ a. Hasbro, 0.9

Hasbro and Mattel, Inc., are the two largest toy companies in North America. Condensed liabilities and stockholders' equity from a recent balance sheet are shown for each company as follows (in thousands):

	Hasbro	Mattel
Current liabilities	$ 905,873	$1,582,520
Long-term debt	494,917	635,714
Other liabilities	—	304,676
Total liabilities	$1,400,790	$2,522,910
Shareholders' equity:		
Common stock	$ 104,847	$ 441,369
Additional paid in capital	322,254	1,613,307
Retained earnings	2,020,348	1,652,140
Accumulated other comprehensive loss and other equity items	11,186	(276,861)
Treasury stock, at cost	(920,475)	(996,981)
Total stockholders' equity	$1,538,160	$2,432,974
Total liabilities and stockholder's equity	$2,938,950	$4,955,884

The income from operations and interest expense from the income statement for both companies were as follows:

	Hasbro	Mattel
Income from operations	$376,363	$728,818
Interest expense	27,521	79,853

a. Determine the ratio of liabilities to stockholders' equity for both companies. Round to one decimal place.
b. Determine the number of times interest charges are earned for both companies. Round to one decimal place.
c. Interpret the ratio differences between the two companies.

EX 14-15
Ratio of liabilities to stockholders' equity and ratio of fixed assets to long-term liabilities

obj. 2

✔ a. H.J. Heinz, 4.4

Recent balance sheet information for two companies in the food industry, H.J. Heinz Company and The Hershey Company, are as follows (in thousands of dollars):

	H.J. Heinz	Hershey
Net property, plant, and equipment	$1,998,153	$1,651,300
Current liabilities	2,505,106	1,453,538
Long-term debt	4,413,641	1,248,128
Other long-term liabilities	1,272,596	486,473
Stockholders' equity	1,841,683	683,423

a. Determine the ratio of liabilities to stockholders' equity for both companies. Round to one decimal place.
b. Determine the ratio of fixed assets to long-term liabilities for both companies. Round to one decimal place.
c. Interpret the ratio differences between the two companies.

EX 14-16
Ratio of net sales to assets

obj. 3

✔ a. YRC Worldwide, 1.7

Three major segments of the transportation industry are motor carriers, such as YRC Worldwide; railroads, such as Union Pacific; and transportation arrangement services, such as C.H. Robinson Worldwide Inc. Recent financial statement information for these three companies is shown as follows (in thousands of dollars):

	YRC Worldwide	Union Pacific	C.H. Robinson Worldwide Inc.
Net sales	$9,918,690	$15,578,000	$6,566,194
Average total assets	5,829,713	36,067,500	1,513,381

a. Determine the ratio of net sales to assets for all three companies. Round to one decimal place.
b. Assume that the ratio of net sales to assets for each company represents their respective industry segment. Interpret the differences in the ratio of net sales to assets in terms of the operating characteristics of each of the respective segments.

EX 14-17
Profitability ratios

obj. 3

✔ a. Rate earned on total assets, 2010, 12.0%

The following selected data were taken from the financial statements of The Sigemund Group Inc. for December 31, 2010, 2009, and 2008:

	December 31		
	2010	2009	2008
Total assets	$3,000,000	$2,700,000	$2,400,000
Notes payable (10% interest)	1,000,000	1,000,000	1,000,000
Common stock	400,000	400,000	400,000
Preferred $6 stock, $100 par (no change during year)	200,000	200,000	200,000
Retained earnings	1,126,000	896,000	600,000

The 2010 net income was $242,000, and the 2009 net income was $308,000. No dividends on common stock were declared between 2008 and 2010.

a. Determine the rate earned on total assets, the rate earned on stockholders' equity, and the rate earned on common stockholders' equity for the years 2009 and 2010. Round to one decimal place.
b. What conclusions can be drawn from these data as to the company's profitability?

EX 14-18
Profitability ratios

obj. 3

✔ a. 2006 rate earned on total assets, 9.5%

Ann Taylor Retail, Inc., sells professional women's apparel through company-owned retail stores. Recent financial information for Ann Taylor is provided below (all numbers in thousands).

	Fiscal Year Ended	
	February 3, 2007	**January 28, 2006**
Net income	$142,982	$81,872
Interest expense	2,230	2,083

	February 3, 2007	**January 28, 2006**	**January 29, 2005**
Total assets	$1,568,503	$1,492,906	$1,327,338
Total stockholders' equity	1,049,911	1,034,482	926,744

Assume the apparel industry average rate earned on total assets is 8.2%, and the average rate earned on stockholders' equity is 10.0% for the year ended February 3, 2007 (fiscal year 2006).

a. Determine the rate earned on total assets for Ann Taylor for the fiscal years ended February 3, 2007, and January 28, 2006. Round to one digit after the decimal place.
b. Determine the rate earned on stockholders' equity for Ann Taylor for the fiscal years ended February 3, 2007, and January 28, 2006. Round to one decimal place.
c. Evaluate the two-year trend for the profitability ratios determined in (a) and (b).
d. Evaluate Ann Taylor's profit performance relative to the industry.

EX 14-19
Six measures of solvency or profitability

objs. 2, 3

✔ c. Ratio of net sales to assets, 5.0

The following data were taken from the financial statements of Heston Enterprises Inc. for the current fiscal year. Assuming that long-term investments totaled $2,100,000 throughout the year and that total assets were $4,000,000 at the beginning of the year, determine the following: (a) ratio of fixed assets to long-term liabilities, (b) ratio of liabilities to stockholders' equity, (c) ratio of net sales to assets, (d) rate earned on total assets, (e) rate earned on stockholders' equity, and (f) rate earned on common stockholders' equity. Round to one decimal place.

Property, plant, and equipment (net)			$ 1,600,000
Liabilities:			
Current liabilities		$ 200,000	
Mortgage note payable, 10%, issued 1999, due 2015		1,000,000	
Total liabilities			$ 1,200,000
Stockholders' equity:			
Preferred $10 stock, $100 par (no change during year)			$ 1,000,000
Common stock, $10 par (no change during year)			1,000,000
Retained earnings:			
Balance, beginning of year	$800,000		
Net income	400,000	$1,200,000	
Preferred dividends	$100,000		
Common dividends	100,000	200,000	
Balance, end of year			1,000,000
Total stockholders' equity			$ 3,000,000
Net sales			$10,000,000
Interest expense			$ 100,000

EX 14-20
Six measures of solvency or profitability

objs. 2, 3

✔ d. Price-earnings ratio, 10.0

The balance sheet for Bearing Industries Inc. at the end of the current fiscal year indicated the following:

Bonds payable, 10% (issued in 2000, due in 2020)	$4,000,000
Preferred $5 stock, $100 par	1,000,000
Common stock, $10 par	2,000,000

Income before income tax was $1,000,000, and income taxes were $150,000, for the current year. Cash dividends paid on common stock during the current year totaled $200,000. The common stock was selling for $40 per share at the end of the year.

Determine each of the following: (a) number of times bond interest charges are earned, (b) number of times preferred dividends are earned, (c) earnings per share on common stock, (d) price-earnings ratio, (e) dividends per share of common stock, and (f) dividend yield. Round to one decimal place except earnings per share, which should be rounded to two decimal places.

EX 14-21
Earnings per share, price-earnings ratio, dividend yield

obj. 3

✔ b. Price-earnings ratio, 12.5

The following information was taken from the financial statements of Finn Resources Inc. for December 31 of the current fiscal year:

Common stock, $20 par value (no change during the year)	$5,000,000
Preferred $10 stock, $40 par (no change during the year)	800,000

The net income was $600,000 and the declared dividends on the common stock were $125,000 for the current year. The market price of the common stock is $20 per share.

For the common stock, determine (a) the earnings per share, (b) the price-earnings ratio, (c) the dividends per share, and (d) the dividend yield. Round to one decimal place except earnings per share, which should be rounded to two decimal places.

Appendix EX 14-22
Price-earnings ratio; dividend yield

obj. 3

The table below shows the stock price, earnings per share, and dividends per share for three companies as of October 2007:

	Price	Earnings per Share	Dividends per Share
Bank of America Corporation	$52.99	$4.59	$2.12
eBay Inc.	33.51	0.57	0.00
The Coca-Cola Company	47.76	2.16	1.24

a. Determine the price-earnings ratio and dividend yield for the three companies. Round to one decimal place.

b. Explain the differences in these ratios across the three companies.

Appendix EX 14-23
Earnings per share

obj. 3

✔ b. Earnings per share on common stock, $23.40

The net income reported on the income statement of Goth Co. was $2,500,000. There were 100,000 shares of $10 par common stock and 40,000 shares of $4 preferred stock outstanding throughout the current year. The income statement included two extraordinary items: a $500,000 gain from condemnation of land and a $200,000 loss arising from flood damage, both after applicable income tax. Determine the per-share figures for common stock for (a) income before extraordinary items and (b) net income.

Appendix EX 14-24
Extraordinary item

Assume that the amount of each of the following items is material to the financial statements. Classify each item as either normally recurring (NR) or extraordinary (E).

a. Loss on the disposal of equipment considered to be obsolete because of the development of new technology.
b. Uncollectible accounts expense.
c. Gain on sale of land condemned by the local government for a public works project.
d. Interest revenue on notes receivable.
e. Uninsured loss on building due to hurricane damage. The building was purchased by the company in 1910 and had not previously incurred hurricane damage.
f. Loss on sale of investments in stocks and bonds.
g. Uninsured flood loss. (Flood insurance is unavailable because of periodic flooding in the area.)

Appendix EX 14-25
Income statement and earnings per share for extraordinary items and discontinued operations

Brady, Inc., reports the following for 2010:

Income from continuing operations before income tax	$500,000
Extraordinary property loss from hurricane	$60,000*
Loss from discontinued operations	$90,000*
Weighted average number of shares outstanding	40,000
Applicable tax rate	40%

*Net of any tax effect.

a. Prepare a partial income statement for Brady, Inc., beginning with income from continuing operations before income tax.
b. Calculate the earnings per common share for Brady, Inc., including per-share amounts for unusual items.

Appendix EX 14-26
Unusual items

Discuss whether Baxter Company correctly reported the following items in the financial statements:

a. In 2010, the company discovered a clerical error in the prior year's accounting records. As a result, the reported net income for 2009 was overstated by $20,000. The company corrected this error by restating the prior-year financial statements.
b. In 2010, the company voluntarily changed its method of accounting for long-term construction contracts from the percentage of completion method to the completed contract method. Both methods are acceptable under generally acceptable accounting principles. The cumulative effect of this change was reported as a separate component of income in the 2010 income statement.

Problems Series A

PR 14-1A
Horizontal analysis for income statement

obj. 1


✔ 1. Net sales 10.0% increase

For 2010, Wiglaf Technology Company reported its most significant decline in net income in years. At the end of the year, C. S. Lewis, the president, is presented with the following condensed comparative income statement:

Wiglaf Technology Company
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales	$560,000	$500,000
Sales returns and allowances	37,500	25,000
Net sales	$522,500	$475,000
Cost of goods sold	372,000	300,000
Gross profit	$150,500	$175,000
Selling expenses	$ 52,000	$ 40,000
Administrative expenses	30,500	25,000
Total operating expenses	$ 82,500	$ 65,000
Income from operations	$ 68,000	$110,000
Other income	3,000	2,000
Income before income tax	$ 71,000	$112,000
Income tax expense	5,500	5,000
Net income	$ 65,500	$107,000

Instructions

1. Prepare a comparative income statement with horizontal analysis for the two-year period, using 2009 as the base year. Round to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the horizontal analysis prepared in (1).

PR 14-2A
Vertical analysis for income statement

obj. 1

✔ 1. Net income, 2010, 16.0%

For 2010, Othere Technology Company initiated a sales promotion campaign that included the expenditure of an additional $20,000 for advertising. At the end of the year, George Wallace, the president, is presented with the following condensed comparative income statement:

Othere Technology Company
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales	$714,000	$612,000
Sales returns and allowances	14,000	12,000
Net sales	$700,000	$600,000
Cost of goods sold	322,000	312,000
Gross profit	$378,000	$288,000
Selling expenses	$154,000	$120,000
Administrative expenses	70,000	66,000
Total operating expenses	$224,000	$186,000
Income from operations	$154,000	$102,000
Other income	28,000	24,000
Income before income tax	$182,000	$126,000
Income tax	70,000	60,000
Net income	$112,000	$ 66,000

Instructions

1. Prepare a comparative income statement for the two-year period, presenting an analysis of each item in relationship to net sales for each of the years. Round to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the vertical analysis prepared in (1).

PR 14-3A
Effect of transactions on current position analysis

obj. 2

✔ 2. c. Current ratio, 2.6

Data pertaining to the current position of Boole Company are as follows:

Cash	$240,000
Temporary investments	120,000
Accounts and notes receivable (net)	360,000
Inventories	380,000
Prepaid expenses	20,000
Accounts payable	140,000
Notes payable (short-term)	200,000
Accrued expenses	60,000

Instructions

1. Compute (a) the working capital, (b) the current ratio, and (c) the quick ratio. Round to one decimal place.
2. List the following captions on a sheet of paper:

Transaction	Working Capital	Current Ratio	Quick Ratio

Compute the working capital, the current ratio, and the quick ratio after each of the following transactions, and record the results in the appropriate columns. Consider each transaction separately and assume that only that transaction affects the data given above. Round to one decimal place.

a. Sold temporary investments at no gain or loss, $45,000.
b. Paid accounts payable, $80,000.
c. Purchased goods on account, $50,000.
d. Paid notes payable, $100,000.
e. Declared a cash dividend, $80,000.
f. Declared a common stock dividend on common stock, $22,500.
g. Borrowed cash from bank on a long-term note, $200,000.
h. Received cash on account, $67,500.
i. Issued additional shares of stock for cash, $400,000.
j. Paid cash for prepaid expenses, $40,000.

PR 14-4A
Nineteen measures of solvency and profitability

objs. 2, 3

✔ 5. Number of days' sales in receivables, 53.7

The comparative financial statements of Optical Solutions Inc. are as follows. The market price of Optical Solutions Inc. common stock was $60.00 on December 31, 2010.

Optical Solutions Inc.
Comparative Retained Earnings Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Retained earnings, January 1	$ 604,000	$306,000
Add net income for year	428,000	314,000
Total	$1,032,000	$620,000
Deduct dividends:		
On preferred stock	$ 4,000	$ 4,000
On common stock	12,000	12,000
Total	$ 16,000	$ 16,000
Retained earnings, December 31	$1,016,000	$604,000

Optical Solutions Inc.
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales	$1,608,000	$1,481,600
Sales returns and allowances	5,920	6,000
Net sales	$1,602,080	$1,475,600
Cost of goods sold	480,200	499,200
Gross profit	$1,121,880	$ 976,400
Selling expenses	$ 324,000	$ 352,000
Administrative expenses	234,000	211,200
Total operating expenses	$ 558,000	$ 563,200
Income from operations	$ 563,880	$ 413,200
Other income	24,000	19,200
	$ 587,880	$ 432,400
Other expense (interest)	110,720	80,000
Income before income tax	$ 477,160	$ 352,400
Income tax expense	49,160	38,400
Net income	$ 428,000	$ 314,000

Optical Solutions Inc.
Comparative Balance Sheet
December 31, 2010 and 2009

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Current assets:		
Cash	$ 240,000	$ 162,400
Temporary investments	364,000	328,800
Accounts receivable (net)	260,000	211,200
Inventories	208,000	66,400
Prepaid expenses	44,000	23,200
Total current assets	$1,116,000	$ 792,000
Long-term investments	204,800	256,000
Property, plant, and equipment (net)	1,539,200	976,000
Total assets	$2,860,000	$2,024,000
Liabilities		
Current liabilities	$ 360,000	$ 320,000
Long-term liabilities:		
Mortgage note payable, 8%, due 2015	$ 384,000	—
Bonds payable, 10%, due 2019	800,000	$ 800,000
Total long-term liabilities	$1,184,000	$ 800,000
Total liabilities	$1,544,000	$1,120,000
Stockholders' Equity		
Preferred $2.00 stock, $50 par	$ 100,000	$ 100,000
Common stock, $5 par	200,000	200,000
Retained earnings	1,016,000	604,000
Total stockholders' equity	$1,316,000	$ 904,000
Total liabilities and stockholders' equity	$2,860,000	$2,024,000

Instructions

Determine the following measures for 2010, rounding to one decimal place:

1. Working capital
2. Current ratio
3. Quick ratio
4. Accounts receivable turnover
5. Number of days' sales in receivables
6. Inventory turnover
7. Number of days' sales in inventory
8. Ratio of fixed assets to long-term liabilities
9. Ratio of liabilities to stockholders' equity
10. Number of times interest charges earned
11. Number of times preferred dividends earned
12. Ratio of net sales to assets
13. Rate earned on total assets
14. Rate earned on stockholders' equity
15. Rate earned on common stockholders' equity
16. Earnings per share on common stock
17. Price-earnings ratio
18. Dividends per share of common stock
19. Dividend yield

PR 14-5A
Solvency and profitability trend analysis

objs. 2, 3

Lancelot Company has provided the following comparative information:

	2010	2009	2008	2007	2006
Net income	$ 1,930,500	$1,287,000	$ 975,000	$ 650,000	$ 500,000
Interest expense	400,200	345,000	300,000	240,000	200,000
Income tax expense	477,360	318,240	244,800	163,200	120,000
Total assets (ending balance)	11,498,760	8,845,200	6,804,000	5,040,000	4,200,000
Total stockholders' equity (ending balance)	6,742,500	4,812,000	3,525,000	2,550,000	1,900,000
Average total assets	10,171,980	7,824,600	5,922,000	4,620,000	3,600,000
Average stockholders' equity	5,777,250	4,168,500	3,037,500	2,225,000	1,650,000

You have been asked to evaluate the historical performance of the company over the last five years.

Selected industry ratios have remained relatively steady at the following levels for the last five years:

	2006–2010
Rate earned on total assets	15%
Rate earned on stockholders' equity	18%
Number of times interest charges earned	3.5
Ratio of liabilities to stockholders' equity	1.4

Instructions

1. Prepare four line graphs with the ratio on the vertical axis and the years on the horizontal axis for the following four ratios (rounded to one decimal place):
   a. Rate earned on total assets
   b. Rate earned on stockholders' equity
   c. Number of times interest charges earned
   d. Ratio of liabilities to stockholders' equity

   Display both the company ratio and the industry benchmark on each graph. That is, each graph should have two lines.
2. Prepare an analysis of the graphs in (1).

Problems Series B

PR 14-1B
Horizontal analysis for income statement

obj. 1

For 2010, Egils Inc. reported its most significant increase in net income in years. At the end of the year, David Dickens, the president, is presented with the following condensed comparative income statement:

✔ 1. Net sales, 26.3% increase

Egils Inc.
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales	$126,200	$100,000
Sales returns and allowances	2,426	2,000
Net sales	$123,774	$ 98,000
Cost of goods sold	58,800	50,000
Gross profit	$ 64,974	$ 48,000
Selling expenses	$ 17,310	$ 15,000
Administrative expenses	13,464	12,000
Total operating expenses	$ 30,774	$ 27,000
Income from operations	$ 34,200	$ 21,000
Other income	1,000	1,000
Income before income tax	$ 35,200	$ 22,000
Income tax expense	12,000	6,000
Net income	$ 23,200	$ 16,000

Instructions

1. Prepare a comparative income statement with horizontal analysis for the two-year period, using 2009 as the base year. Round to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the horizontal analysis prepared in (1).

PR 14-2B
Vertical analysis for income statement

obj. 1

✔ 1. Net income, 2009, 10.0%

For 2010, Einar Industries Inc. initiated a sales promotion campaign that included the expenditure of an additional $40,000 for advertising. At the end of the year, David Heaney, the president, is presented with the following condensed comparative income statement:

Einar Industries
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales	$525,000	$420,000
Sales returns and allowances	25,000	20,000
Net sales	$500,000	$400,000
Cost of goods sold	280,000	220,000
Gross profit	$220,000	$180,000
Selling expenses	$130,000	$ 80,000
Adminstrative expenses	65,000	56,000
Total operating expenses	$195,000	$136,000
Income from operations	$ 25,000	$ 44,000
Other income	30,000	24,000
Income before income tax	$ 55,000	$ 68,000
Income tax expense (benefit)	35,000	28,000
Net income (loss)	$ 20,000	$ 40,000

Instructions

1. Prepare a comparative income statement for the two-year period, presenting an analysis of each item in relationship to net sales for each of the years. Round to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the vertical analysis prepared in (1).

PR 14-3B
Effect of transactions on current position analysis

obj. 2

✔ 2. e. Quick ratio, 0.8

Data pertaining to the current position of Newton Industries, Inc., are as follows:

Cash	$300,000
Temporary investments	250,000
Accounts and notes receivable (net)	350,000
Inventories	440,000
Prepaid expenses	60,000
Accounts payable	420,000
Notes payable (short-term)	460,000
Accrued expenses	120,000

Instructions

1. Compute (a) the working capital, (b) the current ratio, and (c) the quick ratio. Round to one decimal place.
2. List the following captions on a sheet of paper:

Transaction	Working Capital	Current Ratio	Quick Ratio

Compute the working capital, the current ratio, and the quick ratio after each of the following transactions, and record the results in the appropriate columns. Consider each transaction separately and assume that only that transaction affects the data given above. Round to one decimal place.

a. Sold temporary investments at no gain or loss, $120,000.
b. Paid accounts payable, $200,000.
c. Purchased goods on account, $80,000.
d. Paid notes payable, $200,000.
e. Declared a cash dividend, $125,000.
f. Declared a common stock dividend on common stock, $100,000.
g. Borrowed cash from bank on a long-term note, $400,000.
h. Received cash on account, $65,000.
i. Issued additional shares of stock for cash, $800,000.
j. Paid cash for prepaid expenses, $20,000.

PR 14-4B

Nineteen measures of solvency and profitability

objs. 2, 3

✔ 9. Ratio of liabilities to stockholders' equity, 0.6

The comparative financial statements of Caylay Technologies Inc. are as follows. The market price of Caylay Technologies Inc. common stock was $40 on December 31, 2010.

Caylay Technologies Inc.
Comparative Retained Earnings Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Retained earnings, January 1	$1,453,600	$1,218,100
Add net income for year	482,850	307,500
Total	$1,936,450	$1,525,600
Deduct dividends:		
On preferred stock	$ 24,000	$ 24,000
On common stock	48,000	48,000
Total	$ 72,000	$ 72,000
Retained earnings, December 31	$1,864,450	$ 1,453,600

Caylay Technologies Inc.
Comparative Income Statement
For the Years Ended December 31, 2010 and 2009

	2010	2009
Sales (all on account)	$4,245,000	$3,675,000
Sales returns and allowances	35,000	22,500
Net sales	$4,210,000	$3,652,500
Cost of goods sold	1,866,150	1,725,000
Gross profit	$2,343,850	$1,927,500
Selling expenses	$ 907,500	$ 862,500
Administrative expenses	607,500	570,000
Total operating expenses	$1,515,000	$1,432,500
Income from operations	$ 828,850	$ 495,000
Other income	60,000	45,000
	$ 888,850	$ 540,000
Other expense (interest)	196,000	90,000
Income before income tax	$ 692,850	$ 450,000
Income tax expense	210,000	142,500
Net income	$ 482,850	$ 307,500

Caylay Technologies Inc.
Comparative Balance Sheet
December 31, 2010 and 2009

	Dec. 31, 2010	Dec. 31, 2009
Assets		
Current assets:		
Cash	$ 400,000	$ 180,000
Temporary investments	614,000	240,000
Accounts receivable (net)	390,000	283,600
Inventories	631,000	500,000
Prepaid expenses	45,000	52,500
Total current assets	$2,080,000	$1,256,100
Long-term investments	324,450	375,000
Property, plant, and equipment (net)	3,780,000	3,000,000
Total assets	$6,184,450	$4,631,100
Liabilities		
Current liabilities	$ 520,000	$ 427,500
Long-term liabilities:		
Mortgage note payable, 10%, due 2015	$1,000,000	—
Bonds payable, 12%, due 2019	800,000	$ 750,000
Total long-term liabilities	$1,800,000	$ 750,000
Total liabilities	$2,320,000	$1,177,500
Stockholders' Equity		
Preferred $3.00 stock, $100 par	$ 800,000	$ 800,000
Common stock, $10 par	1,200,000	1,200,000
Retained earnings	1,864,450	1,453,600
Total stockholders' equity	$3,864,450	$3,453,600
Total liabilities and stockholders' equity	$6,184,450	$4,631,100

Instructions

Determine the following measures for 2010, rounding to one decimal place:

1. Working capital
2. Current ratio
3. Quick ratio
4. Accounts receivable turnover
5. Number of days' sales in receivables
6. Inventory turnover
7. Number of days' sales in inventory
8. Ratio of fixed assets to long-term liabilities
9. Ratio of liabilities to stockholders' equity
10. Number of times interest charges earned
11. Number of times preferred dividends earned
12. Ratio of net sales to assets
13. Rate earned on total assets
14. Rate earned on stockholders' equity
15. Rate earned on common stockholders' equity
16. Earnings per share on common stock
17. Price-earnings ratio
18. Dividends per share of common stock
19. Dividend yield

PR 14-5B
Solvency and profitability trend analysis

objs. 2, 3

Merlin Company has provided the following comparative information:

	2010	2009	2008	2007	2006
Net income	$ 129,868	$ 174,788	$ 299,809	$ 419,900	$ 380,000
Interest expense	280,021	260,001	240,075	225,000	200,000
Income tax expense	20,002	33,617	67,234	100,800	126,000
Total assets (ending balance)	4,417,178	4,124,350	3,732,443	3,338,500	2,750,000
Total stockholders' equity (ending balance)	1,904,365	1,774,497	1,599,709	1,299,900	880,000
Average total assets	4,270,764	3,928,396	3,535,472	3,044,250	2,475,000
Average stockholders' equity	1,839,431	1,687,103	1,449,804	1,089,950	690,000

You have been asked to evaluate the historical performance of the company over the last five years.

Selected industry ratios have remained relatively steady at the following levels for the last five years:

	2006–2010
Rate earned on total assets	12%
Rate earned on stockholders' equity	18%
Number of times interest charges earned	2.8
Ratio of liabilities to stockholders' equity	1.6

Instructions

1. Prepare four line graphs with the ratio on the vertical axis and the years on the horizontal axis for the following four ratios (rounded to one decimal place):
   a. Rate earned on total assets
   b. Rate earned on stockholders' equity
   c. Number of times interest charges earned
   d. Ratio of liabilities to stockholders' equity

   Display both the company ratio and the industry benchmark on each graph. That is, each graph should have two lines.
2. Prepare an analysis of the graphs in (1).

Nike, Inc., Problem

Financial Statement Analysis

The financial statements for Nike, Inc., are presented in Appendix B at the end of the text. The following additional information (in thousands) is available:

Accounts receivable at May 31, 2005	$2,249.9
Inventories at May 31, 2005	1,811.1
Total assets at May 31, 2005	8,793.6
Stockholders' equity at May 31, 2005	5,644.2

Instructions

1. Determine the following measures for the fiscal years ended May 31, 2007 and May 31, 2006, rounding to one decimal place.
   a. Working capital
   b. Current ratio
   c. Quick ratio
   d. Accounts receivable turnover
   e. Number of days' sales in receivables
   f. Inventory turnover
   g. Number of days' sales in inventory
   h. Ratio of liabilities to stockholders' equity
   i. Ratio of net sales to average total assets
   j. Rate earned on average total assets, assuming interest expense is $20.495 million for the year ending May 31, 2007, and $20.956 million for the year ending May 31, 2006
   k. Rate earned on average common stockholders' equity
   l. Price-earnings ratio, assuming that the market price was $56.75 per share on May 31, 2007, and $40.16 per share on May 31, 2006.
   m. Percentage relationship of net income to net sales
2. What conclusions can be drawn from these analyses?

Special Activities

SA 14-1
Analysis of financing corporate growth

Assume that the president of Garden Isle Brewery made the following statement in the Annual Report to Shareholders:

"The founding family and majority shareholders of the company do not believe in using debt to finance future growth. The founding family learned from hard experience during Prohibition and the Great Depression that debt can cause loss of flexibility and eventual loss of corporate control. The company will not place itself at such risk. As such, all future growth will be financed either by stock sales to the public or by internally generated resources."

As a public shareholder of this company, how would you respond to this policy?

SA 14-2
Receivables and inventory turnover

Tylee Industries, Inc., has completed its fiscal year on December 31, 2010. The auditor, Holly Marcum, has approached the CFO, Doug Bliss, regarding the year-end receivables and inventory levels of Tylee Industries. The following conversation takes place:

Holly: We are beginning our audit of Tylee Industries and have prepared ratio analyses to determine if there have been significant changes in operations or financial position. This helps us guide the audit process. This analysis indicates that the inventory turnover has decreased from 4.5 to 2.1, while the accounts receivable turnover has decreased from 10 to 6. I was wondering if you could explain this change in operations.

Doug: There is little need for concern. The inventory represents computers that we were unable to sell during the holiday buying season. We are confident, however, that we will be able to sell these computers as we move into the next fiscal year.

Holly: What gives you this confidence?

Doug: We will increase our advertising and provide some very attractive price concessions to move these machines. We have no choice. Newer technology is already out there, and we have to unload this inventory.

Holly: . . . and the receivables?

Doug: As you may be aware, the company is under tremendous pressure to expand sales and profits. As a result, we lowered our credit standards to our commercial customers so that we would be able to sell products to a broader customer base. As a result of this policy change, we have been able to expand sales by 35%.

Holly: Your responses have not been reassuring to me.

Doug: I'm a little confused. Assets are good, right? Why don't you look at our current ratio? It has improved, hasn't it? I would think that you would view that very favorably.

Why is Holly concerned about the inventory and accounts receivable turnover ratios and Doug's responses to them? What action may Holly need to take? How would you respond to Doug's last comment?

SA 14-3
Vertical analysis

The condensed income statements through income from operations for Dell Inc. and Apple Computer, Inc., are reproduced below for recent fiscal years (numbers in millions of dollars).

	Dell Inc.	Apple Computer, Inc.
Sales (net)	$57,420	$24,006
Cost of sales	44,904	15,852
Gross profit	$12,516	$ 8,154
Selling, general, and administrative expenses	$ 5,948	$ 2,963
Research and development	498	782
Operating expenses	$ 6,446	$ 3,745
Income from operations	$ 6,070	$ 4,409

Prepare comparative common-sized statements, rounding percents to one decimal place. Interpret the analyses.

SA 14-4
Profitability and stockholder ratios

Harley-Davidson, Inc., is a leading motorcycle manufacturer in the United States. The company manufactures and sells a number of different types of motorcycles, a complete line of motorcycle parts, and brand-related accessories, clothing, and collectibles. In recent years, Harley-Davidson has attempted to expand its dealer network and product lines internationally.

The following information is available for three recent years (in millions except per-share amounts):

	2006	2005	2004
Net income (loss)	$960	$890	$761
Preferred dividends	$0.00	$0.00	$0.00
Interest expense	$36.15	$22.72	$17.64
Shares outstanding for computing earnings per share	280	295	302
Cash dividend per share	$0.63	$0.41	$0.20
Average total assets	$5,369	$5,203	$4,392
Average stockholders' equity	$3,151	$3,088	$2,595
Average stock price per share	$56.12	$54.14	$46.87

1. Calculate the following ratios for each year:
   a. Rate earned on total assets
   b. Rate earned on stockholders' equity
   c. Earnings per share
   d. Dividend yield
   e. Price-earnings ratio
2. What is the ratio of average liabilities to average stockholders' equity for 2006?
3. Explain the direction of the dividend yield and price-earnings ratio in light of Harley-Davidson's profitability trend.
4. Based on these data, evaluate Harley-Davidson's strategy to expand to international markets.

SA 14-5
Comprehensive profitability and solvency analysis

Marriott International, Inc., and Hilton Hotels Corporation are two major owners and managers of lodging and resort properties in the United States. Abstracted income statement information for the two companies is as follows for a recent year:

	Marriott (in millions)	Hilton (in millions)
Operating profit before other expenses and interest	$1,011	$1,274
Other income (expenses)	7	62
Interest expense	(124)	(498)
Income before income taxes	894	838
Income tax expense	286	266
Net income	$ 608	$ 572

Balance sheet information is as follows:

	Marriott (in millions)	Hilton (in millions)
Total liabilities	$5,970	$12,754
Total stockholders' equity	2,618	3,727
Total liabilities and stockholders' equity	$8,588	$16,481

The average liabilities, stockholders' equity, and total assets were as follows:

	Marriott	Hilton
Average total liabilities	$7,250	$ 9,343
Average total stockholders' equity	2,935	3,269
Average total assets	6,933	12,612

1. Determine the following ratios for both companies (round to one decimal place after the whole percent):
   a. Rate earned on total assets
   b. Rate earned on total stockholders' equity
   c. Number of times interest charges are earned
   d. Ratio of liabilities to stockholders' equity
2. Analyze and compare the two companies, using the information in (1).

Answers to Self-Examination Questions

1. **A** Percentage analysis indicating the relationship of the component parts to the total in a financial statement, such as the relationship of current assets to total assets (20% to 100%) in the question, is called vertical analysis (answer A). Percentage analysis of increases and decreases in corresponding items in comparative financial statements is called horizontal analysis (answer B). An example of horizontal analysis would be the presentation of the amount of current assets in the preceding balance sheet, along with the amount of current assets at the end of the current year, with the increase or decrease in current assets between the periods expressed as a percentage. Profitability analysis (answer C) is the analysis of a firm's ability to earn income. Contribution margin analysis (answer D) is discussed in a later managerial accounting chapter.
2. **D** Various solvency measures, categorized as current position analysis, indicate a firm's ability to meet currently maturing obligations. Each measure contributes to the analysis of a firm's current position and is most useful when viewed with other measures and when compared with similar measures for other periods and for other firms. Working capital (answer A) is the excess of current assets over current liabilities; the current ratio (answer B) is the ratio of current assets to current liabilities; and the quick ratio (answer C) is the ratio of the sum of cash, receivables, and temporary investments to current liabilities.
3. **D** The ratio of current assets to current liabilities is usually called the current ratio (answer A). It is sometimes called the working capital ratio (answer B) or bankers' ratio (answer C).
4. **C** The ratio of the sum of cash, receivables, and temporary investments (sometimes called quick assets) to current liabilities is called the quick ratio (answer C) or acid-test ratio. The current ratio (answer A), working capital ratio (answer B), and bankers' ratio (answer D) are terms that describe the ratio of current assets to current liabilities.
5. **C** The number of days' sales in inventory (answer C), which is determined by dividing the average inventory by the average daily cost of goods sold, expresses the relationship between the cost of goods sold and inventory. It indicates the efficiency in the management of inventory. The working capital ratio (answer A) indicates the ability of the business to meet currently maturing obligations (debt). The quick ratio (answer B) indicates the "instant" debt-paying ability of the business. The ratio of fixed assets to long-term liabilities (answer D) indicates the margin of safety for long-term creditors.

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APPENDICES

Appendix A

Interest Tables

Present Value of $1 at Compound Interest Due in *n* Periods

Periods	5%	5.5%	6%	6.5%	7%	8%
1	0.95238	0.94787	0.94334	0.93897	0.93458	0.92593
2	0.90703	0.89845	0.89000	0.88166	0.87344	0.85734
3	0.86384	0.85161	0.83962	0.82785	0.81630	0.79383
4	0.82270	0.80722	0.79209	0.77732	0.76290	0.73503
5	0.78353	0.76513	0.74726	0.72988	0.71290	0.68058
6	0.74622	0.72525	0.70496	0.68533	0.66634	0.63017
7	0.71068	0.68744	0.66506	0.64351	0.62275	0.58349
8	0.67684	0.65160	0.62741	0.60423	0.58201	0.54027
9	0.64461	0.61763	0.59190	0.56735	0.54393	0.50025
10	0.61391	0.58543	0.55840	0.53273	0.50835	0.46319
11	0.58468	0.55491	0.52679	0.50021	0.47509	0.42888
12	0.55684	0.52598	0.49697	0.46968	0.44401	0.39711
13	0.53032	0.49856	0.46884	0.44102	0.41496	0.36770
14	0.50507	0.47257	0.44230	0.41410	0.38782	0.34046
15	0.48102	0.44793	0.41726	0.38883	0.36245	0.31524
16	0.45811	0.42458	0.39365	0.36510	0.33874	0.29189
17	0.43630	0.40245	0.37136	0.34281	0.31657	0.27027
18	0.41552	0.38147	0.35034	0.32189	0.29586	0.25025
19	0.39573	0.36158	0.33051	0.30224	0.27651	0.23171
20	0.37689	0.34273	0.31180	0.28380	0.25842	0.21455
21	0.35894	0.32486	0.29416	0.26648	0.24151	0.19866
22	0.34185	0.30793	0.27750	0.25021	0.22571	0.18394
23	0.32557	0.29187	0.26180	0.23494	0.21095	0.17032
24	0.31007	0.27666	0.24698	0.22060	0.19715	0.15770
25	0.29530	0.26223	0.23300	0.20714	0.18425	0.14602
26	0.28124	0.24856	0.21981	0.19450	0.17211	0.13520
27	0.26785	0.23560	0.20737	0.18263	0.16093	0.12519
28	0.25509	0.22332	0.19563	0.17148	0.15040	0.11591
29	0.24295	0.21168	0.18456	0.16101	0.14056	0.10733
30	0.23138	0.20064	0.17411	0.15119	0.13137	0.09938
31	0.22036	0.19018	0.16426	0.14196	0.12277	0.09202
32	0.20987	0.18027	0.15496	0.13329	0.11474	0.08520
33	0.19987	0.17087	0.14619	0.12516	0.10724	0.07889
34	0.19036	0.16196	0.13791	0.11752	0.10022	0.07304
35	0.18129	0.15352	0.13010	0.11035	0.09366	0.06764
40	0.14205	0.11746	0.09722	0.08054	0.06678	0.04603
45	0.11130	0.08988	0.07265	0.05879	0.04761	0.03133
50	0.08720	0.06877	0.05429	0.04291	0.03395	0.02132

Present Value of $1 at Compound Interest Due in *n* Periods

Periods	9%	10%	11%	12%	13%	14%
1	0.91743	0.90909	0.90090	0.89286	0.88496	0.87719
2	0.84168	0.82645	0.81162	0.79719	0.78315	0.76947
3	0.77218	0.75132	0.73119	0.71178	0.69305	0.67497
4	0.70842	0.68301	0.65873	0.63552	0.61332	0.59208
5	0.64993	0.62092	0.59345	0.56743	0.54276	0.51937
6	0.59627	0.56447	0.53464	0.50663	0.48032	0.45559
7	0.54703	0.51316	0.48166	0.45235	0.42506	0.39964
8	0.50187	0.46651	0.43393	0.40388	0.37616	0.35056
9	0.46043	0.42410	0.39092	0.36061	0.33288	0.30751
10	0.42241	0.38554	0.35218	0.32197	0.29459	0.26974
11	0.38753	0.35049	0.31728	0.28748	0.26070	0.23662
12	0.35554	0.31863	0.28584	0.25668	0.23071	0.20756
13	0.32618	0.28966	0.25751	0.22917	0.20416	0.18207
14	0.29925	0.26333	0.23199	0.20462	0.18068	0.15971
15	0.27454	0.23939	0.20900	0.18270	0.15989	0.14010
16	0.25187	0.21763	0.18829	0.16312	0.14150	0.12289
17	0.23107	0.19784	0.16963	0.14564	0.12522	0.10780
18	0.21199	0.17986	0.15282	0.13004	0.11081	0.09456
19	0.19449	0.16351	0.13768	0.11611	0.09806	0.08295
20	0.17843	0.14864	0.12403	0.10367	0.08678	0.07276
21	0.16370	0.13513	0.11174	0.09256	0.07680	0.06383
22	0.15018	0.12285	0.10067	0.08264	0.06796	0.05599
23	0.13778	0.11168	0.09069	0.07379	0.06014	0.04911
24	0.12640	0.10153	0.08170	0.06588	0.05323	0.04308
25	0.11597	0.09230	0.07361	0.05882	0.04710	0.03779
26	0.10639	0.08390	0.06631	0.05252	0.04168	0.03315
27	0.09761	0.07628	0.05974	0.04689	0.03689	0.02908
28	0.08955	0.06934	0.05382	0.04187	0.03264	0.02551
29	0.08216	0.06304	0.04849	0.03738	0.02889	0.02237
30	0.07537	0.05731	0.04368	0.03338	0.02557	0.01963
31	0.06915	0.05210	0.03935	0.02980	0.02262	0.01722
32	0.06344	0.04736	0.03545	0.02661	0.02002	0.01510
33	0.05820	0.04306	0.03194	0.02376	0.01772	0.01325
34	0.05331	0.03914	0.02878	0.02121	0.01568	0.01162
35	0.04899	0.03558	0.02592	0.01894	0.01388	0.01019
40	0.03184	0.02210	0.01538	0.01075	0.00753	0.00529
45	0.02069	0.01372	0.00913	0.00610	0.00409	0.00275
50	0.01345	0.00852	0.00542	0.00346	0.00222	0.00143

Present Value of Ordinary Annuity of $1 per Period

Periods	5%	5.5%	6%	6.5%	7%	8%
1	0.95238	0.94787	0.94340	0.93897	0.93458	0.92593
2	1.85941	1.84632	1.83339	1.82063	1.80802	1.78326
3	2.72325	2.69793	2.67301	2.64848	2.62432	2.57710
4	3.54595	3.50515	3.46511	3.42580	3.38721	3.31213
5	4.32948	4.27028	4.21236	4.15568	4.10020	3.99271
6	5.07569	4.99553	4.91732	4.84101	4.76654	4.62288
7	5.78637	5.68297	5.58238	5.48452	5.38923	5.20637
8	6.46321	6.33457	6.20979	6.08875	5.97130	5.74664
9	7.10782	6.95220	6.80169	6.65610	6.51523	6.24689
10	7.72174	7.53763	7.36009	7.18883	7.02358	6.71008
11	8.30641	8.09254	7.88688	7.68904	7.49867	7.13896
12	8.86325	8.61852	8.38384	8.15873	7.94269	7.53608
13	9.39357	9.11708	8.85268	8.59974	8.35765	7.90378
14	9.89864	9.58965	9.29498	9.01384	8.74547	8.22424
15	10.37966	10.03758	9.71225	9.40267	9.10791	8.55948
16	10.83777	10.46216	10.10590	9.76776	9.44665	8.85137
17	11.27407	10.86461	10.47726	10.11058	9.76322	9.12164
18	11.68959	11.24607	10.82760	10.43247	10.05909	9.37189
19	12.08532	11.60765	11.15812	10.73471	10.33560	9.60360
20	12.46221	11.95038	11.46992	11.01851	10.59401	9.81815
21	12.82115	12.27524	11.76408	11.28498	10.83553	10.01680
22	13.16300	12.58317	12.04158	11.53520	11.06124	10.20074
23	13.48857	12.87504	12.30338	11.77014	11.27219	10.37106
24	13.79864	13.15170	12.55036	11.99074	11.46933	10.52876
25	14.09394	13.41393	12.78336	12.19788	11.65358	10.67478
26	14.37518	13.66250	13.00317	12.39237	11.82578	10.80998
27	14.64303	13.89810	13.21053	12.57500	11.98671	10.93516
28	14.89813	14.12142	13.40616	12.74648	12.13711	11.05108
29	15.14107	14.33310	13.59072	12.90749	12.27767	11.15841
30	15.37245	14.53375	13.76483	13.05868	12.40904	11.25778
31	15.59281	14.72393	13.92909	13.20063	12.53181	11.34980
32	15.80268	14.90420	14.08404	13.33393	12.64656	11.43500
33	16.00255	15.07507	14.23023	13.45909	12.75379	11.51389
34	16.19290	15.23703	14.36814	13.57661	12.85401	11.58693
35	16.37420	15.39055	14.49825	13.68696	12.94767	11.65457
40	17.15909	16.04612	15.04630	14.14553	13.33171	11.92461
45	17.77407	16.54773	15.45583	14.48023	13.60552	12.10840
50	18.25592	16.93152	15.76186	14.72452	13.80075	12.23348

Present Value of Ordinary Annuity of $1 per Period

Periods	9%	10%	11%	12%	13%	14%
1	0.91743	0.90909	0.90090	0.89286	0.88496	0.87719
2	1.75911	1.73554	1.71252	1.69005	1.66810	1.64666
3	2.53130	2.48685	2.44371	2.40183	2.36115	2.32163
4	3.23972	3.16986	3.10245	3.03735	2.97447	2.91371
5	3.88965	3.79079	3.69590	3.60478	3.51723	3.43308
6	4.48592	4.35526	4.23054	4.11141	3.99755	3.88867
7	5.03295	4.86842	4.71220	4.56376	4.42261	4.28830
8	5.53482	5.33493	5.14612	4.96764	4.79677	4.63886
9	5.99525	5.75902	5.53705	5.32825	5.13166	4.94637
10	6.41766	6.14457	5.88923	5.65022	5.42624	5.21612
11	6.80519	6.49506	6.20652	5.93770	5.68694	5.45273
12	7.16072	6.81369	6.49236	6.19437	5.91765	5.66029
13	7.48690	7.10336	6.74987	6.42355	6.12181	5.84236
14	7.78615	7.36669	6.96187	6.62817	6.30249	6.00207
15	8.06069	7.60608	7.19087	6.81086	6.46238	6.14217
16	8.31256	7.82371	7.37916	6.97399	6.60388	6.26506
17	8.54363	8.02155	7.54879	7.11963	6.72909	6.37286
18	8.75562	8.20141	7.70162	7.24967	6.83991	6.46742
19	8.95012	8.36492	7.83929	7.36578	6.93797	6.55037
20	9.12855	8.51356	7.96333	7.46944	7.02475	6.62313
21	9.29224	8.64869	8.07507	7.56200	7.10155	6.68696
22	9.44242	8.77154	8.17574	7.64465	7.16951	6.74294
23	9.58021	8.88322	8.26643	7.71843	7.22966	6.79206
24	9.70661	8.98474	8.34814	7.78432	7.28288	6.83514
25	9.82258	9.07704	8.42174	7.84314	7.32998	6.87293
26	9.92897	9.16094	8.48806	7.89566	7.37167	6.90608
27	10.02658	9.23722	8.54780	7.94255	7.40856	6.93515
28	10.11613	9.30657	8.60162	7.98442	7.44120	6.96066
29	10.19828	9.36961	8.65011	8.02181	7.47009	6.98304
30	10.27365	9.42691	8.69379	8.05518	7.49565	7.00266
31	10.34280	9.47901	8.73315	8.08499	7.51828	7.01988
32	10.40624	9.52638	8.76860	8.11159	7.53830	7.03498
33	10.46444	9.56943	8.80054	8.13535	7.55602	7.04823
34	10.51784	9.60858	8.82932	8.15656	7.57170	7.05985
35	10.56682	9.64416	8.85524	8.17550	7.58557	7.07005
40	10.75736	9.77905	8.95105	8.24378	7.63438	7.10504
45	10.88118	9.86281	9.00791	8.28252	7.66086	7.12322
50	10.96168	9.91481	9.04165	8.30450	7.67524	7.13266

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Appendix B

FORM 10-K

NIKE INC - NKE

Filed: July 27, 2007 (period: May 31, 2007)

Annual report which provides a comprehensive overview of the company for the past year

Nike Inc. Form 10-K – Annual report [Section 13 or 15(d)] of The Securities Exchange Act of 1934 for the fiscal year ended May 31, 2007.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and
Shareholders of NIKE, Inc.:

We have completed integrated audits of NIKE, Inc.'s consolidated financial statements and of its internal control over financial reporting as of May 31, 2007, in accordance with the standards of the Public Company Accounting Oversight Board (United States). Our opinions, based on our audits, are presented below.

Consolidated financial statements and financial statement schedule

In our opinion, the consolidated financial statements listed in the index appearing under Item 15(a)(1) present fairly, in all material respects, the financial position of NIKE, Inc. and its subsidiaries at May 31, 2007 and 2006, and the results of their operations and their cash flows for each of the three years in the period ended May 31, 2007 in conformity with accounting principles generally accepted in the United States of America. In addition, in our opinion, the financial statement schedule listed in the index appearing under Item 15(a)(2) presents fairly, in all material respects, the information set forth therein when read in conjunction with the related consolidated financial statements. These financial statements and financial statement schedule are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements and financial statement schedule based on our audits. We conducted our audits of these statements in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit of financial statements includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

As discussed in Note 1 to the consolidated financial statements, effective June 1, 2006, the Company changed the manner in which it accounts for stock-based compensation in accordance with the Statement of Financial Accounting Standards No. 123R "Share-Based Payment."

Internal control over financial reporting

Also, in our opinion, management's assessment, included in "Management's Annual Report on Internal Control Over Financial Reporting" appearing under Item 8, that the Company maintained effective internal control over financial reporting as of May 31, 2007 based on criteria established in *Internal Control — Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"), is fairly stated, in all material respects, based on those criteria. Furthermore, in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of May 31, 2007, based on criteria established in *Internal Control — Integrated Framework* issued by the COSO. The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting. Our responsibility is to express opinions on management's assessment and on the effectiveness of the Company's internal control over financial reporting based on our audit. We conducted our audit of internal control over financial reporting in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. An audit of internal control over financial reporting includes obtaining an understanding of internal control over financial reporting, evaluating management's assessment, testing and evaluating the design and operating effectiveness of internal control, and performing such other procedures as we consider necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinions.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in

accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ PricewaterhouseCoopers LLP

Portland, Oregon
July 26, 2007

NIKE, INC.

CONSOLIDATED STATEMENTS OF INCOME

	Year Ended May 31,		
	2007	2006	2005
	(In millions, except per share data)		
Revenues	$ 16,325.9	$ 14,954.9	$ 13,739.7
Cost of sales	9,165.4	8,367.9	7,624.3
Gross margin	7,160.5	6,587.0	6,115.4
Selling and administrative expense	5,028.7	4,477.8	4,221.7
Interest (income) expense, net (Notes 1, 6 and 7)	(67.2)	(36.8)	4.8
Other (income) expense, net (Notes 5 and 16)	(0.9)	4.4	29.1
Income before income taxes	2,199.9	2,141.6	1,859.8
Income taxes (Note 8)	708.4	749.6	648.2
Net income	$ 1,491.5	$ 1,392.0	$ 1,211.6
Basic earnings per common share (Notes 1 and 11)	$ 2.96	$ 2.69	$ 2.31
Diluted earnings per common share (Notes 1 and 11)	$ 2.93	$ 2.64	$ 2.24
Dividends declared per common share	$ 0.71	$ 0.59	$ 0.475

The accompanying notes to consolidated financial statements are an integral part of this statement.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

CONSOLIDATED BALANCE SHEETS

	May 31, 2007	May 31, 2006
	(In millions)	
ASSETS		
Current assets:		
Cash and equivalents	$ 1,856.7	$ 954.2
Short-term investments	990.3	1,348.8
Accounts receivable, net	2,494.7	2,382.9
Inventories (Note 2)	2,121.9	2,076.7
Deferred income taxes (Note 8)	219.7	203.3
Prepaid expenses and other current assets	393.2	380.1
Total current assets	8,076.5	7,346.0
Property, plant and equipment, net (Note 3)	1,678.3	1,657.7
Identifiable intangible assets, net (Note 4)	409.9	405.5
Goodwill (Note 4)	130.8	130.8
Deferred income taxes and other assets (Note 8)	392.8	329.6
Total assets	$ 10,688.3	$ 9,869.6
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current liabilities:		
Current portion of long-term debt (Note 7)	$ 30.5	$ 255.3
Notes payable (Note 6)	100.8	43.4
Accounts payable (Note 6)	1,040.3	952.2
Accrued liabilities (Notes 5 and 16)	1,303.4	1,276.0
Income taxes payable	109.0	85.5
Total current liabilities	2,584.0	2,612.4
Long-term debt (Note 7)	409.9	410.7
Deferred income taxes and other liabilities (Note 8)	668.7	561.0
Commitments and contingencies (Notes 14 and 16)	—	—
Redeemable Preferred Stock (Note 9)	0.3	0.3
Shareholders' equity:		
Common stock at stated value (Note 10):		
Class A convertible — 117.6 and 127.8 shares outstanding	0.1	0.1
Class B — 384.1 and 384.2 shares outstanding	2.7	2.7
Capital in excess of stated value	1,960.0	1,447.3
Accumulated other comprehensive income (Note 13)	177.4	121.7
Retained earnings	4,885.2	4,713.4
Total shareholders' equity	7,025.4	6,285.2
Total liabilities and shareholders' equity	$ 10,688.3	$ 9,869.6

The accompanying notes to consolidated financial statements are an integral part of this statement.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Cash provided (used) by operations:			
Net income	$ 1,491.5	$ 1,392.0	$ 1,211.6
Income charges not affecting cash:			
Depreciation	269.7	282.0	257.2
Deferred income taxes	34.1	(26.0)	21.3
Stock-based compensation (Notes 1 and 10)	147.7	11.8	4.9
Amortization and other	0.5	(2.9)	25.6
Income tax benefit from exercise of stock options	—	54.2	63.1
Changes in certain working capital components and other assets and liabilities:			
Increase in accounts receivable	(39.6)	(85.1)	(93.5)
Increase in inventories	(49.5)	(200.3)	(103.3)
(Increase) decrease in prepaid expenses and other current assets	(60.8)	(37.2)	71.4
Increase in accounts payable, accrued liabilities and income taxes payable	85.1	279.4	112.4
Cash provided by operations	1,878.7	1,667.9	1,570.7
Cash provided (used) by investing activities:			
Purchases of short-term investments	(2,133.8)	(2,619.7)	(1,527.2)
Maturities of short-term investments	2,516.2	1,709.8	1,491.9
Additions to property, plant and equipment	(313.5)	(333.7)	(257.1)
Disposals of property, plant and equipment	28.3	1.6	7.2
Increase in other assets, net of other liabilities	(4.3)	(34.6)	(28.0)
Acquisition of subsidiary, net of cash acquired	—	—	(47.2)
Cash provided (used) by investing activities	92.9	(1,276.6)	(360.4)
Cash provided (used) by financing activities:			
Proceeds from issuance of long-term debt	41.8	—	—
Reductions in long-term debt, including current portion	(255.7)	(6.0)	(9.2)
Increase (decrease) in notes payable	52.6	(18.2)	(81.7)
Proceeds from exercise of stock options and other stock issuances	322.9	225.3	226.8
Excess tax benefits from share-based payment arrangements	55.8	—	—
Repurchase of common stock	(985.2)	(761.1)	(556.2)
Dividends — common and preferred	(343.7)	(290.9)	(236.7)
Cash used by financing activities	(1,111.5)	(850.9)	(657.0)
Effect of exchange rate changes	42.4	25.7	6.8
Net increase (decrease) in cash and equivalents	902.5	(433.9)	560.1
Cash and equivalents, beginning of year	954.2	1,388.1	828.0
Cash and equivalents, end of year	$ 1,856.7	$ 954.2	$ 1,388.1
Supplemental disclosure of cash flow information:			
Cash paid during the year for:			
Interest, net of capitalized interest	$ 60.0	$ 54.2	$ 33.9
Income taxes	601.1	752.6	585.3
Dividends declared and not paid	92.9	79.4	65.3

The accompanying notes to consolidated financial statements are an integral part of this statement.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

CONSOLIDATED STATEMENTS OF SHAREHOLDERS' EQUITY

	Common Stock				Capital in Excess of Stated Value	Accumulated Other Comprehensive Income (Loss)	Retained Earnings	Total
	Class A		Class B					
	Shares	Amount	Shares	Amount				
	(In millions, except per share data)							
Balance at May 31, 2004	155.2	$ 0.1	371.0	$ 2.7	$ 882.3	$ (86.3)	$ 3,982.9	$ 4,781.7
Stock options exercised			8.8		272.2			272.2
Conversion to Class B Common Stock	(11.4)		11.4					—
Repurchase of Class B Common Stock			(13.8)		(8.3)		(547.9)	(556.2)
Dividends on Common stock ($0.475 per share)							(249.4)	(249.4)
Issuance of shares to employees			1.0		21.9			21.9
Stock-based compensation (Note 10):					4.9			4.9
Forfeiture of shares from employees					(1.5)		(0.7)	(2.2)
Comprehensive income (Note 13):								
Net income							1,211.6	1,211.6
Other comprehensive income (net of tax expense of $40.2):								
Foreign currency translation						70.1		70.1
Adjustment for fair value of hedge derivatives						89.6		89.6
Comprehensive income						159.7	1,211.6	1,371.3
Balance at May 31, 2005	143.8	$ 0.1	378.4	$ 2.7	$ 1,171.5	$ 73.4	$ 4,396.5	$ 5,644.2
Stock options exercised			8.0		253.7			253.7
Conversion to Class B Common Stock	(16.0)		16.0					—
Repurchase of Class B Common Stock			(19.0)		(11.3)		(769.9)	(781.2)
Dividends on Common stock ($0.59 per share)							(304.9)	(304.9)
Issuance of shares to employees			1.0		26.9			26.9
Stock-based compensation (Note 10):					11.8			11.8
Forfeiture of shares from employees			(0.2)		(5.3)		(0.3)	(5.6)
Comprehensive income (Note 13):								
Net income							1,392.0	1,392.0
Other comprehensive income (net of tax benefit of $37.8):								
Foreign currency translation						87.1		87.1
Adjustment for fair value of hedge derivatives						(38.8)		(38.8)
Comprehensive income						48.3	1,392.0	1,440.3
Balance at May 31, 2006	127.8	$ 0.1	384.2	$ 2.7	$ 1,447.3	$ 121.7	$ 4,713.4	$ 6,285.2
Stock options exercised			10.7		349.7			349.7
Conversion to Class B Common Stock	(10.2)		10.2					—
Repurchase of Class B Common Stock			(22.1)		(13.2)		(962.0)	(975.2)
Dividends on Common stock ($0.71 per share)							(357.2)	(357.2)
Issuance of shares to employees			1.2		30.1			30.1
Stock-based compensation (Note 10):					147.7			147.7
Forfeiture of shares from employees			(0.1)		(1.6)		(0.5)	(2.1)
Comprehensive income (Note 13):								
Net income							1,491.5	1,491.5
Other comprehensive income (net of tax benefit of $0.5):								
Foreign currency translation						84.6		84.6
Adjustment for fair value of hedge derivatives						(16.7)		(16.7)
Comprehensive income						67.9	1,491.5	1,559.4
Adoption of FAS 158 (net of tax benefit of $5.4) (Note 12):						(12.2)		(12.2)
Balance at May 31, 2007	117.6	$ 0.1	384.1	$ 2.7	$ 1,960.0	$ 177.4	$ 4,885.2	$ 7,025.4

The accompanying notes to consolidated financial statements are an integral part of this statement.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Note 1 — Summary of Significant Accounting Policies

Basis of Consolidation

The consolidated financial statements include the accounts of NIKE, Inc. and its subsidiaries (the "Company"). All significant intercompany transactions and balances have been eliminated.

Stock Split

On February 15, 2007 the Board of Directors declared a two-for-one stock split of the Company's Class A and Class B common shares, which was effected in the form of a 100% common stock dividend distributed on April 2, 2007. All references to share and per share amounts in the consolidated financial statements and accompanying notes to the consolidated financial statements have been retroactively restated to reflect the two-for-one stock split.

Recognition of Revenues

Wholesale revenues are recognized when the risks and rewards of ownership have passed to the customer, based on the terms of sale. This occurs upon shipment or upon receipt by the customer depending on the country of the sale and the agreement with the customer. Retail store revenues are recorded at the time of sale. Provisions for sales discounts, returns and miscellaneous claims from customers are made at the time of sale.

Shipping and Handling Costs

Shipping and handling costs are expensed as incurred and included in cost of sales.

Advertising and Promotion

Advertising production costs are expensed the first time the advertisement is run. Media (TV and print) placement costs are expensed in the month the advertising appears.

A significant amount of the Company's promotional expenses result from payments under endorsement contracts. Accounting for endorsement payments is based upon specific contract provisions. Generally, endorsement payments are expensed on a straight-line basis over the term of the contract after giving recognition to periodic performance compliance provisions of the contracts. Prepayments made under contracts are included in prepaid expenses or other assets depending on the period to which the prepayment applies.

Through cooperative advertising programs, the Company reimburses its retail customers for certain of their costs of advertising the Company's products. The Company records these costs in selling and administrative expense at the point in time when it is obligated to its customers for the costs, which is when the related revenues are recognized. This obligation may arise prior to the related advertisement being run.

Total advertising and promotion expenses were $1,912.4 million, $1,740.2 million, and $1,600.7 million for the years ended May 31, 2007, 2006 and 2005, respectively. Prepaid advertising and promotion expenses recorded in prepaid expenses and other assets totaled $253.0 million and $177.1 million at May 31, 2007 and 2006, respectively.

Cash and Equivalents

Cash and equivalents represent cash and short-term, highly liquid investments with maturities of three months or less at date of purchase. The carrying amounts reflected in the consolidated balance sheet for cash and equivalents approximate fair value.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Short-term Investments

Short-term investments consist of highly liquid investments, primarily U.S. Treasury debt securities, with maturities over three months from the date of purchase. Debt securities which the Company has the ability and positive intent to hold to maturity are carried at amortized cost. Available-for-sale debt securities are recorded at fair value with any net unrealized gains and losses reported, net of tax, in other comprehensive income. Realized gains or losses are determined based on the specific identification method. The Company holds no investments considered to be trading securities. Amortized cost of both available-for-sale and held-to-maturity debt securities approximates fair market value due to their short maturities. Substantially all short-term investments held at May 31, 2007 have remaining maturities of 180 days or less. Included in interest (income) expense, net for the years ended May 31, 2007, 2006, and 2005, was interest income of $116.9 million, $87.3 million and $34.9 million, respectively, related to short-term investments and cash and equivalents.

Allowance for Uncollectible Accounts Receivable

Accounts receivable consists principally of amounts receivable from customers. We make ongoing estimates relating to the collectibility of our accounts receivable and maintain an allowance for estimated losses resulting from the inability of our customers to make required payments. In determining the amount of the allowance, we consider our historical level of credit losses and make judgments about the creditworthiness of significant customers based on ongoing credit evaluations. Accounts receivable with anticipated collection dates greater than twelve months from the balance sheet date and related allowances are considered non-current and recorded in other assets. The allowance for uncollectible accounts receivable was $71.5 million and $67.6 million at May 31, 2007 and 2006, respectively, of which $33.3 million and $29.2 million was recorded in other assets.

Inventory Valuation

Inventories related to our wholesale operations are stated at lower of cost or market and valued on a first-in, first-out ("FIFO") or moving average cost basis. Inventories related to our retail operations are stated at the lower of average cost or market using the retail inventory method. Under the retail inventory method, the valuation of inventories at cost is calculated by applying a cost-to-retail ratio to the retail value inventories. Permanent and point of sale markdowns, when recorded, reduce both the retail and cost components of inventory on hand so as to maintain the already established cost-to-retail relationship.

Property, Plant and Equipment and Depreciation

Property, plant and equipment are recorded at cost. Depreciation for financial reporting purposes is determined on a straight-line basis for buildings and leasehold improvements over 2 to 40 years and for machinery and equipment over 2 to 15 years. Computer software (including, in some cases, the cost of internal labor) is depreciated on a straight-line basis over 3 to 10 years.

Impairment of Long-Lived Assets

The Company estimates the future undiscounted cash flows to be derived from an asset to assess whether or not a potential impairment exists when events or circumstances indicate the carrying value of a long-lived asset may be impaired. If the carrying value exceeds the Company's estimate of future undiscounted cash flows, the Company then calculates the impairment as the excess of the carrying value of the asset over the Company's estimate of its fair market value.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Identifiable Intangible Assets and Goodwill

Goodwill and intangible assets with indefinite lives are not amortized but instead are measured for impairment at least annually in the fourth quarter, or when events indicate that an impairment exists. As required by Statement of Financial Accounting Standards ("SFAS") No. 142, "Goodwill and other Intangible Assets" ("FAS 142"), in the Company's impairment test of goodwill, the Company compares the fair value of the applicable reporting unit to its carrying value. The Company estimates the fair value of its reporting units by using a combination of discounted cash flow analysis and comparisons with the market values of similar publicly traded companies. If the carrying value of the reporting unit exceeds the estimate of fair value, the Company calculates the impairment as the excess of the carrying value of goodwill over its implied fair value. In the impairment tests for indefinite-lived intangible assets, the Company compares the estimated fair value of the indefinite-lived intangible assets to the carrying value. The Company estimates the fair value of indefinite-lived intangible assets and trademarks using the relief from royalty approach, which is a standard form of discounted cash flow analysis used for the valuation of trademarks. If the carrying value exceeds the estimate of fair value, the Company calculates impairment as the excess of the carrying value over the estimate of fair value.

Intangible assets that are determined to have definite lives are amortized over their useful lives and are measured for impairment only when events or circumstances indicate the carrying value may be impaired.

Foreign Currency Translation and Foreign Currency Transactions

Adjustments resulting from translating foreign functional currency financial statements into U.S. dollars are included in the foreign currency translation adjustment, a component of accumulated other comprehensive income in shareholders' equity.

Transaction gains and losses generated by the effect of foreign exchange rates on recorded assets and liabilities denominated in a currency different from the functional currency of the applicable Company entity are recorded in other (income) expense, net, in the period in which they occur.

Accounting for Derivatives and Hedging Activities

The Company uses derivative financial instruments to limit exposure to changes in foreign currency exchange rates and interest rates. The Company accounts for derivatives pursuant to SFAS No. 133, "Accounting for Derivative Instruments and Hedging Activities," as amended and interpreted ("FAS 133"). FAS 133 establishes accounting and reporting standards for derivative instruments and requires that all derivatives be recorded at fair value on the balance sheet. Changes in the fair value of derivative financial instruments are either recognized in other comprehensive income (a component of shareholders' equity) or net income depending on whether the derivative is being used to hedge changes in cash flows or fair value.

See Note 16 for more information on the Company's Risk Management program and derivatives.

Stock-Based Compensation

On June 1, 2006, the Company adopted SFAS No. 123R "Share-Based Payment" ("FAS 123R") which requires the Company to record expense for stock-based compensation to employees using a fair value method. Under FAS 123R, the Company estimates the fair value of options granted under the NIKE, Inc. 1990 Stock Incentive Plan (the "1990 Plan") (see Note 10) and employees' purchase rights under the Employee Stock Purchase Plans ("ESPPs") using the Black-Scholes option pricing model. The Company recognizes this fair value, net of estimated forfeitures, as selling and administrative expense in the Consolidated Statements of Income over the vesting period using the straight-line method.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The Company has adopted the modified prospective transition method prescribed by FAS 123R, which does not require the restatement of financial results for previous periods. In accordance with this transition method, the Company's Consolidated Statement of Income for the year ended May 31, 2007 includes (1) amortization of outstanding stock-based compensation granted prior to, but not vested, as of June 1, 2006, based on the fair value estimated in accordance with the original provisions of SFAS No. 123, "Accounting for Stock-Based Compensation" ("FAS 123") and (2) amortization of all stock-based awards granted subsequent to June 1, 2006, based on the fair value estimated in accordance with the provisions of FAS 123R.

The following table summarizes the effects of applying FAS 123R during the year ended May 31, 2007. The resulting stock-based compensation expense primarily relates to stock options.

(in millions, except per share data)	
Addition to selling and administrative expense	$141.9
Reduction to income tax expense	(45.2)
Reduction to net income[(1)]	$ 96.7
Reduction to earnings per share:	
Basic	$ 0.19
Diluted	$ 0.18

(1) In accordance with FAS 123R, stock-based compensation expense reported during the year ended May 31, 2007, includes $24.2 million, net of tax, or $0.04 per diluted share, of accelerated stock-based compensation expense recorded for employees eligible for accelerated stock option vesting upon retirement.

Prior to the adoption of FAS 123R, the Company used the intrinsic value method to account for stock options and ESPP shares in accordance with Accounting Principles Board Opinion No. 25, "Accounting for Stock Issued to Employees" as permitted by FAS 123. If the Company had instead accounted for stock options and ESPP shares issued to employees using the fair value method prescribed by FAS 123 during the years ended May 31, 2006 and 2005 the Company's pro forma net income and pro forma earnings per share would have been reported as follows:

	Year Ended May 31,	
	2006	2005
	(In millions, except per share data)	
Net income as reported	$ 1,392.0	$ 1,211.6
Add: Stock option expense included in reported net income, net of tax	0.2	0.6
Deduct: Total stock option and ESPP expense under fair value based method for all awards, net of tax[(1)]	(76.8)	(64.1)
Pro forma net income	$ 1,315.4	$ 1,148.1
Earnings per share:		
Basic — as reported	$ 2.69	$ 2.31
Basic — pro forma	2.54	2.19
Diluted — as reported	2.64	2.24
Diluted — pro forma	2.50	2.14

(1) Accelerated stock-based compensation expense for options subject to accelerated vesting due to employee retirement is not included in the pro forma figures shown above for the years ended May 31, 2006 and 2005. This disclosure reflects the expense of such options ratably over the stated vesting period or upon actual employee retirement. Had the Company recognized the fair value for such stock options on an accelerated

basis in this pro forma disclosure, the Company would have recognized additional stock-based compensation expense of $17.5 million, net of tax, or $0.03 per diluted share for the year ended May 31, 2006 and $21.8 million, net of tax, or $0.04 per diluted share for the year ended May 31, 2005.

To calculate the excess tax benefits available for use in offsetting future tax shortfalls as of the date of implementation, the Company is following the alternative transition method discussed in FASB Staff Position No. 123R-3, "Transition Election Relating to Accounting for the Tax Effects of Share-Based Payment Awards."

See Note 10 for more information on the Company's stock programs.

Income Taxes

The Company accounts for income taxes using the asset and liability method. This approach requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of temporary differences between the carrying amounts and the tax basis of assets and liabilities. United States income taxes are provided currently on financial statement earnings of non-U.S. subsidiaries that are expected to be repatriated. The Company determines annually the amount of undistributed non-U.S. earnings to invest indefinitely in its non-U.S. operations. See Note 8 for further discussion.

Earnings Per Share

Basic earnings per common share is calculated by dividing net income by the weighted average number of common shares outstanding during the year. Diluted earnings per common share is calculated by adjusting weighted average outstanding shares, assuming conversion of all potentially dilutive stock options and awards. See Note 11 for further discussion.

Management Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates, including estimates relating to assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates.

Reclassifications

Certain prior year amounts have been reclassified to conform to fiscal year 2007 presentation. These changes had no impact on previously reported results of operations or shareholders' equity.

Recently Issued Accounting Standards

In June 2006, the Financial Accounting Standards Board ("FASB") ratified the consensus reached on Emerging Issues Task Force ("EITF") Issue No. 06-3, "How Taxes Collected from Customers and Remitted to Governmental Authorities Should Be Presented in the Income Statement (That Is, Gross versus Net Presentation)" ("EITF 06-3"). EITF 06-3 requires disclosure of the method of accounting for the applicable assessed taxes and the amount of assessed taxes that are included in revenues if they are accounted for under the gross method. EITF 06-3 was adopted in the fourth quarter ended May 31, 2007; however, since the Company presents revenues net of any taxes collected from customers, no additional disclosures were required.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

In September 2006, the FASB issued SFAS No. 158, "Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans" ("FAS 158"). FAS 158 requires employers to fully recognize the obligations associated with single-employer defined benefit pension, retiree healthcare and other postretirement plans in their financial statements. The Company adopted the provisions of FAS 158 in the fourth quarter ended May 31, 2007. See Note 12 for additional details.

In September 2006, the SEC staff issued Staff Accounting Bulletin No. 108, "Considering the Effects of Prior Year Misstatements when Quantifying Misstatements in Current Year Financial Statements" ("SAB 108"). SAB 108 requires public companies to quantify errors using both a balance sheet and income statement approach and evaluate whether either approach results in quantifying a misstatement as material, when all relevant quantitative and qualitative factors are considered. The adoption of SAB 108 at May 31, 2007 did not have a material impact on the Company's consolidated financial position or results of operations.

In June 2006, the FASB issued FASB Interpretation No. 48, "Accounting for Uncertainty in Income Taxes" ("FIN 48"). FIN 48 clarifies the accounting for uncertainty in income taxes recognized in the Company's financial statements in accordance with FASB Statement No. 109, "Accounting for Income Taxes". The provisions of FIN 48 are effective for the fiscal year beginning June 1, 2007. The Company has evaluated the impact of the provisions of FIN 48 and does not expect that the adoption will have a material impact on the Company's consolidated financial position or results of operations.

In June 2006, the FASB ratified the consensus reached on EITF Issue No. 06-2, "Accounting for Sabbatical Leave and Other Similar Benefits Pursuant to FASB Statement No. 43" ("EITF 06-2"). EITF 06-2 clarifies recognition guidance on the accrual of employees' rights to compensated absences under a sabbatical or other similar benefit arrangement. The provisions of EITF 06-2 are effective for the fiscal year beginning June 1, 2007 and will be applied through a cumulative effect adjustment to retained earnings. The Company has evaluated the provisions of EITF 06-2 and does not expect that the adoption will have a material impact on the Company's consolidated financial position or results of operations.

In September 2006, the FASB issued SFAS No. 157, "Fair Value Measurements" ("FAS 157"). FAS 157 defines fair value, establishes a framework for measuring fair value in accordance with generally accepted accounting principles, and expands disclosures about fair value measurements. The provisions of FAS 157 are effective for the fiscal year beginning June 1, 2008. The Company is currently evaluating the impact of the provisions of FAS 157.

In February 2007, the FASB issued SFAS No. 159, "The Fair Value Option for Financial Assets and Financial Liabilities — Including an Amendment of FASB Statement No. 115" ("FAS 159"). FAS 159 permits entities to choose to measure many financial instruments and certain other items at fair value. Unrealized gains and losses on items for which the fair value option has been elected will be recognized in earnings at each subsequent reporting date. The provisions of FAS 159 are effective for the fiscal year beginning June 1, 2008. The Company is currently evaluating the impact of the provisions of FAS 159.

Note 2 — Inventories

Inventory balances of $2,121.9 million and $2,076.7 million at May 31, 2007 and 2006, respectively, were substantially all finished goods.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Note 3 — Property, Plant and Equipment

Property, plant and equipment includes the following:

	May 31, 2007	May 31, 2006
	(In millions)	
Land	$ 193.8	$ 195.9
Buildings	840.9	842.6
Machinery and equipment	1,817.2	1,661.7
Leasehold improvements	672.8	626.7
Construction in process	94.4	81.4
	3,619.1	3,408.3
Less accumulated depreciation	1,940.8	1,750.6
	$ 1,678.3	$ 1,657.7

Capitalized interest was not material for the years ended May 31, 2007, 2006 and 2005.

Note 4 — Identifiable Intangible Assets and Goodwill:

The following table summarizes the Company's identifiable intangible assets and goodwill balances as of May 31, 2007 and May 31, 2006:

	May 31, 2007			May 31, 2006		
	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount	Gross Carrying Amount	Accumulated Amortization	Net Carrying Amount
	(In millions)					
Amortized intangible assets:						
Patents	$ 44.1	$ (12.3)	$ 31.8	$ 34.1	$ (10.5)	$ 23.6
Trademarks	49.8	(17.5)	32.3	46.4	(11.8)	34.6
Other	21.6	(17.3)	4.3	21.5	(15.7)	5.8
Total	$115.5	$ (47.1)	$ 68.4	$102.0	$ (38.0)	$ 64.0
Unamortized intangible assets — Trademarks			$ 341.5			$ 341.5
Total			$ 409.9			$ 405.5
Goodwill			$ 130.8			$ 130.8

Amortization expense of identifiable assets with definite lives, which is included in selling and administrative expense, was $9.9 million, $9.8 million and $9.3 million for the years ended May 31, 2007, 2006, and 2005, respectively. The estimated amortization expense for intangible assets subject to amortization for each of the years ending May 31, 2008 through May 31, 2012 is as follows: 2008: $9.7 million; 2009: $8.7 million; 2010: $8.2 million; 2011: $7.7 million; 2012: $6.9 million.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Note 5 — Accrued Liabilities

Accrued liabilities include the following:

	May 31, 2007	May 31, 2006
	(In millions)	
Compensation and benefits, excluding taxes	$ 451.6	$ 427.2
Endorser compensation	139.9	124.7
Taxes other than income taxes	133.4	115.1
Dividends payable	92.9	79.5
Fair value of derivatives	90.5	111.2
Import and logistics costs	81.4	63.3
Advertising and marketing	70.6	75.4
Converse arbitration[1]	—	51.9
Other[2]	243.1	227.7
	$ 1,303.4	$ 1,276.0

(1) The Converse arbitration relates to a charge taken during the fourth quarter ended May 31, 2006 as a result of a contract dispute between Converse and a former South American licensee. The dispute was settled during the first quarter ended August 31, 2006.

(2) Other consists of various accrued expenses and no individual item accounted for more than $50 million of the balance at May 31, 2007 or 2006.

Note 6 — Short-Term Borrowings and Credit Lines

Notes payable to banks and interest-bearing accounts payable to Sojitz Corporation of America ("Sojitz America") as of May 31, 2007 and 2006, are summarized below:

	May 31, 2007		May 31, 2006	
	Borrowings	Interest Rate	Borrowings	Interest Rate
	(In millions)			
Notes payable:				
U.S. operations	$ 14.6	0.00%[1]	$ 21.0	0.00%[1]
Non-U.S. operations	86.2	9.85%	22.4	7.72%
	$ 100.8		$ 43.4	
Sojitz America	$ 44.6	6.09%	$ 69.7	5.83%

(1) Weighted average interest rate includes non-interest bearing overdrafts.

The carrying amounts reflected in the consolidated balance sheet for notes payable approximate fair value.

The Company purchases through Sojitz America certain athletic footwear, apparel and equipment it acquires from non-U.S. suppliers. These purchases are for the Company's operations outside of the United States, the Europe, Middle East, and Africa Region and Japan. Accounts payable to Sojitz America are generally due up to 60 days after shipment of goods from the foreign port. The interest rate on such accounts payable is the 60-day London Interbank Offered Rate ("LIBOR") as of the beginning of the month of the invoice date, plus 0.75%.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The Company had no borrowings outstanding under its commercial paper program at May 31, 2007 and 2006.

In December 2006, the Company entered into a $1 billion multi-year credit facility that replaced the Company's previous $750 million facility. The facility matures in December 2011, and can be extended for one additional year on both the first and second anniversary date for a total extension of two years. Based on the Company's current long-term senior unsecured debt ratings, the interest rate charged on any outstanding borrowings would be the prevailing LIBOR plus 0.15%. The facility fee is 0.05% of the total commitment. Under this agreement, the Company must maintain, among other things, certain minimum specified financial ratios with which the Company was in compliance at May 31, 2007. No amounts were outstanding under these facilities as of May 31, 2007 or 2006.

In January 2007, one of the Company's Japanese subsidiaries entered into a 3.0 billion yen (approximately $24.7 million as of May 31, 2007) loan facility that replaced certain intercompany borrowings. The interest rate on the facility is based on the six-month Japanese Yen LIBOR plus a spread, resulting in an all-in rate of 0.805% at May 31, 2007. The facility expires December 31, 2007 unless both parties agree to an extension.

Note 7 — Long-Term Debt

Long-term debt includes the following:

	May 31,	
	2007	2006
	(In millions)	
5.5% Corporate Bond, payable August 15, 2006	$ —	$249.3
4.8% Corporate Bond, payable July 9, 2007	25.0	24.7
5.375% Corporate Bond, payable July 8, 2009	24.8	24.6
5.66% Corporate Bond, payable July 23, 2012	24.8	24.6
5.4% Corporate Bond, payable August 7, 2012	14.6	14.4
4.7% Corporate Bond, payable October 1, 2013	50.0	50.0
5.15% Corporate Bonds, payable October 15, 2015	99.6	98.2
4.3% Japanese yen note, payable June 26, 2011	86.4	93.8
1.5% Japanese yen note, payable February 14, 2012	41.1	—
2.6% Japanese yen note, maturing August 20, 2001 through November 20, 2020	51.2	59.7
2.0% Japanese yen note, maturing August 20, 2001 through November 20, 2020	22.9	26.6
Other	—	0.1
Total	440.4	666.0
Less current maturities	30.5	255.3
	$409.9	$410.7

The fair value of long-term debt is estimated using discounted cash flow analyses, based on the Company's incremental borrowing rates for similar types of borrowing arrangements. The fair value of the Company's long-term debt, including current portion, is approximately $443.2 million at May 31, 2007 and $674.0 million at May 31, 2006.

The Company had interest rate swap agreements with the same notional amount and maturity dates as the $250.0 million corporate bond that matured on August 15, 2006, whereby the Company received fixed interest payments at the same rate as the bond and paid variable interest payments based on the three-month LIBOR plus a spread. The interest rate payable on these swap agreements was approximately 6.6% at May 31, 2006.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The Company has an effective shelf registration statement with the Securities and Exchange Commission for $1 billion of debt securities. The Company has a medium-term note program under the shelf registration ("medium-term note program") that allows the Company to issue up to $500 million in medium-term notes. The Company has issued $240 million in medium-term notes under this program. During the years ended May 31, 2007 and 2006, no notes were issued under the medium-term note program. The issued notes have coupon rates that range from 4.70% to 5.66%. The maturities range from July 9, 2007 to October 15, 2015. For each of these notes, except for the swap for the $50 million note maturing October 1, 2013, the Company has entered into interest rate swap agreements whereby the Company receives fixed interest payments at the same rate as the notes and pays variable interest payments based on the three-month or six-month LIBOR plus a spread. Each swap has the same notional amount and maturity date as the corresponding note. The swap for the $50 million note maturing October 1, 2013, expired October 2, 2006. At May 31, 2007, the interest rates payable on these swap agreements range from approximately 5.2% to 5.9%.

In June 1996, one of the Company's Japanese subsidiaries, NIKE Logistics YK, borrowed 10.5 billion Japanese yen in a private placement with a maturity of June 26, 2011. Interest is paid semi-annually. The agreement provides for early retirement after year ten.

In July 1999, NIKE Logistics YK assumed 13.0 billion in Japanese yen loans as part of its agreement to purchase a distribution center in Japan, which serves as collateral for the loans. These loans mature in equal quarterly installments during the period August 20, 2001 through November 20, 2020. Interest is also paid quarterly.

In February 2007, NIKE Logistics YK entered into a 5.0 billion yen (approximately $41.1 million at May 31, 2007) term loan maturing February 14, 2012 that replaces certain intercompany borrowings. The interest rate on the loan is approximately 1.5% and interest is paid semi-annually.

Amounts of long-term debt maturities in each of the years ending May 31, 2008 through 2012 are $30.5 million, $5.5 million, $30.5 million, $5.5 million and $133.0 million, respectively.

Note 8 — Income Taxes

Income before income taxes is as follows:

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Income before income taxes:			
United States	$ 805.1	$ 838.6	$ 755.5
Foreign	1,394.8	1,303.0	1,104.3
	$ 2,199.9	$ 2,141.6	$ 1,859.8

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The provision for income taxes is as follows:

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Current:			
United States			
Federal	$352.6	$359.0	$279.6
State	59.6	60.6	50.7
Foreign	261.9	356.0	292.5
	674.1	775.6	622.8
Deferred:			
United States			
Federal	38.7	(4.2)	21.9
State	(4.8)	(6.8)	(5.3)
Foreign	0.4	(15.0)	8.8
	34.3	(26.0)	25.4
	$708.4	$749.6	$648.2

Deferred tax (assets) and liabilities are comprised of the following:

	May 31,	
	2007	2006
	(In millions)	
Deferred tax assets:		
Allowance for doubtful accounts	$ (12.4)	$ (10.9)
Inventories	(45.8)	(43.9)
Sales return reserves	(42.1)	(39.4)
Deferred compensation	(132.5)	(110.6)
Stock-based compensation	(30.3)	—
Reserves and accrued liabilities	(46.2)	(50.6)
Property, plant, and equipment	(16.3)	(28.6)
Foreign loss carryforwards	(37.5)	(29.2)
Foreign tax credit carryforwards	(3.4)	(9.5)
Hedges	(26.2)	(25.5)
Other	(33.0)	(29.1)
Total deferred tax assets	(425.7)	(377.3)
Valuation allowance	42.3	36.6
Total deferred tax assets after valuation allowance	(383.4)	(340.7)
Deferred tax liabilities:		
Undistributed earnings of foreign subsidiaries	232.6	135.3
Property, plant and equipment	66.1	91.4
Intangibles	97.2	96.8
Hedges	2.5	7.8
Other	17.8	12.5
Total deferred tax liabilities	416.2	343.8
Net deferred tax liability	$ 32.8	$ 3.1

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

A reconciliation from the U.S. statutory federal income tax rate to the effective income tax rate follows:

	Year Ended May 31,		
	2007	2006	2005
Federal income tax rate	35.0%	35.0%	35.0%
State taxes, net of federal benefit	1.6	1.5	1.8
Foreign earnings	(4.1)	(1.5)	(2.8)
Other, net	(0.3)	—	0.9
Effective income tax rate	32.2%	35.0%	34.9%

The effective tax rate for the year ended May 31, 2007 of 32.2% has decreased from the fiscal 2006 effective tax rate of 35%. The decrease is primarily due to a European tax agreement entered into during the three months ended November 30, 2006. The Company recorded a retroactive benefit for the European tax agreement during the year ended May 31, 2007.

During the quarter ended November 30, 2005, the Company's CEO and Board of Directors approved a domestic reinvestment plan as required by the American Jobs Creation Act of 2004 (the "Act") to repatriate $500 million of foreign earnings in fiscal 2006. The Act created a temporary incentive for U.S. multinational corporations to repatriate accumulated income earned outside the U.S. by providing an 85% dividend received deduction for certain dividends from controlled foreign corporations. A $500 million repatriation was made during the quarter ended May 31, 2006 comprised of both foreign earnings for which U.S. taxes have previously been provided and foreign earnings that had been designated as permanently reinvested. Accordingly, the provisions made did not have a material impact on the Company's income tax expense or effective tax rate for the years ended May 31, 2007, 2006 and 2005.

The Company has indefinitely reinvested approximately $1,185.0 million of the cumulative undistributed earnings of certain foreign subsidiaries. Such earnings would be subject to U.S. taxation if repatriated to the U.S. The amount of unrecognized deferred tax liability associated with the permanently reinvested cumulative undistributed earnings was approximately $248.3 million as of May 31, 2007.

Deferred tax assets at May 31, 2007 and 2006 were reduced by a valuation allowance relating to tax benefits of certain foreign subsidiaries with operating losses where it is more likely than not that the deferred tax assets will not be realized.

During the years ended May 31, 2007, 2006, and 2005, income tax benefits attributable to employee stock-based compensation transactions of $56.6 million, $54.2 million, and $63.1 million, respectively, were allocated to shareholders' equity.

Note 9 — Redeemable Preferred Stock

Sojitz America is the sole owner of the Company's authorized Redeemable Preferred Stock, $1 par value, which is redeemable at the option of Sojitz America or the Company at par value aggregating $0.3 million. A cumulative dividend of $0.10 per share is payable annually on May 31 and no dividends may be declared or paid on the common stock of the Company unless dividends on the Redeemable Preferred Stock have been declared and paid in full. There have been no changes in the Redeemable Preferred Stock in the three years ended May 31, 2007, 2006 and 2005. As the holder of the Redeemable Preferred Stock, Sojitz America does not have general voting rights but does have the right to vote as a separate class on the sale of all or substantially all of the assets of the Company and its subsidiaries, on merger, consolidation, liquidation or dissolution of the Company or on the sale or assignment of the NIKE trademark for athletic footwear sold in the United States.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Note 10 — Common Stock

The authorized number of shares of Class A Common Stock, no par value, and Class B Common Stock, no par value, are 350 million and 1.5 billion, respectively. Each share of Class A Common Stock is convertible into one share of Class B Common Stock. Voting rights of Class B Common Stock are limited in certain circumstances with respect to the election of directors.

In 1990, the Board of Directors adopted, and the shareholders approved, the NIKE, Inc. 1990 Stock Incentive Plan (the "1990 Plan"). The 1990 Plan provides for the issuance of up to 132 million previously unissued shares of Class B Common Stock in connection with stock options and other awards granted under the plan. The 1990 Plan authorizes the grant of non-statutory stock options, incentive stock options, stock appreciation rights, stock bonuses and the issuance and sale of restricted stock. The exercise price for non-statutory stock options, stock appreciation rights and the grant price of restricted stock may not be less than 75% of the fair market value of the underlying shares on the date of grant. The exercise price for incentive stock options may not be less than the fair market value of the underlying shares on the date of grant. A committee of the Board of Directors administers the 1990 Plan. The committee has the authority to determine the employees to whom awards will be made, the amount of the awards, and the other terms and conditions of the awards. The committee has granted substantially all stock options and restricted stock at 100% of the market price on the date of grant. Substantially all stock option grants outstanding under the 1990 plan were granted in the first quarter of each fiscal year, vest ratably over four years, and expire 10 years from the date of grant.

The weighted average fair value per share of the options granted during the years ended May 31, 2007, 2006 and 2005, as computed using the Black-Scholes pricing model, was $8.80, $9.68 and $13.95, respectively. The weighted average assumptions used to estimate these fair values are as follows:

	Year Ended May 31,		
	2007	2006	2005
Dividend yield	1.6%	1%	1%
Expected volatility	19%	21%	42%
Weighted average expected life (in years)	5.0	4.5	5.0
Risk-free interest rate	5.0%	4.0%	3.7%

For the years ended May 31, 2007 and 2006, the Company estimated the expected volatility based on the implied volatility in market traded options on the Company's common stock with a term greater than one year, along with other factors. For the year ended May 31, 2005, the Company estimated the expected volatility based on the historical volatility of the Company's common stock. The weighted average expected life of options is based on an analysis of historical and expected future exercise patterns. The interest rate is based on the U.S. Treasury (constant maturity) risk-free rate in effect at the date of grant for periods corresponding with the expected term of the options.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The following summarizes the stock option transactions under the plan discussed above:

	Shares (In millions)	Weighted Average Option Price
Options outstanding May 31, 2004	37.6	$ 23.71
Exercised	(8.8)	23.17
Forfeited	(0.9)	26.33
Granted	10.8	36.96
Options outstanding May 31, 2005	38.7	27.49
Exercised	(8.0)	24.68
Forfeited	(1.8)	35.75
Granted	11.5	43.68
Options outstanding May 31, 2006	40.4	32.31
Exercised	(10.7)	27.55
Forfeited	(1.6)	37.17
Granted	11.6	39.54
Options outstanding May 31, 2007	39.7	$ 35.50
Options exercisable at May 31,		
2005	14.7	$ 23.01
2006	16.6	25.68
2007	15.3	29.52

The weighted average contractual life remaining for options outstanding and options exercisable at May 31, 2007 was 7.2 years and 5.4 years, respectively. The aggregate intrinsic value for options outstanding and exercisable at May 31, 2007 was $843.7 million and $417.0 million, respectively. The aggregate intrinsic value was the amount by which the market value of the underlying stock exceeded the exercise price of the options. The total intrinsic value of the options exercised during the years ended May 31, 2007, 2006 and 2005 was $204.9 million, $144.0 million and $145.7 million, respectively.

As of May 31, 2007, the Company had $132.4 million of unrecognized compensation costs from stock options, net of estimated forfeitures, to be recognized as selling and administrative expense over a weighted average period of 2.1 years.

In addition to the 1990 Plan, the Company gives employees the right to purchase shares at a discount to the market price under employee stock purchase plans (“ESPPs”). Employees are eligible to participate through payroll deductions up to 10% of their compensation. At the end of each six-month offering period, shares are purchased by the participants at 85% of the lower of the fair market value at the beginning or the ending of the offering period. During the years ended May 31, 2007, 2006 and 2005, employees purchased 0.8 million, 0.8 million and 0.6 million shares, respectively.

From time to time, the Company grants restricted stock and unrestricted stock to key employees under the 1990 Plan. The number of shares granted to employees during the years ended May 31, 2007, 2006 and 2005 were 345,000, 141,000 and 229,000 with weighted average prices of $39.38, $43.38 and $44.65, respectively. Recipients of restricted shares are entitled to cash dividends and to vote their respective shares throughout the period of restriction. The value of all of the granted shares was established by the market price on the date of grant.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

The following table summarizes the Company's total stock-based compensation expense recognized in selling and administrative expense:

	Year Ended May 31,		
	2007	2006	2005
		(in millions)	
Stock options	$134.9	$ 0.3	$1.0
ESPPs	7.0	—	—
Restricted stock[(1)]	5.8	11.5	3.9
Total stock-based compensation expense	$147.7	$11.8	$4.9

(1) The expense related to restricted stock awards was included in selling and administrative expense in prior years and was not affected by the adoption of FAS 123R.

During the years ended May 31, 2007, 2006 and 2005, the Company also granted shares of stock under the Long-Term Incentive Plan ("LTIP"), adopted by the Board of Directors and approved by shareholders in September 1997. The LTIP provides for the issuance of up to 2.0 million shares of Class B Common Stock. Under the LTIP, awards are made to certain executives in their choice of either cash or stock, based on performance targets established over three-year time periods. Once performance targets are achieved, cash or shares of stock are issued. The shares are immediately vested upon grant. The value of the shares is established by the market price on the date of issuance. Under the LTIP, 3,000, 6,000 and 8,000 shares with a price of $38.84, $40.79 and $34.85, respectively, were issued during the years ended May 31, 2007, 2006 and 2005 for the plan years ended May 31, 2006, 2005 and 2004, respectively. The Company recognized nominal expense related to the shares issued during the years ended May 31, 2007 and 2006, and $0.1 million during the year ended May 31, 2005. The Company recognized $30.0 million, $21.7 million and $22.1 million of selling and administrative expense related to the cash awards during the years ended May 31, 2007, 2006 and 2005, respectively. During the year ended May 31, 2007, LTIP participants agreed to amend their grant agreements to eliminate the ability to receive payments in shares of stock, so shares of stock are no longer awarded. Beginning with the plan year ended May 31, 2007, cash will be awarded if performance targets are achieved.

Note 11 — Earnings Per Share

The following represents a reconciliation from basic earnings per share to diluted earnings per share. Options to purchase an additional 9.5 million, 11.3 million and 0.5 million shares of common stock were outstanding at May 31, 2007, 2006 and 2005, respectively, but were not included in the computation of diluted earnings per share because the options were antidilutive.

	Year Ended May 31,		
	2007	2006	2005
	(In millions, except per share data)		
Determination of shares:			
Weighted average common shares outstanding	503.8	518.0	525.2
Assumed conversion of dilutive stock options and awards	6.1	9.6	15.4
Diluted weighted average common shares outstanding	509.9	527.6	540.6
Basic earnings per common share	$ 2.96	$ 2.69	$ 2.31
Diluted earnings per common share	$ 2.93	$ 2.64	$ 2.24

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Note 12 — Benefit Plans

The Company has a profit sharing plan available to most U.S.-based employees. The terms of the plan call for annual contributions by the Company as determined by the Board of Directors. A subsidiary of the Company also has a profit sharing plan available to its U.S.-based employees. The terms of the plan call for annual contributions as determined by the subsidiary's executive management. Contributions of $31.8 million, $33.2 million, and $29.1 million were made to the plans and are included in selling and administrative expenses in the consolidated financial statements for the years ended May 31, 2007, 2006 and 2005, respectively. The Company has various 401(k) employee savings plans available to U.S.-based employees. The Company matches a portion of employee contributions with common stock or cash. Company contributions to the savings plans were $24.9 million, $22.5 million, and $20.3 million for the years ended May 31, 2007, 2006 and 2005, respectively, and are included in selling and administrative expenses.

The Company has pension plans in various countries worldwide. The pension plans are only available to local employees and are generally government mandated. Upon adoption of FAS 158, "Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans" on May 31, 2007, the Company recorded a liability of $17.6 million related to the unfunded pension liabilities of the plans.

Note 13 — Comprehensive Income

Comprehensive income is as follows:

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Net income	$1,491.5	$1,392.0	$1,211.6
Other comprehensive income:			
Change in cumulative translation adjustment and other (net of tax (expense) benefit of ($5.4) in 2007, $19.7 in 2006, and $3.9 in 2005)	84.6	87.1	70.1
Changes due to cash flow hedging instruments (Note 16):			
Net loss on hedge derivatives (net of tax benefit of $9.5 in 2007, $2.8 in 2006 and $28.7 in 2005)	(38.1)	(5.6)	(54.0)
Reclassification to net income of previously deferred losses and (gains) related to hedge derivatives (net of tax expense (benefit) of ($3.6) in 2007, $15.3 in 2006 and ($72.8) in 2005)	21.4	(33.2)	143.6
Other comprehensive income	67.9	48.3	159.7
Total comprehensive income	$1,559.4	$1,440.3	$1,371.3

The components of accumulated other comprehensive income are as follows:

	May 31,	
	2007	2006
	(In millions)	
Cumulative translation adjustment and other[(1)]	$234.3	$161.9
Net deferred loss on hedge derivatives	(56.9)	(40.2)
	$177.4	$121.7

(1) Cumulative translation adjustment and other for the year ended May 31, 2007 includes a $12.2 million net-of-tax adjustment relating to the adoption of FAS 158. See Note 12 for additional details.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Note 14 — Commitments and Contingencies

The Company leases space for certain of its offices, warehouses and retail stores under leases expiring from one to twenty-seven years after May 31, 2007. Rent expense was $285.2 million, $252.0 million and $232.6 million for the years ended May 31, 2007, 2006 and 2005, respectively. Amounts of minimum future annual rental commitments under non-cancelable operating leases in each of the five years ending May 31, 2008 through 2012 are $260.9 million, $219.9 million, $183.3 million, $156.7 million, $128.4 million, respectively, and $587.0 million in later years.

As of May 31, 2007 and 2006, the Company had letters of credit outstanding totaling $165.9 million and $347.6 million, respectively. These letters of credit were generally issued for the purchase of inventory.

In connection with various contracts and agreements, the Company provides routine indemnifications relating to the enforceability of intellectual property rights, coverage for legal issues that arise and other items that fall under the scope of FASB Interpretation No. 45, "Guarantor's Accounting and Disclosure Requirements for Guarantees, Including Indirect Guarantees of Indebtedness of Others." Currently, the Company has several such agreements in place. However, based on the Company's historical experience and the estimated probability of future loss, the Company has determined that the fair value of such indemnifications is not material to the Company's financial position or results of operations.

In the ordinary course of its business, the Company is involved in various legal proceedings involving contractual and employment relationships, product liability claims, trademark rights, and a variety of other matters. The Company does not believe there are any pending legal proceedings that will have a material impact on the Company's financial position or results of operations.

Note 15 — Acquisitions

In August 2004, the Company acquired 100% of the equity interests in Official Starter LLC and Official Starter Properties LLC (collectively "Official Starter"). The Exeter Brands Group LLC, a wholly-owned subsidiary of the Company, was formed soon thereafter to develop the Company's business in retail channels serving value-conscious consumers and to operate the Official Starter business. The acquisition was accounted for under the purchase method of accounting. The cash purchase price, including acquisition costs net of cash acquired, was $47.2 million. All assets and liabilities of Exeter Brands Group were initially recorded in the Company's Consolidated Balance Sheet based on their estimated fair values at the date of acquisition. The results of Exeter Brands Group's operations have been included in the consolidated financial statements since the date of acquisition as part of the Company's Other operating segment. The pro forma effect of the acquisition on the combined results of operations was not significant.

Note 16 — Risk Management and Derivatives

The Company is exposed to global market risks, including the effect of changes in foreign currency exchange rates and interest rates. The Company uses derivatives to manage financial exposures that occur in the normal course of business. The Company does not hold or issue derivatives for trading purposes.

The Company formally documents all relationships between hedging instruments and hedged items, as well as its risk-management objective and strategy for undertaking hedge transactions. This process includes linking all derivatives to either specific assets and liabilities on the balance sheet or specific firm commitments or forecasted transactions.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Substantially all derivatives outstanding as of May 31, 2007 and 2006 are designated as either cash flow or fair value hedges. All derivatives are recognized on the balance sheet at their fair value. Unrealized gain positions are recorded as other current assets or other non-current assets, depending on the instrument's maturity date. Unrealized loss positions are recorded as accrued liabilities or other non-current liabilities. All changes in fair values of outstanding cash flow hedge derivatives, except the ineffective portion, are recorded in other comprehensive income, until net income is affected by the variability of cash flows of the hedged transaction. Fair value hedges are recorded in net income and are offset by the change in fair value of the underlying asset or liability being hedged.

Cash Flow Hedges

The purpose of the Company's foreign currency hedging activities is to protect the Company from the risk that the eventual cash flows resulting from transactions in foreign currencies, including revenues, product costs, selling and administrative expenses, investments in U.S. dollar-denominated available-for-sale debt securities and intercompany transactions, including intercompany borrowings, will be adversely affected by changes in exchange rates. It is the Company's policy to utilize derivatives to reduce foreign exchange risks where internal netting strategies cannot be effectively employed.

Derivatives used by the Company to hedge foreign currency exchange risks are forward exchange contracts and options. Hedged transactions are denominated primarily in euros, British pounds, Japanese yen, Korean won, Canadian dollars and Mexican pesos. The Company hedges up to 100% of anticipated exposures typically twelve months in advance, but has hedged as much as 32 months in advance. When intercompany loans are hedged, it is typically for their expected duration.

Substantially all foreign currency derivatives outstanding as of May 31, 2007 and 2006 qualify for and are designated as foreign-currency cash flow hedges, including those hedging foreign currency denominated firm commitments.

Changes in fair values of outstanding cash flow hedge derivatives, except the ineffective portion, are recorded in other comprehensive income, until net income is affected by the variability of cash flows of the hedged transaction. In most cases amounts recorded in other comprehensive income will be released to net income some time after the maturity of the related derivative. The consolidated statement of income classification of effective hedge results is the same as that of the underlying exposure. Results of hedges of revenue and product costs are recorded in revenue and cost of sales, respectively, when the underlying hedged transaction affects net income. Results of hedges of selling and administrative expense are recorded together with those costs when the related expense is recorded. Results of hedges of anticipated purchases and sales of U.S. dollar-denominated available-for-sale securities are recorded in other (income) expense, net when the securities are sold.

Results of hedges of anticipated intercompany transactions are recorded in other (income) expense, net when the transaction occurs. Hedges of recorded balance sheet positions are recorded in other (income) expense, net currently together with the transaction gain or loss from the hedged balance sheet position. Net foreign currency transaction gains and losses, which includes hedge results captured in revenues, cost of sales, selling and administrative expense and other (income) expense, net, were a $27.9 million loss, a $49.9 million gain, and a $217.8 million loss for the years ended May 31, 2007, 2006, and 2005, respectively.

Premiums paid on options are initially recorded as deferred charges. The Company assesses effectiveness on options based on the total cash flows method and records total changes in the options' fair value to other comprehensive income to the degree they are effective.

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

As of May 31, 2007, $52.8 million of deferred net losses (net of tax) on both outstanding and matured derivatives accumulated in other comprehensive income are expected to be reclassified to net income during the next twelve months as a result of underlying hedged transactions also being recorded in net income. Actual amounts ultimately reclassified to net income are dependent on the exchange rates in effect when derivative contracts that are currently outstanding mature. As of May 31, 2007, the maximum term over which the Company is hedging exposures to the variability of cash flows for all forecasted and recorded transactions is 18 months.

The Company formally assesses, both at a hedge's inception and on an ongoing basis, whether the derivatives that are used in the hedging transaction have been highly effective in offsetting changes in the cash flows of hedged items and whether those derivatives may be expected to remain highly effective in future periods. When it is determined that a derivative is not, or has ceased to be, highly effective as a hedge, the Company discontinues hedge accounting prospectively.

The Company discontinues hedge accounting prospectively when (1) it determines that the derivative is no longer highly effective in offsetting changes in the cash flows of a hedged item (including hedged items such as firm commitments or forecasted transactions); (2) the derivative expires or is sold, terminated, or exercised; (3) it is no longer probable that the forecasted transaction will occur; or (4) management determines that designating the derivative as a hedging instrument is no longer appropriate.

When the Company discontinues hedge accounting because it is no longer probable that the forecasted transaction will occur in the originally expected period, the gain or loss on the derivative remains in accumulated other comprehensive income and is reclassified to net income when the forecasted transaction affects net income. However, if it is probable that a forecasted transaction will not occur by the end of the originally specified time period or within an additional two-month period of time thereafter, the gains and losses that were accumulated in other comprehensive income will be recognized immediately in net income. In all situations in which hedge accounting is discontinued and the derivative remains outstanding, the Company will carry the derivative at its fair value on the balance sheet, recognizing future changes in the fair value in other (income) expense, net. Any hedge ineffectiveness is recorded in other (income) expense, net. Effectiveness for cash flow hedges is assessed based on forward rates.

For each of the years ended May 31, 2007, 2006 and 2005, the Company recorded in other (income) expense, net an insignificant loss representing the total ineffectiveness of all derivatives. Net income for each of the years ended May 31, 2007, 2006 and 2005 was not materially affected due to discontinued hedge accounting.

Fair Value Hedges

The Company is also exposed to the risk of changes in the fair value of certain fixed-rate debt attributable to changes in interest rates. Derivatives currently used by the Company to hedge this risk are receive-fixed, pay-variable interest rate swaps.

Substantially all interest rate swap agreements are designated as fair value hedges of the related long-term debt and meet the shortcut method requirements under FAS 133. Accordingly, changes in the fair values of the interest rate swap agreements are exactly offset by changes in the fair value of the underlying long-term debt. No ineffectiveness has been recorded to net income related to interest rate swaps designated as fair value hedges for the years ended May 31, 2007, 2006 and 2005.

As discussed in Note 7, during the year ended May 31, 2004, the Company issued a $50 million medium-term note maturing October 1, 2013 and simultaneously entered into a receive-fixed, pay-variable interest rate swap with the same notional amount and fixed interest rate as the note. However, the swap expired

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

October 2, 2006. This interest rate swap was not accounted for as a fair value hedge. Accordingly, changes in the fair value of the swap were recorded to net income each period as a component of other (income) expense, net. The change in the fair value of the swap was not material for the years ended May 31, 2007, 2006 and 2005.

In fiscal 2003, the Company entered into an interest rate swap agreement related to a Japanese yen denominated intercompany loan with one of the Company's Japanese subsidiaries. The Japanese subsidiary pays variable interest on the intercompany loan based on 3-month LIBOR plus a spread. Under the interest rate swap agreement, the subsidiary pays fixed interest payments at 0.8% and receives variable interest payments based on 3-month LIBOR plus a spread based on a notional amount of 8 billion Japanese yen. This interest rate swap is not accounted for as a fair value hedge. Accordingly, changes in the fair value of the swap are recorded to net income each period as a component of other (income) expense, net. The change in the fair value of the swap was not material for the years ended May 31, 2007, 2006 and 2005.

The fair values of all derivatives recorded on the consolidated balance sheet are as follows:

	May 31,	
	2007	2006
	(In millions)	
Unrealized Gains:		
Foreign currency exchange contracts and options	$ 43.5	$ 75.7
Interest rate swaps	0.5	0.9
Unrealized (Losses):		
Foreign currency exchange contracts and options	(90.6)	(122.2)
Interest rate swaps	(2.6)	(6.0)

Concentration of Credit Risk

The Company is exposed to credit-related losses in the event of non-performance by counterparties to hedging instruments. The counterparties to all derivative transactions are major financial institutions with investment grade credit ratings. However, this does not eliminate the Company's exposure to credit risk with these institutions. This credit risk is generally limited to the unrealized gains in such contracts should any of these counterparties fail to perform as contracted. To manage this risk, the Company has established strict counterparty credit guidelines that are continually monitored and reported to senior management according to prescribed guidelines. The Company utilizes a portfolio of financial institutions either headquartered or operating in the same countries the Company conducts its business. As a result of the above considerations, the Company considers the risk of counterparty default to be minimal.

In addition to hedging instruments, the Company is subject to concentrations of credit risk associated with cash and equivalents and accounts receivable. The Company places cash and equivalents with financial institutions with investment grade credit ratings and, by policy, limits the amount of credit exposure to any one financial institution. The Company considers its concentration risk related to accounts receivable to be mitigated by the Company's credit policy, the significance of outstanding balances owed by each individual customer at any point in time and the geographic dispersion of these customers.

Note 17 — Operating Segments and Related Information

Operating Segments. The Company's operating segments are evidence of the structure of the Company's internal organization. The major segments are defined by geographic regions for operations participating in NIKE brand sales activity excluding NIKE Golf and NIKE Bauer Hockey. Each NIKE brand geographic segment operates predominantly in one industry: the design, production, marketing and selling of sports and fitness

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

footwear, apparel, and equipment. The "Other" category shown below represents activities of Cole Haan, Converse, Exeter Brands Group (beginning August 11, 2004), Hurley, NIKE Bauer Hockey, and NIKE Golf, which are considered immaterial for individual disclosure based on the aggregation criteria in SFAS No. 131 "Disclosures about Segments of an Enterprise and Related Information".

Where applicable, "Corporate" represents items necessary to reconcile to the consolidated financial statements, which generally include corporate activity and corporate eliminations.

Net revenues as shown below represent sales to external customers for each segment. Intercompany revenues have been eliminated and are immaterial for separate disclosure. The Company evaluates performance of individual operating segments based on pre-tax income. On a consolidated basis, this amount represents income before income taxes as shown in the Consolidated Statements of Income. Reconciling items for pre-tax income represent corporate costs that are not allocated to the operating segments for management reporting including corporate activity, certain currency exchange rate gains and losses on transactions and intercompany eliminations for specific income statement items in the Consolidated Statements of Income.

Additions to long-lived assets as presented in the following table represent capital expenditures.

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

Accounts receivable, inventories and property, plant and equipment for operating segments are regularly reviewed by management and are therefore provided below.

Certain prior year amounts have been reclassed to conform to fiscal 2007 presentation.

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Net Revenue			
United States	$ 6,107.1	$ 5,722.5	$ 5,129.3
Europe, Middle East and Africa	4,723.3	4,326.6	4,281.6
Asia Pacific	2,283.4	2,053.8	1,897.3
Americas	952.5	904.9	695.8
Other	2,259.6	1,947.1	1,735.7
	$16,325.9	$14,954.9	$13,739.7
Pre-tax Income			
United States	$ 1,300.3	$ 1,244.5	$ 1,127.9
Europe, Middle East and Africa	1,000.7	960.7	917.5
Asia Pacific	483.7	412.5	399.8
Americas	187.4	172.6	116.5
Other	303.7	153.6	154.8
Corporate	(1,075.9)	(802.3)	(856.7)
	$ 2,199.9	$ 2,141.6	$ 1,859.8
Additions to Long-lived Assets			
United States	$ 67.3	$ 59.8	$ 54.8
Europe, Middle East and Africa	94.9	73.6	38.8
Asia Pacific	20.7	16.8	22.0
Americas	5.3	6.9	6.8
Other	36.0	33.2	31.3
Corporate	89.3	143.4	103.4
	$ 313.5	$ 333.7	$ 257.1
Depreciation			
United States	$ 45.4	$ 54.2	$ 49.0
Europe, Middle East and Africa	47.4	46.9	45.2
Asia Pacific	25.2	28.4	28.3
Americas	6.1	6.4	4.0
Other	28.2	29.0	28.5
Corporate	117.4	117.1	102.2
	$ 269.7	$ 282.0	$ 257.2

Source: NIKE INC, 10-K, July 27, 2007

NIKE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS — (Continued)

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Accounts Receivable, net			
United States	$ 806.8	$ 717.2	$ 627.0
Europe, Middle East and Africa	739.1	703.3	711.4
Asia Pacific	296.6	319.7	309.8
Americas	184.1	174.5	168.7
Other	404.9	410.0	394.0
Corporate	63.2	58.2	39.0
	$ 2,494.7	$ 2,382.9	$ 2,249.9
Inventories			
United States	$ 796.0	$ 725.9	$ 639.9
Europe, Middle East and Africa	554.5	590.1	496.5
Asia Pacific	214.1	238.3	228.9
Americas	132.0	147.6	96.8
Other	378.7	330.5	316.2
Corporate	46.6	44.3	32.8
	$ 2,121.9	$ 2,076.7	$ 1,811.1
Property, Plant and Equipment, net			
United States	$ 232.7	$ 219.3	$ 216.0
Europe, Middle East and Africa	325.4	266.6	230.0
Asia Pacific	326.1	354.8	380.4
Americas	16.9	17.0	15.7
Other	103.6	98.2	93.4
Corporate	673.6	701.8	670.3
	$ 1,678.3	$ 1,657.7	$ 1,605.8

Revenues by Major Product Lines. Revenues to external customers for NIKE brand products are attributable to sales of footwear, apparel and equipment. Other revenues to external customers primarily include external sales by Cole Haan Holdings Incorporated, Converse Inc., Exeter Brands Group LLC (beginning August 11, 2004), Hurley International LLC, NIKE Bauer Hockey Corp., and NIKE Golf.

	Year Ended May 31,		
	2007	2006	2005
		(In millions)	
Footwear	$ 8,514.0	$ 7,965.9	$ 7,299.7
Apparel	4,576.5	4,168.0	3,879.4
Equipment	975.8	873.9	824.9
Other	2,259.6	1,947.1	1,735.7
	$ 16,325.9	$ 14,954.9	$ 13,739.7

Revenues and Long-Lived Assets by Geographic Area. Geographical area information is similar to that shown previously under operating segments with the exception of the Other activity, which has been allocated to the geographical areas based on the location where the sales originated. Revenues derived in the United States were $7,593.7 million, $7,019.0 million, and $6,284.5 million, for the years ended May 31, 2007, 2006, and

NIKE, INC.

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2005, respectively. The Company's largest concentrations of long-lived assets are in the United States and Japan. Long-lived assets attributable to operations in the United States, which are comprised of net property, plant & equipment were $991.3 million, $998.2 million, and $956.6 million at May 31, 2007, 2006, and 2005, respectively. Long-lived assets attributable to operations in Japan were $260.6 million, $296.3 million, and $321.0 million at May 31, 2007, 2006, and 2005, respectively.

Major Customers. During the years ended May 31, 2007, 2006 and 2005, revenues derived from Foot Locker, Inc. represented 10 percent, 10 percent and 11 percent of the Company's consolidated revenues, respectively. Sales to this customer are included in all segments of the Company.

Item 9. ***Changes In and Disagreements with Accountants on Accounting and Financial Disclosure***

There has been no change of accountants nor any disagreements with accountants on any matter of accounting principles or practices or financial statement disclosure required to be reported under this Item.

Item 9A. ***Controls and Procedures***

We maintain disclosure controls and procedures that are designed to ensure that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized and reported within the time periods specified in the Securities and Exchange Commission's rules and forms and that such information is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate, to allow for timely decisions regarding required disclosure. In designing and evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives, and management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

We carry out a variety of on-going procedures, under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, to evaluate the effectiveness of the design and operation of our disclosure controls and procedures. Based on the foregoing, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective at the reasonable assurance level as of May 31, 2007.

"Management's Annual Report on Internal Control Over Financial Reporting" and the related attestation report of PricewaterhouseCoopers LLP are included in Item 8 on pages 46-49 of this Report.

There has been no change in our internal control over financial reporting during our most recent fiscal quarter that has materially affected, or is reasonable likely to materially affect, our internal control over financial reporting.

Item 9B. ***Other Information***

No disclosure is required under this Item.

Glossary

A

absorption costing The reporting of the costs of manufactured products, normally direct materials, direct labor, and factory overhead, as product costs. (178)

accounts receivable analysis A company's ability to collect its accounts receivable. (593)

accounts receivable turnover The relationship between net sales and accounts receivable, computed by dividing the net sales by the average net accounts receivable; measures how frequently during the year the accounts receivable are being converted to cash. (593)

activity analysis The study of employee effort and other business records to determine the cost of activities. (503)

activity base (driver) A measure of activity that is related to changes in cost. Used in analyzing and classifying cost behavior. Activity bases are also used in the denominator in calculating the predetermined factory overhead rate to assign overhead costs to cost objects. (46, 132, 453)

activity cost pools Cost accumulations that are associated with a given activity, such as machine usage, inspections, moving, and production setups. (451)

activity rate The cost of an activity per unit of activity base, determined by dividing the activity cost pool by the activity base. (453)

activity-based costing (ABC) method A cost allocation method that identifies activities causing the incurrence of costs and allocates these costs to products (or other cost objects), based on activity drivers (bases). (46, 380, 451)

annuity A series of equal cash flows at fixed intervals. (411)

appraisal costs Costs to detect, measure, evaluate, and audit products and processes to ensure that they conform to customer requirements and performance standards. (503)

average rate of return A method of evaluating capital investment proposals that focuses on the expected profitability of the investment. (407)

B

backflush accounting Simplification of the accounting system by eliminating accumulation and transfer of costs as products move through production. (500)

balanced scorecard A performance evaluation approach that incorporates multiple performance dimensions by combining financial and nonfinancial measures. (332)

break-even point The level of business operations at which revenues and expired costs are equal. (141)

budget An accounting device used to plan and control resources of operational departments and divisions. (228)

budget performance report A report comparing actual results with budget figures. (278)

budgetary slack Excess resources set within a budget to provide for uncertain events. (230)

budgeted variable factory overhead The standard variable overhead for the actual units produced. (286)

C

capital expenditures budget The budget summarizing future plans for acquiring plant facilities and equipment. (247)

capital investment analysis The process by which management plans, evaluates, and controls long-term capital investments involving property, plant, and equipment. (406)

capital rationing The process by which management plans, evaluates, and controls long-term capital investments involving fixed assets. (421)

cash budget A budget of estimated cash receipts and payments. (244)

cash payback period The expected period of time that will elapse between the date of a capital expenditure and the complete recovery in cash (or equivalent) of the amount invested. (408)

cash flow per share Normally computed as cash flow from operations per share. (534)

cash flows from financing activities The section of the statement of cash flows that reports cash flows from transactions affecting the equity and debt of the business. (531)

cash flows from investing activities The section of the statement of cash flows that reports cash flows from transactions affecting investments in noncurrent assets. (531)

cash flows from operating activities The section of the statement of cash flows that reports the cash transactions affecting the determination of net income. (530)

common-sized statement A financial statement in which all items are expressed only in relative terms. (588)

continuous budgeting A method of budgeting that provides for maintaining a 12-month projection into the future. (231)

continuous process improvement A management approach that is part of the overall total quality management philosophy. The approach requires all employees to constantly improve processes of which they are a part or for which they have managerial responsibility. (6)

contribution margin Sales less variable costs and variable selling and administrative expenses. (138, 179)

contribution margin analysis The systematic examination of the differences between planned and actual contribution margins. (194)

contribution margin ratio The percentage of each sales dollar that is available to cover the fixed costs and provide an operating income. (138)

controllable costs Costs that can be influenced (increased, decreased, or eliminated) by someone such as a manager or factory worker. (188)

controllable expenses Costs that can be influenced by the decisions of a manager. (322)

controllable revenues Revenues earned by the profit center. (322)

controllable variance The difference between the actual amount of variable factory overhead cost incurred and the amount of variable factory overhead budgeted for the standard product. (286)

controller The chief management accountant of a division or other segment of a business. (5)

controlling A phase in the management process that consists of monitoring the operating results of implemented plans and comparing the actual results with the expected results. (6)

conversion costs The combination of direct labor and factory overhead costs. (11, 499)

cost A payment of cash (or a commitment to pay cash in the future) for the purpose of generating revenues. (8)

cost accounting system A branch of managerial accounting concerned with accumulating manufacturing costs for financial reporting and decision-making purposes. (39)

cost allocation The process of assigning indirect cost to a cost object, such as a job. (46)

cost behavior The manner in which a cost changes in relation to its activity base (driver). (132)

cost center A decentralized unit in which the department or division manager has responsibility for the control of costs incurred and the authority to make decisions that affect these costs. (320)

cost object The object or segment of operations to which costs are related for management's use, such as a product or department. (8)

cost of finished goods available for sale The beginning finished goods inventory added to the cost of goods manufactured during the period. (15)

cost of goods manufactured The total cost of making and finishing a product. (15)

cost of goods sold The cost of finished goods available for sale minus the ending finished goods inventory. (15)

cost of goods sold budget A budget of the estimated direct materials, direct labor, and factory overhead consumed by sold products. (241)

cost of merchandise sold The cost that is reported as an expense when merchandise is sold. (14)

cost of production report A report prepared periodically by a processing department, summarizing (1) the units for which the department is accountable and the disposition of those units and (2) the costs incurred by the department and the allocation of those costs between completed and incomplete production. (87)

cost of quality report A report summarizing the costs, percent of total, and percent of sales by appraisal, prevention, internal failure, and external failure cost of quality categories. (505)

cost per equivalent unit The rate used to allocate costs between completed and partially completed production. (92)

cost price approach An approach to transfer pricing that uses cost as the basis for setting the transfer price. (337)

cost variance The difference between actual cost and the flexible budget at actual volumes. (278)

costs of quality The cost associated with controlling quality (prevention and appraisal) and failing to control quality (internal and external failure). (503)

cost-volume-profit analysis The systematic examination of the relationships among selling prices, volume of sales and production, costs, expenses, and profits. (137)

cost-volume-profit chart A chart used to assist management in understanding the relationships among costs, expenses, sales, and operating profit or loss. (146)

currency exchange rate The rate at which currency in another country can be exchanged for local currency. (420)

current position analysis A company's ability to pay its current liabilities. (591)

current ratio A financial ratio that is computed by dividing current assets by current liabilities. (591)

currently attainable standards Standards that represent levels of operation that can be attained with reasonable effort. (275)

D

decision making A component inherent in the other management processes of planning, directing, controlling, and improving. (6)

differential analysis The area of accounting concerned with the effect of alternative courses of action on revenues and costs. (363)

differential cost The amount of increase or decrease in cost expected from a particular course of action compared with an alternative. (363)

differential income (or loss) The difference between the differential revenue and the differential costs. (363)

differential revenue The amount of increase or decrease in revenue expected from a particular course of action as compared with an alternative. (363)

direct costs Costs that can be traced directly to a cost object. (8)

direct labor cost The wages of factory workers who are directly involved in converting materials into a finished product. (10)

direct labor cost budget Budget that estimates direct labor hours and related costs needed to support budgeted production. (239)

direct labor rate variance The cost associated with the difference between the standard rate and the actual rate paid for direct labor used in producing a commodity. (283)

direct labor time variance The cost associated with the difference between the standard hours and the actual hours of direct labor spent producing a commodity. (283)

direct materials cost The cost of materials that are an integral part of the finished product. (9)

direct materials price variance The cost associated with the difference between the standard price and the actual price of direct materials used in producing a commodity. (281)

direct materials purchases budget A budget that uses the production budget as a starting point to budget materials purchases. (238)

direct materials quantity variance The cost associated with the difference between the standard quantity and the actual quantity of direct materials used in producing a commodity. (281)

direct method A method of reporting the cash flows from operating

activities as the difference between the operating cash receipts and the operating cash payments. (531)

directing The process by which managers, given their assigned level of responsibilities, run day-to-day operations. (6)

dividend yield A ratio, computed by dividing the annual dividends paid per share of common stock by the market price per share at a specific date, that indicates the rate of return to stockholders in terms of cash dividend distributions. (604)

dividends per share Measures the extent to which earnings are being distributed to common shareholders. (604)

DuPont formula An expanded expression of return on investment determined by multiplying the profit margin by the investment turnover. (327)

E

earnings per share (EPS) on common stock The profitability ratio of net income available to common shareholders to the number of common shares outstanding. (602)

electronic data interchange (EDI) An information technology that allows different business organizations to use computers to communicate orders, relay information, and make or receive payments. (497)

employee involvement A philosophy that grants employees the responsibility and authority to make their own decisions about their operations. (496)

engineering change order (ECO) A document that initiates a change in the specification or a product or process. (452)

enterprise resource planning (ERP) An integrated business and information system used by companies to plan and control both internal and supply chain operations. (497)

equivalent units of production The number of production units that could have been completed within a given accounting period, given the resources consumed. (89)

external failure costs The costs incurred after defective units or services have been delivered to consumers. (503)

F

factory burden Another term for manufacturing overhead or factory overhead. (10)

factory overhead cost All of the costs of producing a product except for direct materials and direct labor. (10)

factory overhead cost budget Budget that estimates the cost for each item of factory overhead needed to support budgeted production. (240)

factory overhead cost variance report Reports budgeted and actual costs for variable and fixed factory overhead along with the related controllable and volume variances. (289)

favorable cost variance A variance that occurs when the actual cost is less than standard cost. (278)

feedback Measures provided to operational employees or managers on the performance of subunits of the organization. These measures are used by employees to adjust a process or a behavior to achieve goals. See management by exception. (6)

financial accounting The branch of accounting that is concerned with recording transactions using generally accepted accounting principles (GAAP) for a business or other economic unit and with a periodic preparation of various statements from such records. (3)

finished goods inventory The direct materials costs, direct labor costs, and factory overhead costs of finished products that have not been sold. (13)

finished goods ledger The subsidiary ledger that contains the individual accounts for each kind of commodity or product produced. (51)

first-in, first-out (FIFO) inventory cost flow method The method of inventory costing based on the assumption that the costs of merchandise sold should be charged against revenue in the order in which the costs were incurred. (87)

fixed costs Costs that tend to remain the same in amount, regardless of variations in the level of activity. (134)

flexible budget A budget that adjusts for varying rates of activity. (232)

free cash flow The amount of operating cash flow remaining after replacing current productive capacity and maintaining current dividends. (549)

G

goal conflict A condition that occurs when individual objectives conflict with organizational objectives. (230)

H

high-low method A technique that uses the highest and lowest total costs as a basis for estimating the variable cost per unit and the fixed cost component of a mixed cost. (136)

horizontal analysis Financial analysis that compares an item in a current statement with the same item in prior statements. (585)

I

ideal standards Standards that can be achieved only under perfect operating conditions, such as no idle time, no machine breakdowns, and no materials spoilage; also called theoretical standards. (275)

indirect costs Costs that cannot be traced directly to a cost object. (8)

indirect method A method of reporting the cash flows from operating activities as the net income from operations adjusted for all deferrals of past cash receipts and payments and all accruals of expected future cash receipts and payments. (532)

inflation A period when prices in general are rising and the purchasing power of money is declining. (420)

internal failure costs The costs associated with defects that are discovered by the organization before the product or service is delivered to the consumer. (503)

internal rate of return (IRR) method A method of analysis of proposed capital investments that uses present value concepts to compute the rate of return from the net cash flows expected from the investment. (415)

inventory analysis A company's ability to manage its inventory effectively. (594)

inventory turnover The relationship between the volume of goods sold and inventory, computed by dividing the cost of goods sold by the average inventory. (595)

investment center A decentralized unit in which the manager has the responsibility and authority to make decisions that affect not only costs and revenues but also the fixed assets available to the center. (326)

investment turnover A component of the rate of return on investment, computed as the ratio of sales to invested assets. (327)

J

job cost sheet An account in the work in process subsidiary ledger in which the costs charged to a particular job order are recorded. (42)

job order cost system A type of cost accounting system that provides for a separate record of the cost of each particular quantity of product that passes through the factory. (39)

just-in-time (JIT) processing A processing approach that focuses on eliminating time, cost, and poor quality within manufacturing and nonmanufacturing processes. (102, 490)

L

lead time The elapsed time between starting a unit of product into the beginning of a process and its completion. (491)

line department A unit that is directly involved in the basic objectives of an organization. (4)

M

management (or managerial) accounting The branch of accounting that uses both historical and estimated data in providing information that management uses in conducting daily operations, in planning future operations, and in developing overall business strategies. (3)

management by exception The philosophy of managing which involves monitoring the operating results of implemented plans and comparing the expected results with the actual results. This feedback allows management to isolate significant variations for further investigation and possible remedial action. (6)

management process The five basic management functions of (1) planning, (2) directing, (3) controlling, (4) improving, and (5) decision making. (5)

Management's Discussion and Analysis (MD&A) An annual report disclosure that provides management's analysis of the results of operations and financial condition. (606)

managerial accounting The branch of accounting that uses both historical and estimated data in providing information that management uses in conducting daily operations, in planning future operations, and in developing overall business strategies. (3)

manufacturing cells A grouping of processes where employees are cross-trained to perform more than one function. (103)

manufacturing margin The variable cost of goods sold deducted from sales. (179)

manufacturing overhead Costs, other than direct materials and direct labor costs, that are incurred in the manufacturing process. (10)

margin of safety Indicates the possible decrease in sales that may occur before an operating loss results. (154)

market price approach An approach to transfer pricing that uses the price at which the product or service transferred could be sold to outside buyers as the transfer price. (334)

market segment A portion of business that can be assigned to a manager for profit responsibility. (189)

markup An amount that is added to a "cost" amount to determine product price. (373)

master budget The comprehensive budget plan linking all the individual budgets related to sales, cost of goods sold, operating expenses, projects, capital expenditures, and cash. (235)

materials inventory The cost of materials that have not yet entered into the manufacturing process. (13)

materials ledger The subsidiary ledger containing the individual accounts for each type of material. (41)

materials requisition The form or electronic transmission used by a manufacturing department to authorize materials issuances from the storeroom. (42)

merchandise available for sale The cost of merchandise available for sale to customers calculated by adding the beginning merchandise inventory to net purchases. (14)

mixed cost A cost with both variable and fixed characteristics, sometimes called a semivariable or semifixed cost. (134)

multiple production department factory overhead rate method A method that allocated factory overhead to product by using factory overhead rates for each production department. (447)

N

negotiated price approach An approach to transfer pricing that allows managers of decentralized units to agree (negotiate) among themselves as to the transfer price. (335)

net present value method A method of analysis of proposed capital investments that focuses on the present value of the cash flows expected from the investments. (413)

noncontrollable cost Cost that cannot be influenced (increased, decreased, or eliminated) by someone such as a manager or factory worker. (188)

nonfinancial measure A performance measure that has not been stated in dollar terms. (502)

nonfinancial performance measure A performance measure expressed in units rather than dollars. (294)

non-value-added activity The cost of activities that are perceived as unnecessary from the customer's perspective and are thus candidates for elimination. (506)

non-value-added lead time The time that units wait in inventories, move

unnecessarily, and wait during machine breakdowns. (492)

number of days' sales in inventory The relationship between the volume of sales and inventory, computed by dividing the inventory at the end of the year by the average daily cost of goods sold. (595)

number of days' sales in receivables The relationship between sales and accounts receivable, computed by dividing the net accounts receivable at the end of the year by the average daily sales. (594)

number of times interest charges are earned A ratio that measures creditor margin of safety for interest payments, calculated as income before interest and taxes divided by interest expense. (597)

O

objectives (goals) Developed in the planning stage, these reflect the direction and desired outcomes of certain courses of action. (6)

operating leverage A measure of the relative mix of a business's variable costs and fixed costs, computed as contribution margin divided by operating income. (152)

operational planning The development of short-term plans to achieve goals identified in a business's strategic plan. Sometimes called tactical planning. (6)

opportunity cost The amount of income forgone from an alternative to a proposed use of cash or its equivalent. (369)

overapplied factory overhead The amount of factory overhead applied in excess of the actual factory overhead costs incurred for production during a period. (48)

P

Pareto chart A bar chart that shows the totals of a particular attribute for a number of categories, ranked left to right from the largest to smallest totals. (505)

period costs Those costs that are used up in generating revenue during the current period and that are not involved in manufacturing a product, such as selling, general, and administrative expenses. (11, 52)

planning A phase of the management process whereby objectives are outlined and courses of action determined. (6)

predetermined factory overhead rate The rate used to apply factory overhead costs to the goods manufactured. The rate is determined by dividing the budgeted overhead cost by the estimated activity usage at the beginning of the fiscal period. (46)

present value concept Cash to be received (or paid) in the future is not the equivalent of the same amount of money received at an earlier date. (410)

present value index An index computed by dividing the total present value of the net cash flow to be received from a proposed capital investment by the amount to be invested. (414)

present value of an annuity The sum of the present values of a series of equal cash flows to be received at fixed intervals. (411)

prevention costs Costs incurred to prevent defects from occurring during the design and delivery of products or services. (503)

price-earnings (P/E) ratio The ratio of the market price per share of common stock, at a specific date, to the annual earnings per share. (603)

prime costs The combination of direct materials and direct labor costs. (11)

process A sequence of activities linked together for performing a particular task. (295, 507)

process cost system A type of cost system that accumulates costs for each of the various departments within a manufacturing facility. (40, 81)

process manufacturers Manufacturers that use large machines to process a continuous flow of raw materials through various stages of completion into a finished state. (81)

process-oriented layout Organizing work in a plant or administrative function around processes (tasks). (495)

product cost concept A concept used in applying the cost-plus approach to product pricing in which only the costs of manufacturing the product, termed the product cost, are included in the cost amount to which the markup is added. (376)

product costing Determining the cost of a product. (444)

product costs The three components of manufacturing cost: direct materials, direct labor, and factory overhead costs. (11)

production bottleneck A condition that occurs when product demand exceeds production capacity. (381)

production budget A budget of estimated unit production. (237)

production department factory overhead rates Rates determined by dividing the budgeted production department factory overhead by the budgeted allocation base for each department. (448)

product-oriented layout Organizing work in a plant or administrative function around products; sometimes referred to as product cells. (495)

profit center A decentralized unit in which the manager has the responsibility and the authority to make decisions that affect both costs and revenues (and thus profits). (322)

profit margin A component of the rate of return on investment, computed as the ratio of income from operations to sales. (327)

profitability The ability of a firm to earn income. (590)

profit-volume chart A chart used to assist management in understanding the relationship between profit and volume. (148)

pull manufacturing A just-in-time method wherein customer orders trigger the release of finished goods, which triggers production, which triggers release of materials from suppliers. (496)

push manufacturing Materials are released into production and work in process is released into finished goods in anticipation of future sales. (496)

Q

quantity factor The effect of a difference in the number of units sold, assuming no change in unit sales price or unit cost. (194)

quick assets Cash and other current assets that can be quickly converted to cash, such as marketable securities and receivables. (592)

quick ratio A financial ratio that measures the ability to pay current liabilities with quick assets (cash, marketable securities, accounts receivable). (592)

R

radio frequency identification devices (RFID) Electronic tags (chips) placed on or embedded within products that can be read by radio waves that allow instant monitoring or production location. (497)

rate earned on common stockholders' equity A measure of profitability computed by dividing net income, reduced by preferred dividend requirements, by common stockholders' equity. (601)

rate earned on stockholders' equity A measure of profitability computed by dividing net income by total stockholders' equity. (600)

rate earned on total assets A measure of the profitability of assets, without regard to the equity of creditors and stockholders in the assets. (599)

ratio of fixed assets to long-term liabilities A leverage ratio that measures the margin of safety of long-term creditors, calculated as the net fixed assets divided by the long-term liabilities. (596)

ratio of liabilities to stockholders' equity A comprehensive leverage ratio that measures the relationship of the claims of creditors to stockholders' equity. (596)

ratio of net sales to assets Ratio that measures how effectively a company uses its assets, computed as net sales divided by average total assets. (598)

rate of return on investment (ROI) A measure of managerial efficiency in the use of investments in assets, computed as income from operations divided by invested assets. (327)

Raw and In Process (RIP) Inventory The capitalized cost of direct materials purchases, labor, and overhead charged to the production cell. (499)

receiving report The form or electronic transmission used by the receiving personnel to indicate that materials have been received and inspected. (41)

relevant range The range of activity over which changes in cost are of interest to management. (132)

residual income The excess of divisional income from operations over a "minimum" acceptable income from operations. (330)

responsibility accounting The process of measuring and reporting operating data by areas of responsibility. (319)

responsibility center An organizational unit for which a manager is assigned responsibility over costs, revenues, or assets. (229)

S

sales budget One of the major elements of the income statement budget that indicates the quantity of estimated sales and the expected unit selling price. (236)

sales mix The relative distribution of sales among the various products available for sale. (151, 190)

service department charges The costs of services provided by an internal service department and transferred to a responsibility center. (322)

setup Changing the characteristics of a machine to produce a different product. (452)

single plantwide factory overhead rate method A method that allocates all factory overhead to products by using a single factory overhead rate. (445)

Six-Sigma A quality improvement process developed by Motorola Corporation consisting of five steps: define, measure, analyze, improve, and control (DMAIC). (496)

solvency The ability of a firm to pay its debts as they come due. (590)

staff department A unit that provides services, assistance, and advice to the departments with line or other staff responsibilities. (5)

standard cost A detailed estimate of what a product should cost. (274)

standard cost systems Accounting systems that use standards for each element of manufacturing cost entering into the finished product. (274)

standards Performance goals, often relating to how much a product should cost. (274)

statement of cash flows A summary of the cash receipts and cash payments for a specific period of time, such as a month or a year. (530)

statement of cost of goods manufactured The income statement of manufacturing companies. (15)

static budget A budget that does not adjust to changes in activity levels. (232)

strategic planning The development of a long-range course of action to achieve business goals. (6)

strategies The means by which business goals and objectives will be achieved. (6)

sunk cost A cost that is not affected by subsequent decisions. (363)

supply chain management The coordination and control of materials, services, information, and finances as they move in a process from supplier, through the manufacturer, wholesaler, and retailer to the consumer. (497)

T

target costing The target cost is determined by subtracting a desired profit from a market method determined price. The resulting target cost is used to motivate cost improvements in design and manufacture. (380)

theory of constraints (TOC) A manufacturing strategy that attempts to remove the influence of bottlenecks (constraints) on a process. (381)

time tickets The form on which the amount of time spent by each employee and the labor cost incurred for each individual job, or for factory overhead, are recorded. (43)

time value of money concept The concept that an amount of money invested today will earn income. (407)

total cost concept A concept used in applying the cost-plus approach to product pricing in which all the costs of manufacturing the product plus

the selling and administrative expenses are included in the cost amount to which the markup is added. (373)

total manufacturing cost variance The difference between total standard costs and total actual costs for units produced. (279)

transfer price The price charged one decentralized unit by another for the goods or services provided. (333)

U

underapplied factory overhead The amount of actual factory overhead in excess of the factory overhead applied to production during a period. (48)

unfavorable cost variance A variance that occurs when the actual cost exceeds the standard cost. (278)

unit contribution margin The dollars available from each unit of sales to cover fixed costs and provide operating profits. (139)

unit price (cost) factor The effect of a difference in unit sales price or unit cost on the number of units sold. (194)

V

value-added activity The cost of activities that are needed to meet customer requirements. (506)

value-added lead time The time required to manufacture a unit of product or other output. (491)

value-added ratio The ratio of the value-added lead time to the total lead time. (492)

variable cost concept A concept used in applying the cost-plus approach to product pricing in which only the variable costs are included in the cost amount to which the markup is added. (377)

variable cost of goods sold Consists of direct materials, direct labor, and variable factory overhead for the units sold. (179)

variable costing The concept that considers the cost of products manufactured to be composed only of those manufacturing costs that increase or decrease as the volume of production rises or falls (direct materials, direct labor, and variable factory overhead). (137, 179)

variable costs Costs that vary in total dollar amount as the level of activity changes. (133)

vertical analysis An analysis that compares each item in a current statement with a total amount within the same statement. (587)

volume variance The difference between the budgeted fixed overhead at 100% of normal capacity and the standard fixed overhead for the actual production achieved during the period. (287)

W

whole units The number of units in production during a period, whether completed or not. (89)

work in process inventory The direct materials costs, the direct labor costs, and the applied factory overhead costs that have entered into the manufacturing process but are associated with products that have not been finished. (13)

working capital The excess of the current assets of a business over its current liabilities. (591)

Y

yield A measure of materials usage efficiency. (101)

Z

zero-based budgeting A concept of budgeting that requires all levels of management to start from zero and estimate budget data as if there had been no previous activities in their units. (231)

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The Basics

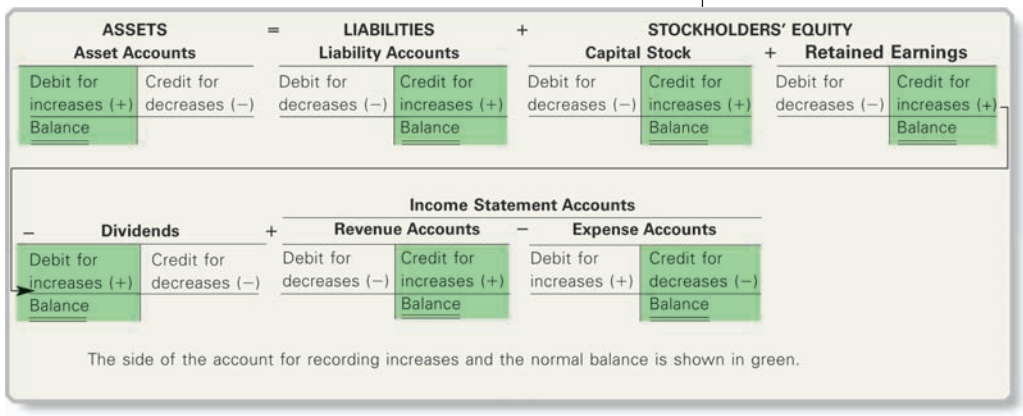
1. Accounting Equation:

Assets = Liabilities + (Stockholders' Equity) Owner's Equity

2. T Account:

Account Title	
Left Side debit	Right Side credit

3. Rules of Debit and Credit:



4. Analyzing and Journalizing Transactions

1. Carefully read the description of the transaction to determine whether an asset, liability, capital stock, retained earnings, revenue, expense, or dividends account is affected by the transaction.
2. For each account affected by the transaction, determine whether the account increases or decreases.
3. Determine whether each increase or decrease should be recorded as a debit or a credit, following the rules of debit and credit.
4. Record the transaction using a journal entry.
5. Periodically post journal entries to the accounts in the ledger.
6. Prepare an unadjusted trial balance at the end of the period.

5. Financial Statements:

INCOME STATEMENT
A summary of the revenue and expenses of a business entity for a specific period of time, such as a month or a year.

RETAINED EARNINGS STATEMENT
A summary of the changes in the retained earnings of a business entity that have occurred during a specific period of time, such as a month or a year.

BALANCE SHEET
A list of the assets, liabilities, and stockholders' equity of a business entity as of a specific date, usually at the close of the last day of a month or a year.

STATEMENT OF CASH FLOWS
A summary of the cash receipts and cash payments of a business entity for a specific period of time, such as a month or a year.

6. Accounting Cycle:

1. Transactions are analyzed and recorded in the journal.
2. Transactions are posted to the ledger.
3. An unadjusted trial balance is prepared.
4. Adjustment data are assembled and analyzed.
5. An optional end-of-period spreadsheet (work sheet) is prepared.
6. Adjusting entries are journalized and posted to the ledger.
7. An adjusted trial balance is prepared.
8. Financial statements are prepared.
9. Closing entries are journalized and posted to the ledger.
10. A post-closing trial balance is prepared.

7. Types of Adjusting Entries:

1. Prepaid expense (deferred expense)
2. Unearned revenue (deferred revenue)
3. Accrued revenue (accrued asset)
4. Accrued expense (accrued liability)
5. Depreciation expense

Each entry will always affect both a balance sheet and an income statement account.

8. Closing Entries:

1. Revenue account balances are transferred to an account called Income Summary.
2. Expense account balances are transferred to an account called Income Summary.
3. The balance of Income Summary (net income or net loss) is transferred to Retained Earnings.
4. The balance of the owner's drawing account is transferred to Retained Earnings.

9. Special Journals:

Providing services on account ⟶ recorded in ⟶ Revenue (sales) journal
Receipt of cash from any source ⟶ recorded in ⟶ Cash receipts journal
Purchase of items on account ⟶ recorded in ⟶ Purchases journal
Payments of cash for any purpose ⟶ recorded in ⟶ Cash payments journal

10. Shipping Terms:

	FOB Shipping Point	FOB Destination
Ownership (title) passes to buyer when merchandise is	delivered to freight carrier	delivered to buyer
Freight costs are paid by	buyer	seller

11. Format for Bank Reconciliation:

Cash balance according to bank statement		$xxx
Add: Additions by company not on bank statement	$xx	
Bank errors	xx	xx
		$xxx
Deduct: Deductions by company not on bank statement	$xx	
Bank errors	xx	xx
Adjusted balance		$xxx
Cash balance according to company's records		$xxx
Add: Additions by bank not recorded by company	$xx	
Company errors	xx	xx
		$xxx
Deduct: Deductions by bank not recorded by company	$xx	
Company errors	xx	xx
Adjusted balance		$xxx

12. Inventory Costing Methods:

1. First-in, First-out (FIFO)
2. Last-in, First-out (LIFO)
3. Average Cost

13. Interest Computations:

$$\text{Interest} = \text{Face Amount (or Principal)} \times \text{Rate} \times \text{Time}$$

14. Methods of Determining Annual Depreciation:

$$\text{STRAIGHT-LINE: } \frac{\text{Cost} - \text{Estimated Residual Value}}{\text{Estimated Life}}$$

DOUBLE-DECLINING-BALANCE: Rate* × Book Value at Beginning of Period

*Rate is commonly twice the straight-line rate (1/Estimated Life).

15. Adjustments to Net Income (Loss) Using the Indirect Method

	Increase (Decrease)
Net income (loss)	$ XXX
Adjustments to reconcile net income to net cash flow from operating activities:	
Depreciation of fixed assets	XXX
Amortization of intangible assets	XXX
Losses on disposal of assets	XXX
Gains on disposal of assets	(XXX)
Changes in current operating assets and liabilities:	
Increases in noncash current operating assets	(XXX)
Decreases in noncash current operating assets	XXX
Increases in current operating liabilities	XXX
Decreases in current operating liabilities	(XXX)
Net cash flow from operating activities	$ XXX or $(XXX)

16. Contribution Margin Ratio

$$\text{Contribution Margin Ratio} = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$$

17. Break-Even Sales (Units)

$$\text{Break-Even Sales (Units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

18. Sales (Units)

$$\text{Sales (Units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

19. Margin of Safety

$$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

20. Operating Leverage

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Income from Operations}}$$

21. Variances

$$\text{Direct Materials Price Variance} = \left(\text{Actual Price} - \text{Standard Price}\right) \times \text{Actual Quantity}$$

$$\text{Direct Materials Quantity Variance} = \left(\text{Actual Quantity} - \text{Standard Quantity}\right) \times \text{Standard Price}$$

$$\text{Direct Labor Rate Variance} = \left(\text{Actual Rate per Hour} - \text{Standard Rate per Hour}\right) \times \text{Actual Hours}$$

$$\text{Direct Labor Time Variance} = \left(\text{Actual Direct Labor Hours} - \text{Standard Direct Labor Hours}\right) \times \text{Standard Rate per Hour}$$

$$\text{Variable Factory Overhead Controllable Variance} = \text{Actual Variable Factory Overhead} - \text{Budgeted Variable Factory Overhead}$$

$$\text{Fixed Factory Overhead Volume Variance} = \left(\text{Standard Hours for 100\% of Normal Capacity} - \text{Standard Hours for Actual Units Produced}\right) \times \text{Fixed Factory Overhead Rate}$$

22. Rate of Return on Investment (ROI)

$$\text{Rate of Return on Investment (ROI)} = \frac{\text{Income from Operations}}{\text{Invested Assets}}$$

Alternative ROI Computation:

$$\text{ROI} = \frac{\text{Income from Operations}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

23. Capital Investment Analysis Methods:

1. Methods That Ignore Present Values:
   A. Average Rate of Return Method
   B. Cash Payback Method
2. Methods That Use Present Values:
   A. Net Present Value Method
   B. Internal Rate of Return Method

24. Average Rate of Return

$$\text{Average Rate of Return} = \frac{\text{Estimated Average Annual Income}}{\text{Average Investment}}$$

25. Present Value Index

$$\text{Present Value Index} = \frac{\text{Total Present Value of Net Cash Flow}}{\text{Amount to Be Invested}}$$

26. Present Value Factor for an Annuity of $1

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$$

Classification of Accounts

Account Title	*Account Classification*	*Normal Balance*	*Financial Statement*
Accounts Payable	Current liability	Credit	Balance sheet
Accounts Receivable	Current asset	Debit	Balance sheet
Accumulated Depreciation	Contra fixed asset	Credit	Balance sheet
Accumulated Depletion	Contra fixed asset	Credit	Balance sheet
Advertising Expense	Operating expense	Debit	Income statement
Allowance for Doubtful Accounts	Contra current asset	Credit	Balance sheet
Amortization Expense	Operating expense	Debit	Income statement
Bonds Payable	ZLong-term liability	Credit	Balance sheet
Building	Fixed asset	Debit	Balance sheet
Capital Stock	Stockholders' equity	Credit	Balance sheet
Cash	Current asset	Debit	Balance sheet
Cash Dividends	Stockholders' equity	Debit	Retained earnings statement
Cash Dividends Payable	Current liability	Credit	Balance sheet
Common Stock	Stockholders' equity	Credit	Balance sheet
Cost of Merchandise (Goods) Sold	Cost of merchandise (goods sold)	Debit	Income statement
Deferred Income Tax Payable	Current liability/Long-term liability	Credit	Balance sheet
Delivery Expense	Operating expense	Debit	Income Statement
Depletion Expense	Operating expense	Debit	Income statement
Discount on Bonds Payable	Long-term liability	Debit	Balance sheet
Dividend Revenue	Other income	Credit	Income statement
Dividends	Stockholders' equity	Debit	Retained earnings statement
Employees Federal Income Tax Payable	Current liability	Credit	Balance sheet
Equipment	Fixed asset	Debit	Balance sheet
Exchange Gain	Other income	Credit	Income statement
Exchange Loss	Other expense	Debit	Income statement
Factory Overhead (Overapplied)	Deferred credit	Credit	Balance sheet (interim)
Factory Overhead (Underapplied)	Deferred debit	Debit	Balance sheet (interim)
Federal Income Tax Payable	Current liability	Credit	Balance sheet
Federal Unemployment Tax Payable	Current liability	Credit	Balance sheet
Finished Goods	Current asset	Debit	Balance sheet
Freight In	Cost of merchandise sold	Debit	Income statement
Freight Out	Operating expense	Debit	Income statement
Gain on Disposal of Fixed Assets	Other income	Credit	Income statement
Gain on Redemption of Bonds	Other income	Credit	Income statement
Gain on Sale of Investments	Other income	Credit	Income statement
Goodwill	Intangible asset	Debit	Balance sheet
Income Tax Expense	Income tax	Debit	Income statement
Income Tax Payable	Current liability	Credit	Balance sheet
Insurance Expense	Operating expense	Debit	Income statement
Interest Expense	Other expense	Debit	Income statement
Interest Receivable	Current asset	Debit	Balance sheet
Interest Revenue	Other income	Credit	Income statement
Investment in Bonds	Investment	Debit	Balance sheet
Investment in Stocks	Investment	Debit	Balance sheet
Investment in Subsidiary	Investment	Debit	Balance sheet
Land	Fixed asset	Debit	Balance sheet
Loss on Disposal of Fixed Assets	Other expense	Debit	Income statement
Loss on Redemption of Bonds	Other expense	Debit	Income statement

Account Title	*Account Classification*	*Normal Balance*	*Financial Statement*
Loss on Sale of Investments	Other expense	Debit	Income statement
Marketable Securities	Current asset	Debit	Balance sheet
Materials	Current asset	Debit	Balance sheet
Medicare Tax Payable	Current liability	Credit	Balance sheet
Merchandise Inventory	Current asset/Cost of merchandise sold	Debit	Balance sheet/Income statement
Notes Payable	Current liability/Long-term liability	Credit	Balance sheet
Notes Receivable	Current asset/Investment	Debit	Balance sheet
Organizational Expenses	Operating expense	Debit	Income statement
Patents	Intangible asset	Debit	Balance sheet
Paid-In Capital from Sale of Treasury Stock	Stockholders' equity	Credit	Balance sheet
Paid-In Capital in Excess of Par (Stated Value)	Stockholders' equity	Credit	Balance sheet
Payroll Tax Expense	Operating expense	Debit	Income statement
Pension Expense	Operating expense	Debit	Income statement
Petty Cash	Current asset	Debit	Balance sheet
Premium on Bonds Payable	Long-term liability	Credit	Balance sheet
Prepaid Insurance	Current asset	Debit	Balance sheet
Prepaid Rent	Current asset	Debit	Balance sheet
Preferred Stock	Stockholders' equity	Credit	Balance sheet
Purchases	Cost of merchandise sold	Debit	Income statement
Purchases Discounts	Cost of merchandise sold	Credit	Income statement
Purchases Returns and Allowances	Cost of merchandise sold	Credit	Income statement
Rent Expense	Operating expense	Debit	Income statement
Rent Revenue	Other income	Credit	Income statement
Retained Earnings	Stockholders' equity	Credit	Balance sheet/Retained earnings statement
Salaries Expense	Operating expense	Debit	Income statement
Salaries Payable	Current liability	Credit	Balance sheet
Sales	Revenue from sales	Credit	Income statement
Sales Discounts	Revenue from sales	Debit	Income statement
Sales Returns and Allowances	Revenue from sales	Debit	Income statement
Sales Tax Payable	Current liability	Credit	Balance sheet
Sinking Fund Cash	Investment	Debit	Balance sheet
Sinking Fund Investments	Investment	Debit	Balance sheet
Social Security Tax Payable	Current liability	Credit	Balance sheet
State Unemployment Tax Payable	Current liability	Credit	Balance sheet
Stock Dividends	Stockholders' equity	Debit	Retained earnings statement
Stock Dividends Distributable	Stockholders' equity	Credit	Balance sheet
Supplies	Current asset	Debit	Balance sheet
Supplies Expense	Operating expense	Debit	Income statement
Treasury Stock	Stockholders' equity	Debit	Balance sheet
Uncollectible Accounts Expense	Operating expense	Debit	Income statement
Unearned Rent	Current liability	Credit	Balance sheet
Utilities Expense	Operating expense	Debit	Income statement
Vacation Pay Expense	Operating expense	Debit	Income statement
Vacation Pay Payable	Current liability/Long-term liability	Credit	Balance sheet
Work in Process	Current asset	Debit	Balance sheet

Abbreviations and Acronyms Commonly Used in Business and Accounting

AAA	American Accounting Association
ABC	Activity-based costing
AICPA	American Institute of Certified Public Accountants
CIA	Certified Internal Auditor
CIM	Computer-integrated manufacturing
CMA	Certified Management Accountant
CPA	Certified Public Accountant
Cr.	Credit
Dr.	Debit
EFT	Electronic funds transfer
EPS	Earnings per share
FAF	Financial Accounting Foundation
FASB	Financial Accounting Standards Board
FEI	Financial Executives International
FICA tax	Federal Insurance Contributions Act tax
FIFO	First-in, first-out
FOB	Free on board
GAAP	Generally accepted accounting principles
GASB	Governmental Accounting Standards Board
GNP	Gross National Product
IMA	Institute of Management Accountants
IRC	Internal Revenue Code
IRS	Internal Revenue Service
JIT	Just-in-time
LIFO	Last-in, first-out
Lower of C or M	Lower of cost or market
MACRS	Modified Accelerated Cost Recovery System
n/30	Net 30
n/eom	Net, end-of-month
P/E Ratio	Price-earnings ratio
POS	Point of sale
ROI	Return on investment
SEC	Securities and Exchange Commission
TQC	Total quality control