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STUDY SYSTEM

2005/06 EDITION

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CIMA PUBLISHING

Paper C1

Management Accounting Fundamentals

Revised edition relevant for **2005/2006** Computer Based Assessment

- Practice questions throughout
- Complete revision section

Helping you to pass your CIMA exam

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PUBLISHING

CIMA'S Official *Study System*
Revised edition relevant for 2005/2006
Computer Based Assessment

Certificate Level

Management Accounting Fundamentals

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Important Note
A new edition of the *CIMA Official Terminology* is due to be published in September 2005. As this is past the publication date of this Study System the page reference numbers for 'Management Accounting Official Terminology' contained in this Study System are for the 2000 edition. You should ensure that you are familiar with the 2005 *CIMA Official Terminology* (ISBN: 0 7506 6827 X) once published, available from www.cimapublishing.com

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The CIMA *Study System*

Acknowledgements

Every effort has been made to contact the holders of copyright material, but if any here have been inadvertently overlooked the publishers will be pleased to make the necessary arrangements at the first opportunity.

How to use your CIMA *Study System*

This *Management Accounting Fundamentals Study System* has been devised as a resource for students attempting to pass their CIMA computer based assessment, and provides:

- a detailed explanation of all syllabus areas;
- generous question practice, together with full solutions;
- a preparing for the assessment section, complete with assessment standard questions and solutions.

This Study System has been designed with the needs of home-study and distance-learning candidates in mind. Such students require very full coverage of the syllabus topics, and also the facility to undertake extensive question practice. However, the Study System is also ideal for fully taught courses.

The main body of the text is divided into a number of chapters, each of which is organised on the following pattern:

- *Detailed learning outcomes* expected after your studies of the chapter are complete. You should assimilate these before beginning detailed work on the chapter, so that you can appreciate where your studies are leading.
- *Step-by-step topic coverage*. This is the heart of each chapter, containing detailed explanatory text supported where appropriate by worked examples and exercises. You should work carefully through this section, ensuring that you understand the material being explained and can tackle the examples and exercises successfully. Remember that in many cases knowledge is cumulative: if you fail to digest earlier material thoroughly, you may struggle to understand later chapters.
- *Question practice*. The test of how well you have learned the material is your ability to tackle assessment-standard questions. Make a serious attempt at producing your own answers, but at this stage do not be too concerned about attempting the questions in

assessment conditions. In particular, it is more important to absorb the material thoroughly than to observe the time limits that would apply in the actual assessment.
- *Solutions*. Avoid the temptation merely to 'audit' the solutions provided. It is an illusion to think that this provides the same benefits as you would gain from a serious attempt of your own. However, if you are struggling to get started on a question you should read the introductory guidance provided at the beginning of the solution, and then make your own attempt before referring back to the full solution.

Having worked through the chapters you are ready to begin your final preparations for the assessment. The final section of this CIMA Study System provides you with the guidance you need. It includes the following features:

- A brief guide to revision technique.
- A note on the format of the assessment. You should know what to expect when you tackle the real assessment, and in particular the number of questions that you will be required to attempt.
- Guidance on how to tackle the assessment itself.
- A table mapping revision questions to the syllabus learning outcomes allowing you to quickly identify questions by subject area.
- Revision questions and solutions. These are of CBA standard and should be tackled in assessment conditions, especially as regards the time allocation.
- Two mock assessments. You should plan to attempt these just before the date of the real CBA. By this stage your revision should be complete and you should be able to attempt the mock papers in assessment conditions.

If you work conscientiously through this CIMA Study System according to the guidelines above you will be giving yourself an excellent chance of success in the assessment. Good luck with your studies!

Guide to the Icons used within this Text

Key term or definition

Equation to learn

Exam tip or topic likely to appear in the exam

Exercise

Question

Solution

Comment or Note

Study technique

Passing exams is partly a matter of intellectual ability, but however accomplished you are in that respect you can improve your chances significantly by the use of appropriate study and revision techniques. In this section we briefly outline some tips for effective study during the earlier stages of your approach to the assessment. Later in the text we mention some techniques that you will find useful at the revision stage.

Planning

To begin with, formal planning is essential to get the best return from the time you spend studying. Estimate how much time in total you are going to need for each subject that you face. Remember that you need to allow time for revision as well as for initial study of the material. The amount of notional study time for any subject is the minimum estimated time that students will need to achieve the specified learning outcomes set out in the syllabus. This time includes all appropriate learning activities, for example face-to-face tuition, private study, directed home study, learning in the workplace, revision time, etc. You may find it helpful to read *Better exam results* by Sam Malone, CIMA Publishing, ISBN: 075066357X. This book will provide you with proven study techniques. Chapter by chapter it covers the building blocks of successful learning and examination techniques.

The notional study time for Certificate level *Management Accounting Fundamentals* is 130 hours. Note that the standard amount of notional learning hours attributed to one full-time academic year of approximately 30 weeks is 1,200 hours.

By way of example, the notional study time might be made up as follows:

	Hours
Face-to-face study: up to	40
Personal study: up to	65
'Other' study – e.g. learning in the workplace, revision, etc.: up to	25
	130

Note that all study and learning-time recommendations should be used only as a guideline and are intended as minimum amounts. The amount of time recommended for face-to-face tuition, personal study and/or additional learning will vary according to the type of course undertaken, prior learning of the student, and the pace at which different students learn.

Now split your total time requirement over the weeks between now and the assessment. This will give you an idea of how much time you need to devote to study each week. Remember to allow for holidays or other periods during which you will not be able to study (e.g. because of seasonal workloads).

With your study material before you, decide which chapters you are going to study in each week, and which weeks you will devote to revision and final question practice.

Prepare a written schedule summarising the above – and stick to it!

It is essential to know your syllabus. As your course progresses you will become more familiar with how long it takes to cover topics in sufficient depth. Your timetable may need to be adapted to allocate enough time for the whole syllabus.

Tips for effective studying

(1) Aim to find a quiet and undisturbed location for your study, and plan as far as possible to use the same period of time each day. Getting into a routine helps to avoid wasting

time. Make sure that you have all the materials you need before you begin so as to minimise interruptions.

(2) Store all your materials in one place, so that you do not waste time searching for items around the house. If you have to pack everything away after each study period, keep them in a box, or even a suitcase, which will not be disturbed until the next time.
(3) Limit distractions. To make the most effective use of your study periods you should be able to apply total concentration, so turn off the TV, set your phones to message mode, and put up your 'do not disturb' sign.
(4) Your timetable will tell you which topic to study. However, before diving in and becoming engrossed in the finer points, make sure you have an overall picture of all the areas that need to be covered by the end of that session. After an hour, allow yourself a short break and move away from your books. With experience, you will learn to assess the pace you need to work at.
(5) Work carefully through a chapter, making notes as you go. When you have covered a suitable amount of material, vary the pattern by attempting a practice question.
(6) Make notes as you study, and discover the techniques that work best for you. Your notes may be in the form of lists, bullet points, diagrams, summaries, 'mind maps', or the written word, but remember that you will need to refer back to them at a later date, so they must be intelligible. If you are on a taught course, make sure you highlight any issues you would like to follow up with your lecturer.
(7) Organise your paperwork. There are now numerous paper storage systems available to ensure that all your notes, calculations and articles can be effectively filed and easily retrieved later.

Computer-based assessment

CIMA has introduced computer-based assessment (CBA) for all subjects at Certificate level. The website says "*Objective questions are used. The most common type is 'multiple choice', where you have to choose the correct answer from a list of possible answers, but there are a variety of other objective question types that can be used within the system. These include true/false questions, matching pairs of text and graphic, sequencing and ranking, labelling diagrams and single and multiple numeric entry.*

Candidates answer the questions by either pointing and clicking the mouse, moving objects around the screen, typing numbers, or a combination of these responses. Try the online demo at http://www.cimaglobal.com to see how the technology works.

The CBA system can ensure that a wide range of the syllabus is assessed, as a pre-determined number of questions from each syllabus area (dependent upon the syllabus weighting for that particular area) are selected in each assessment."

In every chapter of this study system we have introduced these types of questions but obviously we have to label answers A, B, C etc. rather than using click boxes. For convenience we have retained quite a lot of questions where an initial scenario leads to a number of sub-questions. There will be questions of this type in the CBA but they will rarely have more than three sub-questions. In all such cases examiners will ensure that the answer to one part does not hinge upon a prior answer.

There are two types of questions which were previously involved in objective testing in paper-based exams and which are not at present possible in a CBA. The actual drawing of graphs and charts is not yet possible. Equally there will be no questions calling for comments to be written by students. Charts and interpretations remain on many syllabi and will be examined at Certificate level but using other methods.

For further CBA practice, CIMA Publishing has produced CIMA Inter@ctive CD-ROMs for all certificate level subjects. These products use the same software as found in the real computer-based assessment and are available at www.cimapublishing.com.

Management Accounting Fundamentals and computer-based assessment

The assessment for Management Accounting Fundamentals is a 90-minute computer-based assessment comprising 40 compulsory questions, with one or more parts. Single part questions are generally worth 1–2 marks each, but two and three part questions may be worth 4 or 6 marks. There will be no choice and all questions should be attempted if time permits. CIMA are continuously developing the question styles within the CBA system and you are advised to try the on-line website demo at www.cimaglobal.com, to both gain familiarity with assessment software and examine the latest style of questions being used.

The *Management Accounting Fundamentals* syllabus

Syllabus overview

Management Accounting Fundamentals is an introduction to management accounting for students with limited knowledge or no knowledge of this subject. While this paper focuses on the application of fundamental methods and techniques, students are also expected to have an understanding of when and when not to use them. Students must also appreciate the contribution made by information technology to management accounting.

Aims

This syllabus aims to test the candidate's ability to:

- explain the basic concepts and processes used to determine product and service costs;
- explain absorption cost, marginal cost, opportunity cost, notional cost and relevant cost concepts;
- apply CVP analysis and interpret the results;
- apply a range of costing and accounting systems;
- explain the role of budgets and standard costing within organisations;
- prepare and interpret budgets, standard costs and variance statements.

Assessment

The computer-based assessment lasts 90 minutes and comprises 40 compulsory questions with one or more parts. A varied range of objective test questions is used.

Learning outcomes and syllabus content

(i) Cost determination

Study weighting: 30 per cent
Learning outcomes

On completion of their studies students should be able to:

- explain why organisations use costing systems;
- explain raw material accounting and control procedures;
- explain and calculate reorder quantity, reorder level, maximum stock, minimum stock and economic order quantity;
- explain FIFO, LIFO and weighted average stock valuation methods;
- calculate stock, cost of sales and gross profit under LIFO, FIFO and weighted average;
- explain labour accounting and control procedures;
- discuss and calculate factory incentive schemes for individuals and groups;
- explain absorption costing;
- prepare cost statements for allocation and apportionment of overheads including reciprocal service departments;
- calculate and discuss overhead absorption rates;
- calculate under/over recovery of overheads;
- calculate product costs under absorption and marginal costing;
- compare and contrast absorption and marginal costing.

Syllabus content

- classification of costs;
- materials: accounting and control procedures;
- labour: accounting and control procedures;
- factory incentive schemes for individuals and groups;
- overhead costs: allocation, apportionment, reapportionment and absorption of overhead costs (NB: The repeated distribution method only will be used for reciprocal service department costs.);
- absorption costing;
- marginal costing;
- materials: reorder quantity, reorder level, maximum stock, minimum stock, economic order quantity.

(ii) Standard costing

Study weighting: 15 per cent
Learning outcomes

On completion of their studies students should be able to:

- explain the principles of standard costing;
- prepare the standard cost for a product/service;
- calculate and interpret variances for sales, materials; labour; variable overheads and fixed overheads;
- prepare a report reconciling budget gross profit/contribution with actual profit.

Syllabus content

- principles of standard costing;
- preparation of standard costs under absorption and marginal costing;
- variances: materials: total, price and usage; labour: total, rate and efficiency; variable overhead: total, expenditure and efficiency; fixed overhead: total, expenditure and volume (absorption costing); fixed overhead: expenditure (marginal costing); sales: total sales margin variance.

(iii) Costing and accounting systems

Study weighting: 20 per cent

Learning outcomes

On completion of their studies students should be able to:

- compare and contrast job, batch, contract and process costing systems;
- prepare ledger accounts for job, batch, contract (in accordance with SSAP 9) and process costing systems (NB: The average cost method only will be used for process costing and students must be able to calculate normal losses and abnormal loss/gains and deal with opening and closing stocks.);
- prepare and contrast cost statements for service and manufacturing organisations;
- prepare profit and loss accounts from the same data under absorption and marginal costing and reconcile and explain the differences in reported profits;
- prepare accounting entries for an integrated accounting system using standard costs;
- explain the difference between integrated and interlocking accounting systems.

Syllabus content

- job, batch, contract and process costing;
- cost accounting statements for services and service industries;
- marginal and absorption costing profit and loss accounts;
- accounting entries for an integrated accounting system;
- interlocking accounting.

(iv) Marginal costing and decision-making

Study weighting: 15 per cent

Learning outcomes

On completion of their studies students should be able to:

- identify relevant costs and revenues;
- identify cost behaviour;
- explain the contribution concept;
- calculate and interpret the breakeven point, profit target, margin of safety and profit/volume ratio for a single product;
- prepare breakeven charts and profit/volume graphs for a single product;

- calculate the profit-maximising sales mix for a company with a single resource constraint which has total freedom of action;
- discuss CVP analysis.

Syllabus content

- relevant cost concepts, including sunk costs, committed costs and opportunity costs;
- fixed, variable and semi-variable costs;
- contribution concept;
- breakeven charts, profit volume graphs, breakeven point, profit target, margin of safety, contribution/sales ratio;
- limiting factor analysis.

(v) Budgeting

Study weighting: 20 per cent

Learning outcomes

On completion of their studies students should be able to:

- explain why organisations prepare budgets;
- explain how organisations prepare budgets;
- explain the use of IT in the budget process;
- prepare functional budgets, profit and loss account, balance sheet and a simple cash budget;
- calculate simple cost estimates using high-low method and line of best fit;
- prepare simple reports showing actual and budgeted results;
- explain the differences between fixed and flexible budgets;
- prepare a fixed and flexible budget;
- calculate expenditure, volume and total budget variances.

Syllabus content

- budget theory;
- budget preparation;
- IT and budgeting;
- cost estimation and estimating techniques;
- reporting of actual against budget;
- fixed and flexible budgeting.

Basic Aspects of Cost Accounting

1

Learning Outcomes

After completing this chapter, you should be able to:

- explain why organisations use costing systems;
- explain the nature and purpose of cost classification;
- identify cost behaviour;
- calculate simple cost estimates using the high–low method and line of best fit.

1.1 Introduction

In this chapter we will look at some of the fundamental concepts of the framework of cost accounting. You will learn some basic definitions which underpin all of the material in your *Management Accounting Fundamentals* syllabus.

1.2 Why organisations use costing systems

An organisation's costing system is the foundation of the internal financial information system for managers. It provides the information that management needs to plan and control the organisation's activities and to make decisions about the future. Examples of the type of information provided by a costing system and the uses to which it might be put include the following.

- Actual unit costs for the latest period; could be used for cost control by comparing with a predetermined unit standard cost, which would also be provided by the costing system. Could also be used as the basis for planning future unit costs and for decisions about pricing and production levels.
- Actual costs of operating a department for the latest period; could be used for cost control by comparing with a predetermined budget for the department. Could also be used as the basis for planning future budgeted costs and for decisions such as outsourcing.
- The forecast costs to be incurred at different levels of activity. Could be used for planning, for decision making and as a part of cost control by comparing the actual costs with the forecasts.

This is by no means an exhaustive list of the information that is provided by a costing system but it should serve to demonstrate that the main use of a costing system is to provide the basic information that management needs for planning, control and decision-making.

1.3 What is meant by 'cost'?

The word 'cost' can be used in two contexts. It can be used as a noun, for example, when referring to the cost of an item. Alternatively, it can be used as a verb, for example, we can say that we are attempting to cost an activity. CIMA's definition of cost used in these two contexts is as follows:

- *As a noun:* 'the amount of expenditure (actual or notional) incurred on, or attributable to, a specified thing or activity'.
- *As a verb:* 'to ascertain the cost of a specified thing or activity'.

(We will explain notional costs later in this text when we discuss the use of costs for decision-making.)

The terminology goes on to explain that the word cost can rarely stand alone and should be qualified as to its nature and limitations. You will be seeing throughout this text that there are many different types of cost and that each has its usefulness and limitations in different circumstances.

1.4 Cost units

The CIMA *Management Accounting: Official Terminology* defines a cost unit as 'a unit of product or service in relation to which costs are ascertained'.

This means that a cost unit can be anything for which it is possible to ascertain the cost. The cost unit selected in each situation will depend on a number of factors, including the purpose of the cost ascertainment exercise and the amount of information available.

Cost units can be developed for all kinds of organisations, whether manufacturing, commercial or public service based. Some examples from the CIMA *Terminology* are as follows:

Industry sector	*Cost unit*
Brick-making	1000 bricks
Electricity	Kilowatt-hour (kW h)
Professional services	Chargeable hour
Education	Enrolled student
Activity	*Cost unit*
Credit control	Account maintained
Selling	Customer call

Exercise 1.1

Can you think of at least one other cost unit which could be used for each of these industries and activities? For example, in controlling the costs of the selling activity we might monitor the cost per order taken.

The above list is not exhaustive. A cost unit can be anything which is measurable and useful for cost control purposes. For example, with brick-making, 1,000 bricks is suggested as a cost unit. It would be possible to determine the cost per brick but perhaps in this case a larger measure is considered more suitable and useful for control purposes.

Notice that this list of cost units contains both tangible and intangible items. Tangible items are those which can be seen and touched, for example, the 1,000 bricks. Intangible items cannot be seen and touched but they can be measured, for example, a chargeable hour of accounting service.

1.4.1 Composite cost units

The cost units for services are usually intangible and they are often composite cost units, that is, they are often made up of two parts. For example, if we were attempting to monitor and control the costs of a delivery service we might measure the cost per tonne delivered. However, 'tonne delivered' would not be a particularly useful cost unit because it would not be valid to compare the cost per tonne delivered from London to Edinburgh with the cost per tonne delivered from London to Brighton. The former journey is much longer and it will almost certainly cost more to deliver a tonne over the longer distance.

Composite cost units assist in overcoming this problem. We could perhaps use a 'tonne-mile' instead. This means that we would record and monitor the cost of carrying one tonne for one mile. The cost per tonne-mile would be a comparable measure whatever the length of journey and this is therefore a valid and useful cost unit for control purposes.

Other examples of composite cost units might be as follows:

Business	*Cost unit*
Hotel	Bed night
Bus company	Passenger mile
Hospital	In-patient day

Exercise 1.2

Can you think of some other examples of composite cost units that could be used in these businesses and in other types of business?

1.5 Cost centres

The CIMA *Terminology* defines a cost centre as 'a production or service location, function, activity or item of equipment for which costs are accumulated'.

A cost centre is used as a 'collecting place' for costs. The cost of operating the cost centre is determined for the period, and then this total cost is related to the cost units which have passed through the cost centre.

For instance, an example of a production cost centre could be the machine shop in a factory. The production overhead cost for the machine shop might be £100,000 for the period. If 1,000 cost units have passed through this cost centre we might say that the production overhead cost relating to the machine shop was £100 for each unit.

The CIMA definition of a cost centre also mentions a service location, a function, an activity or an item of equipment being used as a cost centre. Examples of these might be as follows but you should try to think of some others:

Type of cost centre	*Examples*
Service location	Stores, canteen
Function	Sales representative
Activity	Quality control
Item of equipment	Packing machine

If you are finding it difficult to see how a sales representative could be used as a cost centre, then work carefully through the following points.

1. What are the costs which might be incurred in 'operating' a sales representative for one period?

   Examples might be the representative's salary cost, the cost of running a company car, the cost of any samples given away by the representative and so on. Say these amount to £40,000.
2. Once we have determined this cost, the next thing we need to know is the number of cost units that can be related to the sales representative.

   The cost unit selected might be £100 of sales achieved. If the representative has achieved £400,000 of sales, then we could say that the representative's costs amounted to £10 per £100 of sales. The representative has thus been used as a cost centre or collecting place for the costs, which have then been related to the cost units.

1.6 Classification of costs

Costs can be classified in many different ways. It is necessary to be able to classify all costs, that is, to be able to arrange them into logical groups, in order to devise an efficient system to collect and analyse the costs. The classifications selected and the level of detail used in the classification groupings will depend on the purpose of the classification exercise.

The CIMA *Terminology* defines classification as 'the arrangement of items in logical groups having regard to their nature (subjective classification) or purpose (objective classification)'.

1.6.1 Classification of costs according to their nature

This means grouping costs according to whether they are materials, labour or expense cost.

Material costs include the cost of obtaining the materials and receiving them within the organisation. The cost of having the materials brought to the organisation is known as *carriage inwards*.

Labour costs are those costs incurred in the form of wages and salaries, together with related employment costs. In the United Kingdom, there is an additional cost borne by the employer in respect of employees which is paid to the government: this is called National Insurance. These costs are documented internally, the amount of the wages and salary costs being determined by reference to agreed rates of pay and attendance time and output measures, depending on the method of remuneration being used.

Expense costs are external costs such as rent, business rates, electricity, gas, postages, telephones and similar items which will be documented by invoices from suppliers.

Within each of these classifications there is a number of subdivisions; for example, within the materials classification the subdivisions might include the following:

(a) Raw materials, that is, the basic raw material used in manufacture.
(b) Components, that is, complete parts that are used in the manufacturing process.
(c) Consumables, that is, cleaning materials, etc.
(d) Maintenance materials, that is, spare parts for machines, lubricating oils, etc.

This list of subdivisions is not exhaustive, and there may even be further subdivisions of each of these groups. For example, the raw materials may be further divided according to the type of raw material, for example, steel, plastic, glass, etc.

Exercise 1.3

Can you think of some possible subdivisions for the costs that are classified as labour costs and as expense costs?

1.6.2 Classification of costs according to their purpose

When costs are classified having regard to their purpose, they are grouped according to the reason for which they have been incurred. The broadest classification of this type is to divide costs into *direct* costs and *indirect* costs.

A direct cost is one that can be clearly identified with whatever we are trying to cost. For example, suppose that a furniture maker is determining the cost of a wooden table. The manufacture of the table has involved the use of timber, screws and metal drawer handles. These items are classified as *direct materials*. The wages paid to the machine operator, assembler and finisher in actually making the table would be classified as *direct labour costs*. The designer of the table may be entitled to a royalty payment for each table made, and this would be classified as a *direct expense*.

Other costs incurred would be classified as *indirect costs*. They cannot be directly attributed to a particular cost unit, although it is clear that they have been incurred in the production of the table. Examples of indirect production costs are as follows:

Cost incurred	*Cost classification*
Lubricating oils and cleaning materials	Indirect material
Salaries of supervisory labour	Indirect labour
Factory rent and power	Indirect expense

It is important for you to realise that a particular cost may sometimes be a direct cost and sometimes an indirect cost. It depends on what we are trying to cost.

For example, the salary of the machining department supervisor is a direct cost of that department because it can be specifically identified with the department. However, it is an indirect cost of each of the cost units processed in the machining department because it cannot be specifically identified with any particular cost unit.

1.6.3 Other examples of cost classification

(a) *Fixed and variable costs*. This classification is made according to whether a cost varies in total when the activity level changes. A fixed cost remains unaltered when activity varies. The total expenditure on variable costs will change in line with changes in the level of activity. This particular classification can be especially useful if we are classifying costs for decision-making purposes. (Fixed and variable costs are discussed in greater detail later in this chapter.)

(b) *Production, selling and distribution, and administration costs*. This classification is based on a functional analysis of costs. It groups costs according to the function of the business which has incurred them. Although there are other functional groups of costs, these are the main classifications. This sort of analysis is particularly useful for inventory (stock) valuation purposes. For example, selling overheads should not be included in the valuation of stock because an item which is still held in stock would not yet have incurred any selling overheads.

(c) *Controllable and non-controllable costs*. Costs may be classified in management reporting systems according to whether they are controllable or non-controllable. This means that the costs which are within the control of management are highlighted in the reports so that management action is directed where it is most worthwhile.

(d) *Normal and abnormal costs*. A normal cost is one which management was expecting to incur and which is of the expected order of magnitude. An abnormal cost is one which was not expected or which is larger or smaller than expected. This type of classification is used to draw managers' attention to the cost of abnormal events.

The most common normal and abnormal costs arise in process costing, which we will be studying in detail in a later chapter.

(e) *Relevant and non-relevant costs*. This method of classification divides costs according to whether they are relevant to a decision being taken, or not relevant to the decision. Examples of non-relevant costs are sunk costs or past costs, which you will be learning about in a later chapter.

1.7 Coding of costs

CIMA defines a code as 'a system of symbols designed to be applied to a classified set of items to give a brief accurate reference, facilitating entry, collation and analysis'.

A cost coding system is therefore based on the selected cost classifications. It provides a way of expressing the classification of each cost in a shortened symbolised form.

1.7.1 Composite codes

The CIMA *Terminology* describes the use of composite symbols in codes. For example, let us consider the hypothetical composite symbol 298.311.

The first three digits might indicate the nature of the expenditure. This is the subjective classification referred to in CIMA's definition of classification.

2 – labour
9 – semi-skilled
8 – grade 8

Anyone who is familiar with the coding system would be able to identify that the expenditure was incurred on grade 8 semi-skilled labour.

The last three digits might indicate the cost centre or cost unit to be charged. This is the objective classification referred to in CIMA's definition of classification.

3 – indirect cost
1 – north-east factory
1 – machining department

The code can indicate that the expenditure is to be charged as indirect labour to the machining department in the north-east factory.

The code number 298.311 is much clearer than this lengthy description of where the cost is to be charged.

1.7.2 The advantages of a coding system

Some of the advantages of a well-designed coding system are as follows:

(a) A code is usually briefer than a description. The example in the previous section demonstrates this advantage very clearly. This saves time in a manual system and reduces the data storage capacity required in a computerised system.
(b) A code reduces ambiguity. Two people might each use a quite different description for the same item but a code will be more precise.
(c) A code is more suitable than a description in computerised systems, that is, data processing is facilitated.

1.7.3 The requirements for an efficient coding system

(a) The code should be unique and certain, that is, each item should have only one possible code number which can easily be identified from the structure of the code.
(b) The coding system should be comprehensive and elastic, that is, it should be possible to identify a code for every item and the coding system should be capable of expanding to accommodate new items.
(c) The code should be as brief as possible, having regard to the amount of detail which is needed in the analysis of the items being coded.
(d) To minimise errors, the code should incorporate check digits so that a computerised system can detect coding errors.
(e) The maintenance of the coding system should be centrally controlled. It should not be possible for individuals to independently add new codes to the existing coding system.
(f) Wherever possible, all codes should be of the same length. This makes errors easier to spot and it assists computerised data processing.

1.8 Elements of cost

The elements of cost are the constituent parts of costs which make up the total cost of a cost unit. It will be useful at this stage to look at how costs are built up for a particular cost unit. Once you have learned about cost behaviour (later in this chapter) you will then be in

	£	£
Direct material		15
Direct labour		5
Direct expenses		2
Prime cost or total direct cost		22
Production overhead:		
indirect material	4	
indirect labour	6	
indirect expenses	6	
		16
Total production/factory cost		38
Selling, distribution and administration overhead		2
Total cost		40
Profit		10
Selling price		50

Figure 1.1 The build-up of cost

a position to learn more detail about the major cost elements: materials, labour and overheads.

In Figure 1.1, the outline cost statement for a unit shows you how the total cost for a unit might be built up. Notice in particular that a number of subtotals can be highlighted before the total cost figure is determined. The importance of each of these subtotals will become more clear as you progress through your studies of *Management Accounting Fundamentals*.

The numbers in this example are for illustration purposes only, so that you can see which costs are included in each subtotal.

The illustration is based on absorption costing principles. Do not worry about this for now: later in this *Study System* you will learn about the difference between absorption costing and marginal costing.

In this example there is a profit of £10 on this particular cost unit. This is referred to as a profit *margin* on sales of 20 per cent (10/50) and a profit *mark-up* on cost of 25 per cent (10/40). These are the 'strictly correct' definitions of margin and mark-up. However, in practice, the two terms tend to be used interchangeably.

The important thing in an assessment question is that you should establish whether profit is to be calculated as a percentage of cost, or as a percentage of selling price.

1.9 Cost behaviour

Many factors affect the level of costs incurred; for instance inflation will cause costs to increase over a period of time. In management accounting, when we talk about cost behaviour we are referring to the way in which costs are affected by fluctuations in the level of activity.

The level of activity can be measured in many different ways. For example, we can record the number of units produced, miles travelled, hours worked, percentage of capacity utilised and so on.

An understanding of cost behaviour patterns is essential for many management tasks, particularly in the areas of planning, decision-making and control. It would be impossible for managers to forecast and control costs without at least a basic knowledge of the way in which costs behave in relation to the level of activity.

In this section we will look at the most common cost behaviour patterns and we will consider some examples of each.

1.9.1 Fixed cost

The CIMA *Terminology* defines a fixed cost as 'a cost which is incurred for an accounting period, and which, within certain output or turnover limits, tends to be unaffected by fluctuations in the levels of activity (output or turnover)'.

Another term that can be used to refer to a fixed cost is a period cost. This highlights the fact that a fixed cost is incurred according to the time elapsed, rather than according to the level of activity.

A fixed cost can be depicted graphically as shown in Figure 1.2.

Examples of fixed costs are rent, rates, insurance and executive salaries.

The graph shows that the cost is constant (in this case at £5,000) for all levels of activity. However, it is important to note that this is only true for the relevant range of activity. Consider, for example, the behaviour of the rent cost. Within the relevant range it is possible to expand activity without needing extra premises and therefore the rent cost remains constant. However, if activity is expanded to the critical point where further premises are needed, then the rent cost will increase to a new, higher level.

This cost behaviour pattern can be described as a stepped fixed cost (Figure 1.3).

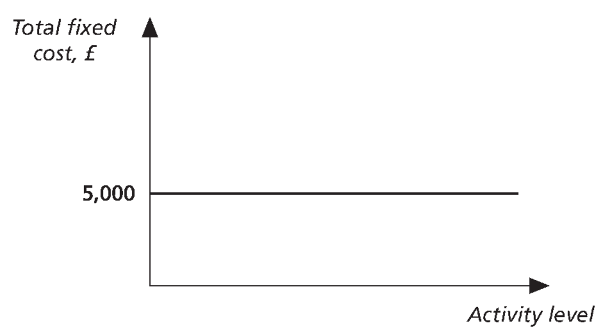

Figure 1.2 Fixed cost

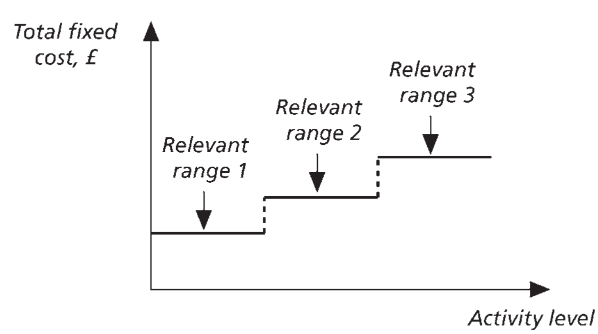

Figure 1.3 Stepped fixed cost

The cost is constant within the relevant range for each activity level but when a critical level of activity is reached, the total cost incurred increases to the next step.

The possibility of changes occurring in cost behaviour patterns means that it is unreliable to predict costs for activity levels which are outside the relevant range. For example our records might show the cost incurred at various activity levels between 100 units and 5,000 units. We should therefore try to avoid using this information as the basis for forecasting the level of cost which would be incurred at an activity of, say, 6,000 units, which is outside the relevant range.

This warning does not only apply to fixed costs: it is never wise to attempt to predict costs for activity levels outside the range for which cost behaviour patterns have been established.

When you are drawing or interpreting graphs of cost behaviour patterns, it is important that you pay great attention to the label on the vertical axis. In Figures 1.2 and 1.3 the graphs depicted the total cost incurred. If the vertical axis had been used to represent the fixed cost per unit, then it would look as shown in Figure 1.4.

The fixed cost per unit reduces as the activity level is increased. This is because the same amount of fixed cost is being spread over an increasing number of units.

1.9.2 Variable cost

The CIMA *Terminology* defines a variable cost as 'a cost which varies with a measure of activity'.

Examples of variable costs are direct material, direct labour and variable overheads.

Exercise 1.4

Figure 1.5 depicts the total variable cost at each activity level. Can you draw a sketch graph of the variable cost per unit?

Figure 1.5 depicts a linear variable cost. It is a straight line through the origin, which means that the cost is nil at zero activity level. When activity increases, the total variable cost increases in direct proportion, that is, if activity goes up by 10 per cent, then the total variable cost also increases by 10 per cent, as long as the activity level is still within the relevant range.

The gradient of the line will depend on the amount of variable cost per unit.

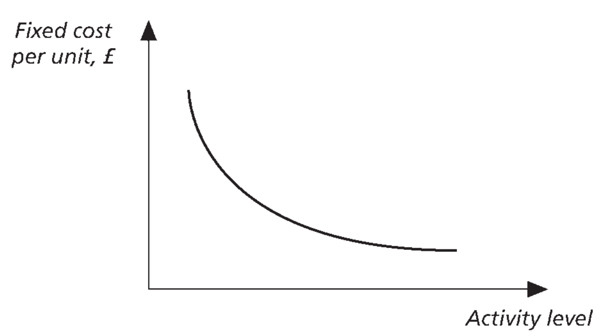

Figure 1.4 Fixed cost per unit

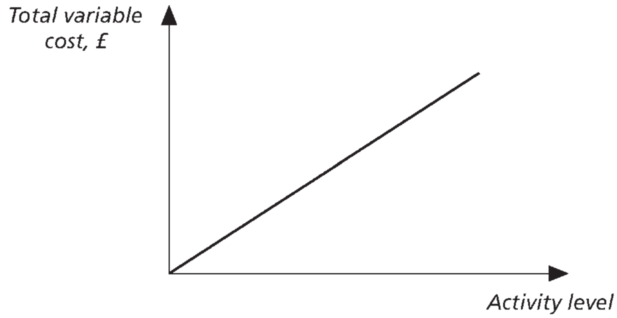

Figure 1.5 Linear variable cost

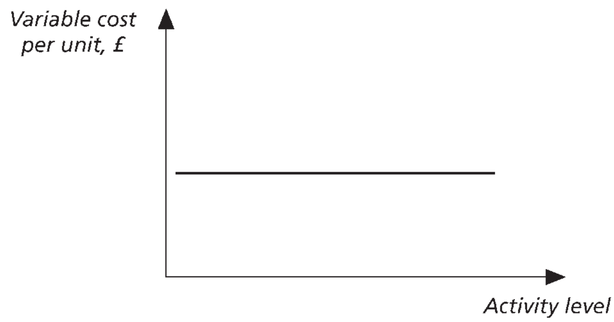

Figure 1.6 Variable cost per unit

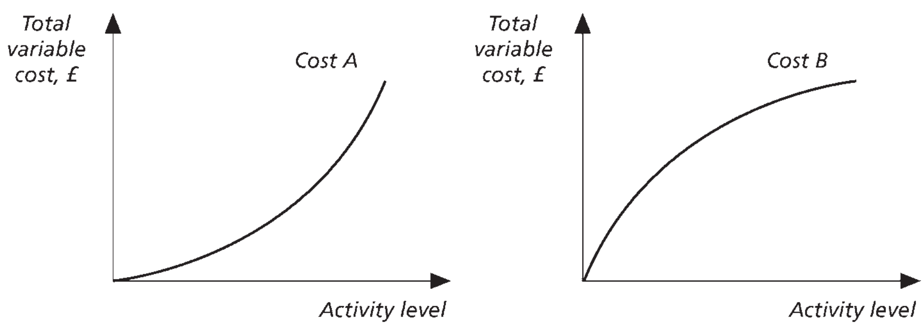

Figure 1.7 Non-linear variable costs

If you attempted Exercise 1.4, then your graph of variable cost per unit should look like Figure 1.6. The straight line parallel to the horizontal axis depicts a constant variable cost per unit, within the relevant range.

In most assessment situations, and very often in practice, variable costs are assumed to be linear. Although many variable costs do approximate to a linear function, this assumption may not always be realistic. A variable cost may be non-linear as depicted in either of the diagrams in Figure 1.7.

These costs are sometimes called curvilinear variable costs.

The graph of cost A becomes steeper as the activity level increases. This indicates that each successive unit of activity is adding more to the total variable cost than the previous unit. An example of a variable cost which follows this pattern could be the cost of direct labour where employees are paid an accelerating bonus for achieving higher levels of output. The graph of cost B becomes less steep as the activity level increases. Each successive unit of activity adds less to total variable cost than the previous unit. An example of a variable cost which follows this pattern could be the cost of direct material where quantity discounts are available.

Exercise 1.5

Can you think of other variable costs which might follow the behaviour patterns depicted in Figure 1.7?

The important point is that managers should be aware of any assumptions that have been made in estimating cost behaviour patterns. They can then use the information which is based on these assumptions with a full awareness of its possible limitations.

1.9.3 Semi-variable cost

A semi-variable cost is also referred to as a semi-fixed or mixed cost. The CIMA *Terminology* defines it as 'a cost containing both fixed and variable components and which is thus partly affected by a change in the level of activity'.

A graph of a semi-variable cost might look like Figure 1.8.

Examples of semi-variable costs are gas and electricity. Both of these expenditures consist of a fixed amount payable for the period, with a further variable amount which is related to the consumption of gas or electricity.

Alternatively a semi-variable cost behaviour pattern might look like Figure 1.9.

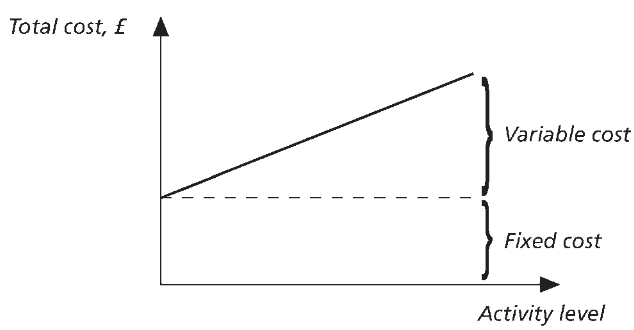

Figure 1.8 Semi-variable cost

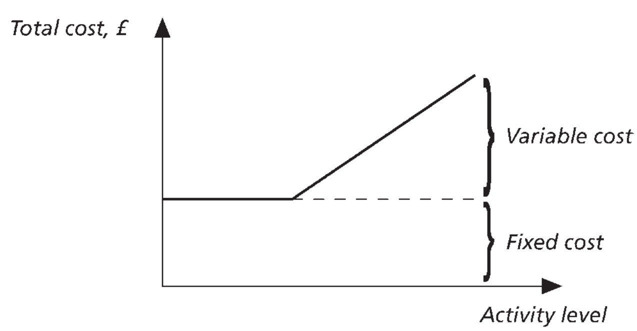

Figure 1.9 Semi-variable cost

This cost remains constant up to a certain level of activity and then increases as the variable cost element is incurred. An example of such a cost might be the rental cost of a photocopier where a fixed rental is paid and no extra charge is made for copies up to a certain number. Once this number of copies is exceeded, a constant charge is levied for each copy taken.

Exercise 1.6

Can you think of other examples of semi-variable costs with behaviour patterns like those indicated in Figures 1.8 and 1.9?

1.9.4 Analysing semi-variable costs

The semi-variable cost behaviour pattern depicted in Figure 1.8 is most common in practice and in assessment situations.

When managers have identified a semi-variable cost they will need to know how much of it is fixed and how much is variable. Only when they have determined this will they be able to estimate the cost to be incurred at relevant activity levels. Past records of costs and their associated activity levels are usually used to carry out the analysis. The three most common methods used to separate the fixed and variable elements are as follows:

(a) The high–low method.
(b) The scattergraph method.
(c) The least squares method of regression analysis.

You will be learning about the least squares method in your studies of *Business Mathematics*. In this text we will look at methods (a) and (b) in more depth.

The high–low method

This method picks out the highest and lowest activity levels from the available data and investigates the change in cost which has occurred between them. The highest and lowest points are selected to try to use the greatest possible range of data. This improves the accuracy of the result.

Example: the high–low method

A company has recorded the following data for a semi-variable cost:

Month	*Activity level (units)*	*Cost incurred (£)*
January	1,800	36,600
February	2,450	41,150
March	2,100	38,700
April	2,000	38,000
May	1,750	36,250
June	1,950	37,650

The highest activity level occurred in February and the lowest in May. Since the amount of fixed cost incurred in each month is constant, the extra cost resulting from the activity increase must be the variable cost.

	Activity level (units)	£
February	2,450	41,150
May	1,750	36,250
Increase	700	4,900

The extra variable cost for 700 units is £4,900. We can now calculate the variable cost per unit:

$$\text{Variable cost} = \frac{4{,}900}{700} = £7 \text{ per unit}$$

Substituting back in the data for February, we can determine the amount of fixed cost:

	£
February	
Total cost	41,150
Variable cost (2,450 units × £7)	17,150
Therefore, fixed cost per month	24,000

Now that the fixed and variable cost elements have been identified, it is possible to estimate the total cost for any activity level within the range 1,750 units to 2,450 units.

The scattergraph method

This method takes account of all available historical data and it is very simple to use. However, it is very prone to inaccuracies that arise due to subjectivity and the likelihood of human error.

1. First a scattergraph is drawn which plots all available pairs of data on a graph.
2. Then a line of best fit is drawn by eye. This is the line which, in the judgement of the user, appears to be the best representation of the gradient of the sets of points on the graph. This is demonstrated in Figure 1.10.

! The inaccuracies involved in drawing the line of best fit should be obvious to you. If you had been presented with this set of data, your own line of best fit might have been slightly different from ours.

3. The point where the extrapolation of this line cuts the vertical axis (the intercept) is then read off as the total fixed cost element. The variable cost per unit is given by the gradient of the line.

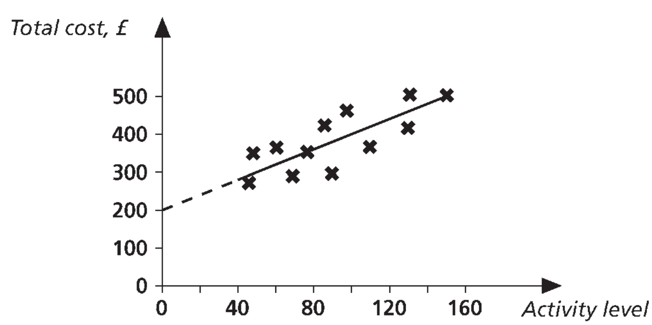

Figure 1.10 Scattergraph

From Figure 1.10, the fixed cost contained within this set of data is adjudged to be £200.

The variable cost is calculated as follows:

Cost for zero units = £200

Cost for 150 units = £500

$$\text{Gradient (i.e. variable cost)} = \frac{500 - 200}{150 - 0} = £2 \text{ per unit}$$

1.9.5 Using historical data

The main problem which arises in the determination of cost behaviour is that the estimates are usually based on data collected in the past. Events in the past may not be representative of the future and managers should be aware of this if they are using the information for planning and decision-making purposes.

1.10 Summary

Having read this chapter the main points that you should understand are as follows.

1. A costing system provides the information that management needs to plan and control the organisation's activities and to make decisions about the future.
2. A cost unit is the basic unit of measurement selected for cost control purposes.
3. A cost centre is used as a 'collecting place' for costs, which may then be further analysed and related to individual cost units.
4. Costs may be classified in a number of different ways depending on the reason for the classification exercise. The main classifications are according to their nature or their purpose, fixed and variable, a functional analysis, controllable and non-controllable, normal and abnormal, relevant and non-relevant.
5. A coding system provides a way of expressing each classification in a shortened symbolised form.
6. The prime cost or total direct cost of a cost unit is the total of its direct material cost, direct labour cost and direct expenses cost.
7. The total production cost of a cost unit is the total of its prime (direct) cost and its production overhead cost.
8. Costs which are not affected by changes in the level of activity are fixed costs or period costs.
9. A stepped fixed cost is constant within the relevant range for each activity level.
10. A variable cost increases or decreases in line with changes in the level of activity.
11. A cost which is partly fixed and partly variable is a semi-variable, semi-fixed or mixed cost.
12. Observed cost behaviour patterns apply only over the relevant range of activity levels.
13. The fixed and variable elements of a semi-variable cost can be determined using the high–low method or a scattergraph.

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Revision Questions 1

Question 1 Multiple choice

In the multiple choice questions in the actual assessment each option would usually have an empty box or circle beside it. You would be required to simply place the cursor on the relevant box and click the mouse to select the correct answer. In this Study System we have labelled the four options as A, B, C and D. These letters are for reference purposes only and to assist us in our discussion of the solutions.

You are advised to try the online demo of cba questions on CIMA's website at www.cimaglobal.com/cba so that you will be aware of the way in which the questions will be presented.

1.1 Cost centres are:

(A) units of output or service for which costs are ascertained.
(B) functions or locations for which costs are ascertained.
(C) a segment of the organisation for which budgets are prepared.
(D) amounts of expenditure attributable to various activities.

1.2 Prime cost is:

(A) all costs incurred in manufacturing a product.
(B) the total of direct costs.
(C) the material cost of a product.
(D) the cost of operating a department.

1.3 Fixed costs are conventionally deemed to be:

(A) constant per unit of output.
(B) constant in total when production volume changes.
(C) outside the control of management.
(D) those unaffected by inflation.

1.4 The following data relate to two activity levels of an out-patient department in a hospital:

Number of consultations by patients	4,500	5,750
Overheads	£269,750	£289,125

Fixed overheads are not affected by the number of consultations per period.
The variable cost per consultation:

(A) is approximately £15.50
(B) is approximately £44.44

(C) is approximately £59.94
(D) cannot be calculated without more information.

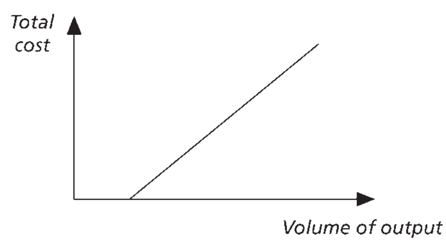
1.5 P Ltd is preparing the production budget for the next period. Based on previous experience, it has found that there is a linear relationship between production volume and production costs. The following cost information has been collected in connection with production:

Volume (units)	*Cost (£)*
1,600	23,200
2,500	25,000

What would be the production cost for a production volume of 2,700 units?

(A) £5,400
(B) £25,400
(C) £27,000
(D) £39,150

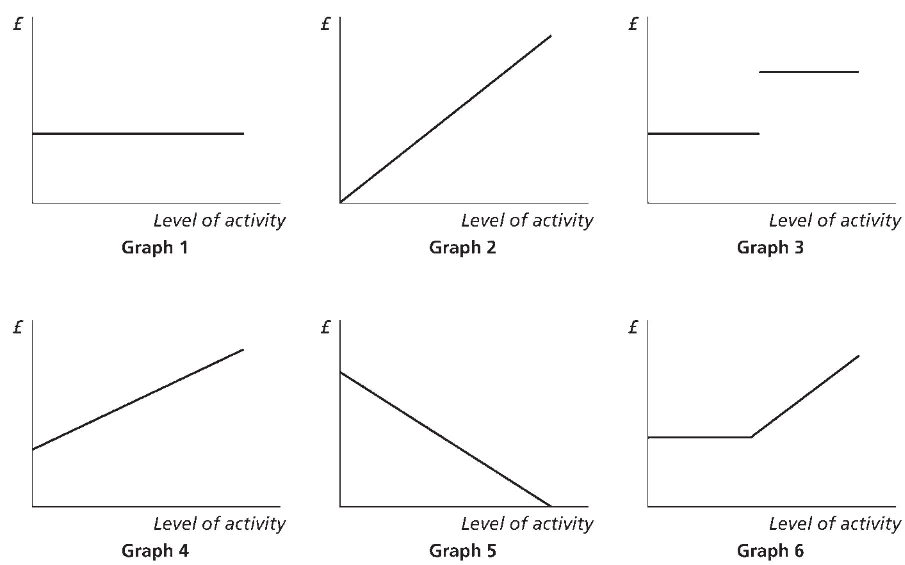
1.6 The following is a graph of cost against volume of output:



To which of the following costs does the graph correspond?

(A) Electricity bills made up of a standing charge and a variable charge.
(B) Bonus payments to employees when production reaches a certain level.
(C) Sales commission payable per unit up to a maximum amount of commission.
(D) Bulk discounts on purchases, the discount being given on all units purchased.

The following information relates to questions 1.7–1.11



Which one of the above graphs illustrates the costs described in questions 1.7–1.11?

1.7 A linear variable cost – when the vertical axis represents cost incurred.

(A) Graph 1
(B) Graph 2
(C) Graph 4
(D) Graph 5

1.8 A fixed cost – when the vertical axis represents cost incurred.

(A) Graph 1
(B) Graph 2
(C) Graph 3
(D) Graph 6

1.9 A linear variable cost – when the vertical axis represents cost per unit.

(A) Graph 1
(B) Graph 2
(C) Graph 3
(D) Graph 6

1.10 A semi-variable cost – when the vertical axis represents cost incurred.

(A) Graph 1
(B) Graph 2
(C) Graph 4
(D) Graph 5

1.11 A step fixed cost – when the vertical axis represents cost incurred.

(A) Graph 3
(B) Graph 4
(C) Graph 5
(D) Graph 6

? **Question 2** Short objective-test questions

2.1 Which of the following are stepped fixed costs?

☐ Machine rental costs
☐ Direct material costs
☐ Royalties payable on units produced
☐ Depreciation on delivery vehicles

2.2 A company increases its activity within the relevant range. Tick the correct boxes below to indicate the effect on costs.

• Total variable costs will:	increase	☐
	decrease	☐
	remain the same	☐
• Total fixed cost will:	increase	☐
	decrease	☐
	remain the same	☐

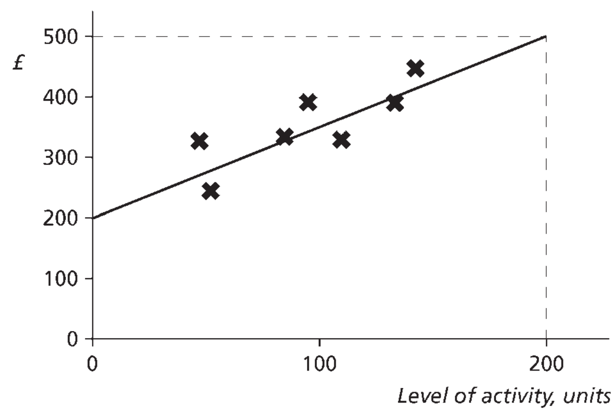
- The variable cost per unit will: increase ☐ / decrease ☐ / remain the same ☐
- The fixed cost per unit will: increase ☐ / decrease ☐ / remain the same ☐

2.3 The variable production cost per unit of product B is £2 and the fixed production overhead for a period is £4,000. The total production cost of producing 3,000 units of B in a period is £ ☐.

2.4 In a hotel, which of the following would be suitable cost units and cost centres?

	Suitable as cost centre	*Suitable as cost unit*
Restaurant	☐	☐
Guest night	☐	☐
Meal served	☐	☐
Fitness suite	☐	☐
Bar	☐	☐

2.5



Based on the above scattergraph:

- the period fixed cost is £ ☐
- the variable cost per unit is £ ☐

2.6 The following data relates to the overhead costs of a commercial laundry for the latest two periods.

Overhead costs	*Number of items laundered*
£	
5,140	2,950
5,034	2,420

A formula that could be used to estimate the overhead costs for a forthcoming period is:

Overhead cost = £☐ + (£☐ × number of items laundered)

? Question 3 Cost classification

A company manufactures and retails clothing.

You are required to write the correct classification for each of the costs below into the box provided, using the following classifications (each cost is intended to belong to only one classification):

(i) direct materials
(ii) direct labour
(iii) direct expenses
(iv) indirect production overhead
(v) research and development costs
(vi) selling and distribution costs
(vii) administration costs
(viii) finance costs

1. lubricant for sewing machines ☐
2. floppy disks for general office computer ☐
3. maintenance contract for general office photocopying machine ☐
4. telephone rental plus metered calls ☐
5. interest on bank overdraft ☐
6. Performing Rights Society charge for music broadcast throughout the factory ☐
7. market research undertaken prior to a new product launch ☐
8. wages of security guards for factory ☐
9. carriage on purchases of basic raw material ☐
10. royalty payable on number of units of product XY produced ☐
11. road fund licences for delivery vehicles ☐
12. parcels sent to customers ☐
13. cost of advertising products on television ☐
14. audit fees ☐
15. chief accountant's salary ☐
16. wages of operatives in the cutting department ☐
17. cost of painting advertising slogans on delivery vans ☐
18. wages of storekeepers in materials store ☐
19. wages of fork lift truck drivers who handle raw materials ☐
20. developing a new product in the laboratory ☐

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Solutions to Revision Questions

1

Solution 1

- The best way to approach multiple-choice questions is to work out your own answer first, before you look at the options. If your answer is not included in the options then you may be forced to guess. Improve your chances by eliminating the unlikely answers, or those that you know to be incorrect. Then take a guess from the remaining choices.
- Make sure that you answer every question. You will not be penalised for an incorrect answer – and you might guess correctly!

1.1 Answer: (B)

Cost centres act as 'collecting places' for costs before they are analysed further.

1.2 Answer: (B)

Answer (A) describes total production cost. Answer (C) is only a part of prime cost. Answer (D) is an overhead cost.

1.3 Answer: (B)

The total amount of fixed costs remains unchanged when production volume changes, therefore the unit rate fluctuates.

1.4 Answer: (A)

With the same amount of fixed overheads at both activity levels, the change in overheads must be due to extra variable cost.

	Overheads	*Consultations*
	£	
High	289,125	5,750
Low	269,750	4,500
Change	19,375	1,250

$$\text{Variable overhead cost per consultation} = \frac{£19{,}375}{1{,}250} = £15.50$$

1.5 Answer: (B)

Units	£
2,500	25,000
1,600	23,200
900	1,800

$$\text{Variable cost per unit} = \frac{£1{,}800}{900} = £2$$

Substitute in high activity:

	£
Total cost	25,000
Variable cost = 2,500 units × £2	5,000
Therefore fixed cost	20,000

Forecast for 2,700 units:

	£
Fixed cost	20,000
Variable cost 2,700 × £2	5,400
Total cost	25,400

1.6 Answer: (B)

The graph shows a variable cost which starts to be incurred only beyond a certain volume of output. Only B fits this description of cost behaviour.

1.7 Answer: (B)

Graph 2 depicts a cost which increases in total by equal amounts for each increment in the level of activity.

1.8 Answer: (A)

Graph 1 depicts a cost which remains the same regardless of the level of activity.

1.9 Answer: (A)

The variable cost per unit remains constant regardless of the level of activity.

1.10 Answer: (C)

Graph 4 depicts a cost which contains a fixed element which is incurred even at zero activity. Thereafter the cost increases in total by equal amounts for each increment in the level of activity: this is the extra variable cost incurred.

1.11 Answer: (A)

Graph 3 depicts a cost which remains constant up to a critical level of activity. At that point the total cost increases by a step to a new, higher level.

Solution 2

- Always read the question carefully. For example, question 2.1 does *not* state 'which *one* of the following are stepped fixed costs?'. In fact, there is more than one correct answer.

2.1 Machine rental cost is a stepped fixed cost. For one machine the total rental cost stays constant until the machine is working at full capacity. Then two machines will be needed and the rental cost goes up a step to a new higher level. When the two machines are at full capacity there will be a need to rent three machines, and so on.

Depreciation on delivery vehicles is a stepped fixed cost. Depreciation is calculated on an annual basis and is unlikely to be affected by the level of activity in the short term. For one vehicle the annual depreciation is a constant amount. If two vehicles are required the depreciation cost goes up a step, and so on.

Royalty costs and direct material costs are variable costs.

2.2 As activity increases within the relevant range, the total variable costs will *increase* and the total fixed cost will *remain the same*. The variable cost per unit will *remain the same* and the fixed cost per unit will *decrease*.

2.3 Total production cost = (3,000 × £2) + £4,000 = £10,000.

2.4

	Suitable as cost centre	*Suitable as cost unit*
Restaurant	✔	
Guest night		✔
Meal served		✔
Fitness suite	✔	
Bar	✔	

2.5 The period fixed cost is £200. The variable cost per unit is:

$$\frac{£500 - £200}{200 \text{ units}} = £1.50 \text{ per unit}$$

2.6

Overhead costs	*Number of items laundered*
£	
5,140	2,950
5,034	2,420
106	530

Variable cost per item laundered = £106/530 = £0.20
Substitute in high activity:

	£
Total cost	5,140
Variable cost = 2,950 items × £0.20	590
Therefore fixed cost	4,550

A formula that could be used to estimate the overhead costs for a forthcoming period is:
Overhead cost = £4,550 + (£0.20 × number of items laundered)

☑ Solution 3

- When you are trying to determine whether a cost is direct or indirect, think about whether the cost would need to be shared over several cost units or whether it can be attributed directly to a particular unit. A cost that needs to be shared must be an indirect cost.

Item	*Classification*	*Item*	*Classification*
1	(iv)	11	(vi)
2	(vii)	12	(vi)
3	(vii)	13	(vi)
4	(vii)	14	(vii)
5	(viii)	15	(vii)
6	(iv)	16	(ii)
7	(vi)	17	(vi)
8	(iv)	18	(iv)
9	(iv)	19	(iv)
10	(iii)	20	(v)

Materials

2

Learning Outcomes

After completing this chapter, you should be able to:

- explain raw material accounting and control procedures;
- explain and calculate reorder quantity, reorder level, maximum stock, minimum stock and economic order quantity;
- explain the FIFO, LIFO and weighted average stock valuation methods;
- calculate stock value, cost of sales and gross profit under LIFO, FIFO and weighted average.

2.1 Introduction

In this chapter you will learn about the control and valuation of inventory (stock). Stock represents a major investment for many organisations, not only in terms of the capital invested in the stock itself but also in terms of the cost of the space it occupies, the cost of insuring and keeping it safe and so on. It is clear that stock levels should not be allowed to become too high but on the other hand if stock is too low there is a risk of running out of an item completely, which could lead to lost sales or disruptions to production.

Therefore, it is very important that stock is carefully monitored and controlled. The procedures in this chapter will be described in terms of materials stock but they can be applied to all types of stock held by an organisation.

In the first part of the chapter you will be looking at the procedures for ordering and recording the movement of stock and you will learn about a number of controls that can be used to ensure that stock is maintained at the optimum level. This involves a number of equations which you must commit to memory because they will not be provided in the assessment.

The second part of the chapter looks at different methods that can be used to value stock and the impact of each of these on the profit reported for the period.

2.2 The purchase of materials

The purchasing process begins when a person in the organisation recognises the need to acquire a particular item. Two possibilities exist:

- Production receives an order for work and recognises the need to obtain special materials which are not normally held in stock by the organisation.
- Stores recognises that the level of stock has fallen to a low level or receives a request for materials which they are unable to supply.

The main distinction between these is that the first refers to non-stock items and the second refers to stock items. A formal request from production for materials, whether for stock items or non-stock items, is made using a *material requisition* which is illustrated in Figure 2.1.

You should notice that this document includes the following details:

- quantity and description of the materials required;

! Each material will have a code number so that it can be identified without ambiguity. This is an example of the application of coding systems that you learned about in Chapter 1.

- the use of the materials, that is, which cost centre or job should be charged with their cost;
- the date when the request was made;
- an authorised signature;
- a space for the recipient to sign to acknowledge receipt of the goods.

Material Requisition

Serial No: ....

Charge Job/
Cost Centre No: ....

Date: ....

Code No.	Description	Quantity or weight	Cost office only				
			Rate	Unit	£	£	Stores ledger

Authorised by:	Storekeeper:	Prices entered by:
Received by:	Bin card entered:	Calculations checked:

Figure 2.1 Material requisition

This document is used whenever materials are required and it is presented to the stores, who will supply the materials requested. If the stores cannot supply the items or if stock is at a low level, then the purchasing process begins.

The stores will make a formal request to the purchasing function to obtain the materials using a *purchase requisition* which is illustrated in Figure 2.2.

Note how the contents of this document are similar to those of the material requisition. It is this document which formally authorises the buyer to obtain the materials.

The purchasing function will then contact a number of suppliers, normally at least three, to obtain quotations for the supply of the materials required. The quotation will give details of the price to be charged, including carriage where appropriate, the delivery time, and other conditions of sale. Using this information the buyer will select the best quotation having regard to price, quality, reliability of the supplier, and delivery times. The buyer will then raise a *purchase order*.

A specimen purchase order is illustrated in Figure 2.3. You should notice how it makes reference to the 'attached conditions of purchase' which would refer to the original quotation and terms of supply.

When the goods are delivered they will normally be accompanied by a delivery note from the supplier. It is common for all orders to be delivered to stores (unless there is good reason to have them delivered elsewhere) and for the storekeeper to be responsible for checking the delivery and acknowledging its receipt by signing the supplier's delivery note. The storekeeper will then raise a *goods received note* (also called a *goods inward note*), copies of which will be sent to the purchasing department and the accounts department. This is the document which is used to record the receipt of goods (as we will explain later in this chapter). An example of a goods received note is shown in Figure 2.4.

Purchase Requisition

Date .... Serial No: ....

Purpose* : stock/special production/consumables/
capital equipment/(budget reference ....)
*Delete as appropriate.

Quantity and units	Description	Material code	Job or dept. code	Delivery required		Purchase order		
				Date	Place	No.	Date	Supplier

Origination department: .... Authorisation ....

Figure 2.2 Purchase requisition

Purchase Order

To: .... Serial No: ....
.... Date: ....
.... Purchase Req. No: ....

Please supply, in accordance with the attached conditions of purchase:

Figure 2.3 Purchase order

Goods Received Note

Supplier: .... Serial No: ....
.... Date issued: ....
Carrier: .... Purchase Order No: ....
Date of delivery: ....

Description	Code	Quantity	Packages	Gross weight

Received by: ....

Figure 2.4 Goods received note

! The storekeeper may also sign an inspection note to confirm that the materials were in good condition on receipt. Alternatively, this could be included as part of the goods received note.

Later the supplier will send an invoice to the accounts department. The invoice should refer to the original purchase order, and the accounts department will use this and the copy goods received note to ensure that the invoice is correct by checking that the price and quantity details are the same as those ordered and received.

The stores will then issue the materials as required to production when requested to do so by a material requisition. It is the material requisition which is used to record the issue of materials from stock.

This process of ordering, receiving and issuing materials from stock has been explained in the above paragraphs in the context of a manufacturing business and its handling of raw materials. You should note that similar procedures apply to other types of organisation and to retailers obtaining finished goods stocks.

Whatever type of organisation is involved, the procedures for obtaining, receiving and issuing stock are very important. We will now see how it is equally important to control the level of stock held.

2.3 Controlling the level of inventory (stock)

2.3.1 The need for inventory (stock)

There are many different forms of stock but essentially stock is either used within an organisation to enable it to operate efficiently or it comprises items for resale.

Irrespective of the use of the item of stock it is important not to run out because this will either result in inefficiency within the organisation or in lost sales or even loss of customers to competing organisations. However, the solution is not to hold huge stocks, except perhaps when a price rise is anticipated. Stockholding is costly in terms of storage space, insurance, security and risk of obsolescence, as well as storekeeper's wages and salaries. In addition, the holding of stock must be thought of as an investment of money which, therefore, cannot be used to earn further income.

The solution lies in maintaining a level of stock sufficient to meet the needs of the organisation, having regard to the costs both of holding stock and of the procurement process.

2.3.2 A system of control levels

One technique to ensure that stock is held at an optimum level is to use a series of control levels for each stock item. These levels are based on an analysis of past stock usage and delivery (or lead) times. For each of these, minimum, maximum and average values are collected (usually measured in days, but any time period may be used), and from these a number of control levels are calculated.

Before we look at the stock-control formulae and their application, we will need to consider the concept of the free stock balance. This is a notional, not physical, balance which helps to ensure that stock-outs do not occur.

$$\text{Free stock balance} = \text{physical stock} + \text{stock on order with suppliers} \\ - \text{outstanding requirements unfulfilled}$$

For example, suppose that the physical stock balance is 1,750 units, 27,500 units are on order with the supplier but have not yet been received, and material requisitions not yet fulfilled amount to 16,250 units. The free stock balance is:

$$1{,}750 + 27{,}500 - 16{,}250 = 13{,}000 \text{ units}$$

The free stock balance is usually the balance that is monitored to determine when a new order should be placed.

Now we will look at the formulae for the various stock control levels.

You need to learn all of these formulae, as well as the formula for the calculation of free stock, and ensure that you understand how to apply them.

(a) The reorder level is the level of free stock at which an order should be placed for replacement stock. It is set so that, at least in theory, it is not possible to run out of stock.

$$\text{Reorder level} = \text{Maximum usage} \times \text{maximum lead time}$$

(b) The minimum level is a warning level which signals to management that stock is falling to unacceptably low levels. Since this level is below the reorder level, an order should already have been placed. Management should progress the order to reduce the possibility of a stockout.

$$\text{Minimum level} = \text{Reorder level} - (\text{average usage} \times \text{average lead time})$$

(c) The maximum level is a warning level which signals to management that stock is rising to unacceptably high levels. This level should be exceeded only if delivery time or usage is actually less than that used in the original calculations. If this occurs frequently, the data used in the calculations should be reviewed.

$$\text{Maximum level} = \text{Reorder level} + \text{reorder quantity} - (\text{minimum usage} \times \text{minimum lead time})$$

(d) The reorder quantity is the predetermined amount of stock which is ordered when the reorder level is reached. If it represents the order size which minimises the total of ordering (procurement) costs and stockholding costs, it is referred to as the *economic order quantity* (EOQ). The EOQ is derived by examining the combined costs of *ordering* stock and *holding* stock. The higher the quantity we order each time, the fewer orders we need to place in a year, which means that ordering costs are reduced. On the other hand, holding costs *increase* if we order large quantities each time. This is because the average stock level is high, leading to an increased need for warehouse space, increased finance charges on the money tied up in stocks, etc. The mathematical technique of differentiation enables us to calculate the optimum order quantity, being the quantity which minimises the total of these two cost elements. Although you do not need to understand the mathematical derivation of the EOQ formula, you do need to understand its constituent parts and how to apply it.

The EOQ formula will be provided in the assessment if you need it. The equation is as follows:

$$\text{EOQ} = \sqrt{\frac{2C_oD}{C_h}}$$

where C_o = cost of the placing an order, D = annual demand and C_h = the cost of holding one unit in stock for 1 year.

(e) If the stock control levels and order quantities have been correctly calculated and are based on accurate forecasts, then the stock level should just fall to the minimum or safety level as the new order is received. If demand rates are constant, then it is possible to calculate the average stock as follows:

$$\text{Average stock} = \text{safety stock} + \tfrac{1}{2}\,\text{reorder quantity}$$

If you look at this formula you will see that it is assuming that stock levels fluctuate evenly between the lowest level (the safety stock) and the highest level (the amount in stock immediately after an order has been received, i.e. safety stock + reorder quantity).

However, you should note that economic order theory assumes that no safety stock is held, that is, that a replenishment order is received just as the stock level falls to zero. If no safety stock is held then the formula for average stock becomes:

π Average stock $= \frac{1}{2}$ reorder quantity

2.3.3 Using the control levels: a worked example

The following example illustrates the calculation of the stock levels.

The data below relate to an item of raw material:

Usage per day	250 units
Minimum lead time	20 days
Maximum lead time	30 days
Cost of ordering material	£300 per order
Carrying costs	£1.40 per unit per year

Note: Assume that each year consists of 240 working days.

You are required to calculate:

(i) the reorder level;
(ii) the economic order quantity;
(iii) the maximum level;
(iv) the minimum level.

Solution

(i) The reorder level is given by:

Maximum usage per day × maximum number of days' delivery time

$= 250 \times 30 = 7{,}500$ units

(ii) The economic order quantity is given by:

$$\text{EOQ} = \sqrt{\frac{2C_oD}{C_h}} = \sqrt{\frac{2 \times 300 \times (240 \times 250)^*}{1.40}} = 5{,}070 \text{ units}$$

*Annual demand = 250 units × 240 working days

(iii) The maximum level is given by:

Reorder level + reorder quantity − (minimum usage per day × minimum lead time)

$= 7{,}500 + 5{,}070 - 5{,}000 = 7{,}570$ units

(iv) The minimum level is given by:

Reorder level − (average usage × average lead time)

= 7,500 − (250 ×25*) = 1,250 units

*Average lead time = (20 + 30) ÷ 2

In this example, the EOQ could have been derived by tabulating the costs of different order sizes, and plotting these on a graph to find the minimum total cost. Using the same data this method is illustrated below.

Usage per annum = 250 units per day × 240 days = 60,000 units.

If order sizes of 4,000, 5,000 and 6,000 are considered, the following results occur:

Order quantity	4,000	5,000	6,000
Number of orders per year	15	12	10
Average stock level	2,000	2,500	3,000

Note that the number of orders per year is found by dividing the annual usage by the order quantity, and the average stock level is one-half of the order quantity. This assumes that stock is used at a constant rate throughout the year, and that the stock level falls to zero just as the replenishment is received, that is, economic order theory assumes that no safety stock is held.

Based upon the above the costs are:

	£	£	£
Ordering cost (£300 per order)	4,500	3,600	3,000
Carrying costs			
(Average stock level × £1.40)	2,800	3,500	4,200
	7,300	7,100	7,200

These results show that of these the most cost-effective option is to order twelve times per annum with an order quantity of 5,000 units. These values, plotted in Figure 2.5, show that the lowest cost occurs at an order quantity of approximately 5,100 units, which is close to our calculated EOQ of 5,070 units.

The disadvantage of the control level system is that it requires control levels to be set and then monitored for each item of stock to ensure that there has not been a significant change in the factors determining the stock levels. This is a time-consuming exercise but the task is made easier with the assistance of computers.

2.3.4 Pareto's law

Pareto's law is also referred to as the 80/20 rule. It represents an analysis of a frequency distribution comparing value and number of items. It can be applied to stock control because in many organisations 80 per cent of the value of stock will be represented by just 20 per cent of the items.

The CIMA *Terminology* illustrates this as in Figure 2.6.

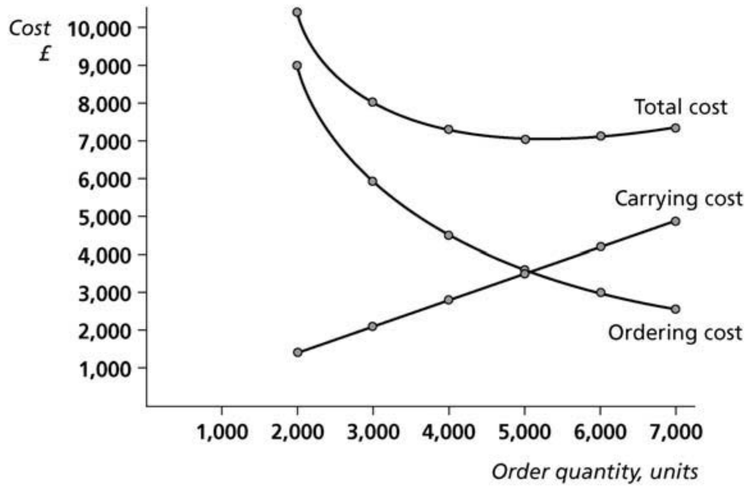


Figure 2.5 Minimizing stock costs

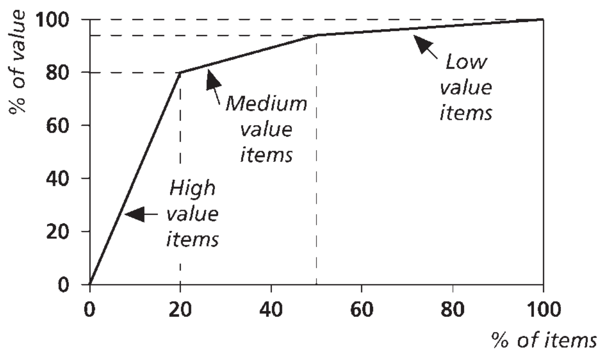


Figure 2.6 Pareto (80/20) distribution: stock

2.3.5 The ABC classification

A number of techniques have been developed from Pareto's law which are based on an ABC *analysis* of stocks. One type of ABC analysis proposes that the frequency of review of the control levels should vary according to whether an item belongs in class A, class B or class C.

An analysis of stock items might reveal the following distribution:

Class	*% of annual usage value*	*% of stock items*
A	80	20
B	say 15	say 25
C	say 5	say 55
	100	100

Items in class A would be reviewed perhaps weekly or monthly, to ensure that the set control levels are appropriate for current conditions concerning rate of usage, delivery or lead time, etc. The set control levels for class B items could be reviewed, say, quarterly, and the control levels for class C items might be reviewed only every 6 months.

This system reduces the time and cost associated with the monitoring of control levels and ensures that management attention is focused where it is most worthwhile.

2.3.6 Maintenance inventories (stocks)

Extreme care must be used if this type of ABC analysis is applied to stock items used to maintain equipment, vehicles and other similar assets. Maintenance is partly preventive (using routine servicing) and partly unpredictable (breakdown repairs). As a result past usages often do not allow an accurate prediction to be made of future usages and control levels may prove unreliable in such circumstances. Some organisations hold a safety stock (or buffer stock) in order to reduce the risk of stockouts.

2.4 Recording the movement of inventory (stock)

Earlier in this chapter you have learned about the various procedures involved in the purchase and issue of stock and the documents used to record and authorise individual transactions. These transactions need to be recorded in such a way that the balance of stock held at any time can be determined without needing to count the physical number of items held.

One way of doing this is to use a *bin card*. The bin card was traditionally kept with the stock items which makes it convenient for entering any increases or decreases in the level of stock as they occur. An example of a bin card is shown in Figure 2.7.

As you can see, there is a facility for showing the quantity of goods received and issued, and the balance after each transaction, together with a note of any items on order. You should note that only quantities are recorded not money values.

The bin card may also show the free stock balance.

The quantity information contained on the bin card is also entered on a document known as a stores ledger card, which is illustrated in Figure 2.8.

The source documents for recording these issues and receipts are materials requisitions and goods received notes, which have been described earlier in this chapter.

You should note the similarity in layout between the bin card and the stores ledger card and recognise that the main difference is that the stores ledger card includes monetary values whereas the bin card does not.

Sometimes, materials may be issued and subsequently found to be surplus to requirements. These will be returned to the stores and this transaction must be recorded, so as to increase the recorded stock quantity to its correct level and reduce the recorded cost value of the materials issued to production. This transaction can be thought of as the opposite of an issue to production and it is recorded on a *materials returned note*, which is illustrated in Figure 2.9.

Bin Card

Description .... Location .... Code ....

Maximum .... Minimum .... Re-order level .... Re-order quantity ....

Receipts			Issues			Current stock level	On order		
Date	Ref.	Quantity	Date	Ref.	Quantity		Date	Ref.	Quantity

Figure 2.7 Bin card

Stores Ledger Card

Description .... Unit .... Location .... Code ....

Maximum .... Minimum .... Re-order level .... Re-order quantity ....

Date	Receipts			Issues			Balance		
	Quantity	Price	£	Quantity	Price	£	Quantity	Price	£

Figure 2.8 Stores ledger card

Materials Returned Note

Credit job/cost centre no: .... Serial no: ....

Date: ....

Code no	Description	Qty/ weight	Cost office only				
			Rate	Unit	£	£	Stores ledger

Received by: .... Bin card entered: .... Calculations checked: ....

Figure 2.9 Materials returned note

Notice the similarity between the materials returned note and the material requisition. The returned note indicates which job or cost centre is to be credited with the cost of the materials.

Occasionally, a cost centre may transfer material to another cost centre, without the material first being sent back to the stores. To ensure that the correct job or cost centre is charged with the cost of the materials a *materials transfer note* is raised. This note details the material being transferred, giving the same information as a material requisition/materials returned note, that is, code no., description, quantity, etc. The transfer note also shows which cost centre or job is to be credited with the cost of the material and which is to be debited. The stock records are not altered because the stock does not physically return to the stores.

2.5 Computerised recording systems

Many organisations have computerised the systems they use to record movements in stock with the effect that bin cards and stores ledger cards are replaced by files on a computer database. Although separate records may be kept containing the data with and without monetary values, this is unlikely because it is a duplication of effort and storage space.

The use of a computerised system allows electronic devices such as bar code readers to be used, thus reducing the chances of error caused by manual input of data. It may also allow the data capture process to be carried out more quickly, therefore improving the information for management.

2.6 Stocktaking and perpetual inventory

The process of stocktaking is the physical counting of stock held at a particular date. This generally occurs to coincide with the accounting year end of the organisation and in larger companies it may also be required for their interim results. Some companies choose not to carry out their stocktaking as a single exercise but instead use a system of *continuous stocktaking*. This method involves a random selection of stock items being checked in such a manner as to ensure that all stock items are counted at least once each year, with regularly used stocks being counted more often than lesser used items. The use of bin cards and/or stores ledger cards to record the effects of daily transactions on stock balances is known as a *perpetual inventory system*. The use of this system enables the physical stocktaking quantities to be compared with the balances recorded (known as book stock) and differences noted.

Any difference may simply be a delay in the recording of the movement in an item of stock, but any significant differences need to be investigated, and if necessary written off so as to reduce the recorded stock to its correct level.

2.7 Valuation of inventory (stock) and materials issued

2.7.1 The basic principle

The valuation of stock, although a cost accounting function, is required for financial accounting too, and you should be aware that the regulations concerning the valuation of stock which apply to financial accounting may be a significant influence in determining the valuation method used. The general principle is that stock should be valued at cost. The definition of cost can be fairly complex, particularly in the case of internally manufactured items (these will be dealt with later in this *Study System*). For bought-in items, cost is defined as the cost of purchase together with any additional costs necessary to the acquisition. Some items that can cause complications are detailed below:

- *Carriage and storage costs*. If the purchaser is required to pay these costs, then they can be included as a part of the cost of the goods.
- *Value added tax (VAT)*. This is an amount added to the purchase price of goods. It can usually be reclaimed. If this is the case then the VAT does not represent a cost and it must be excluded from the purchase price.
- *Cash discount*. This is a discount which may be given for early payment of an invoice. Cash discounts are not usually included in the cost accounts. They are regarded as a financial accounting item.
- *Trade discount*. This is a reduction in the unit price which is given to some customers. It is often given as a 'reward' for ordering large quantities. For example, the unit price of an item may be £10 but a 5 per cent discount is offered for purchases of more than 50 units. For orders of 50 units or less the unit price would be £10 but for orders of more than 50 units the unit price shown in the stock records would be £9.50.

2.7.2 What is cost?

The following example illustrates the problem of determining the cost of the stock held at a particular time:

September 1	Opening balance		Nil
	Bought	100 units	@ £5.00 each
2	Issued	50 units	
10	Bought	50 units	@ £5.50 each
20	Issued	60 units	
27	Bought	100 units	@ £5.60 each

It is easy to calculate the quantity of items remaining in stock on 27 September by comparing the total quantity purchased (250) with the total number issued (110). The closing stock quantity is therefore 140 units (250 − 110). However what is the cost of the items in stock?

Unless each item is individually marked with the price at which it was bought and the balance is identified by individual items at individual prices, it is difficult to know what value should be placed on the stock items. This method of individual pricing does exist (it is known as the *specific price* method), but because of the cost of operating such a system it is unsuitable for all but very expensive items where the stock quantities and rates of usage are low. Alternative methods are used instead, each of which will now be explained using the data from the above example.

2.7.3 First in, first out (FIFO)

This method assumes for valuation purposes that the items received earliest are those which are issued first. This does not necessarily mean that these are the items which have physically been issued first. The stores ledger card recording the transactions using this method would appear as follows:

Stores ledger card

		Receipts			*Issues*			*Balance*	
Date	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
September									
1							Nil		Nil
1	100	5.00	500				100	5.00	500
2				50	5.00	250	50	5.00	250
10	50	5.50	275				50	5.00	250
							50	5.50	275
							100		525
20				50	5.00	250			
				10	5.50	55			
				60		305	40	5.50	220
27	100	5.60	560				40	5.50	220
							100	5.60	560
							140		780

Note that the issue made on 20 September is valued as 50 units at £5 each plus ten units at £5.50 each. This is because the earliest price paid for any of the remaining stock held at the time of issue was £5.

You should note the clarity of the entries, particularly those relating to the closing balances at the end of each day which are stated in chronological order.

You must practice producing neat workings for your stores ledger card. Speed and accuracy are essential in the assessment and although you will not be awarded marks for your workings they will help to ensure that you arrive at the correct answer.

2.7.4 Last in, first out (LIFO)

This method assumes for valuation purposes that the latest price paid for items received is the one to be used to price issues. Using this method the stores ledger card recording the same transactions would appear as follows:

Stores ledger card

	Receipts			*Issues*			*Balance*		
Date	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
September									
1							Nil		Nil
1	100	5.00	500				100	5.00	500
2				50	5.00	250	50	5.00	250
10	50	5.50	275				50	5.00	250
							50	5.50	275
							100		525
20				50	5.50	275			
				10	5.00	50			
				60		325	40	5.00	200
27	100	5.60	560				40	5.00	200
							100	5.60	560
							140		760

Using this valuation method, the first 50 items issued on 20 September are valued at £5.50 per unit. This is because the latest price paid at that date was the price paid for the delivery received on 10 September, which was £5.50 per unit. The remaining ten units are valued at the price of £5 paid for the delivery received on 1 September.

2.7.5 Cumulative weighted average (AVCO)

This method calculates a weighted average price each time there is a receipt, using the formula:

$$\text{Weighted average price} = \frac{(\text{Value of stock b/f} + \text{value of purchases})}{(\text{Quantity of stock b/f} + \text{quantity purchased})}$$

This average value per unit is then used for all issues until another purchase is received when the average is recalculated. The stores ledger card recording the same transactions using this method is as follows:

Stores ledger card

	Receipts			Issues			Balance		
Date	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
September									
1							Nil		Nil
1	100	5.00	500				100	5.00	500
2				50	5.00	250	50	5.00	250
10	50	5.50	275				100	5.25	525
20				60	5.25	315	40	5.25	210
27	100	5.60	560				140	5.50	770

Note that the price per unit on 10 September is calculated by the formula shown above:

$$\frac{£(250 + 275)}{50 + 50} = £5.25 \text{ per unit}$$

The average value per unit of £5.50 calculated on 27 September (£770/140) would be used to value all issues after this date until another receipt occurs when the average would be recalculated.

2.7.6 Comparison of FIFO, LIFO and AVCO

The following table shows the closing stock valuations and values of issues using each of the three methods. In each case the value of the issues is obtained by totalling the individual issue valuations.

	Closing stock valuation	*Value of issues*
	£	*£*
FIFO	780	555
LIFO	760	575
AVCO	770	565

Points to note about the different inventory (stock) valuation methods include the following.

- The values for AVCO in the table lie between those for LIFO and FIFO. This should always occur because AVCO is an averaging method.
- Both LIFO and FIFO require records to be kept of each batch of purchases so that the appropriate price may be attached to each issue.
- Price fluctuations are smoothed out with the AVCO method which makes the data easier to use for decision making, although the rounding of the unit value might cause some difficulties.
- Many management accountants would argue that LIFO provides more relevant information for decision making because it uses the most up-to-date price.
- However LIFO may sometimes confuse managers, since the pricing method represents the opposite to what is happening in reality, that is, the stock will probably be physically issued on a FIFO basis.

The overriding consideration for the internal cost accounting system is that the information should be useful for management purposes.

Let us look in more detail at the assertion that LIFO provides more relevant information for decision making. If we assume that the items in the above example are items for resale, then using the FIFO method the cost of the items issued on 20 September was £305. If a customer offered you £315 for them you might well accept the offer on the basis that you had made £10 profit. If the LIFO method is used the offer would be rejected because the cost of the issue is stated to be £325 and thus to accept the customer's offer would be to make a loss. Which is correct?

It is reasonable to believe that in order to make a profit you should be able to replace the items that you have sold and still have some of the sale proceeds left over. In this example the latest price paid on 10 September was £5.50 per unit and with the benefit of hindsight we know that the price on 27 September is £5.60 per unit. It is reasonable therefore to expect that the cost of replacing the items sold will be at least £5.50 per unit, which totals £330.

Thus, it can be seen that the use of the FIFO method would lead you to a decision which would cause you to be unable to replace the items sold with the sale proceeds received. The use of the LIFO method is thus argued to be better for decision-making.

2.7.7 Stock valuation and the effect on profit

An important point to realise is that, since each of the stock valuation methods produces a different stock valuation, the profit reported under each of the methods will be different. An example will help you to see the difference.

Example

Continuing with the example in Section 2.7.2, suppose that the units issued from stock are sold direct to the customer for £8 per unit. The gross profit recorded under each of the stock valuation methods would be as follows.

	FIFO	*LIFO*	*AVCO*
	£	£	£
Sales revenue: $110 \times$ £8	880	880	880
Purchases	1,335	1,335	1,335
Less closing stock	780	760	770
Cost of goods sold	555	575	565
Gross profit	325	305	315

The prices of receipts are rising during the month. Therefore the FIFO method, which prices issues at the older, lower prices, results in the highest value of closing stock and the highest profit figure. The AVCO method produces results that lie between those for FIFO and LIFO.

2.7.8 Periodic weighted average

This method is similar to the cumulative weighted average method described earlier, except that instead of calculating a new average price every time a receipt occurs an average is calculated based on the total purchases for the period. This average is then applied to all issues in the period.

$$\text{Periodic weighted average price} = \frac{\text{cost of opening stock} + \text{total cost of receipts in period}}{\text{units in opening stock} + \text{total units received in period}}$$

Using the same data, the periodic weighted average cost per unit is:

$$\frac{(£500 + £275 + £560)}{(100 + 50 + 100)} = \frac{£1{,}335}{250} = £5.34 \text{ per unit}$$

Every issue is priced at £5.34 per unit. The total value of all issues would be 110 units @ £5.34 = £587.40, leaving a closing stock of 140 units valued at £747.60.

In an assessment you must always use the *cumulative* weighted average pricing method unless you are specifically instructed to use the periodic weighted average method.

2.7.9 Other inventory (stock) valuation methods

- *Highest in, first out (HIFO)*. This method values issues at the highest price of the items in stock at the time of issue. This is a very prudent approach but it does not logically follow any particular chronological pattern.
- *Next in, first out (NIFO)*. This method values issues at the price to be paid for the next delivery. This may be the same as replacement price (see below) but this is not necessarily true. The method is likely to value issues at the most up-to-date price, but it is administratively inconvenient.
- *Replacement cost*. This method values issues at the cost of their replacement. It is therefore the best method to be used for decision-making (provided that the item is to be replaced). It can be costly to operate because of the need to determine the replacement cost of the item each time an issue is made.
- *Standard cost*. This is a valuation based on an estimated price. It is used in a standard costing system which is explained later in this *Study System*.

2.8 Summary

Having read this chapter the main points that you should understand are as follows.

1. A number of documents are used to record the ordering, receipt and movement of stock. These include a purchase requisition, purchase order, goods received note, material requisition, materials returned note, materials transfer note, bin card and stores ledger card.

2. A system of control levels may be used to maintain stock at the optimum level. The critical control levels are maximum, minimum and reorder level.
3. The free stock balance is usually the balance that is monitored to determine when a new order should be placed. It takes account of the stock on order from suppliers and the outstanding requirements not yet fulfilled.
4. The economic order quantity is the order quantity which minimises the total costs associated with ordering and storing stock.
5. An ABC analysis of stocks attempts to focus control effort where it would be most worthwhile.
6. Continuous stocktaking involves counting the stock of a number of items on a random basis throughout the year so that each item is counted and checked against stock records at least once each year.
7. A perpetual inventory system records each receipt and issue of stock as it occurs.
8. The pricing of issues from stock has a direct effect on cost of sales, stock valuations and reported profits.
9. The FIFO method prices issues at the price of the oldest items remaining in stock. The LIFO method prices issues at the price of the items in stock that were received most recently.
10. The weighted average method uses an average price that can be calculated using two different bases: the cumulative weighted average and the periodic weighted average. The cumulative weighted average calculates a new average price every time a new batch is received into stock. The periodic weighted average calculates an average price at the end of each period.
11. Other stock valuation methods exist including highest in first out (HIFO), next in first out (NIFO), replacement cost and standard cost.

Revision Questions 2

Question 1 Multiple choice

1.1 Bringer Minn Ltd is a small importing company. On 1 November, it had an opening balance of 50 units of commodity X, valued at £900. On 12 November, it purchased in bulk a further 250 units of commodity X for a gross price of £5,000. It received a bulk purchase discount of 5 per cent and a further discount of 3 per cent on the gross price for making an early cash payment. On 29 November, it sold 200 units of commodity X for a sales value of £6,600. Using the FIFO method of valuation, the gross profit in the company's trading account for November for the sale of commodity X was:

(A) £2,700
(B) £2,790
(C) £2,850
(D) £2,940

1.2 P Ltd had an opening stock value of £2,640 (300 units valued at £8.80 each) on 1 April. The following receipts and issues were recorded during April:

10 April	Receipt	1,000 units	£8.60 per unit
23 April	Receipt	600 units	£9.00 per unit
29 April	Issues	1,700 units	

Using the LIFO method, what was the total value of the issues on 29 April?

(A) £14,840
(B) £14,880
(C) £14,888
(D) £15,300

1.3 A firm has a high level of stock turnover and uses the FIFO issue pricing system. In a period of rising purchase prices, the closing stock valuation is:

(A) close to current purchase prices.
(B) based on the prices of the first items received.
(C) much lower than current purchase prices.
(D) the average of all goods purchased in the period.

1.4 Using the FIFO system for pricing stock issues means that, when prices are rising:

(A) product costs are overstated and profits understated.
(B) product costs are kept in line with price changes.
(C) product costs are understated and profits understated.
(D) product costs are understated and profits overstated.

1.5 During a period of rising prices, which *one* of the following statements is correct?

(A) The LIFO method will produce lower profits than the FIFO method, and lower closing stock values.
(B) The LIFO method will produce lower profits than the FIFO method, and higher closing stock values.
(C) The FIFO method will produce lower profits than the LIFO method, and lower closing stock values.
(D) The FIFO method will produce lower profits than the LIFO method, and higher closing stock values.

1.6 There are 27,500 units of Part Number X53 on order with the suppliers and 16,250 units outstanding on existing customers' orders. If the free stock is 13,000 units, what is the physical stock?

(A) 1,750 units.
(B) 3,250 units.
(C) 14,000 units.
(D) 29,250 units.

1.7 A component has a safety stock of 500, a reorder quantity of 3,000 and a rate of demand which varies between 200 and 700 per week. The average stock is approximately:

(A) 2,000 units.
(B) 2,300 units.
(C) 2,500 units.
(D) 3,500 units.

Data for questions 1.8 and 1.9

A national chain of tyre fitters stocks a popular tyre for which the following information is available:

Average usage	140 tyres per day
Minimum usage	90 tyres per day
Maximum usage	175 tyres per day
Lead time	10–16 days
Reorder quantity	3,000 tyres

1.8 Based on the data above, at what level of stocks should a replenishment order be issued?

(A) 2,240 tyres.
(B) 2,800 tyres.
(C) 3,000 tyres.
(D) 5,740 tyres.

1.9 Based on the data above, what is the maximum and minimum level of stocks possible?

	Maximum	*Minimum*
(A)	2,800 tyres	4,900 tyres
(B)	3,980 tyres	4,900 tyres
(C)	4,900 tyres	980 tyres
(D)	4,900 tyres	1,900 tyres

1.10 The following information is available regarding a particular component:

Component price	£27
Component usage	5,000 per month
Cost of placing an order	£20
Cost of storing components for one year	1% of stock value

The economic order quantity for the component (to the nearest unit) is:

(A) 298 units.
(B) 861 units.
(C) 2,981 units.
(D) 15,492 units.

1.11 The economic order quantity is:

(A) the order quantity which minimises the total of stock ordering and holding costs.
(B) the order quantity used for special ordering purposes.
(C) the order quantity used for buffer stock.
(D) the order quantity used to avoid stock-outs.

? **Question 2** Short objective-test questions

2.1 Place the following documents in the sequence 1–4 in which they will be raised during the process of purchasing materials and then issuing them from stock to a production cost centre. Write the relevant numbers (1, 2, 3, 4) in the boxes provided.

☐ Purchase requisition
☐ Materials requisition
☐ Purchase order
☐ Goods received note

2.2 Economic order quantity $= \sqrt{\frac{2C_oD}{C_h}}$

In the above formula, if D = annual demand, which of the following statements are *true*?

	True	*False*
(a) C_o = cost of an item of stock	☐	☐
(b) C_h = cost of storing an item of stock	☐	☐

2.3 Is the following statement *true* or *false*?
The minimum level is the level of free stock at which an order should be placed for replacement stock.

True ☐
False ☐

2.4 *Tick the correct box:*
The recording as they occur of receipts, issues and the resulting balances of individual items of stock is known as:

continuous stocktaking ☐
perpetual inventory ☐

2.5 Opening stock for a particular component at the beginning of April was zero. The following receipts and issues were recorded during April.

April 1	Received 100 components at a price of £6.00 each
April 2	Issued 30 components
April 8	Received 30 components at a price of £6.50 each
April 10	Issued 60 components
April 15	Received 100 components at a price of £6.50 each
April 16	Issued 40 components

The weighted average pricing method is used.
Complete the following boxes.
The total value of the components issued on April 10 was £☐.
The cost per component issued on April 16 was £☐.

2.6 In a period of rising prices, which of the following statements are *true*? Tick the box for any statement that is true.

☐ (a) Reported profits will be higher with FIFO than with LIFO.
☐ (b) The value of closing stock will be higher with FIFO than with LIFO.
☐ (c) LIFO would be the preferable method for financial accounting purposes because it uses the most up-to-date price.

2.7 Information concerning stock item W is as follows.

Purchase price	*Administration cost*	*Annual demand*	*Holding cost per year*
£200 per unit	£80 per order	15,000 units	13.33% of purchase price

(a) The number of orders to be placed each year = ☐.
(b) The total annual holding cost of stock item W is £☐ (to the nearest £1,000).

2.8 The following information relates to component C554 on a certain day.

	Units
Opening stock on stores ledger card, physical balance	25
Total units shown on:	
purchase requisition	60
material requisitions, all fulfilled	16
goods received note	70
materials returned note	5
materials transfer note	3

The number of units of component C554 shown as the physical closing balance on the stores ledger card will be ☐.

2.9 BB imports product U and sells the product to retail customers at a price of £14 per case. BB had no stock at the beginning of February and during February the following receipts and sales were recorded.

6 February	Received	1,400 cases @ £8.20 per case
15 February	Received	900 cases @ £9.10 per case
20 February	Sold	780 cases
22 February	Received	330 cases @ £9.90 per case
28 February	Sold	860 cases

(a) Using the FIFO method of stock valuation, the gross profit reported for February would be £☐.

(b) Using the LIFO method of stock valuation, the gross profit reported for February would be £☐.

? **Question 3** Longer revision question: stock valuation

Three students, K, L and M, are equal partners in a joint venture which involves them, on a part-time basis, in buying and selling sacks of product F. The transactions for the three months ended 30 June were as stated below. You are to assume that purchases at unit costs given were made at the beginning of each month and that the sales were made at the end of each month at the fixed price of £1.50 per sack.

	Purchases		*Sales*
Month	*Sacks*	*Unit cost*	*Sacks*
		£	
April	1,000	1.00	500
May	500	1.20	750
June	1,000	1.00	200

In July, the student partners held a meeting to review their financial position and share out the profits but there was disagreement because each partner had priced the issues on a different basis. K had used FIFO, L had used LIFO and M had used a weighted average, basing his weighted average on the whole of the 3 months' purchases.

Shown below is an extract from K and L's stores ledger cards.

	Receipts			*Sales*			*Balance*		
Month	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
April	1,000	1.00	1,000	500			500		
May	500	1.20	600	750		A	250		B
June	1,000	1.00	1,000	200		C	1,050		D

Requirements

(a) The values shown as A, B, C and D in K's records, using a FIFO system, would be:

A: £ ☐
B: £ ☐
C: £ ☐
D: £ ☐

(b) The values shown as A, B, C and D in L's records, using a LIFO system, would be:

A: £ ☐
B: £ ☐
C: £ ☐
D: £ ☐

(c) The value of the closing stock in M's records, using a weighted average based on the whole of the 3 months' purchases, would be £ ☐.

(d) The profit reported by each of the students for the 3-month period would be:

K (FIFO): £ ☐
L (LIFO): £ ☐
M (wt. ave.): £ ☐

(e) The pricing method being used by student M is known as a: (*tick the correct box*)

☐ periodic weighted average method
☐ cumulative weighted average method.

Solutions to Revision Questions

2

Solution 1

- You will need to think carefully when you are selecting the answer for the narrative multiple-choice questions. Read each option slowly and ensure that all aspects of the description are correct before you make your final selection.
- Remember to use *annual* demand for D in the formula for the EOQ.

1.1 Answer: (C)

The main problem here is whether the cost of the units of commodity X is taken before or after the discounts.

1. The bulk purchase discount should be deducted, to arrive at a net purchase price of £(5,000 – 250) = £4,750, or £19 per unit.
2. The discount for early payment is a financial transaction, which will be recorded as 'discounts received' (£150) in the profit and loss account. The discount will therefore not be used to reduce the purchase price of the stocks, and is not a trading account item.

	£
Cost of sales	
50 units (opening stock)	900
150 units × £19	2,850
	3,750
Sales value	6,600
Gross profit	2,850

1.2 Answer: (B)

The latest prices are used first:

	£
600 units from 23 April × £9.00 per unit	5,400
1,000 units from 10 April × £8.60 per unit	8,600
100 units from opening stock × £8.80 per unit	880
Total	14,880

1.3 Answer: (A)

Using FIFO, the stock will be valued at the latest prices paid for the items. If stock turnover is high, then the items in stock will have been purchased fairly recently. Therefore, they will be valued at prices which are close to current purchase prices.

1.4 Answer: (D)

FIFO uses the price of the oldest items in stock. When prices are rising, the charges made to product costs lag behind current prices. Product costs and charges to cost of sales are therefore understated and profits are overstated.

1.5 Answer: (A)

LIFO charges the latest prices to cost of sales. Therefore, during a period of rising prices the LIFO method will produce a higher cost of sales and a lower profit. Since stock is valued using the older prices, the LIFO closing stock values will be lower.

1.6 Answer: (A)

$$\text{Free stock} = \text{physical stock} + \text{stock on order} - \text{commitments outstanding}$$
$$13{,}000 = \text{physical stock} + 27{,}500 - 16{,}250$$
$$\therefore \text{ Physical stock} = 13{,}000 - 27{,}500 + 16{,}250 = 1{,}750 \text{ units}$$

1.7 Answer: (A)

$$\begin{aligned}\text{Average stock} &= \text{safety stock} + \frac{1}{2}\text{reorder quantity.}\\ &= 500 + \frac{1}{2}\ (3{,}000)\\ &= 2{,}000 \text{ units}\end{aligned}$$

1.8 Answer: (B)

$$\begin{aligned}\text{Reorder level} &= \text{maximum usage} \times \text{maximum lead time}\\ &= 175 \times 16\\ &= 2{,}800 \text{ tyres}\end{aligned}$$

1.9 Answer: (C)

$$\begin{aligned}\text{Maximum level} &= \text{reorder level} + \text{reorder quantity} - (\text{min. usage} \times \text{min. lead time})\\ &= 2{,}800 + 3{,}000 - (90 \times 10)\\ &= 4{,}900 \text{ tyres}\end{aligned}$$

$$\begin{aligned}\text{Minimum level} &= \text{reorder level} - (\text{average usage} \times \text{average lead time})\\ &= 2{,}800 - (140 \times 13) = 980 \text{ tyres}\end{aligned}$$

1.10 Answer: (C)

$$\text{EOQ} = \sqrt{\frac{2C_oD}{C_h}} = \sqrt{\frac{2 \times 20 \times (5{,}000 \times 12)}{27 \times 0.01}} = 2{,}981 \text{ units}$$

1.11 Answer: (A)

The EOQ is the most economic stock replenishment order size, which minimises the sum of stock ordering costs and stockholding costs.

✓ Solution 2

2.1
1. *Purchase requisition* – the formal request from the stores to the purchasing function to ask them to obtain the materials.
2. *Purchase order* – raised by the buyer and sent to the supplier.
3. *Goods received note* – raised by the storekeeper when the materials are received into stores.
4. *Materials requisition* – raised by the production cost centre to request the issue of materials from stores.

2.2 (a) *False.* C_o is the cost of placing an order.
(b) *False.* C_h is the cost of storing an item of stock *for 1 year*. The time period must be the same as the time period stated for the demand.

2.3 *False.* This is a description of the reorder level.

2.4 The recording as they occur of receipts, issues and the resulting balances of individual items of stock is known as *perpetual inventory*.

2.5 The total value of the components issued on April 10 was £369.00
The cost per component issued on April 16 was £6.40

Workings:

	Receipts			Issues			Balance		
Date	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
1							Nil		Nil
1	100	6.00	600.00				100	6.00	600.00
2				30	6.00	180.00	70	6.00	420.00
8	30	6.50	195.00				100	6.15[1]	615.00
10				60	6.15	369.00	40	6.15	246.00
15	100	6.50	650.00				140	6.40[2]	896.00

Notes

1. $\frac{£420 + £195}{100} = £6.15$
2. $\frac{£246 + £650}{140} = £6.40$

2.6 (a) *True.* The FIFO issues from stock, to be charged as a part of cost of sales, will be made at the older, lower prices.
(b) *True.* The FIFO closing stock will be valued at the most recent prices.
(c) *False.* The LIFO stock valuation method is not acceptable under SSAP 9, the accounting standard which regulates the valuation of stock for financial accounting purposes.

2.7 (a) Economic order quantity $= \sqrt{\frac{2 \times 80 \times 15{,}000}{0.1333 \times 200}} = 300$ units
Number of orders to be placed $= 15{,}000/300 = 50$ orders
(b) EOQ model assumes average stock $=$ EOQ/2 (i.e. safety stock $=$ zero)

2.8 The number of units of component C554 shown as the physical closing balance on the stores ledger card will be 84 units (25 − 16 + 70 + 5 = 84).

The purchase requisition details are not used to update the physical stock balance. This is the document which requests the purchasing function to place an order with the supplier. The materials transfer note does not affect the stock balance. It records the transfer of materials between cost units or cost centres so that the correct unit or centre is charged with the cost of the materials. The relevant materials are not actually returned to stock.

2.9 (a) Using the FIFO method of stock valuation, the gross profit reported for February would be £9,296.
(b) Using the LIFO method of stock valuation, the gross profit reported for February would be £8,141.

Workings:
(a) FIFO

	Receipts			*Sales*			*Balance*		
Date	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
6	1,400	8.20	11,480				1,400	8.20	11,480
15	900	9.10	8,190				1,400	8.20	11,480
							900	9.10	8,190
							2,300		19,670
20				780	8.20	6,396	620	8.20	5,084
							900	9.10	8,190
							1,520		13,274
22	330	9.90	3,267				620	8.20	5,084
							900	9.10	8,190
							330	9.90	3,267
							1,850		16,541
28				620	8.20	5,084	660	9.10	6,006
				240	9.10	2,184	330	9.90	3,267
				860		7,268	990		9,273

Gross profit = (£14 × (780 + 860)) − £(6,396 + 7,268) = £9,296

(b) LIFO

	Receipts			*Sales*			*Balance*		
Date	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
6	1,400	8.20	11,480				1,400	8.20	11,480
15	900	9.10	8,190				1,400	8.20	11,480
							900	9.10	8,190
							2,300		19,670
20				780	9.10	7,098	1,400	8.20	11,480
							120	9.10	1,092
							1,520		12,572
22	330	9.90	3,267				1,400	8.20	11,480
							120	9.10	1,092
							330	9.90	3,267
							1,850		15,839
28				330	9.90	3,267			
				120	9.10	1,092			
				410	8.20	3,362			
				860		7,721	990	8.20	8,118

Gross profit = (£14 × (780 + 860)) – £(7,098 + 7,721) = £8,141

Solution 3

- Probably the best approach is to draft your own rough stock records as workings.
- Remember the need for accuracy; it is your final answer that counts. You will not receive marks for your workings.

(a) A £800
B £300
C £240
D £1,060

Workings: K's records using FIFO

	Receipts			*Sales*			*Balance*		
Month	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
April	1,000	1.00	1,000	500	1.00	500	500	1.00	500
May	500	1.20	600	500	1.00	500			
				250	1.20	300			
				750		800	250	1.20	300
June	1,000	1.00	1,000	200	1.20	240	50	1.20	60
							1,000	1.00	1,000
							1,050		1,060

(b) A £850
B £250
C £200
D £1,050

Workings: L's records using LIFO

	Receipts			*Sales*			*Balance*		
Month	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
April	1,000	1.00	1,000	500	1.00	500	500	1.00	500
May	500	1.20	600	500	1.20	600			
				250	1.00	250			
				750		850	250	1.00	250
June	1,000	1.00	1,000	200	1.00	200	1,050	1.00	1,050

(c) £1,092

Workings:
Weighted average price for 3 months $= \frac{£(1{,}000+600+1{,}000)}{1{,}000+500+1{,}000} = £1.04$ per unit
Value of closing stock = 1,050 units × £1.04 = £1,092

(d) K (FIFO) £635
L (LIFO) £625
M (wt. ave.) £667

Workings:

	K	*L*	*M*
	£	*£*	*£*
Sales (1,450 @ £1.50)	2,175	2,175	2,175
Cost of sales:			
Purchases	2,600	2,600	2,600
Less closing stock	1,060	1,050	1,092
	1,540	1,550	1,508
Profit	635	625	667

(e) The pricing method being used by student M is known as a *periodic weighted average method.*

M's weighted average is based on the whole of the three month's purchases, so this is a periodic average. The method that recalculates the weighted average price every time a receipt occurs is called the cumulative or perpetual weighted average method.

Labour

3

Learning Outcomes

After completing this chapter, you should be able to:

- explain labour accounting and control procedures;
- discuss and calculate factory incentive schemes for individuals and groups.

3.1 Introduction

This chapter looks at another important cost that is incurred by all organisations: labour cost. You will be learning about different remuneration schemes, their suitability in various circumstances and their effect on labour cost. You will also be studying the documents that are used to record labour activity. The chapter concludes with a discussion of the analysis and classification of the various elements of labour cost.

3.2 Remuneration systems

A wide range of methods may be used by different organisations to remunerate employees. Some employees receive a salary, which is a fixed sum and does not depend on their output or hours of attendance. Other methods may remunerate employees according to their activity level or hours of work. These methods can be grouped into three categories: time-based systems, piecework systems and bonus schemes.

3.2.1 Time-based systems

These are based on the principle that an employee is paid for the hours attended, regardless of the amount of work achieved. The method thus operates by recording the amount of time the employee spends at the workplace. The wages earned are then computed by multiplying the number of hours by the agreed hourly wage rate.

It is common for this system to be supplemented by the payment of a higher rate per hour for working hours in excess of the normal working week. This is known as overtime and it is commonly paid at a premium of between 25 and 100 per cent above the normal hourly rate.

A time-based method of remuneration may be suitable in the following circumstances:

- where the output is difficult to measure, such as in administrative functions;
- where activities vary considerably, such as repairing machinery;
- where quality of output is extremely important and to use other systems might encourage employees to give priority to the speed of their output with the result that quality diminishes.

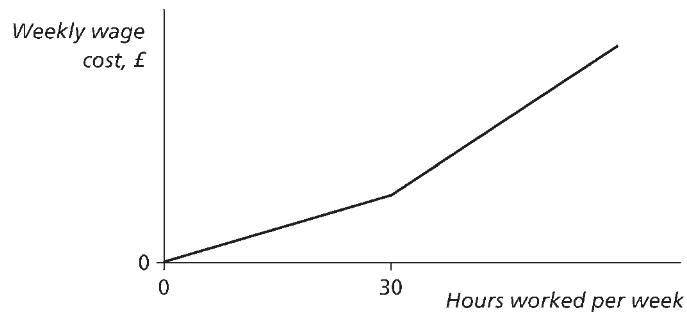
Example

Carol is employed by H Limited. She works a basic week of 30 hours and is paid £8 per hour. If she works overtime this is paid at a premium of 50 per cent above her normal hourly rate (this is known as 'time-and-a-half'). During the week ended 4 July she worked 35 hours.

Her gross wage was:

	£
Basic rate: 35 hours @ £8 per hour	280
Overtime premium: 5 hours @ £4 per hour	20
	300

A sketch graph of the direct wages cost where overtime premium is payable would look like this (not to scale):



The gradient of the graph becomes steeper when hours worked exceed 30 per week.

3.2.2 Piecework systems

With piecework systems, an employee is paid according to the output achieved. In these systems it is necessary to record the amount of work done by each employee but the amount of attendance time is less significant.

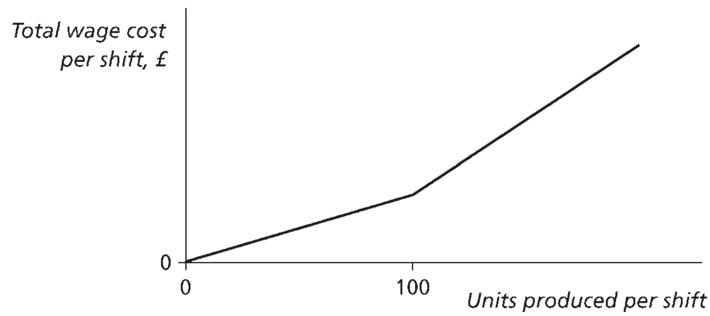
A variation of the basic piecework principle is for the organisation to set a daily target level of activity and for the employee to be paid a higher rate per unit for those completed in excess of the target.

A piecework system is used when quantity of output is important, and quality control can be satisfactorily maintained by other management techniques.

Example

Dave is employed on a part-time basis by K Limited. He is paid £0.40 for each unit he produces up to 100 units per shift. Any units produced above this target are paid at £0.50 per unit. Last shift he produced 108 units. His earnings that shift were:

	£
100 @ £0.40	40
8 @ £0.50	4
	44



A sketch graph of this piecework system would look like this (not to scale):

The gradient of the graph becomes steeper when output exceeds 100 units per shift.

3.2.3 Bonus schemes

A variety of bonus and incentive schemes exist. They are all similar and are designed to increase productivity.

The schemes rely on the setting of a target and the comparison of actual performance with that target. The savings which result from the employee's greater efficiency are then shared between the employee and the employer on a proportionate basis. Usually the employee receives between 30 and 60 per cent of the time saved as a bonus number of hours paid at the normal hourly rate.

Example

John is a skilled engineer, paid £12 per hour. Each job he does has a time allowance and he is paid 50 per cent of any time he saves each week as a bonus paid at his hourly rate.

During the week ended 11 July, John worked for 40 hours and completed jobs having a total time allowed of 47 hours.

John's earnings were:

	£
40 hours @ £12	480
Bonus 3.5 hours* @ £12	42
	522

*Seven hours were saved against the total time allowed, so there are 3.5 bonus hours.

A wide variety of incentive and bonus schemes exist. In the assessment you must read the description of the scheme carefully before you apply it to the data supplied.

3.2.4 Group incentive schemes

Bonus or incentive schemes may sometimes be applied to groups instead of to individuals. Group incentive schemes may be appropriate in circumstances such as:

- when it is not possible to measure individual performance – for example, in an office;
- when operations are performed by a group or team and not by individuals working alone – for example, road repairs or refuse collection;
- where production is integrated and increased output depends on a number of people all making extra effort – for example, in production line manufacture such as that in the automobile industry.

Group schemes can be based on piecework or on a time-related bonus, but they may also be linked to other aspects of performance such as quality targets or cost savings, especially in an office environment.

Group incentive schemes have a number of advantages:

- non-production employees can be included in the scheme;
- a team spirit may develop between members of the group;
- administration is reduced because the number of individual time recordings is lower;
- group working arrangements may be more flexible than if individual recording systems are used.

However, they also have disadvantages:

- sharing the group bonus between individuals in the group may require lengthy negotiation and can lead to bad feeling if it is not handled correctly;
- the incentive payment is not linked directly to the individual's performance, so the incentive effort may be reduced;
- friction may develop within the group if some members are perceived to be making less effort.

3.3 Other aspects of remuneration systems

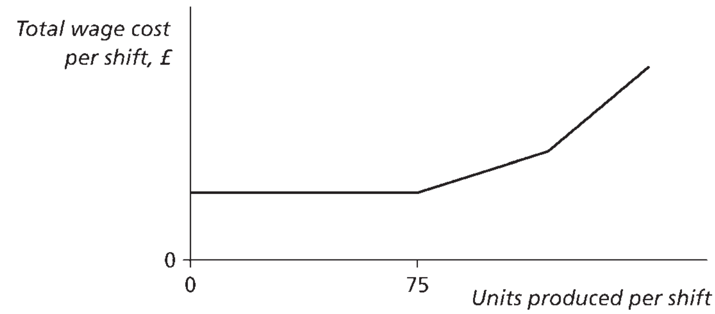
3.3.1 Guaranteed minimum wage

A guaranteed minimum wage may be included within a piecework system. It protects employees by guaranteeing them a minimum weekly wage based on an hourly rate multiplied by the employee's number of attendance hours. Note that this is only applied if the level of piecework earnings is below this guaranteed minimum level.

Example

If Dave (see Section 3.2.2) had only produced 50 units but was entitled to a guaranteed minimum wage of £30 per shift, he would receive £30 even though his piecework earnings were only 50 × £0.40 = £20.

A sketch graph of this piecework system would look like this (not to scale):



The wages cost remains constant at £30 per shift, until output reaches 75 units (75 × £0.40 = £30). After this point the wages cost increases according to the rate per unit, as before.

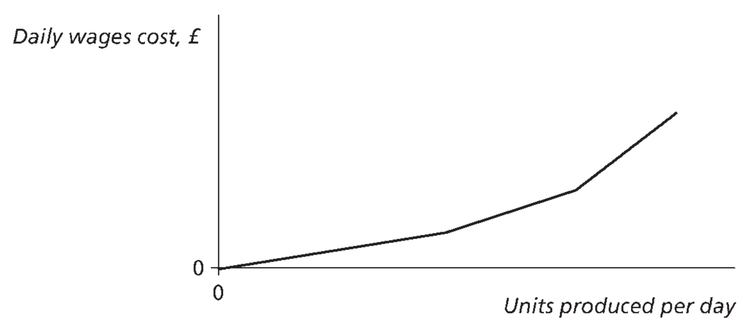
3.3.2 Differential piece rate

Using this system a target number of units is set and different rates per unit are paid depending upon the total number of units achieved. Usually a daily target is used. For example:

Units produced in a day	£
1–100 units	0.40 each
101–129 units	0.42 each
130 units and above	0.44 each

You should note that it is usual for the higher rates to apply only to the additional units, not to all of the units achieved.

A sketch graph of a differential piece-rate system would look like this (not to scale):



The gradient of the graph becomes progressively steeper with each successive increase in the rate paid per unit.

3.3.3 Other bonuses and benefits

In addition to the above, some organisations provide other bonuses and benefits to their employees. Examples of these include: company cars, staff discounts, subsidised canteen, free health insurance, non-contributory pension schemes, creche facilities, etc.

These cannot be considered to improve efficiency in the same way as the bonus schemes described above. However, it is widely believed that they encourage employees to remain with their present employer, and thus reduce *labour turnover*.

Labour turnover is a measure of the number of leavers relative to the size of the workforce. It is normally expressed as a percentage.

$$\text{Labour turnover for period} = \frac{\text{number of leavers replaced}}{\text{average number of employees}} \times 100$$

The level of labour turnover should be minimised because of the cost of recruiting and training employees. For this reason, it is necessary to establish the reason why an employee is leaving. If possible, management should take action to solve the problems which cause people to leave.

3.4 Time-recording systems: clock cards

We have seen that there is a need to record an employee's attendance time when using certain remuneration systems. It is common for the attendance time to be recorded using a clock card or other time-recording device.

A clock card is a document on which are recorded the starting and finishing times of an employee. This may be done manually or by insertion into a time-recording device. An illustration of a clock card is given in Figure 3.1.

Instead of mechanical clocks and cards, an electronic time-recording device may be used, as described in the next section.

3.5 Flexible time working

This is an arrangement whereby the employee is required to attend for a minimum number of hours each day (often within specified hours), but outside of this they may work at any time provided they accumulate the agreed total number of hours for a particular period. This system usually uses a time-recording device which is similar in principle to a time clock except that it is electronic rather than mechanical. Each employee is issued with a plastic card (similar in size and shape to a credit card) which contains a magnetic strip. The magnetic strip contains employee details, and when the employee inserts the card into the time-recording device the card is updated. This system allows the employee to know how many hours have been worked in the current period so that they may make plans to ensure that they accumulate the correct number of hours by the end of the period.

3.6 Activity-recording devices

3.6.1 Piecework/bonus tickets

The piecework method of remuneration and the operation of bonus schemes require an analysis of the activity of each employee during a particular pay period in order to determine the amount of gross wages payable. In addition, the amount of time spent by an employee in completing particular activities is required for cost analysis purposes. Piecework/bonus tickets are used to determine the amount of piecework earnings or the amount of bonus earnings payable to an employee. An example of such a document is given in Figure 3.2.

Clock Card

No . Name

	In	Out	In	Out	Hrs
M					
T					
W					
Th					
F					
S					
Su					

Figure 3.1 Clock card

Time Sheet

Employee name: No:

Start date: Finish date:

Department: Operation:

Day	Start	Finish	Time	Production	Supervisor's signature
1					
2					
3					
4					
5					
Total					
Time allowed					
Time saved					

	Hours	Rate £ p	Paid £ p
Time wages			
Bonus			
Total wages			

Figure 3.2 Piecework/bonus ticket

You should note how each day's activity is confirmed by a supervisor's signature. This illustration is intended to be a multipurpose document, suitable for both piecework and bonus calculations. However, it may be unsuitable for organisations whose employees carry out a number of different tasks. For these organisations it is likely that a separate record would be issued for each day. This would be similar in layout to the timesheet, which is explained below.

3.6.2 Timesheets

A timesheet is used to analyse the attendance time of an employee over the tasks which have been completed. This enables the wages cost to be charged to the correct cost centre or cost unit. This analysis should also include idle time and other non-productive periods. Idle time occurs when an employee is being paid but is not carrying out any productive work – for example, due to a machine breakdown. Timesheets may be completed on a daily or weekly basis. A weekly timesheet is illustrated in Figure 3.3.

Notice how the timesheet is divided into two sections, one for completion by the employee and the other for completion by the costing department. Note also the confirmation signature by the employee's supervisor.

Weekly Timesheet

Employee No. | Dept: ....

Week ending: | Name.

To be completed by employee				For office use		
Day	Start	Finish	Job	Code	Hours	Amounts £ p
Supervisor's signature				Gross wages		

Figure 3.3 Weekly timesheet

3.7 Accounting for the cost of labour

3.7.1 Employer's National Insurance costs

In the United Kingdom, employees pay income tax, usually under the pay-as-you-earn (PAYE) system. Employers deduct income tax from gross wages before they are paid to the employee. Employers also deduct the *employee's* National Insurance (NI) contributions from gross wages to determine the net wage to be paid to the employee. The employer will pay the deducted tax and NI to the relevant authorities on behalf of the employee.

In addition, the employer pays *employer's* NI contributions based on the level of the employee's wages. This, then, is an added cost of employment: it is often referred to as an *employment-related cost*.

In the previous section, the illustration suggested that the gross wages of each employee would be analysed between the tasks completed in the pay period. This approach is adopted by some organisations who then treat the cost of employer's NI as an indirect cost. However, some organisations regard this related employment cost as part of the wage cost of each employee and would share it among the tasks completed by adding it to the gross wages value, thus treating it as part of direct wages cost.

3.7.2 Overtime premium

As was shown in an earlier example, it is common for hours worked in excess of the basic working week to be paid at a higher rate per hour. The extra amount is usually referred to as overtime premium. This overtime premium may be caused by the specific request of a customer who requires a job to be completed early or at a specific time, or may have resulted because of the organisation's need to complete work which would not be finished without the working of overtime. In the situation caused by the customer, the customer should be advised that overtime would be required and that this cost would be charged to them. Thus, in this situation, the overtime premium can be clearly identified as being caused by that particular task and is a direct cost which should be attributed to it. In other more general circumstances the cost of the overtime premium is regarded as an indirect cost, even the premium that is paid to direct workers, because it cannot be identified with a specific cost unit.

3.7.3 Bonus earnings

The earning of bonuses, if paid on an individual task basis, can be clearly attributed to a particular task and so would be a direct labour cost of this task. However, if the bonus system accumulates the total allowable time and hours worked for a particular pay period and then calculates the bonus based on these totals, any bonus will usually be treated as an indirect cost.

3.7.4 Idle time

Idle-time payments are made when an employee is available for work and is being paid, but is not carrying out any productive work. Idle time can arise for various reasons including machine breakdown, lack of orders or unavailability of materials. Idle time must be recorded carefully and management must ensure that it is kept to a minimum. It will be necessary to take account of idle time if a reconciliation is being performed between an employee's total attendance time and the total time charged to cost units or cost centres. If there is any difference between these two total times it may be caused by the amount of idle time. Idle time payments are treated as indirect costs in the analysis of wages.

3.7.5 Example: analysis of labour costs

The wages analysis for cost centre 456 shows the following summary of gross pay:

	Direct employees	*Indirect employees*
	£	£
Basic pay – ordinary hours	48,500	31,800
Overtime pay – basic rate	1,600	2,800
– premium	800	1,400
Bonuses paid	5,400	8,700
Total gross pay	56,300	44,700

Which of these are direct labour costs and which are indirect labour costs?

Solution

There is no indication that the overtime and bonuses can be specifically identified with any particular cost unit. Therefore, the overtime premium and the bonuses are indirect costs, even the amounts which were paid to direct employees. The wages can be analysed as follows:

	Direct labour cost	*Indirect labour cost*
	£	£
Basic pay	48,500	31,800
Overtime pay – basic rate	1,600	2,800
– premium		2,200
Bonuses paid		14,100
	50,100	50,900

It would not be 'fair' to charge the overtime premium of direct workers to the cost unit which happened to be worked on during overtime hours if this unit did not specifically cause the overtime to be incurred. Therefore, the premium is treated as an indirect cost of all units produced in the period.

The direct labour cost of £50,100 can be directly identified with cost units and will be charged to these units based on the analysis in the timesheets. The indirect costs cannot be identified with any particular cost unit and will be shared out over all units, using the methods described in the next chapter.

3.8 Summary

Having read this chapter the main points that you should understand are as follows:

1. The three main categories of remuneration system are time-based systems, piecework systems and bonus schemes.
2. A differential piece rate system pays different rates per unit depending on the output achieved.
3. The labour turnover rate monitors the percentage of employees that leave the organisation and are replaced. It should be kept as low as possible.
4. Labour attendance and activity may be recorded on clock cards, daily timesheets and weekly timesheets.
5. Overtime premium is the extra hourly rate paid for working above an agreed number of hours in a period. It is usually an indirect cost unless the overtime has been worked at the specific request of a customer.

Activity 3

Timesheet analysis

Attempt this exercise before reading the outline solution

This activity will give you practice in completing timesheets and analysing wages costs. Below you will see the timesheet for an employee in the factory where you work as wages clerk.

Weekly timesheet

Employee name: F Onslow — Employee no.: 572

Week ending: 30 March Year 2 — Hourly rate of pay: £6

To be completed by employee				For office use	
				Total hours	
Day	Start	Finish	Description of task	Direct	Indirect
Mon	9.00	12.00	Machining		
Mon	1.00	5.00	Finishing		
Tue	–	–	Sick		
Wed	9.00	12.00	Machining		
Wed	1.00	2.00	Waiting for work		
Wed	2.00	6.00	Machining		
Thu	9.00	12.00	Finishing		
Thu	1.00	5.00	Training		
Fri	9.00	12.00	Machining		
Fri	1.00	6.00	Machining		
			Total hours		
			Basic pay for week @ £6 per hour	£	£
			Overtime premium	£	£
			Total gross pay	£	£

Comments:

Overtime: reasons for occurrence

1. Wednesday – machining urgent job at customer's request
2. Friday – unexpected large number of orders

Supervisor's signature:

You are required to complete the analysis of gross wages for the week, using the following additional information to help you:

- Staff who are off sick are paid for seven hours at the basic rate for each day of sickness.
- Time spent training is paid at the employee's basic hourly rate.
- Overtime is paid for any hours worked in excess of seven hours per day at time-and-a-half, that is, the overtime premium is 50 per cent of the hourly rate per hour of overtime.

Outline solution

Your completed timesheet should look like this:

Weekly timesheet

Employee name: F Onslow Employee no.: 572
Week ending: 30 March Year 2 Hourly rate of pay: £6

To be completed by employee				For office use	
				Total hours	
Day	Start	Finish	Description of task	Direct	Indirect
Mon	9.00	12.00	Machining	3	
Mon	1.00	5.00	Finishing	4	
Tue	–	–	Sick		7
Wed	9.00	12.00	Machining	3	
Wed	1.00	2.00	Waiting for work		1
Wed	2.00	6.00	Machining	4	
Thu	9.00	12.00	Finishing	3	
Thu	1.00	5.00	Training		4
Fri	9.00	12.00	Machining	3	
Fri	1.00	6.00	Machining	5	
			Total hours	25	12
			Basic pay for week @ £6 per hour	£ 150	£ 72
			Overtime premium	£ 3	£ 3
			Total gross pay	£ 153	£ 75

Comments:

Overtime: reasons for occurrence

1. Wednesday – machining urgent job at customer's request
2. Friday – unexpected large number of orders

Supervisor's signature: Gerry

You might have found it a bit tricky to calculate and analyse the overtime premium.

- **Wednesday**. Eight hours worked in total = one hour overtime. Therefore, overtime premium = one hour @ £3 = £3. This is analysed as a direct cost because it was carried out at the specific request of a customer.
- **Friday**. Eight hours worked = one hour overtime. Therefore, overtime premium = one hour @ £3 = £3. This is analysed as an indirect cost because it cannot be traced to a particular unit.

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Revision Questions 3

Question 1 Multiple choice

1.1 Gross wages incurred in department 1 in June were £54,000. The wages analysis shows the following summary breakdown of the gross pay:

	Paid to direct labour	*Paid to indirect labour*
	£	£
Ordinary time	25,185	11,900
Overtime		
basic pay	5,440	3,500
premium	1,360	875
Shift allowance	2,700	1,360
Sick pay	1,380	300
	36,065	17,935

What is the direct wages cost for department 1 in June?

(A) £25,185
(B) £30,625
(C) £34,685
(D) £36,065

1.2 A manufacturing firm is very busy and overtime is being worked.
The amount of overtime premium contained in direct wages would normally be classed as:

(A) part of prime cost.
(B) factory overheads.
(C) direct labour costs.
(D) administrative overheads.

1.3 Which of the following would be classed as indirect labour?

(A) Assembly workers in a company manufacturing televisions.
(B) A stores assistant in a factory store.
(C) Plasterers in a construction company.
(D) An audit clerk in a firm of auditors.

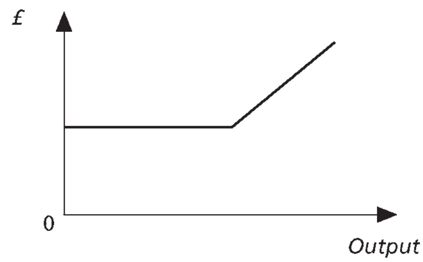
1.4 The following data relates to a direct employee in production department A:

Normal working day	7 hours
Hourly rate of pay	£8
Standard time allowed to produce one unit	6 minutes
Bonus payable at basic hourly rate	50% of time saved

What would be the gross wages payable in a day when the employee produces 82 units?

(A) £33.60
(B) £60.80
(C) £65.60
(D) £84.00

1.5



The labour cost graph above depicts:

(A) a piece-rate scheme with a minimum guaranteed wage.
(B) a straight piece-rate scheme.
(C) a straight time-rate scheme.
(D) a differential piece-rate scheme.

? **Question 2** Short objective-test questions

2.1 Is the following statement *true* or *false*? Tick the correct box.
If overtime is worked at the specific request of a customer who requires a job to be completed early, the overtime premium incurred is usually treated as a direct cost of the customer's job.

True ☐ False ☐

2.2 A piecework system is suitable when which one of the following is most important (*tick the correct box*).

Quality of output ☐
Quantity of output ☐

2.3 Tick the correct box to indicate which remuneration scheme is being described in each case.

(a) The time taken for a team of people to complete a job is recorded. A bonus is then calculated for the team based on the time saved against a previously agreed target time.

Differential piecework scheme ☐
Piecework scheme with guaranteed day rate ☐
Group incentive scheme ☐

(b) An employee is paid for each unit produced, at the following rates.

Units produced per day	*Rate paid £ per unit in this band*
1–10	4.00
11–15	4.30
16+	4.60

Differential piecework scheme ☐
Piecework scheme with guaranteed day rate ☐
Group incentive scheme ☐

(c) An employee is paid £40 per day, plus £0.50 for each unit produced.

Differential piecework scheme ☐
Piecework scheme with guaranteed day rate ☐
Group incentive scheme ☐

2.4 Using the data in question 2.3(b), what will be the earnings of an employee who produces 22 units in a day? Write your answer in this box. £ ☐

2.5 A team of four employees is required to operate an expensive piece of plant. A group bonus scheme is in operation and three shifts of 8 hours each are worked each day. The agreed quota is 300 units of output per shift and if this quantity or less is produced the basic rates of pay apply. However, if more than 300 units are produced per shift, higher remuneration is payable to all members of the team. Such higher remuneration is based on percentage additions to the basic pay.

The percentage increases are:

For output per shift of (units)	*Increase %*
301–360	20
361–420	40
421–500	50

For each grade of employee the basic rate of pay is as follows:

Grade	*Number of employees*	*Hourly rate* £
Senior technicians	1	18
Operatives	2	12
Apprentices	1	6

Complete the following table of the group hourly rate of remuneration:

Shift output Units	*Group hourly rate* £
up to 300	☐
301–360	☐
361–420	☐
421–500	☐

2.6 Which of the following is/are classified as indirect labour cost?

Idle time payments made to direct employees ☐
Overtime premium paid to direct employees at the request of a customer ☐
Payments made to direct employees undertaking maintenance tasks ☐

Solutions to Revision Questions

3

Solution 1

- Every bonus scheme is different. In question 1.4 you will need to read the information carefully to ensure that you understand the principles, then follow these principles to calculate the correct bonus – and do not forget to add the basic pay to the bonus to arrive at the total amount payable!

1.1 Answer: (B)

£25,185 + £5,440 = £30,625. The only direct costs are the wages paid to direct workers for ordinary time, plus the basic pay for overtime. Overtime premium and shift allowances are usually treated as overheads. However, if and when the overtime and shiftwork are incurred specifically for a particular cost unit, they are classified as direct costs of that cost unit. Sick pay is treated as an overhead and is therefore classified as an indirect cost.

1.2 Answer: (B)

Overtime premium is usually treated as an overhead cost if the overtime cannot be specifically identified with a particular cost unit.

1.3 Answer: (B)

The stores assistant is the only person from the four options who is not working directly on the organisation's output.

1.4 Answer: (B)

	Minutes
Time allowed: 82 units × 6 min	492
Time taken: 7 hours	420
Time saved	72
	£
Bonus payable:	
50% × 72 min × £8 per hour	4.80
Basic wage: 7 hours × £8	56.00
Gross wages payable	60.80

1.5 Answer: (A)

The minimum guaranteed wage is shown as a fixed cost up to a certain output. Thereafter, the total cost increases at a steady rate, as piecework rates are paid for increased output.

Solution 2

2.1 *True*. The premium can be directly identified with the customer's job.

2.2 A piecework system is suitable when *quantity* of output is most important.

2.3 (a) Group incentive scheme
(b) Differential piecework scheme
(c) Piecework scheme with guaranteed day rate

2.4

	£
First 10 units = 10 × £4	40.00
Units 11–15 = 5 × £4.30	21.50
Units 16–22 = 7 × £4.60	32.20
Total earnings	93.70

2.5 *Working*
Basic hourly rate = (1 × £18) + (2 × £12) + (1 × £6) = £48

Shift output	*Group hourly rate*
Units	£
up to 300	48.00
301–360	57.60
361–420	67.20
421–500	72.00

2.6 Idle-time payments are an *indirect labour* cost because they cannot be identified with specific cost units. Overtime premium paid at the specific request of a customer is a *direct labour* cost because it can be traced to a specific cost unit.

Payments made to direct workers undertaking maintenance tasks would be classified as *indirect labour* cost because these payments cannot be traced to specific cost units.

The Analysis of Overhead

4

LEARNING OUTCOMES

After completing this chapter, you should be able to:

- explain absorption costing;
- prepare cost statements for allocation and apportionment of overheads, including reciprocal service departments;
- calculate and discuss overhead absorption rates and the under- or over-recovery of overheads;
- calculate product costs under absorption costing.

4.1 Introduction

Now that we have completed our study of direct material cost and direct labour cost we will move on to the analysis of indirect costs or overheads. We will be looking at the three stage process of attributing overheads to individual cost units: allocation, apportionment and absorption.

You will need a thorough understanding of the contents of this chapter for your studies of the *Management Accounting Fundamentals* syllabus and for many of the syllabuses at later stages in the CIMA examinations.

4.2 What is an overhead cost?

4.2.1 Definition

An overhead cost is defined in the CIMA *Terminology* as 'expenditure on labour, materials or services which cannot be economically identified with a specific saleable cost unit'.

Overhead costs are also referred to as *indirect costs*. Therefore, overhead cost comprises indirect material, indirect labour and indirect expenses. The indirect nature of overheads means that they need to be 'shared out' among the cost units as fairly and as accurately as possible.

In this chapter, you will be learning how this 'sharing out', or *attribution*, is accomplished for production overheads, using a costing method known as *absorption costing*.

One of the main reasons for absorbing overheads into the cost of units is for inventory (stock) valuation purposes. Accounting standards recommend that inventory valuations should include an element of fixed production overheads incurred in the normal course of business. We therefore have to find a fair way of sharing out the fixed production overhead costs among the units produced.

4.2.2 Functional analysis of overhead costs

Overhead costs may be classified according to the function of the organisation responsible for incurring the cost. Examples of overhead cost classifications include production overhead, selling and distribution overhead, and administration overhead. It is usually possible to classify the majority of overhead cost in this way, but some overhead costs relate to the organisation generally and may be referred to as general overhead.

In this chapter we shall focus on production overhead. Production is that function of the business which converts raw materials into the organisation's finished product. The production department is usually divided into a number of departments or cost centres. Some of these cost centres are directly involved with the production process. These are called *production cost centres* and might include, for example, the cutting department and the finishing department.

Other cost centres in the production department are not directly involved with the production process but provide support services for the production cost centres. These are called *service cost centres*, and examples include the maintenance department and the stores.

4.3 Overhead allocation and apportionment

The first stage in the analysis of production overheads is the selection of appropriate cost centres. The selection will depend on a number of factors, including the level of control required and the availability of information.

Having selected suitable cost centres, the next stage in the analysis is to determine the overhead cost for each cost centre. This is achieved through the process of allocation and apportionment.

Cost allocation is possible when we can identify a cost as specifically attributable to a particular cost centre. For example the salary of the manager of the packing department can be allocated to the packing department cost centre. It is not necessary to share the salary cost over several different cost centres.

Cost apportionment is necessary when it is not possible to allocate a cost to a specific cost centre. In this case the cost is shared out over two or more cost centres according to the estimated benefit received by each cost centre. As far as possible the basis of apportionment is selected to reflect this benefit received. For example, the cost of rent and rates might be apportioned according to the floor space occupied by each cost centre.

The following example illustrates the allocation and apportionment of production overhead costs.

Example

The information given below relates to a four-week accounting period of WHW Ltd.

	Machining	*Assembly*	*Finishing*	*Stores*
Area occupied (square metres)	24,000	36,000	16,000	4,000
Plant and equipment at cost (£000)	1,400	200	60	10
Number of employees	400	800	200	20
Direct labour hours	16,000	32,000	4,000	
Direct wages (£)	32,600	67,200	7,200	
Machine hours	32,000	4,000	200	
Number of requisitions on stores	310	1,112	100	
Allocated costs	£	£	£	£
Indirect wages	9,000	15,000	4,000	6,000
Indirect materials	394	1,400	600	
Maintenance	1,400	600	100	
Power	1,600	400	200	

Other costs (in total)	£
Rent	2,000
Business rates	600
Insurance on building	200
Lighting and heating	400
Depreciation on plant and equipment	16,700
Wage-related costs	28,200
Factory administration and personnel	7,100
Insurance on plant and equipment	1,670
Cleaning of factory premises	800
	57,670

The data above distinguishes between those costs which can and those which cannot be allocated to a cost centre. The first step is to construct an overhead analysis sheet having separate columns for each cost centre, together with a column for the total costs, a description of the cost item, and the basis upon which the cost has been apportioned between the cost centres if applicable.

An explanation of the apportionment method is given beneath the analysis.

Item	*Basis of apportionment*	*Machining* £	*Assembly* £	*Finishing* £	*Stores* £	*Total* £
Indirect wages	Allocation	9,000	15,000	4,000	6,000	34,000
Indirect materials	Allocation	394	1,400	600	–	2,394
Maintenance	Allocation	1,400	600	100	–	2,100
Power	Allocation	1,600	400	200	–	2,200
Rent	Area occupied	600	900	400	100	2,000
Business rates	Area occupied	180	270	120	30	600
Building insurance	Area occupied	60	90	40	10	200
Lighting/heating	Area occupied	120	180	80	20	400
Depreciation on plant/equip't	Plant/equip't at cost	14,000	2,000	600	100	16,700
Wage-related costs	Total wages	8,320	16,440	2,240	1,200	28,200
Factory admin. and personnel	No. of employees	2,000	4,000	1,000	100	7,100
Insurance on plant/equip't	Plant/equip't at cost	1,400	200	60	10	1,670
Factory cleaning	Area occupied	240	360	160	40	800
		39,314	41,840	9,600	7,610	98,364

You should note that the direct wages costs are not included in the analysis because they are not overhead costs. Also notice that the apportionment of wage-related costs is based on *total* wages – that is, the sum of the direct and indirect wages for each cost centre.

The apportioned costs are all calculated using the general formula:

$$\frac{\text{Total overhead cost}}{\text{Total value of apportionment base}} \times \text{Value of apportionment base of the cost centre being calculated}$$

For example, in the case of depreciation apportioned to the machining cost centre:

$$\frac{£16,700}{£1,670,000} \times £1,400,000 = £14,000$$

The result of the initial allocation and apportionment is that the organisation's production overhead costs have been identified with cost centres associated with production. However, the service cost centre (stores) is not directly involved in the manufacture of the saleable cost unit. Nevertheless, it is part of the production function and the total cost of operating the stores should be attributed to the saleable cost units. The total cost of the stores must be shared or apportioned between those production cost centres which derive benefit from the stores service.

If we now return to our example, the next step is to apportion the cost of the stores department to the production cost centres.

Item	*Basis of apportionment*	*M/c* £	*Ass'y* £	*Finish* £	*Stores* £	*Total* £
B/fwd		39,314	41,840	9,600	7,610	98,364
Stores costs	No. of requisitions on stores	1,550	5,560	500	(7,610)	–
		40,864	47,400	10,100	–	98,364

We have now achieved the objective of allocating and apportioning all of the production overhead costs to the departments directly involved in the manufacture of the saleable cost unit.

4.4 Absorption of overheads into saleable cost units

4.4.1 General principles

The last stage in the analysis of overheads is their absorption into the cost units produced in the production cost centres. This is sometimes referred to as *overhead recovery*.

To begin with, we need to measure the level of production achieved. There are many measures which may be used, but the most common are:

- physical units produced;
- labour hours worked;
- machine hours operated.

! You will see later in this *Study System* that, in a standard costing environment, the two methods based on hourly rates use *standard* labour hours and *standard* machine hours as the absorption basis.

It is quite likely that different production departments will measure their production in different ways. The objective is to use a measure which reflects the nature of the work involved. The physical unit measure is in theory the simplest but it is only valid if all of the items produced require the same amount of resources.

The overhead costs of each production cost centre are then divided by the quantity of production achieved to calculate the amount of overhead cost to be attributed to each unit. This is the technique of overhead absorption and we shall illustrate it by extending our example on allocation and apportionment.

The output of the machining department is to be measured using the number of machine hours produced, while the output of the assembly and finishing departments is to be measured using the number of direct labour hours produced. The reasons for this can be seen from the number of machine and direct labour hours for each department shown in the original data for the example. The machining department is clearly machine-intensive, whereas the other departments are labour-intensive.

The absorption rates are calculated by dividing the costs attributed to the department by its appropriate measure of output.

	Machining	*Assembly*	*Finishing*
Production overhead costs obtained by allocation and apportionment	£40,864	£47,400	£10,100
Number of:			
machine hours	32,000		
direct labour hours		32,000	4,000
Absorption rates:			
per machine hour	£1.277		
per direct labour hour		£1.48125	£2.525

4.4.2 Applying the overhead absorption rate

When using an absorption method based either on direct labour hours or on machine hours the cost direct attributed to each unit is obtained by multiplying the time taken per unit by the absorption rate per hour.

For example, if a particular cost unit took three machine hours in the machining department, and five direct labour hours in each of the assembly and finishing departments, the overhead cost absorbed by the cost unit would be as follows:

	£
Machining: 3 hours × £1.277	3.83
Assembly: 5 hours × £1.48125	7.41
Finishing: 5 hours × £2.525	12.63
Overhead absorbed by cost unit	23.87

4.4.3 Other absorption bases

In addition to the three bases of absorption mentioned above, a percentage rate based on any of the following may be used:

- direct material cost;
- direct labour cost;
- prime cost.

For example, if a direct labour cost percentage is used the absorption rates would be as follows:

	Machining	*Assembly*	*Finishing*
	£	£	£
Production overhead costs	40,864	47,400	10,100
Direct wages cost	32,600	67,200	7,200
Direct labour cost percentage	125%	71%	140%

If our cost unit had a labour cost of £12 in the machining department, and £20 in each of the assembly and finishing departments, the overhead cost absorbed by the cost unit using this method would be as follows:

	£
Machining: 125% × £12 =	15.00
Assembly: 71% × £20 =	14.20
Finishing: 140% × £20 =	28.00
Overhead absorbed by cost unit	57.20

The direct material cost and the prime cost methods work in a similar way.

4.4.4 Selecting the most appropriate absorption rate

The data in the last example demonstrate how the calculated production cost of a particular cost unit can be dramatically different, depending on the overhead absorption method selected. It is important that the selected method results in the most realistic charge for overhead, reflecting the incidence of overheads in the cost centre as closely as possible within the limits of available data.

You must not make the common mistake of thinking that the best absorption method in this example would be the one which results in the lowest overhead charge to our cost unit. Remember that the same total cost centre overhead is being shared out over the cost units produced, whichever absorption method is selected. If this unit is given a lower charge for overhead, then other cost units will be charged with a higher amount so that the total overhead is absorbed overall.

A major factor in selecting the absorption rate to be used is a consideration of the practical applicability of the rate. This will depend on the ease of collecting the data required to use the selected rate.

It is generally accepted that a time-based method should be used wherever possible, that is, the machine hour rate or the labour hour rate. This is because many overhead costs increase with time, for example indirect wages, rent and rates. Therefore, it makes sense to attempt to absorb overheads according to how long a cost unit takes to produce. The longer it takes, the more overhead will have been incurred in the cost centre during that time.

In addition to these general considerations, each absorption method has its own advantages and disadvantages:

(a) *Rate per unit*. This is the easiest method to apply but it is only suitable when all cost units produced in the period are identical. Since this does not often happen in practice this method is rarely used.
(b) *Direct labour hour rate*. This is a favoured method because it is time-based. It is most appropriate in labour-intensive cost centres, which are becoming rarer nowadays and so the method is less widely used than it has been in the past.
(c) *Machine hour rate*. This is also a favoured method because it is time-based. It is most appropriate in cost centres where machine activity predominates and is therefore more widely used than the direct labour hour rate. As well as absorbing the time-based overheads mentioned earlier, it is more appropriate for absorbing the overheads related to machine activity, such as power, maintenance, repairs and depreciation.
(d) *Direct wages cost percentage*. This method may be acceptable because it is to some extent time-based. A higher direct wages cost may indicate a longer time taken and therefore a greater incidence of overheads during this time. However the method will not produce equitable overhead charges if different wage rates are paid to individual employees in the cost centre. If this is the case, then there may not be a direct relationship between the wages paid and the time taken to complete a cost unit.
(e) *Direct materials cost percentage*. This is not a very logical method because there is no reason why a higher material cost should lead to a cost unit apparently incurring more production overhead cost. The method can be used if it would be too costly and inconvenient to use a more suitable method.
(f) *Prime cost percentage*. This method is not recommended because it combines methods (d) and (e) and therefore suffers from the combined disadvantages of both.

4.5 Predetermined overhead absorption rates

Overhead absorption rates are usually predetermined, that is, they are calculated in advance of the period over which they will be used.

The main reason for this is that overhead costs are not incurred evenly throughout the period. In some months the actual expenditure may be very high and in others it may be relatively low. The actual overhead rate per hour or per unit will therefore be subject to wide fluctuations. If the actual rate was used in product costing, then product costs would also fluctuate wildly. Such product costs would be very difficult to use for planning and control purposes.

Fluctuations in the actual level of production would also cause the same problem of fluctuating product costs.

To overcome this problem the absorption rate is determined in advance of the period, using estimated or budget figures for overhead and for the number of units of the absorption base (labour hours or machine hours, etc.).

A further advantage of using predetermined rates is that managers have an overhead rate permanently available which they can use in product costing, price quotations and so on. The actual overhead costs and activity levels are not known until the end of the period. It would not be desirable for managers to have to wait until after the end of the period before they had a rate of overhead that they could use on a day-to-day basis.

4.5.1 Under- or over-absorption of overheads

The problem with using predetermined overhead absorption rates is that the actual figures for overhead and for the absorption base are likely to be different from the estimates used in calculating the absorption rate. It is this difference which causes an under-/over-absorption of production overhead. We will now return to our example in Section 4.4 to see how this is calculated, assuming that machine/labour hour rates have been used to absorb the overheads.

We will assume that all of the values used in the calculations in our example are estimates based on WHW Limited's budgets.

The *actual* costs for the same four-week period have now been allocated and apportioned using the same techniques and bases as shown in our earlier example, with the following total actual costs being attributed to each cost centre:

	Machining	*Assembly*	*Finishing*
	£	£	£
Actual costs	43,528	49,575	9,240

Actual labour and machine hours recorded against each cost centre were:

	Machining	*Assembly*	*Finishing*
Number of:			
machine hours	32,650		
labour hours		31,040	3,925

The amount of overhead cost absorbed into each department's total number of saleable cost units will be calculated by multiplying the absorption rate calculated in Section 4.4 (using the budget data) by the actual number of hours. The amounts absorbed are thus:

	Machining	*Assembly*	*Finishing*
Amount absorbed:	£	£	£
32,650 hours × £1.277	41,694		
31,040 hours × £1.48125		45,978	
3,925 hours × £2.525			9,911

This is compared with the actual cost incurred and the difference is the under-/over-absorption of production overhead:

	Machining	*Assembly*	*Finishing*
	£	£	£
Amount absorbed	41,694	45,978	9,911
Actual cost incurred	43,528	49,575	9,240
Over-absorption			671
Under-absorption	1,834	3,597	

If the amount absorbed exceeds the amount incurred, then an over-absorption arises; the opposite is referred to as an under-absorption. The terms *under-recovery* and *over-recovery* are sometimes used.

4.5.2 The reasons for under- or over-absorption

The under- or over-absorption has arisen because the actual overhead incurred per hour was different from the predetermined rate per hour. There are two possible causes of this:

(a) The actual number of hours (machine or direct labour) was different from the number contained in the budget data. If this happens, then we would expect the variable element of the overhead to vary in direct proportion to the change in hours, so this part of the absorption rate would still be accurate. However, the fixed overhead would not alter with the hours worked and this means that the actual overhead per hour would be different from the predetermined rate.
(b) The actual production overhead incurred may be different from the estimate contained in the predetermined rate. Apart from the expected change in variable overhead referred to in (a), this would also cause an under- or over-absorption of overhead.

4.5.3 Accounting for under- or over-absorbed overheads

If overheads are under-absorbed it effectively means that product costs have been understated. It is not usually considered necessary to adjust individual unit costs and therefore stock values are not altered. However, the cost of units sold will have been understated and therefore the under-absorption is charged to the income statement (profit and loss account) for the period.

The reverse is true for any over-absorption, which is credited to the income statement (profit and loss account) for the period. Some organisations do not charge or credit the under- or over-absorption to the profit and loss account every period. Instead, the amount for each period is transferred to a suspense account. At the end of the year the net balance on this account is transferred to the profit and loss account. This procedure is particularly appropriate when activity fluctuations cause under- and over-absorptions which tend to cancel each other out over the course of the year.

4.5.4 The problems caused by under-/over-absorption of overheads

If overheads are under-absorbed then managers have been working with unit rates for overheads which are too low. Prices may have been set too low and other similar decisions may have been taken based on inaccurate information. If the amount of under-absorption is significant, then this can have a dramatic effect on reported profit.

Do not make the common mistake of thinking that over-absorption is not such a bad thing because it leads to a boost in profits at the period end. If overhead rates have been unnecessarily high, then managers may have set selling prices unnecessarily high, leading to lost sales. Other decisions would also have been based on inaccurate information.

Although it is almost impossible to avoid under- and over-absorption altogether, it is possible to minimise the amount of adjustment necessary at the year end. This is achieved by conducting regular reviews of the actual expenditure and activity levels which are arising. The overhead absorption rate can thus be reviewed to check that it is still appropriate to absorb the overheads sufficiently accurately by the year end. If necessary the overhead absorption rate can be adjusted to reflect more recent estimates of activity and expenditure levels.

4.6 Illustrative example

You can use the following short example to practise the techniques which we have covered so far in this chapter.

The information given below relates to the forthcoming period for a manufacturer's operation. There are four cost centres of which two are involved in production and two are service cost centres.

		Production depts		*Service depts*	
	Total	*A*	*B*	*Canteen*	*Stores*
	£	£	£	£	£
Allocated costs	70,022	21,328	29,928	8,437	10,329
Other costs:					
Rent and rates	4,641				
Buildings insurance	3,713				
Electricity and gas	6,800				
Plant depreciation	28,390				
Plant insurance	8,517				
	122,083				
Area occupied (square metres)		7,735	6,188	1,547	3,094
Plant at cost (£000)		1,845	852	–	142
Number of employees		600	300	30	70
Machine hours		27,200	800	–	–
Direct labour hours		6,800	18,000	–	–
Number of stores requisitions		27,400	3,400	–	–

Use this information to calculate a production overhead absorption rate for departments A and B.

4.6.1 Solution

The first step is to prepare an overhead analysis sheet which shows the apportionment of the overheads, using the most appropriate basis for each.

Overhead item	*Basis of apportionment*	*Total* £	*Dept A* £	*Dept B* £	*Canteen* £	*Stores* £
Allocated costs	–	70,022	21,328	29,928	8,437	10,329
Rent and rates[1]	Area	4,641	1,934	1,547	387	773
Buildings insurance	Area	3,713	1,547	1,238	309	619
Electricity & gas	Area	6,800	2,833	2,267	567	1,133
Depreciation	Plant cost	28,390	18,450	8,520	–	1,420
Insurance	Plant cost	8,517	5,535	2,556	–	426
		122,083	51,627	46,056	9,700	14,700
Canteen[2]	Employees	–	6,000	3,000	(9,700)	700
Stores[3]	Requisitions	–	13,700	1,700	–	(15,400)
		122,083	71,327	50,756	–	–

Notes

1. The rent and rates cost is apportioned as follows. Total area occupied is 18,564 square metres. Therefore, rent and rates cost £4,641/18,564 = £0.25 per square metre.
   All of the other apportionments are calculated in the same way.
2. Since the canteen serves all other departments, its costs must be apportioned first, over the 970 employees in the other departments.
3. Once the stores have received a charge from the canteen, the total stores costs can be apportioned to the production departments.

Looking at the data for machine hours and direct labour hours in each of the departments, it appears that the most appropriate absorption base for department A is machine hours and for department B is direct labour hours. The absorption rates can now be calculated.

$$\text{Production department A} = £71{,}327/27{,}200 = £2.62 \text{ per machine hour}$$

$$\text{Production department B} = £50{,}756/18{,}000 = £2.82 \text{ per direct labour hour}$$

We can now extend the example a little further to practise using the calculated absorption rates. What is the total production cost of the following job?

	Job 847
Direct material cost	£487
Direct labour cost	£317
Machine hours in department A	195
Direct labour hours in department B	102

The overhead absorption rates can be applied as follows:

	Job 847 £
Direct material cost*	487.00
Direct labour cost*	317.00
Prime cost	804.00
Production overhead:	
Department A 195 hours × £2.62	510.90
Department B 102 hours × £2.82	287.64
Total production cost	1602.54

* Remember that direct costs are not affected by the overhead absorption rate selected.

See if you can calculate the under- or over-absorbed overhead in each of the departments using the following data. The actual overhead incurred would have been determined by the allocation and apportionment of the actual overhead costs.

	Department A	*Department B*
Actual results		
Overhead incurred	£70,483	£52,874
Direct labour hours	6,740	18,300
Machine hours	27,900	850

The first step is to calculate how much overhead would have been absorbed, based on the actual hours and the predetermined overhead absorption rate for each department. This total can then be compared with the actual overhead incurred.

	Department A	*Department B*
	£	£
Overhead absorbed		
27,900 × £2.62	73,098	
18,300 × £2.82		51,606
Overhead incurred	70,483	52,874
(Under-)/over-absorption	2,615	(1,268)

4.7 Reciprocal servicing

4.7.1 Taking account of reciprocal servicing

In the previous example there were two service cost centres: the canteen and the stores. The stores personnel made use of the canteen and it was therefore equitable to charge some of the canteen costs to the stores cost centre. It was not necessary to charge any of the stores costs to the canteen because there was no indication that the canteen made use of the stores facilities.

If the canteen had used the stores facilities, then we would say that reciprocal servicing was taking place, that is, that the service cost centres each used the other's facilities.

This can lead to a complicated situation because we do not know the total of the stores costs until a proportion of the canteen costs has been charged to it. Similarly, we do not know the total of the canteen costs until the total of the stores costs has been apportioned.

There are two methods which can be used to solve this problem. Your *Management Accounting Fundamentals* syllabus requires you to be able to use only the repeated distribution method. We will use the following example to illustrate this. The other method, using algebra, is outside the scope of your syllabus.

Example

A company reapportions the costs incurred by two service cost centres – materials handling and inspection – to three production cost centres – machining, finishing and assembly.

The following are the overhead costs which have been allocated and apportioned to the five cost centres:

	£000
Machining	400
Finishing	200
Assembly	100
Materials handling	100
Inspection	50

Estimates of the benefits received by each cost centre are as follows:

	Machining	*Finishing*	*Assembly*	*Materials handling*	*Inspection*
	%	%	%	%	%
Materials handling	30	25	35	–	10
Inspection	20	30	45	5	–

These percentages indicate the use which each of the cost centres makes of the materials handling and inspection facilities. Calculate the charge for overhead to each of the three production cost centres, including the amounts reapportioned from the two service centres.

Solution: repeated distribution method

The task of allocating and apportioning the overheads to all cost centres has already been done (the primary apportionment). The problem now is to reapportion the costs of the service centres (the secondary apportionment).

Using the repeated distribution method the service cost centre costs are apportioned backwards and forwards between the cost centres until the figures become very small. At this stage it might be necessary to round the last apportionments.

In the workings that follow we have chosen to begin the secondary apportionment by apportioning the inspection costs first. The £50,000 inspection cost is reapportioned according to the percentages provided, then the total of the materials handling department is reapportioned and so on. The final result would have been the same if we had chosen instead to begin by apportioning the materials handling costs first.

	Machining	*Finishing*	*Assembly*	*Materials handling*	*Inspection*
	£	£	£	£	£
Initial allocation	400,000	200,000	100,000	100,000	50,000
Apportion inspection	10,000	15,000	22,500	2,500	(50,000)
Apportion materials handling	30,750	25,625	35,875	(102,500)	10,250
Apportion inspection	2,050	3,075	4,612	513	(10,250)
Apportion materials handling	154	128	180	(513)	51
Apportion inspection*	11	16	24	–	(51)
Total charge for overhead	442,965	243,844	163,191	0	0

* When the service department cost reduces to a small amount the final apportionment is adjusted for roundings.

The objective has been achieved and all of the overheads have been apportioned to the production cost centres, using the percentages given. A spreadsheet or similar software package would obviously be helpful here!

4.7.2 The usefulness of reapportioned service centre costs

The task of accounting for reciprocal servicing can be fairly laborious, particularly if it must be performed manually. Managers must therefore ensure that the effort is worth while.

Generally, if the service centre costs are significant and they make considerable use of each other's services, then accounting for reciprocal servicing is probably worthwhile. In other cases the reciprocal servicing could be ignored, or alternatively the service centre which does the most work for the other service centres could be apportioned first. The other service centres could then be apportioned direct to the production cost centres.

The overriding consideration must be the usefulness to managers of the resulting information. If the improved accuracy of the overhead absorption rates is deemed to be worth while, then reciprocal servicing should be taken into account in service cost reapportionment.

In the assessment, you must never ignore the existence of reciprocal servicing unless you are specifically instructed to do so.

4.8 Summary

Having read this chapter the main points you should understand are as follows:

1. The three stages in attributing overheads to cost units are allocation, apportionment and absorption. Allocation involves allotting whole items of cost to a single cost centre. Apportionment is necessary when it is not possible to allot the whole cost to a single cost centre. The cost must then be apportioned between cost centres using a suitable basis.
2. The primary apportionment of production overheads involves apportioning the overhead costs to all cost centres. The secondary apportionment is then necessary to reapportion the service cost centre costs to the production cost centres.
3. The final totals of the production cost centre overheads are absorbed into product costs using a predetermined production overhead absorption rate. The absorption basis should reflect the type of activity undertaken within each production cost centre.
4. The production overhead absorption rate is calculated by dividing the budgeted cost centre overheads by the budgeted number of units of the absorption base (machine hours, direct labour hours, etc.).
5. Under- or over-absorption arises at the end of a period when the amount of production overhead absorbed into cost units is lower than or higher than the actual production overhead incurred during the period.
6. Reciprocal servicing occurs where service cost centres each do work for the other. In this situation the service cost centre overheads are reapportioned using the repeated distribution method.

Revision Questions 4

Question 1 Multiple choice

1.1 A method of dealing with overheads involves spreading common costs over cost centres on the basis of benefit received. This is known as:

(A) overhead absorption.
(B) overhead apportionment.
(C) overhead allocation.
(D) overhead analysis.

1.2 An overhead absorption rate is used to:

(A) share out common costs over benefiting cost centres.
(B) find the total overheads for a cost centre.
(C) charge overheads to products.
(D) control overheads.

1.3 Over-absorbed overheads occur when:

(A) absorbed overheads exceed actual overheads.
(B) absorbed overheads exceed budgeted overheads.
(C) actual overheads exceed budgeted overheads.
(D) budgeted overheads exceed absorbed overheads.

Data for questions 1.4 and 1.5

Budgeted labour hours	8,500
Budgeted overheads	£148,750
Actual labour hours	7,928
Actual overheads	£146,200

1.4 Based on the data given above, what is the labour hour overhead absorption rate?

(A) £17.50 per hour.
(B) £17.20 per hour.
(C) £18.44 per hour.
(D) £18.76 per hour.

1.5 Based on the data given above, what is the amount of overhead under-/over-absorbed?

(A) £2,550 under-absorbed.
(B) £2,529 over-absorbed.
(C) £2,550 over-absorbed.
(D) £7,460 under-absorbed.

1.6 A management consultancy recovers overheads on chargeable consulting hours. Budgeted overheads were £615,000 and actual consulting hours were 32,150. Overheads were under-recovered by £35,000.

If actual overheads were £694,075, what was the budgeted overhead absorption rate per hour?

(A) £19.13
(B) £20.50
(C) £21.59
(D) £22.68

1.7 P Ltd absorbs overheads on the basis of direct labour hours. The overhead absorption rate for the period has been based on budgeted overheads of £150,000 and 50,000 direct labour hours.

During the period, overheads of £180,000 were incurred and 60,000 direct labour hours were used.

Which of the following statements is correct?

(A) Overhead was £30,000 over-absorbed.
(B) Overhead was £30,000 under-absorbed.
(C) No under- or over-absorption occurred.
(D) None of the above.

? Question 2 Short objective-test questions

2.1 Match the overhead costs to the most appropriate basis of cost apportionment. Write the correct letter in the box provided beside each apportionment basis. An apportionment basis may be selected more than once.

Overhead cost
(a) Canteen costs
(b) Cleaning of factory premises
(c) Power
(d) Rent
(e) Insurance of plant and machinery

Apportionment bases

☐ Floor area
☐ Plant and equipment at cost
☐ Number of employees
☐ Machine running hours
☐ Direct labour hours

2.2 Maintenance costs are to be apportioned to production cost centres on the basis of the following number of maintenance hours worked in each cost centre.

	Machining	*Assembly*	*Finishing*
Maintenance hours worked	1,000	700	300

Complete the following extract from the overhead analysis sheet:

Overhead cost item	*Total*	*Machining*	*Assembly*	*Finishing*
	£	£	£	£
Maintenance cost	38,000	☐	☐	☐

2.3 After the initial overhead allocation and apportionment has been completed, the overhead analysis sheet for a car repair workshop is as follows:

Total overhead cost	*Vehicle servicing*	*Crash repairs*	*Tyre fitting*	*Canteen and vending*
£	£	£	£	£
233,000	82,000	74,000	61,000	16,000

The costs of the canteen and vending cost centre are to be reapportioned to the other cost centres on the basis of the number of personnel in each cost centre.

	Vehicle servicing	*Crash repairs*	*Tyre fitting*	*Canteen and vending*
Number of personnel	20	15	5	2

The canteen and vending cost to be apportioned to the crash repair cost centre is £ ☐

2.4 The budgeted fixed overhead absorption rate for last period was £5 per direct labour hour. Other data for the period are as follows:

Actual fixed overhead expenditure	£234,500
Actual direct labour hours	51,300
Budgeted fixed overhead expenditure	£212,900

The number of direct labour hours budgeted to be worked last period was ☐

2.5 *Tick the correct box.*
Activity in the packing department of a company manufacturing fine china involves operatives bubble-wrapping finished items and placing them in boxes which are then sealed and labelled. Most of the boxes are sealed and labelled by specialised machines, but about a quarter of them have to be sealed and labelled by hand. Budgeted activity levels for next period are 3,800 machine hours and 3,600 direct labour hours. The most appropriate production overhead absorption rate for the packing department would be a:

Machine hour rate ☐
Direct labour hour rate ☐

2.6 Data for the machining cost centre are as follows:

Budgeted cost centre overhead	£210,000
Actual cost centre overhead	£230,000
Budgeted machine hours	42,000
Actual machine hours	43,000

Complete the following calculation.

	£		
Overhead absorbed	☐		
Actual overhead incurred	☐		*Tick correct box:*
Overhead under-/over-absorbed	☐	under-absorbed	☐
		over-absorbed	☐

2.7 The number of machine and labour hours budgeted for three production cost centres for the forthcoming period is as follows:

	Machining	*Assembly*	*Finishing*
Machine hours	50,000	4,000	5,000
Labour hours	10,000	30,000	20,000

The most appropriate production overhead absorption basis for each cost centre would be (tick the correct box):

	Machining	*Assembly*	*Finishing*
Rate per machine hour	☐	☐	☐
Rate per labour hour	☐	☐	☐

2.8 Production overhead in department A is absorbed using a predetermined rate per machine hour. Last period, the production overhead in department A was under-absorbed. Which of the following situations could have contributed to the under absorption? *(tick all that apply)*

☐ the actual production overhead incurred was lower than budgeted.
☐ the actual production overhead incurred was higher than budgeted.
☐ the actual machine hours were lower than budgeted.
☐ the actual machine hours were higher than budgeted.

? **Question 3** Overhead analysis and absorption

The Utopian Hotel is developing a cost accounting system. Initially it has been decided to create four cost centres: Residential and Catering deal directly with customers, while Housekeeping and Maintenance are internal service cost centres.

The management accountant is in the process of calculating overhead absorption rates for the next period. An extract from the overhead analysis sheet is as follows:

	Basis of apportionment	*Residential* £	*Catering* £	*Housekeeping* £	*Maintenance* £	*Total* £
Consumables	Allocated	14,000	23,000	27,000	9,000	73,000
Staff costs	Allocated	16,500	13,000	11,500	5,500	46,500
Rent and rates				A		37,500
Contents ins.	Value of equip.		B			14,000
Heat and light		C				18,500

Other information
The following information is also available:

	Residential	*Catering*	*Housekeeping*	*Maintenance*	*Total*
Floor area (sq. metres)	2,750	1,350	600	300	5,000
Value of equipment, etc.	£350,000	£250,000	£75,000	£75,000	£750,000

Requirements

(a) The entries on the overhead analysis sheet shown as A to C are:

A £☐ (to the nearest £)
B £☐ (to the nearest £)
C £☐ (to the nearest £)

(b) The initial overhead allocation and apportionment has now been completed. The cost centre overhead totals are as follows:

	Residential £	*Catering* £	*Housekeeping* £	*Maintenance* £	*Total* £
Initial allocation and apportionment	85,333	68,287	50,370	23,010	227,000

Housekeeping works 70 per cent for Residential and 30 per cent for Catering, and Maintenance works 20 per cent for Housekeeping, 30 per cent for Catering and 50 per cent for Residential.

After the reapportionment of the Housekeeping and Maintenance cost centres, the total cost centre overheads for Residential and Catering will be, to the nearest £:

Residential £☐
Catering £☐

? **Question 4** Overhead absorption rates

QRS Ltd has three main departments – Casting, Dressing and Assembly – and has prepared the following production overhead budgets for period 3

Department	*Casting*	*Dressing*	*Assembly*
Production overheads	£225,000	£175,000	£93,000
Expected production hours	7,500	7,000	6,200

During period 3, actual results were as follows:

Department	*Casting*	*Dressing*	*Assembly*
Production overheads	£229,317	£182,875	£92,500
Production hours	7,950	7,280	6,696

Requirements

(a) The departmental overhead absorption rates per production hour for period 3 are:

Casting £☐
Dressing £☐
Assembly £☐

(b) (i) The overheads in the Casting department were (tick the correct box and insert the value of the over-/under-absorption):

under-absorbed ☐ over-absorbed ☐
by £☐

(ii) The overheads in the Dressing department were (tick the correct box and insert the value of the over-/under-absorption):

under-absorbed ☐ over-absorbed ☐
by £☐

(c) The overheads in the Assembly department were over-absorbed. Which of the following factors contributed to the over absorption?

☐ the actual overheads incurred were lower than budgeted.
☐ the actual production hours were higher than budgeted.

? **Question 5** Overhead analysis

DC Ltd is an engineering company which uses job costing to attribute costs to individual products and services provided to its customers. It has commenced the preparation of its fixed production overhead cost budget for year 2 and has identified the following costs:

	£000
Machining	600
Assembly	250
Finishing	150
Stores	100
Maintenance	80
	1,180

The stores and maintenance departments are production service departments. An analysis of the services they provide indicates that their costs should be apportioned accordingly:

	Machining	*Assembly*	*Finishing*	*Stores*	*Maintenance*
Stores	40%	30%	20%	–	10%
Maintenance	55%	20%	20%	5%	–

Requirements

(a) After the apportionment of the service department costs, the total overheads of the production departments will be (*to the nearest £500*):

Machining £☐
Assembly £☐
Finishing £☐

(b) DC Ltd's overhead absorption rates for year 1 are as follows:

Machining £13.83 per machine hour
Assembly £9.98 per labour hour
Finishing £9.45 per labour hour

Job no. XX34 is to be started and completed in year 1. Data for the job is as follows:

Direct materials cost £2,400
Direct labour cost £1,500

Machine hours and labour hours required for the job are:

	Machine hours	*Labour hours*
Machining department	45	10
Assembly department	5	15
Finishing department	4	12

DC Ltd adds 10 per cent to total production cost in order to absorb non-production overhead costs, and profit is calculated as 20 per cent of selling price.

Requirement

Complete the following statements (*to the nearest penny*):

(i) The total production overhead cost of job no. XX34 is £☐
(ii) The total production cost of job no. XX34 is £☐
(iii) The selling price of job no. XX34 is £☐

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Solutions to Revision Questions

4

Solution 1

- Always remember that production overhead absorption rates are predetermined, that is, they are based on budgeted production overhead and budgeted activity levels.
- Over- or under-absorbed overhead = overhead absorbed − actual overhead incurred. If actual overhead exceeds the amount absorbed, then there is an under-absorption. If actual overhead is less than the amount absorbed, there is an over-absorption.

1.1 Answer: (B)

Answer (A) describes the final stage of charging overheads to cost units. (C) describes the allotment of whole items of cost to a single cost unit or cost centre. (D) describes the whole process of overhead allocation, apportionment and absorption.

1.2 Answer: (C)

An overhead absorption rate is a means of attributing overhead to a product or service based, for example, on direct labour hours.

1.3 Answer: (A)

Over- or under-absorption of overhead is the difference between absorbed overheads and actual overheads. Under-absorption occurs when actual overheads exceed absorbed overheads.

1.4 Answer: (A)

Labour hour overhead absorption rate = £148,750/£8,500 = £17.50 per hour.

1.5 Answer: (D)

	£
Overhead incurred	146,200
Overhead absorbed = £17.50 × 7,928 hours	138,740
Under-absorption	7,460

1.6 Answer: (B)

Let £x = budgeted overhead absorption rate per hour:

	£
Actual overheads	694,075
Less: absorbed overheads	32,150x
Difference = under-absorption	35,000

$$\therefore\ x = \frac{694{,}075 - 35{,}000}{32{,}150} = 20.5$$

1.7 Answer: (C)

	£
Absorbed: (£150,000/50,000) = £3/hour × 60,000	180,000
Actual incurred	180,000
Under-/over-absorption	–

Solution 2

2.1 (a) Number of employees
(b) Floor area
(c) Machine running hours
(d) Floor area
(e) Plant and equipment at cost

2.2 Overhead cost per maintenance hour $= \dfrac{£38{,}000}{1{,}000 + 700 + 300} = £19$

Overhead cost item	*Total*	*Machining*	*Assembly*	*Finishing*
	£	£	£	£
Maintenance cost	38,000	19,000	13,300	5,700

2.3 Canteen and vending cost per personnel member in production cost centres* $= \dfrac{£16{,}000}{20 + 15 + 5} = £400$

* The canteen and vending personnel are not included because the canteen cannot give a charge to itself.

The canteen and vending cost apportioned to the crash repair cost centre is £400 × 15 = £6,000.

2.4 Direct labour hours budgeted to be worked last period = 42,580.

$$\text{Budgeted overhead absorption rate} = \frac{\text{budgeted fixed overhead expenditure}}{\text{budgeted direct labour hours}}$$

$$£5 = \frac{£212{,}900}{\text{budgeted direct labour hours}}$$

Budgeted direct labour hours = £212,900/£5 = 42,580.

2.5 The most appropriate production overhead absorption rate for the packing department would be a *direct labour hour rate*.

Although the number of machine hours in the cost centre is significant, we are told that a quarter of the output is not placed on the machines. No machine hours would be recorded for this output and the use of a machine hour rate would mean that this part of the output received no charge for the overheads of the packing cost centre.

2.6 Overhead absorption rate $= \dfrac{£210{,}000}{42{,}000} = £5$ per machine hour

	£
Overhead absorbed (£5 × 43,000)	215,000
Actual overhead incurred	230,000
Overhead under-absorbed	15,000

2.7 Looking at the number of machine and labour hours budgeted for each cost centre it is clear that the machining department is machine intensive. Therefore, a *rate per machine hour* would be most appropriate for this cost centre.

The assembly and finishing departments are labour intensive. Therefore, a *rate per labour hour* would be most appropriate for each of these cost centres.

2.8 Two of the stated factors could have contributed to the under absorption:

- *the actual production overhead incurred was higher than budgeted*; if this did happen then the predetermined absorption rate would be too low and there would be a potential under absorption;
- *the actual machine hours were lower than budgeted*; if this occurred then there would be fewer than expected hours to absorb the production overhead, potentially leading to under absorption.

✓ Solution 3

- This is an example of an application of absorption costing in a non-manufacturing situation. Do not be put off by this. In an assessment you must be prepared to deal with all sorts of unfamiliar situations. The principles of overhead analysis that you have learned in this chapter can be applied in the same way in this non-manufacturing environment. Residential and Catering are the equivalent of the production cost centres that you have learned about, whereas Housekeeping and Maintenance are internal service departments whose costs will need to be reapportioned.
- Maintenance does work for Housekeeping, but notice that Housekeeping does not provide any service to Maintenance. Therefore, in part (b), if you apportion the total of Maintenance first, including the appropriate charge to Housekeeping, you can then apportion the new total for Housekeeping straight to the departments which deal directly with customers, that is, Residential and Catering.

(a) A £4,500
B £4,667
C £10,175

Workings:

A: Using floor area as the apportionment basis, the rent and rates cost apportioned to Housekeeping = (600/5,000) × £37,500 = £4,500.
B: (250,000/750,000) × £14,000 = £4,667.
C: Using floor area as the apportionment basis, the heat and light cost apportioned to Residential = (2,750/5,000) × £ 18,500 = £10,175.

(b) Residential £135,318
Catering £91,682

Workings:

	Residential	*Catering*	*Housekeeping*	*Maintenance*	*Total*
	£	£	£	£	£
Initial allocation and appt.	85,333	68,287	50,370	23,010	227,000
Maintenance reapportioned					
50% to Residential	11,505				
30% to Catering		6,903			
20% to Housekeeping			4,602	(23,010)	
	96,838	75,190	54,972	–	
Housekeeping reapportioned					
70% to Residential	38,480				
30% to Catering		16,492	(54,972)		
	135,318	91,682	–		

Solution 4

- A common mistake in part (b) would be to compare the actual overheads with the budgeted overheads instead of with the absorbed overheads when calculating the under- or over-absorption.

(a) Predetermined departmental overhead absorption rates for period 3 (per production hour)

Casting	*Dressing*	*Assembly*
$\frac{£225,000}{7,500} = £30$	$\frac{£175,000}{7,000} = £25$	$\frac{£93,000}{6,200} = £15$

(b) (i) The overheads in the Casting department were over-absorbed by £9,183
(ii) The overheads in the Dressing department were under-absorbed by £875.

Workings:

	Casting	*Dressing*
	£	*£*
Overheads absorbed:		
£30/hour × 7,950	238,500	
£25/hour × 7,280		182,000
Actual overheads	(229,317)	(182,875)
Over-/(under)-absorption	9,183	(875)

(c) Both factors would have contributed to the over absorption. The amount of overhead absorbed increased in line with the production hours, which would have led to over absorption even if the overhead expenditure had remained constant. The fact that the overhead expenditure was below budget would have increased the amount of over absorption.

☑ Solution 5

- You will need to use the repeated distribution method to deal with the reciprocal servicing in part (a).
- The question mentions job costing, which is the subject of Chapter 5. For now, all you need to know is that an individual job – in this case job XX34 – is simply treated as a cost unit for the purposes of overhead absorption.

(a) Machining: £691,500
Assembly: £299,500
Finishing: £189,000

Workings:

	Machining	*Assembly*	*Finishing*	*Stores*	*Maintenance*
	£000	*£000*	*£000*	*£000*	*£000*
Allocated costs	600.00	250.00	150.00	100.00	80.00
Stores apportionment	40.00	30.00	20.00	(100.00)	10.00
Maintenance apportionment	49.50	18.00	18.00	4.50	(90.00)
Stores apportionment	2.00	1.50	1.00	(4.50)	–
Total	691.50	299.50	189.00	–	–

(b) (i) £885.45
(ii) £4,785.45
(iii) £6,580.00

Workings:

	£	£
Direct material		2,400.00
Direct labour		1,500.00
Prime cost		3,900.00
Overhead cost:		
Machining (45 × £13.83)	622.35	
Assembly (15 × £9.98)	149.70	
Finishing (12 × £9.45)	113.40	
		885.45
Total production cost		4,785.45
Non-production overhead (10%)		478.55
Total cost		5,264.00
Profit mark-up (25%)*		1,316.00
Price for Job XX34		6,580.00

* A profit margin of 20 per cent of selling price is the same as a mark-up of 25 per cent of cost. Check for yourself that the calculated profit margin is in fact 20 per cent of the selling price.

Specific Order Costing

5

Learning Outcomes

After completing this chapter, you should be able to:

- compare and contrast job, batch and contract costing systems;
- prepare ledger accounts for job, batch and contract systems in accordance with SSAP 9.

5.1 Introduction

You now have a good understanding of the basic principles of a range of cost collection and analysis techniques. You should therefore be ready to move on and see how these principles are applied in the context of a number of cost accounting methods.

Every organisation will have its own costing system with characteristics which are unique to that particular system. However, the basic costing method is likely to depend on the type of activity that the organisation is engaged in. The costing system would have the same basic characteristics as the systems of other organisations which are engaged in similar activities.

Specific order costing methods are appropriate for organisations which produce cost units which are separately identifiable from one another. Job costing, batch costing and contract costing are all types of specific order costing that you will learn about in this chapter. In organisations which use these costing methods, each cost unit is different from all others and each has its own unique characteristics.

5.2 Job costing

Job costing applies where work is undertaken according to specific orders from customers to meet their own special requirements. Each order is of relatively short duration. For example, a customer may request the manufacture of a single machine to the customer's own specification. Other examples, this time from service organisations, might be the repair of a vehicle or the preparation of a set of accounts for a client.

The job costing method can also be applied to monitor the costs of internal work done for the organisation's own benefit. For example, job cost cards can be used to collect the costs of property repairs carried out by the organisation's own employees, or they may be used in the costing of internal capital expenditure jobs.

5.2.1 Job cost cards and databases

The main feature of a job costing system is the use of a job cost card or job card which is used to collect the costs of each job. In practice this would probably be a file in a computerised system but the essential feature is that each job would be given a specific job number which identifies it from all other jobs. Costs would be allocated to this number as they are incurred on behalf of the job. Since the sales value of each job can also be separately identified, it is then possible to determine the profit or loss on each job.

The job card would record details of the job as it proceeds. The items recorded would include:

- job number;
- description of the job; specifications, etc.;
- customer details;
- estimated cost, analysed by cost element;
- selling price, and hence estimated profit;
- delivery date promised;
- actual costs to date, analysed by cost element;
- actual delivery date, once the job is completed;
- sales details, for example, delivery note no., invoice no.

An example of a job card prepared for a plumbing job is shown in Figure 5.1. This job would have been carried out on the customer's own premises. The card has a separate section to record the details of each cost element. There is also a summary section where the actual costs incurred are compared with the original estimate. This helps managers to control costs and to refine their estimating process.

5.2.2 Collecting the direct costs of each job

(a) Direct labour

The correct analysis of labour costs and their attribution to specific jobs depends on the existence of an efficient time recording and booking system. For example, timesheets may be used to record how each employee's time is spent, using job numbers where appropriate to indicate the time spent on each job. The wages cost can then be charged to specific job numbers (or to overhead costs, if the employee was engaged on indirect tasks). Figure 5.1 shows that nine direct labour hours were worked on job number 472.

(b) Direct material

All documentation used to record movements of material within the organisation should indicate the job number to which it relates.

For example, a material requisition note should have a space to record the number of the job for which the material is being requisitioned. If any of this material is returned to stores, then the material returned note should indicate the original job number which is to

JOB CARD Job no.: 472

Estimate no.: 897 Job description: Instal shower Model no. 5856

Details: Mrs. P. Johnson
01734 692174
30 Hillside, Whyteham
Price estimate: £330

Date started: 15 June 20×4

MATERIALS					LABOUR						Production overhead		
Date	Req. no.	Qty	Price £	Value £	Date	Emp. no.	Cost ctr	Hrs	Rate	£	Hours	Overhead absorption rate	£
14/6	641	1	128.00	128.00	15/6	17	4	8	10	80.00	9	4.50	40.50
15/6	644	2	3.10	6.20	15/6	12	3	1	10	10.00			
			Total c/f	134.20					Total c/f	90.00		Total c/f	40.50

EXPENSES	
Description	Cost £
Total c/f	

JOB COST SUMMARY		
Cost element	Actual £	Estimate £
Direct materials b/f	134.20	150.00
Direct labour b/f	90.00	80.00
Direct expenses b/f	–	–
Total direct cost	224.20	230.00
Production o/h b/f	40.50	36.00
Total production cost	264.70	266.00
Admin. o/h (5%)	13.24	13.30
Total cost	277.94	279.30
Price estimate	330.00	330.00
Job profit/loss)	52.06	50.70

Job card completed by:

Figure 5.1 Job card

be credited with the cost of the returned material. Figure 5.1 shows that two separate material requisitions were raised for material used on job number 472.

(c) Direct expenses

Although direct expenses are not as common as direct material and direct labour costs, it is still essential to analyse them and ensure that they are charged against the correct job number.

For example, if a machine is hired to complete a particular job, then this is a direct expense of the job. The purchase invoice should be coded to ensure that it is charged to the job. Alternatively, if cash is paid, then the cash book analysis will show the job number which is to be charged with the cost. We can see from Figure 5.1 that no direct expenses were incurred on behalf of job number 472.

5.2.3 Attributing overhead costs to jobs

(a) Production overheads

The successful attribution of production overhead costs to cost units depends on the existence of well-defined cost centres and appropriate absorption bases for the overhead costs of each cost centre.

It must be possible to record accurately the units of the absorption base which are applicable to each job. For example, if machine hours are to be used as the absorption base, then the number of machine hours spent on each job must be recorded on the job cost card. The relevant cost centre absorption rate can then be applied to produce a fair overhead charge for the job.

The production overhead section of the job card in Figure 5.1 shows that the absorption rate is £4.50 per labour hour. The labour analysis shows that 9 hours were worked on this job, therefore the amount of production overhead absorbed by the job is £40.50.

(b) Non-production overheads

The level of accuracy achieved in attributing costs such as selling, distribution and administration overheads to jobs will depend on the level of cost analysis which an organisation uses.

Many organisations simply use a predetermined percentage to absorb such costs, based on estimated levels of activity for the forthcoming period. The following example will demonstrate how this works.

Example

A company uses a predetermined percentage of production cost to absorb distribution costs into the total cost of its jobs. Based on historical records and an estimate of activity and expenditure levels in the forthcoming period, they have produced the following estimates:

Estimated distribution costs to be incurred	£13,300
Estimated production costs to be incurred on all jobs	£190,000

Therefore, predetermined overhead absorption rate for
distribution costs = £13,300/£190,000 × 100% = 7% of production costs

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The plumbing company that has produced the job card in Figure 5.1 uses a predetermined percentage of 5 per cent of total production cost to absorb administration overhead into job costs. You can see the calculations in the job cost summary on the card.

The use of predetermined rates will lead to the problems of under- or over-absorbed overhead which we discussed in the previous chapter. The rates should therefore be carefully monitored throughout the period to check that they do not require adjusting to more accurately reflect recent trends in costs and activity.

5.2.4 A worked example

The following example will help you to practise presenting a cost analysis for a specific job.

Jobbing Limited manufactures precision tools to its customers' own specifications. The manufacturing operations are divided into three cost centres: A, B and C.

An extract from the company's budget for the forthcoming period shows the following data:

Cost centre	*Budgeted production overhead*	*Basis of production overhead absorption*
A	£38,500	22,000 machine hours
B	£75,088	19,760 machine hours
C	£40,964	41,800 labour hours

Job number 427 was manufactured during the period and its job cost card reveals the following information relating to the job:

Direct material requisitioned	£6,780.10
Direct material returned to stores	£39.60
Direct labour recorded against job number 427:	
Cost centre A:	146 hours at £4.80 per hour
Cost centre B:	39 hours at £5.70 per hour
Cost centre C:	279 hours at £6.10 per hour
Special machine hired for this job: hire cost £59.00	
Machine hours recorded against job number 427:	
Cost centre A:	411 hours
Cost centre B:	657 hours
Price quoted and charged to customer, including delivery	£17,200

Jobbing Limited absorbs non-production overhead using the following predetermined overhead absorption rates:

Administration and general overhead	10% of production cost
Selling and distribution overhead	12% of selling price

You are required to present an analysis of the total cost and profit or loss attributable to job number 427.

Solution

First, we need to calculate the predetermined overhead absorption rates for each of the cost centres, using the basis indicated.

$$\text{Cost centre A} = \frac{£38{,}500}{22{,}000} = £1.75 \text{ per machine hour}$$

$$\text{Cost centre B} = \frac{£75{,}088}{19{,}760} = £3.80 \text{ per machine hour}$$

$$\text{Cost centre C} = \frac{£40{,}964}{41{,}800} = £0.98 \text{ per labour hour}$$

Now we can prepare the cost and profit analysis, presenting the data as clearly as possible.

Cost and profit analysis: job number 427	£	£
Direct material (note 1)		6,740.50
Direct labour:		
Cost centre A 146 hours × £4.80	700.80	
Cost centre B 39 hours × £5.70	222.30	
Cost centre C 279 hours × £6.10	1,701.90	
		2,625.00
Direct expenses: hire of jig		59.00
Prime cost		9,424.50
Production overhead absorbed:		
Cost centre A 411 hours × £1.75	719.25	
Cost centre B 657 hours × £3.80	2,496.60	
Cost centre C 279 hours × £0.98	273.42	
		3,489.27
Total production cost		12,913.77
Administration and general overhead (10% × £12,913.77)		1,291.38
Selling and distribution overhead (12% × £17,200)		2,064.00
Total cost		16,269.15
Profit		930.85
Selling price		17,200.00

Note 1

The figure for material requisitioned has been reduced by the amount of returns to give the correct value of the materials actually used for the job.

5.3 Batch costing

The CIMA *Terminology* defines a batch as 'a group of similar articles which maintains its identity throughout one or more stages of production and is treated as a cost unit'. Examples include a batch of manufactured shoes or a batch of programmes printed for a local fete.

You can probably see that a batch is very similar in nature to the jobs which we have been studying so far in this chapter. It is a separately identifiable cost unit for which it is possible to collect and monitor the costs.

The job costing method can therefore be applied in costing batches. The only difference is that a number of items are being costed together, instead of a single item or service.

Once the cost of the batch has been determined, the cost per item within the batch can be calculated by dividing the total cost by the number of items produced.

Batch costing can be applied in many situations, including the manufacture of furniture, clothing and components. It can also be applied when manufacturing is carried out for the organisation's own internal purposes, for example in the production of a batch of components to be used in production.

5.4 Contract costing

Contract costing is another form of specific order costing. It is usually applied to building contracts which are of relatively long duration in comparison with the jobs which we have so far considered. The contracts are undertaken according to specific customer requirements and they are usually carried out on sites away from the organisation's own premises. Contract costing can be used in bridge-building, tunnel construction, motorway construction, shipbuilding and similar long-term works.

5.4.1 Architect's certificates and progress payments

Because of the long-term nature of building work, it is usual for the contract to provide for the customer to make payments as the contract proceeds. These interim payments are known as progress payments.

A surveyor or architect will visit the contract at various stages of its completion. Having inspected the progress of the work, the architect will issue a certificate which states the sales value of the work which has been completed to date. An appropriate invoice can then be sent to the customer, with a copy of the architect's certificate attached to verify the value of the work certified.

5.4.2 Retention money

The contract will usually provide for the customer to pay only a percentage of the value of the work certified. The balance which is not paid is called retention money. The retention percentage varies depending on the terms of the contract, but it is often about 10 per cent of the certified value. The customer retains this amount until an agreed time after the contract is completed, to guard against monetary loss due to unforeseen circumstances arising.

5.4.3 Contract accounts

The objective of contract costing is much the same as that of job costing. The costs of each contract must be systematically collected and monitored. For this purpose a separate account is maintained for each contract. All of the costs of the contract are collected in the account, which can then be used to assist in determining the contract profit.

The long-term nature of contracts means that they often span more than one accounting period. If a contract is still in progress at the end of the company's financial year, then it is necessary to value the contract work in progress for balance sheet purposes. In addition a calculation is performed to determine how much profit has been earned on the contract during the year and this amount is credited to the total company's income statement (profit and loss account) for the year. The profit on a contract is thus recognised in stages as the contract progresses, instead of waiting until the contract is completed to recognise any profit.

The reason for this is to attempt to present a true and fair view of the company's performance. It avoids the excessive fluctuations in reported profits which may arise if profits are recognised only when contracts are completed. For example, if several contracts were completed in one year, then the reported profits would be very high. In the next year there may be no contracts completed at all and excessive losses would be reported. Anybody who was trying to use the company's accounts to assess its performance would find it very difficult to make any judgements based on such wildly fluctuating reported profits. Reporting the profits as the contract progresses helps to smooth out these fluctuations.

5.4.4 Accounting for contract materials

Materials delivered to the contract site could come from the organisation's own inventories (stocks) or they could be delivered direct to the site by the supplier. In both cases the movement of the materials must be carefully documented so that the correct contract is charged with the receipt of the materials. The contract account would be debited with the cost of the materials delivered. If any material is returned to stores or to the supplier, then the necessary documentation would be raised and the cost of these materials would be credited to the contract account.

At the end of the accounting period there will often be some material still on site which is to be used in the next period. The cost of this material stock will be credited to the contract account for the period and carried down as a debit balance at the start of the next period.

Exercise 5.1

What documentation would be used to record (i) the movement of material from stores to a contract; (ii) the cost of materials delivered from the supplier to a contract site?

Solution

(i) Materials requisition note.
(ii) Supplier's invoice and a goods received note.

5.4.5 Accounting for plant used on the contract

Various types of heavy plant are used on building contracts, for example cranes, bulldozers and cement mixers. The plant is often transferred from one contract to another as it is needed. As with the movements of materials, it is important that plant movements are carefully documented and controlled. The objective is to ensure that the contract receives a fair charge for the depreciation of the plant while it has been used on the contract. There are two main ways in which this can be accomplished.

(a) Valuing the plant on transfer

With this method the plant is valued when it is transferred to the contract and this amount is debited to the contract account. The plant is then valued again when it is transferred from the contract and the value is credited to the contract account. The difference between these two amounts represents the depreciation which has been charged to the contract.

If the plant is still in use on the contract at the end of an accounting period, then the value of the plant remaining on site is credited to the account and carried forward as a debit balance into the next period. In this way, each accounting period will receive a fair charge for plant depreciation.

(b) Calculating the depreciation charge

With this method the contract is simply charged a proportion of the annual depreciation for the plant, depending on the length of time it was used on the contract. This method would be more appropriate for a plant which is moved frequently and which does not stay on any one contract for a long time.

5.4.6 Cost classification in contract costing

An important point to appreciate is that, because of the nature of the work undertaken when contract costing is applied, many costs that would in most circumstances be indirect costs are, in fact, direct costs of the contract.

Contract work is usually undertaken on a large scale at the customer's own premises – for example, when building a hospital or constructing a new road. Each contract will often be large enough to merit the employment of a full-time supervisor and perhaps the installation of its own telephone line and electricity services. This means that costs such as supervisors' salaries and telephone and electricity expenses would be a direct cost of the contract, because they can be specifically identified with it. Contrast this with the more common situation, with other costing methods, where these items are classified as indirect costs and it is necessary to attribute them as fairly as possible to several different cost centres or cost units.

5.4.7 Calculating contract profit and preparing balance sheet entries

When calculating the profit to be recognised on uncompleted contracts, it is essential that the requirements of the prudence concept are adhered to, that is, that profits are not overstated and a conservative view is taken. Indeed if a loss is foreseen on completion of the project, then the whole of the future loss should be taken into account as soon as possible.

The best way to see how contract costing works is to study it in the context of the following example.

5.4.8 Contract costing: a worked example

On 3 January, year 8, B Construction Ltd started work on the construction of an office block for a contracted price of £750,000 with completion promised by 31 March, year 9. Budgeted cost of the contract was £600,000. The construction company's financial year end was 31 October, year 8, and on that date the accounts appropriate to the contract contained the following balances:

	£000
Materials issued to site	161
Materials returned from site	14
Wages paid	68
Own plant in use on site, at cost	96
Hire of plant and scaffolding	72
Supervisory staff:	
direct	11
indirect	12
Head office charges	63
Value of work certified to 31 October, year 8	400
Cost of work completed but not yet certified	40
Cash received related to work certified	330

Depreciation on own plant to be provided at the rate of 12.5 per cent per annum on cost.
£2,000 is owing for wages.
Estimated value of materials on site is £24,000.

No difficulties are envisaged during the remaining time to complete the contract.

You are required to:

(a) prepare the contract account for the period ended 31 October, year 8, and show the amount to be included in the construction company's income statement (profit and loss account) for that period;

(b) show extracts from the construction company's balance sheet at 31 October, year 8, so far as the information provided will allow.

Solution

If we are attempting to calculate the notional profit on the contract to date, the first thing that we need to know is the total cost incurred in the period. This can then be matched against the revenue earned to determine the notional profit to date.

The matching concept requires that the correct costs and revenues are matched together. The revenue is given by the value of the work certified, as indicated on the architect's certificates. This revenue must be matched against the cost of the work certified.

A contract account is used to collect the costs incurred. Any costs which relate to future periods must be carried forward in the account, and must not be matched against the revenue for this period.

The figures in brackets refer to the explanatory notes which follow the account.

Office block contract account to 31 October, year 8

	£000		*£000*
Materials issued	161	Material returned (2)	14
Wages paid	68	Materials on site c/d (4)	24
Plant at cost (1)	96	Plant on site c/d (1)	86
Hire of plant and scaffolding	72	Cost of work not certified c/d (5)	40
Supervisory staff:		Cost of work certified c/d (6)	321
direct	11		
indirect	12		
Head office charges	63		
Wages accrued c/d (3)	2		
	485		485

Notice that the cash received from the customer is not entered in the contract account, and neither is the value of work certified. These are not items of cost information, but they will help later in determining the notional profit to date.

Office block contract account from 1 November, year 8

	£000		*£000*
Material on site b/d (4)	24	Wages accrued b/d (3)	2
Plant on site b/d (1)	86		
Cost of work not certified b/d (5)	40		
Cost of work certified b/d (6)	321		

At the start of the next financial year the account contains all of the brought-forward balances from the previous year.

Explanatory notes

1. *Depreciation of plant.* As explained earlier in this chapter, the depreciation charge can be calculated and charged to the contract, or the remaining value of plant on site can be carried forward into the next period. The net effect is the same, but in this example it seems more logical to show the value of the plant carried forward, to reflect the continuing nature of the contract.

   Make sure that you do not make the common mistake of including the value of the plant *and* the depreciation charge. This would be double-counting.

	£000
Value of plant delivered to site	96
Depreciation while in use:	
10/12 × (£96,000 × 12.5%)	10
Value of plant carried down to next period	86

   Did you notice that the plant was in use for only ten months of the year, *not* for the whole year?

   The net effect of the debit of £96,000 and the credit of £86,000, in the contract account to 31 October, is to charge the correct amount of £10,000 for depreciation.
2. *Materials returned.* The materials returned from the site are credited to the contract and debited to the central stores account.
3. *Wages accrued.* This entry ensures that the correct amount is charged for wages in the period. The credit entry is carried down into the account for next period. Therefore when the wages are actually paid next period, the credit entry will be netted against the payment and there will be no effect on next period's costs.

   The application of the accruals concept ensures that the correct cost is matched against the revenue for the period.
4. *Materials on site.* These materials have not yet been used and their cost is carried down into the next period. If this was not done, then the cost of the work certified would be overstated.
5. *Cost of work not certified.* You should keep in mind all the time the fact that we are trying to determine a cost for the work certified, to be matched against the value of the architect's certificates. This amount of £40,000 is the cost incurred since the architect's visit. The architect would not therefore have seen this work and would not have included its value in the certificates issued. The cost must be carried forward into next period, so that it can be matched against the value when the architect does certify it.
6. *Cost of work certified.* Now that all of the adjustments have been made to carry forward the costs that do not relate to the work certified, the balance on the account must be the cost of work certified.

The cost of work certified can now be matched against the value of work certified to determine the notional profit for the period:

	£000
Value of work certified to 31 October, year 8	400
Cost of work certified to 31 October, year 8	321
Notional profit to date	79

Before any profit can be recognised on a contract, three questions must be asked:

1. *Is the contract in its early stages?* If it is, then it is not possible to foresee the final outcome with reasonable certainty and no profit should be taken. In our example, the contract has incurred more than half of its budgeted cost and has earned more than half its revenue. Therefore, the answer to this first question is 'no', and it seems reasonable to recognise some profit on the contract.
2. *Are any losses evident on this contract?* If there is a notional loss to date, or a loss is foreseen on completion of the contract, then all of the foreseen loss must be recognised now. Once again, the answer to this question is 'no', and we can proceed to the third question.
3. *Are any difficulties foreseen?* It may be possible to foresee difficulties arising during the remaining time to complete the contract. These difficulties may not actually result in losses, but any costs should be provided for in full as soon as they are foreseen. In this example there are no difficulties envisaged.

Since the answer to each of these three questions is 'no', it seems reasonable to proceed and calculate an amount of profit to be recognised in B Construction Ltd's accounts for the year ending 31 October, year 8. Later in this chapter you will see how to deal with the situations when the answers to these questions are 'yes'.

It is not prudent to take the whole of the notional profit to date, therefore the following formula will be used in this example:

$$\text{Profit to be recognised} = \text{notional profit to date} \times \frac{\text{cash received}}{\text{value of work certified}}$$

Taking this fraction of the notional profit is allowing for the fact that the customer has withheld some retention money.

Sometimes the amount to be taken is further reduced, by multiplying this result by a fraction of $\frac{2}{3}$ or $\frac{3}{4}$. This is a prudent approach which stems from the traditional practice in the construction industry and would also produce a perfectly acceptable profit figure for this example.

The figures can now be inserted into the formula.

$$\text{Profit to be recognised} = £79{,}000 \times \frac{£330{,}000}{£400{,}000} = £65{,}175 \text{ say } £65{,}000$$

This is an acceptable solution to the remainder of part (a) in our example: the amount to be included in the construction company's income statement (profit and loss account) for the period ended 31 October, year 8 is £65,000. This would affect the construction company's accounts as follows:

	£000
Cost to be charged to profit and loss account in respect of this contract	321
Profit to be recognised	65
Therefore, revenue to be credited to profit and loss account	386

It is important that you should realise that this is just one of many methods which could be used to calculate the profit to be recognised on the contract. Another common practice is to forecast the total profit which will be earned on completion of the contract, and then to take a proportion of this profit according to the estimated degree of completion to date.

The estimate of the degree of completion is based on the revenue or the cost incurred to date, as follows:

$$\text{Profit to be recognised} = \text{estimated final profit on contract} \times \frac{\text{cost incurred to date}}{\text{estimated final contract cost}}$$

or

$$\text{Profit to be recognised} = \text{estimated final profit on contract} \times \frac{\text{revenue earned to date}}{\text{estimated final contract revenue}}$$

These amounts of profit can be reduced to allow for any retention monies.

The method of looking forward to the final profit on the contract is most commonly used when a contract is nearing completion. This means that it is possible to forecast the costs and revenues to completion (and therefore the final profit) with reasonable certainty.

Many different methods could be used to determine the amount of profit to be recognised. The most important thing from the point of view of the assessment is to read the question carefully to check what information is available and follow any instructions given concerning the calculation of profit.

Now you need to learn how to deal with part (b) of the question: showing the relevant extracts from the company's balance sheet.

There will be three items in the company's balance sheet in respect of this contract. (Figures in brackets refer to the explanatory notes which follow.)

(a) The contract debtor account (account receivable)

The contract debtor account will look like this:

Office block contract debtor

	£000		£000
Sales (1)	386	Bank (2)	330
		Balance c/d	56
	386		386

Explanatory notes

1. The revenue of £386,000, which was calculated earlier, will be credited to the sales account and debited to the debtor account.
2. The cash received related to the work certified, as specified in the question, will be debited to the bank account and credited to the debtor account.

The balance of £56,000 on the debtor account will be shown within debtors in the company's balance sheet, classified as 'amounts recoverable on long-term contracts'.

The other balance sheet extracts will relate to the remaining balances brought down on the contract account which you saw earlier.

Office block contract account from 1 November, year 8

	£000		£000
Material on site b/d	24	Wages accrued b/d	2
Plant on site b/d	86		
Cost of work not certified b/d	40		

The £321,000 cost of work certified is not shown because it has now been transferred to the company's profit and loss account.

(b) The plant on site

The £86,000 book value of the plant on site will be shown under non-current assets (fixed assets) on the balance sheet.

(c) The other contract balances

The remaining balance of £62,000 (£24,000 + £40,000 − £2,000) will be shown within stock on the company's balance sheet, classified as 'long-term contract balances'.

Hopefully, you will agree that once the profit figure has been determined, the calculation of the balance sheet extracts in this example is relatively straightforward.

Unfortunately, complications can arise and you should know how to deal with them.

(a) *If the contract is in its early stages, say, less than 30 per cent complete*. In this case, it is not possible to assess the final outcome of the contract with reasonable certainty and no profit should be taken.

If this were the case in our example, then profit would be zero and revenue of £321,000 would be taken to the income statement (profit and loss account). This is exactly equal to the cost of work certified to date, £321,000, which would also be transferred to profit and loss, resulting in neither a profit nor a loss. The revenue figure is now less than the amount received from the customer and there would be a credit balance on the customer account as follows:

Office block contract debtor

	£000		*£000*
Sales	321	Bank	330

The £9,000 excess would be set off against the £62,000 long-term contract balances identified earlier, which would now be shown within inventory (stock) as 'long-term contract balances £53,000'.

A complication which can arise (but not in this example) is when the credit balance on the customer account exceeds the figure for long-term contract balances (i.e. if the credit balance had been greater than £62,000). In this situation the excess which cannot be offset should be shown within payables (creditors) as 'payments on account'.

(b) *If the contract incurs a loss*. If a loss is foreseen on the contract, then the whole of the loss should be shown immediately, even if there is a notional profit to date. Suppose that because of problems envisaged before completion, the forecast loss on the office block contract in our example is £100,000. The charge to cost of sales would then be increased to allow for the full amount of loss, by creating a provision for contract losses.

	£000
Value of work certified to 31 October, year 8	400
Charge to cost of sales for year ended 31 October, year 8	500
Loss on contract	(100)

The relevant ledger accounts would look like this:

Office block contract debtor

	£000		*£000*
Sales	400	Bank	330
		Balance c/d	70
	400		400

Company cost of sales account (extract)

	£000		*£000*
Office block contract:			
Cost of work certified	321		
Provision for losses	179		
	500		

Provision for contract losses

	£000		*£000*
		Cost of sales	179

The sales value of £400,000 and the cost of sales of £500,000 would be transferred to the profit and loss account, thus recognising the full expected loss of £100,000.

The debtor of £70,000 would be disclosed as before within debtors as 'amounts recoverable on contracts'.

The £179,000 provision for losses should be offset against the long-term contract balances, which amount to £62,000 in our example. Where the provision exceeds the long-term contract balances, as in this example, the excess should be included within 'provisions for foreseeable losses'. This means that there will be no entry under inventories (stocks) for this contract, but instead there will be an amount of £117,000 shown under 'provisions for foreseeable losses' (which may alternatively be designated 'provisions for liabilities and charges').

5.4.9 Contract costing: a second example

Work carefully through this next example, checking that you understand all the workings. It uses data taken from an article published in the February 1996 issue of *CIMA Student*.

This example will show you how to use one of the alternative methods of determining the notional profit to date.

E Ltd, a construction company, has two sites on which it is building residential homes. Site A was started on 1 November 1994 and is expected to be completed by 30 June 1996. Site B was started on 1 October 1995 and is not due for completion until 30 April 1997.

The company's financial year ends on 31 December.

The following details relate to the contracts as at 31 December 1995.

	Site A	*Site B*
	£000	*£000*
Work in progress (1 January 1995)	51	
Materials sent to site	193	63
Materials returned from site	11	3
Plant sent to site	75	40
Material on site (31 December 1995)	6	25
Direct wages paid	142	48
Other site expenses paid	46	13
Cost of work certified	315	44
Cash received from clients	475	38

Notes:

1. The plant was sent to site at the commencement of the contract. For site A, the value shown is its net book value at 1 January 1995 and for site B, the value shown is that at the commencement of the contract. Depreciation is to be provided using the reducing balance method at an annual rate of 20 per cent.
2. At 31 December 1995 there were wages outstanding of £2,000 at site A and £1,000 at site B.
3. The cash received from clients represents the value of work certified and invoiced less an agreed retention of 5 per cent. Apart from the retention there were no amounts outstanding from clients at 31 December 1995.
4. The total contract prices are £600,000 for site A and £400,000 for site B.
5. The estimated costs to complete the work at the sites is £110,000 at site A and £240,000 at site B.
6. No profit was recognised in respect of site A in the financial year ended 31 December 1994.

Solution

The first step is to prepare a contract account for each of the sites. For ease of presentation our solution shows the accounts side by side in a columnar format.

Contract accounts to 31 December 1995

	A	*B*		*A*	*B*
	£000	*£000*		*£000*	*£000*
Work in progress b/d	51		Materials returned from site	11	3
Materials sent to site	193	63	Material on site c/d	6	25
Plant sent to site	75	40	Plant on site c/d (see note)	60	38
Direct wages paid	142	48	Cost of work certified c/d	315	44
Other site expenses paid	46	13	Cost of work not certified c/d		
Wages accrued c/d	2	1	(balancing figures)	117	55
	509	165		509	165

Note: Depreciation of plant

Site A = £75,000 × 20% = £15,000
Value of plant on site c/d = £75,000 − £15,000 = £60,000
Site B = £40,000 × 20% × $\frac{3}{12}$ = £2,000
Value of plant on site c/d = £40,000 − £2,000 = £38,000

Note that the plant is in use at site B for only 3 months.

The next step is to calculate the profit to be taken on each contract. We are given information about the costs to complete the work at each site. Therefore, we will base the amount of profit to be recognised on the estimated final profit on the contract, taking account of the degree of completion.

The degree of completion can be measured using either sales values or costs.

	Site A	*Site B*
Using sales values		
Value certified (note 1):		
£475,000 × $\frac{100}{95}$	£500,000	
£38,000 × $\frac{100}{95}$		£40,000
Contract price	£600,000	£400,000
Degree of completion:		
$\frac{500}{600}$	83.3%	
$\frac{40}{400}$		10.0%
Using cost values		
Cost incurred/estimated total cost (notes 2, 3):		
$\frac{£432,000}{£542,000}$	79.7%	
$\frac{£99,000}{£339,000}$		29.2%

Notes

1. The agreed retention is 5 per cent. Therefore, the cash received from clients is multiplied by $\frac{100}{95}$ to determine the value certified.
2.

	Site A	*Site B*
	£000	*£000*
Cost incurred to date:		
cost of work certified	315	44
cost of work not certified	117	55
	432	99

3.

	Site A	*Site B*
	£000	*£000*
Estimated total costs:		
costs incurred to date	432	99
estimated costs to complete	110	240
	542	339

You can see that there is a difference in the estimated degree of completion calculated using each method. Whichever method is used it must be applied consistently.

You can also see that the degree of completion at site B is small. Therefore, it is not prudent to recognise any profit on this contract at this stage. As a general guide, no profit should be recognised until a contract is at least 30 per cent complete.

For contract A, the profit to be recognised is as follows:

	Site A
	£000
Contract price	600
Estimated total cost	542
Estimated final profit on contract	58
Degree of completion*: × 79.7%	
Profit to be recognised = £46,000	(to the nearest £000)

* The most prudent figure is taken for degree of completion (i.e. the lowest figure).

This would affect E Ltd's accounts as follows:

	Site A	*Site B*
	£000	*£000*
Cost to be charged to P&L a/c	315	44
Profit to be recognised	46	–
Revenue to be credited to P&L a/c	361	44

Cost of work certified is charged to the profit and loss account.

Contract debtor accounts

	Site A	*Site B*		*Site A*	*Site B*
	£000	*£000*		*£000*	*£000*
Sales	361	44	Bank	475	38
Balance c/d	114		Balance c/d		6
	475	44		475	44

The net balance on the debtor account for site A is a credit balance of £114,000. This can be offset against other long-term contract balances.

Payments received in respect of site A are £114,000 higher than the revenue recognised in the period.

Long-term contract balances

	Site A	*Site B*	*Total*
	£000	*£000*	*£000*
Material on site	6	25	31
Cost of work not certified	117	55	172
Less wages accrued	(2)	(1)	(3)
	121	79	200
Offset credit balance on debtors – site A	(114)		(114)
Long-term contract balances	7	79	86
Amounts recoverable on long-term contracts*		6	6

* This is the debtor balance on the contract for site B.

Plant

The £98,000 book value of the plant on site will be shown under non-current (fixed) assets on the balance sheet.

If you do happen to refer to the original article from which this example is taken you will see that different figures are shown for debtors and long-term contract balances. This is because a different basis was used to calculate the revenue to be credited to profit and loss.

The most important figure from the point of view of cost accounting, that is, the profit to be recognised, is the same. The most important aspects are to apply the selected basis consistently and to record correctly the consequent effect on the balance sheet.

5.4.10 Contract costing: a final example

Try to produce your own answer to this example before you read the solution.

S Ltd is building an extension to a local factory. The agreed contract price is £300,000. The contract commenced on 1 March year 2 and is scheduled for completion on 30 June year 3.

S Ltd's financial year ends on 31 December.

The following details are available concerning the factory contract as at 31 December year 2.

	£000
Materials sent to site from central stores	15
Materials delivered to site direct from suppliers	70
Plant delivered to site (net book value)	40
Direct wages paid	73
Direct site expenses paid	38
Head office charges	12
Material returned from site to central stores	6
Value of work certified, 31 December year 2	230
Net book value of plant on site, 31 December year 2	32
Materials on site, 31 December year 2	4
Direct wages owing at 31 December year 2	3
Cash received from customer	207
Estimated cost to complete the contract	125

You are required to prepare the contract account for the period ended 31 December year 2, and to show the amount to be included in S Ltd's profit and loss account in respect of the contract for that period.

Solution

Factory extension contract account to 31 December, year 2

	£000		£000
Materials from stores	15	Materials returned to stores	6
Materials from suppliers	70	Plant on site c/d	32
Plant delivered to site	40	Materials on site c/d	4
Direct wages paid	73	Cost of work to date (balancing figure)	209
Direct site expenses paid	38		
Head office charges	12		
Wages accrued c/d	3		
	251		251
Plant on site b/d	32	Wages accrued b/d	3
Materials on site b/d	4		

In order to decide whether a profit should be recognised on the contract we will refer to the questions detailed in Section 5.4.8.

1. *Is the contract in its early stages?* No, the contract has been operating for 10 months and now has only 6 months to completion.
2. *Are any losses evident on the contract?* Yes, the following calculation shows that a loss is foreseen, therefore the whole of the future loss should be taken into account now.

	£000
Cost of work to date (from contract account)	209
Estimated cost to complete the contract	125
Total cost of contract	334
Agreed contract price	300
Expected loss on contract	(34)

The charge to cost of sales must allow for the full amount of the loss and the amount to be included in S Ltd's profit and loss account for the period is as follows:

	£000	
Value of work certified to 31 December year 2	230	(Revenue credited to company profit and loss)
Charge to cost of sales for year ended 31 December year 2*	264	(Cost of sales debited to company profit and loss)
Expected loss on contract	(34)	

* The charge to cost of sales is the 'balancing' figure required to record a loss of £34,000 when it is offset against the £230,000 value of work certified.

5.5 Summary

Having read this chapter the main points that you should understand are as follows.

1. Specific order costing methods are appropriate for organisations that produce cost units which are separately identifiable from each other. Job costing, batch costing and contract costing are all specific order costing methods.
2. Job costing applies where work is undertaken according to individual customer requirements. Each job is of relatively short duration and may be undertaken on the customer's premises or on the contractor's premises.
3. Contract costing also applies where work is undertaken according to individual customer requirements, but each contract is usually of longer duration. Contracts frequently span more than one accounting period and are often constructional in nature.
4. Batch costing is a form of job costing where each batch of similar items is a separately identifiable cost unit.
5. In a job costing system, each job is given a unique number and the costs of each job are collected and analysed on a job card.
6. As a contract progresses the work completed is certified at various stages by an architect and the customer will make progress payments to the contractor. The customer might not pay the full amount of the value certified because retention monies are often held in case unforeseen circumstances arise.
7. In order to avoid wide fluctuations in reported profits an estimate may be made of the profit earned on an incomplete contract to date and this profit may be recognised in the contractor's income statement (profit and loss account).
8. Profit may be recognised on an incomplete contract as long as it is not in its early stages, its outcome can be reasonably foreseen and no adverse circumstances are expected. If a loss is expected on a contract then the whole of the loss must be provided for immediately.
9. Many different methods may be used to calculate the profit to be recognised on an incomplete contract. It is essential that the method selected is prudent and that it is applied consistently.

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Revision Questions 5

Question 1 Multiple choice

1.1 Which of the following are characteristics of job costing?

(i) Customer-driven production.
(ii) Complete production possible within a single accounting period.
(iii) Homogeneous products.

(A) (i) and (ii) only.
(B) (i) and (iii) only.
(C) (ii) and (iii) only.
(D) All of them.

1.2 Which of the following are characteristics of contract costing?

(i) Homogeneous products.
(ii) Customer-driven production.
(iii) Short timescale from commencement to completion of the cost unit.

(A) (i) and (ii) only.
(B) (ii) and (iii) only.
(C) (i) and (iii) only.
(D) (ii) only.

1.3 In a job costing system, which of the following documents is used to record the issue of a direct material to a job?

(A) Goods received note.
(B) Materials requisition.
(C) Purchase order.
(D) Purchase requisition.

1.4 The following items may be used in costing jobs:

(i) Actual material cost.
(ii) Actual manufacturing overheads.
(iii) Absorbed manufacturing overheads.
(iv) Actual labour cost.

Which of the above are contained in a typical job cost?

(A) (i), (ii) and (iv) only.
(B) (i) and (iv) only.

(C) (i), (iii) and (iv) only.
(D) All four of them.

Data for questions 1.5 and 1.6

A firm uses job costing and recovers overheads on direct labour cost.

Three jobs were worked on during a period, the details of which were:

	Job 1	*Job 2*	*Job 3*
	£	£	£
Opening work-in-progress	8,500	0	46,000
Material in period	17,150	29,025	0
Labour for period	12,500	23,000	4,500

The overheads for the period were exactly as budgeted: £140,000.

1.5 Jobs 1 and 2 were the only incomplete jobs. What was the value of closing work in progress?

(A) £81,900
(B) £90,175
(C) £140,675
(D) £214,425

1.6 Job 3 was completed during the period and consisted of a batch of 2,400 identical circuit boards. The firm adds 50 per cent to total production costs to arrive at a selling price. What is the selling price of a circuit board?

(A) It cannot be calculated without more information.
(B) £31.56
(C) £41.41
(D) £58.33

1.7 BH Ltd is currently undertaking a contract to build an apartment block. The contract commenced on 1 January year 2 and is expected to take 13 months to complete. The contract value is £54m. The contractor's financial year ends on 30 September.

The contract account for the building of the apartment block indicates the following situation at 30 September year 2:

Value of work certified	£30m
Costs incurred to date	£20m
Future costs to completion	£28m

The amount of profits to be recognised is based on the value of work certified to date. It is company policy not to recognise profit on contracts unless the value certified is at least 50 per cent of the total contract value.

The maximum amount of profit/loss for the contract that can be taken to the profit and loss account for the year ended 30 September year 2 is:

(A) Nil
(B) £1.99m
(C) £3.33m
(D) £5.55m.

Question 2 Short objective-test questions

2.1 Match the organisational activities below to the most appropriate costing method by writing (a), (b) or (c) in the box provided.

Costing methods

(a) Job costing
(b) Batch costing
(c) Contract costing

Organisational activities

- Accounting and taxation services ☐
- Shoe manufacturing ☐
- Plumbing and heating repairs ☐
- Road building ☐
- Building maintenance and repairs ☐

2.2 Calculate the selling price for each job (a) to (c) (to the nearest penny), and write the correct answer in the box provided.

(a) Total cost of job = £45. Profit mark-up = 25 per cent of cost. Job selling price = £☐.
(b) Production cost of job = £38. Percentage to be added to production cost to absorb general overheads = 10 per cent. Profit mark-up = 20 per cent of total cost. Job selling price = £☐.
(c) Total cost of job = £75. Profit margin = 15 per cent of selling price. Job selling price = £☐.

2.3 Is the following sentence *true* or *false*? Tick the correct box.
Interim payments that are received from a customer as a contract progresses are known as retention monies.

True ☐
False ☐

2.4 A plant with a net book value of £40,000 is delivered to contract ZX on 31 March. The plant is still in use on the contract at the company's year end, 31 December. Company policy is to depreciate all contract plant on a reducing balance basis, at a rate of 25 per cent per annum.

Complete the box in the contract account to show how the plant would be accounted for.

Contract ZX [extract]

		£			£
31 Mar.	Plant delivered to contract	40,000	31 Dec.	Plant c/d	☐

2.5 The cost incurred on contract D372 to date is £465,000. The contract is 80 per cent complete and no problems are foreseen before its completion. The value of work certified is £545,000 and the cost of work not certified is £35,000. Cash received from the customer is £517,750. The profit and revenue to be recognised on the contract are to be calculated as follows:

$$\text{Profit to be recognised} = \text{Notional profit to date} \times \frac{\text{Cash received}}{\text{Value of work certified}}$$

$$\text{Revenue to be recognised} = \text{cost of work certified} + \text{profit recognised to contract}$$

The revenue to be credited to the company profit and loss account in respect of contract D372 is £ ☐.

2.6 A company calculates the prices of jobs by adding overheads to the prime cost and adding 30 per cent to total costs as a profit margin. Complete the following job cost summary information:

Job Y256	£
Prime cost	☐
Overheads	694
Total cost	☐
Profit margin	☐
Selling price	1,690

2.7 A particular contract has earned a nominal profit to date but the contract overall is expected to incur a loss by the time it is completed. The loss should not be recognised in the accounts until the period when the loss actually occurs.

True ☐
False ☐

2.8 A commercial decorating organisation budgets for four per cent idle time on all its jobs.

The estimated number of active labour hours required to complete decorating job no. D47 is 120 hours. The hourly labour rate is £11.

The estimated labour cost of job no. D47 is (to the nearest £) £ ☐.

Question 3 Batch costing

Jetprint Ltd specialises in printing advertising leaflets and is in the process of preparing its price list. The most popular requirement is for a folded leaflet made from a single sheet of A4 paper. From past records and budgeted figures, the following data has been estimated for a typical batch of 10,000 leaflets.

Artwork	£65
Machine setting	4 hours £22 per hour
Paper	£12.50 per 1,000 sheets
Ink and consumables	£40
Printers' wages	4 hours at £8 per hour (*Note:* Printers' wages vary with volume.)

General fixed overheads are £15,000 per period, during which a total of 600 labour hours are expected to be worked.

The firm wishes to achieve 30 per cent profit on sales.

Requirements

(a) The selling prices (*to the nearest pound*) per thousand leaflets for quantities of:

(i) 10,000 leaflets is £ ☐
(ii) 20,000 leaflets is £ ☐

(b) During the period, the firm printed and sold 64 batches of 10,000 leaflets and 36 batches of 20,000 leaflets. All costs were as expected.

(i) General fixed overhead for the period was (tick the correct box):
☐ under-absorbed
☐ over-absorbed
(ii) The value of the under- over-absorption of general fixed overhead was £ ☐.

Question 4 Contract costing

HR Construction plc makes up its accounts to 31 March each year. The following details have been extracted in relation to two of its contracts as at 31 March 20X5:

	Contract A	*Contract B*
Commencement date	1 April 20X4	1 December 20X4
Target completion date	31 May 20X5	30 June 20X5
Retention %	4	3
	£000	*£000*
Contract price	2,000	550
Materials sent to site	700	150
Materials returned to stores	80	30
Plant sent to site	1,000	150
Materials transferred to contract B	40	–
Materials transferred from contract A	–	40
Materials on site 31 March 20X5	75	15
Value certified	1,500	500
Cost of work certified	1,065	453
Cost of work not certified	160	20
Estimated cost of completion	135	110

Depreciation is charged on plant using the straight-line method at the rate of 12 per cent p.a.

Requirements

(a) The net book value of the plant on site at 31 March 20X5 is:

(i) Contract A: £ ☐
(ii) Contract B: £ ☐

(b) The total cost of materials for the contracts to 31 March 20X5 is:

(i) Contract A: £ ☐
(ii) Contract B: £ ☐

(c) HR's policy is to recognise profit on uncompleted contracts as:

$$\text{Estimated total contract profit} \times \frac{\text{Value certified}}{\text{Contract price}}$$

(i) The profit to be recognised on contract A to date is £ $\boxed{}$

(ii) The charge to cost of sales in respect of contract B to date is £ $\boxed{}$

Solutions to Revision Questions 5

☑ Solution 1

- If you are reduced to guessing the answer to a multiple-choice question, remember to eliminate first those answers that you know to be incorrect. Then, select an answer from the remaining options. This technique would be particularly useful for questions 1.1–1.3.
- If you have forgotten what you have learned about materials documentation, revisit Chapter 2 before attempting question 1.3.

1.1 Answer: (A)

Job costing applies to situations where work is carried out to customer specifications, and each order is of relatively short duration. Each job is separately identifiable, therefore characteristic (iii) is incorrect.

1.2 Answer: (D)

Contract costing applies to situations where work is carried out to customer specifications, and typically each contract takes more than one year to complete. Thus, only (ii) is correct.

1.3 Answer: (B)

The *materials requisition* is completed by the production department. It acts as a formal request for the necessary material to be issued from stores. It will indicate the job number to be charged with use of the materials.

The *goods received note* is completed by the storekeeper to record the entry of stock into stores when it is received from the supplier.

The *purchase order* is raised by the purchasing department and sent to the supplier when more stock is needed in stores.

The *purchase requisition* is completed by the storekeeper as a formal request to the purchasing function to obtain the materials needed to replenish stock. A purchase order will then be completed and sent to the supplier.

1.4 Answer: (C)

Overheads are absorbed into the cost of each job as the period progresses, using a predetermined overhead absorption rate. It is not usually possible to identify the actual overhead cost for each individual job – therefore option A is incorrect.

Option (B) is incorrect because it does not include any overhead cost. Option (D) is incorrect because it includes a double charge for overhead.

1.5 Answer: (D)

$$\text{Overhead absorption rate} = \frac{£140{,}000}{£40{,}000} \times 100\% = 350\% \text{ of direct labour.}$$

Work in progress valuation	*£*	*£*
Costs given in question:		
Job 1	38,150	
Job 2	52,025	
		90,175
Overhead absorbed:		
Job 1 £12,500 × 350%	43,750	
Job 2 £23,000 × 350%	80,500	
		124,250
		214,425

1.6 Answer: (C)

	Job 3
	£
Costs given in question	50,500
Overhead absorbed: £4,500 × 350%	15,750
Total production cost	66,250
Mark up 50%	33,125
Sales value of batch	99,375

Selling price per circuit board $\left(\frac{99{,}375}{2{,}400}\right)$ = £41.41.

1.7 Answer: (C)

The value certified is more than 50 per cent of the total contract value (£30m/£54m = 56%), therefore a profit can be recognised on this contract.

The maximum amount of profit that might be recognised at 30 September is as follows:

	£m
Contract value	54
Less:	
Costs to date	(20)
Future costs	(28)
Expected profit	6

Profit to be recognised = £6m × (£30m/£54m) = £3.33m.

Solution 2

2.1
- Accounting and taxation services (a)
- Shoe manufacturing (b)

- Plumbing and heating repairs (a)
- Road building (c)
- Building maintenance and repairs (a) (the cost units are probably of relatively short duration)

2.2 (a) £45 + 25% = £56.25
(b) £38 + 10% = £41.80 total cost + 20% = £50.16
(c) Note that the margin is expressed as a percentage of selling price: £75$\times \frac{100}{85}$ = £88.24

2.3 *False*. This is a description of progress payments.

2.4

CONTRACT ZX (extract)

		£			£
31 Mar.	Plant delivered to contract	40,000	31 Dec.	Plant c/d*	32,500

* Depreciation for 9 months = £40,000 × 25% × $\frac{9}{12}$ = £ 7,500
∴ Net book value of plant at 31 December = £40,000 − £ 7,500 = £32,500

2.5 The revenue to be credited to the company profit and loss account in respect of contract D372 is £539,250. The contract is 80 per cent complete and no problems are foreseen, therefore it is acceptable to recognise a profit on the contract.

	£000
Value of work certified	545
Cost of work certified (£465,000 − £35,000)	430*
Notional profit to date	115

$$\text{Profit to be recognised} = £115{,}000 \times \frac{£517{,}750}{£545{,}000} = £109{,}250$$

	£
Cost of work certified	430,000*
Profit to be recognised	109,250
Revenue to be credited to company profit and loss	539,250

2.6

- In this question the profit is calculated as a percentage of cost. Sometimes the profit is expressed as a percentage of selling price so be sure to read the question carefully.
- Calculate the total cost first, then the remaining answers can be slotted in as balancing figures.

Job Y256	£
Prime cost	606
Overheads	694
Total cost (1,690 × $\frac{100}{130}$)	1,300
Profit margin	390
Selling price	1,690

2.7 *False*. A contract loss should be allowed for in the accounts as soon as it is foreseen.

2.8 The estimated labour cost of job no. D47 is £1,375.

Workings

The idle time would be stated as a percentage of the *paid* labour hours.

	Hours
Active labour hours required	120
Idle time (× 4/96)	5
Total paid hours required	125
Labour cost @ £11 per hour	£1,375

Solution 3

- You will need to recognise that some costs are fixed and others are variable – note that you cannot simply double the cost of 10,000 leaflets to obtain the cost for 20,000.
- In part (b), not all the capacity is utilised and consequently there is an under-absorption of fixed overheads. In Chapter 4 you learned that this will amount to an extra charge to reduce the profit for the period.

(a) (i) £64

(ii) £53

Workings:	*Cost of batch 10,000 leaflets*	*Cost of batch 20,000 leaflets*
	£	£
Artwork[1]	65.00	65.00
Machine setting[1]	88.00	88.00
Paper	125.00	250.00
Ink and consumables	40.00	80.00
Printers' wages	32.00	64.00
	350.00	547.00
General fixed overheads[2]	100.00	200.00
Total cost	450.00	747.00
Profit ($\frac{30}{70}$ × cost)	192.86	320.14
Sales revenue required	642.86	1,067.14
Selling price per 1,000	£64.00	£53.00

Notes:

1. Machine setting and artwork costs are not affected by the size of the batch.
2. General fixed overhead $= £15,000/600 = £25$ per hour.

(b) (i) General fixed overhead for the period was *under-absorbed*.

Actual labour hours worked = (64 × 4 hours) + (36 × 8 hours) = 544 hours. This is less than the budgeted labour hours of 600 therefore the overhead would be under-absorbed.

(ii)

Overhead absorbed = 544 hours × £25 =	£13,600
Overhead incurred	£15,000
Under-absorbed overhead	£1,400

Solution 4

- You will need to produce a lot of workings. These will be for your own benefit because workings do not earn marks in the assessment.
- Note that contract B has been in operation for only 4 months.

(a) (i) £880,000
(ii) £144,000
Workings:

	Contract A	*Contract B*
	£000	*£000*
Plant sent to site	1,000	150
Depreciation		
(12%)	120	
(12% × $\frac{4}{12}$)		6
Net book value	880	144

(b) (i) £505,000
(ii) £145,000
Workings:

	Contract A	*Contract B*
	£000	*£000*
Materials sent to site	700	150
Materials returned to stores	(80)	(30)
Materials transferred	(40)	40
Materials on site at 31 March	(75)	(15)
	505	145

(c) (i) £480,000
(ii) £533,000
Workings:

	Contract A	*Contract B*
	£000	*£000*
Contract price	2,000	550
Cost incurred to date		
(1,065 + 160)	(1,225)	
(453 + 20)		(473)
Cost to completion	(135)	(110)
Estimated total contract profit	640	(33)
Recognised	480[1]	(33)[2]
Value of work certified		500
Charge to cost of sales (bal. fig.)		533
Profit/(loss) recognised on contract		(33)

Notes:
1. 640 × $\left(\frac{1{,}500}{2{,}000}\right)$
2. The full amount of loss is allowed for.

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Continuous Operation Costing

6

LEARNING OUTCOMES

After completing this chapter, you should be able to:

- compare and contrast job, batch, contract and process costing systems;
- prepare and contrast cost statements for service and manufacturing organisations;
- prepare ledger accounts for process costing systems.

6.1 Introduction

In this chapter you will learn about another costing method: continuous operation costing. The CIMA *Terminology* defines this as 'the costing method applicable where goods or services result from a sequence of continuous or repetitive operations or processes. Costs are averaged over the units produced during the period, being initially charged to the operation or process'.

We can contrast this with the specific order costing methods which you learned about in the previous chapter. Those methods were used when each cost unit was different from the others, involving different operations or processes for each unit according to the customer requirements.

With continuous operation costing it is not possible to identify costs with specific cost units. Hence you will be learning how to average the costs over the units produced, as described in the CIMA definition.

6.2 Service costing

6.2.1 The application of service costing

Service costing can be applied to services provided to customers outside the organisation, for example, the services supplied by transport operations, hospitals and hotels.

It can also be applied to internal services and functions which do work for other departments within the same organisation. For example, service costing can be applied to the services supplied by the canteen, the maintenance department and the personnel function.

6.2.2 Establishing a suitable cost unit

Many of these services produce an intangible 'output', that is, their output cannot be physically seen and touched. In order to maintain effective cost control it is essential to establish a measurable cost unit for which we can ascertain and monitor the costs.

In Chapter 1 we saw how composite cost units are often used to monitor and control the costs in service operations. Any cost unit can be used as long as it can be objectively measured and its cost can be determined and compared from one period to another and if possible from one organisation to another.

Exercise 6.1

Suggest a composite cost unit that could be used in each of these service organisations: (i) hotel; (ii) hospital; (iii) haulage contractor.

Solution

(i) Hotel: bed-night or room-night.
(ii) Hospital: in-patient day.
(iii) Haulage contractor: tonne-kilometre.

6.2.3 Establishing the cost per unit

Once a suitable cost unit has been selected, the cost for each unit can be determined using the same averaging method as for all continuous operations:

$$\text{Average cost per unit of service} = \frac{\text{Total costs incurred in period}}{\text{Number of units of service supplied in the period}}$$

6.2.4 The instantaneous and perishable nature of services

Many services are provided instantaneously rather than for inventory (stock); for example, a restaurant meal is cooked as it is ordered by the customer. This brings with it particular management problems of planning and control but it does mean that the incidence of work in progress is very low, that is, it is rarely necessary to value part-finished units of service at the end of an accounting period.

Many services also 'perish' immediately; for example, if a cinema seat is vacant when a film is showing it cannot be stored in inventory (stock) for a later sale. The opportunity to gain revenue from that seat at that particular showing of the film has been lost forever. Therefore, capacity utilisation becomes a very important issue for managers in many service organisations.

Example: service costing in a consultancy business

As you read through this example, notice that we are applying all of the principles of cost analysis that you have already learned about in this *Study System*. The only difference is that the principles are being applied to determine the cost of intangible services, rather than of tangible products.

Mr G and Mrs H have recently formed a consultancy business and they wish to establish the following rates to charge clients:

- an hourly rate for productive client work;
- an hourly rate for time spent travelling to/from the clients' premises;
- a rate per mile for expenses incurred in travelling to/from the clients' premises.

Pricing policy

Mr G and Mrs H have decided that their pricing policy will be based on the cost per hour plus a 5 per cent profit mark-up. Travelling time will be charged to clients at one-third of the normal hourly rate. Travelling expenses will be charged to clients at cost.

Activity estimates

Mr G and Mrs H each expect to work for 8 hours per day, 5 days per week, 45 weeks per year. They refer to this as 'available time'.

- Twenty-five per cent of the available time will be spent dealing with administrative matters relating to the general running of the business.
- In the first year, 22.5 per cent of the available time will be idle, that is, no work will be done in this time.
- The remainder of the available time is expected to be chargeable to clients.
- Travelling time will amount to 25 per cent of the chargeable time, during which a total of 18,000 miles will be travelled.

Cost estimates

- Mr G and Mrs H each wish to receive a salary of £20,000 in the first year of trading.
- Other costs to be incurred in the first year of trading:

	£
Electricity	1,200
Fuel for vehicles	1,800
Depreciation of vehicles	6,000
Insurance – professional liability and office	600
Vehicle insurance and road tax	1,080
Office rent and rates	8,400
Telephone expenses	3,000
General office expenses	8,900
Servicing and repair of vehicles	1,200

Solution

If you look back to Section 6.2.3 you will be reminded that we need to know two things in order to establish the cost per unit of service:

- the total costs incurred in the period;
- the number of units of service supplied in the period.

We need to classify the costs provided to determine the total cost associated with travelling, and that associated with providing consultancy services.

	Consultancy £	*Travelling* £
Salaries	40,000	
Electricity	1,200	
Fuel		1,800
Depreciation		6,000
Insurance	600	
Vehicle insurance, etc.		1,080
Office rent and rates	8,400	
Telephone expenses	3,000	
General office expenses	8,900	
Servicing vehicles, etc.		1,200
	62,100	10,080

Now we need to determine the number of units of service by which each of these cost totals is to be divided.

The calculation of the rate per mile for travelling expenses is relatively straightforward:

$$\text{Rate per mile} = \frac{\text{Total travelling expenses}}{\text{Miles travelled}} = \frac{£10{,}080}{18{,}000} = £0.56 \text{ per mile}$$

The calculation of the hourly rate for productive work and travelling time is a little more complicated. The first step is to determine the number of units of service supplied, that is, the chargeable hours. We need to look at the activity estimates provided in order to analyse the available time.

		Hours
Total available hours for the first year = 2 people × 8 hours × 5 days × 45 weeks		3,600
Less: administration time	25.0%	
idle time	22.5%	
	47.5% × 3,600	(1,710)
Time chargeable to clients		1,890
Productive time spent with clients (75%)		1,417.5
Travelling time (25%)		472.5

Travelling time will be charged at one-third of the normal hourly rate, therefore we need to calculate a 'weighted' figure for chargeable time.

$$\text{Weighted chargeable time} = 1{,}417.5 + \frac{472.5}{3} = 1{,}575 \text{ hours}$$

Now we can combine the consultancy services costs and the weighted chargeable time to determine an hourly rate for each type of work.

$$\text{Cost per chargeable hour} = \frac{£62{,}100}{1{,}575} = £39.43$$

Hourly rate for productive client work = £39.43 + 5% profit mark-up = £41.40 per hour

$$\text{Hourly rate for travelling time} = \frac{£41.40}{3} = £13.80 \text{ per hour}$$

We can perform a final check to ensure that these hourly rates will produce the required revenue.

Required revenue = consultancy costs £62,100 + 5% mark-up = £65,205

Revenue at calculated hourly rates:	£
Productive client work = 1,417.5 hours × £41.40	58,684.50
Travelling time = 472.5 hours × £13.80	6,520.50
Total revenue	65,205.00

6.3 Process costing

6.3.1 What is process costing?

Process costing is used by organisations where a number of production processes are involved and the output of one process is the input to a later process, this continuing until the final product is completed. Examples of industries where process costing might be applied are food processing, chemicals and brewing. The final product is said to be homogeneous (i.e., each unit is identical and cannot be distinguished from another unit), and is usually manufactured for inventory (stock) from which sales are made to customers. Unlike job costing the product is not customer specific and the range of products available is likely to be limited, but it is likely that the customer base will be large.

When using process costing the process is the collection point for costs incurred. This means that materials and labour costs will be identified with the particular process to which they relate. The method is best explained by a simple example.

Example

During August a processing company incurred the following costs in its three processes:

	Process 1	*Process 2*	*Process 3*
	£	£	£
Direct materials	6,000	4,000	9,000
Direct labour	1,000	2,000	3,000
Direct expenses	2,000	3,000	4,000
Production overhead	1,000	2,000	3,000

The quantities of input and output were as follows:

	Process 1	*Process 2*	*Process 3*
	kg	*kg*	*kg*
Input	500	200	300
Output	500	700	1,000

The input quantities shown above do not include the output from the previous process. The output from process 1 is transferred to process 2, which in turn transfers its output to process 3 which after further processing results in the final product.

The process accounts will appear as follows:

Process 1

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	500	20.00	10,000
Labour		1,000				
Expenses		2,000				
Overheads		1,000				
	500	10,000		500		10,000

Process 2

	kg	£		kg	£/kg	£
Process 1	500	10,000	Output	700	30.00	21,000
Materials	200	4,000				
Labour		2,000				
Expenses		3,000				
Overheads		2,000				
	700	21,000		700		21,000

Process 3

	kg	£		kg	£/kg	£
Process 2	700	21,000	Output	1,000	40.00	40,000
Materials	300	9,000				
Labour		3,000				
Expenses		4,000				
Overheads		3,000				
	1,000	40,000		1,000		40,000

You should note the layout of the process account. It is a ledger account with debit and credit entries, but it is different from financial accounting ledger accounts because it includes other columns. On the debit side there is a column for the quantity as well as the values, and on the credit side as well as the quantity column there is a column showing the cost per unit. The value per unit of output is calculated by dividing the cost by the number of units.

When preparing process accounts it is important that the quantity columns are completed first and balanced *before* attempting to value the units. This example was a simple one, but as this chapter progresses and introduces more complications you will see why this technique is recommended.

Note too that the total cost of process 1 is attributed to its output and that this is then transferred to process 2. This procedure is repeated in process 2. The output from process 3 is finished goods.

6.3.2 A brief word about double-entry bookkeeping

The process account has been described as a ledger account. This means that it should conform to the rule of double-entry bookkeeping, that is, every debit entry should have a corresponding credit entry and vice versa. Where are the double entries in the above example?

It can be seen that the output from processes 1 and 2 is entered on the credit side of those accounts and that the corresponding debit is entered in the process 2 and 3 accounts.

But what about the other entries? The output from process 3 is finished goods which are a form of inventory (stock), and the debit entry for this is found in a finished goods stock account. The costs incurred are materials, labour, expenses and overhead costs. You have learnt earlier that stores ledger cards are maintained for materials so the credit entry for materials issued from stores will be shown on the stores ledger card with the corresponding debit appearing in the process account. With regard to labour and expenses and overheads the simplistic view is to assume that they correspond to entries in supplier accounts (or cash/bank accounts). We will return to this aspect of cost accounting in the next chapter; for now just understand that process accounts are part of double-entry cost bookkeeping.

6.3.3 Losses in process

The majority of process industries expect there to be a loss in the production process.

A certain amount of loss is expected and therefore unavoidable and this is referred to in cost accounting terminology as a *normal loss*.

This loss may occur through evaporation or may be a form of defective production. The extent of the normal loss may be estimated using past records and experience. As a loss, the only value that the organisation can derive from it is its scrap value (if it has any). It is therefore considered good practice to regard the net cost (after deducting any scrap sale proceeds if applicable) of producing the normal loss as a cost of the process and to attribute it to the remaining units. The following example of a single process shows how this is achieved.

The costs of the process are as follows:

	Process 1
	£
Direct materials	6,000
Direct labour	1,000
Direct expenses	2,000
Production overhead	1,000

The input quantity was 500 kg and the expected or normal loss was 10 per cent of input. Actual output was 450 kg. The process account would appear as follows:

Process 1

	kg	*£*		*kg*	*£/kg*	*£*
Materials	500	6,000	Output	450	22.22	10,000
Labour		1,000	Normal loss	50	–	–
Expenses		2,000				
Overheads		1,000				
	500	10,000		500		10,000

The total costs of the process (£10,000) have been attributed to the output of 450 kg. This has the effect of increasing the cost per kg of good output to compensate for the cost of producing the unavoidable normal loss.

If the normal loss could be sold for scrap at a value of £5 per kg, then this would reduce the net cost of producing the normal loss. The effect of this on the entries in the process account is as follows:

Process 1

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	450	21.67	9,750
Labour		1,000				
Expenses		2,000	Normal loss	50	5.00	250
Overheads		1,000				
	500	10,000		500		10,000

Note now the credit side of the process account shows the scrap value of the normal loss. The net cost of the process is reduced by the £250 scrap value to £9,750 and this is attributed to the output. The effect is to reduce the cost per kg of the output to £21.67.

The double entry for the normal loss is usually made in a scrap stock or scrap sales account.

Scrap stock account

	kg	£		£
Process 1 – normal loss	50	250	Debtor/cash	250

6.3.4 Abnormal losses and gains

We have seen that the normal loss is an estimate of the loss expected to occur in a particular process. This estimate may be incorrect and a different amount of loss may occur.

If the actual loss is greater than the normal loss then the excess loss is referred to as an *abnormal loss*.

If the actual loss is less than the normal loss then the difference is referred to as an *abnormal gain*.

The following example illustrates the calculations and entries in the process account when an abnormal loss occurs.

Example

Input 500 kg of materials costing	£6,000
Labour cost	£1,000
Expenses cost	£2,000
Overhead cost	£1,000

Normal loss is estimated to be 10 per cent of input.
Losses may be sold as scrap for £5 per kg.
Actual output was 430 kg.

The process account is shown below.

Remember that, earlier in the chapter, we recommended that you should insert the units into the process account first, and then balance them off. In this example, this results in a balancing value on the credit side of 20 kg, which is the abnormal loss.

Process account

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	430	21.67	9,317
Labour		1,000	Normal loss	50	5.00	250
Expenses		2,000	Abnormal loss	20	21.67	433
Overheads		1,000				
	500	10,000		500		10,000

The valuation per kg of £21.67 is calculated as follows:

$$\frac{\text{Cost incurred} - \text{scrap value of normal loss}}{\text{Expected output}} = \frac{£10{,}000 - £250}{450} = £21.67$$

The abnormal loss units are valued at the same rate per unit as the good output units. The normal loss is valued at its scrap value only.

The next step is to prepare the scrap stock and abnormal loss accounts. These are shown below.

Scrap stock account

	£		£
Process – normal loss	250	Debtor/cash: (50 + 20) × £5	350
Abnormal loss transfer	100		
	350		350

The scrap stock balance now represents the total of 70 kg scrapped, with a total scrap value of £350.

Abnormal loss account

	£		£
Process	433	Scrap stock: 20 × £5	100
		Profit and loss	333
	433		433

The resulting balance on the abnormal loss account is the net cost of producing an excess loss (i.e., after deducting the scrap sale proceeds). It has now been highlighted separately for management attention, and the balance is transferred to the income statement (profit and loss account).

If the actual loss is smaller than the amount expected, then an abnormal gain is said to have occurred. The abnormal gain is the extent to which the loss is smaller than expected. If we consider the same example again, except that the actual output achieved was 470 kg, we can see that the following process account results. Remember to balance the units column first. The normal loss is the same, because the input is the same.

Process account

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	470	21.67	10,183
Labour		1,000				
Expenses		2,000	Normal loss	50	5.00	250
Overheads		1,000				
Abnormal gain	20	433				
	520	10,433		520		10,433

Note that the balancing value in the quantity column is now on the debit side. It represents the abnormal gain. The calculation of the cost per unit remains the same, but now there is an additional entry on the debit side.

Exercise 6.2

Following the principles that you have learned so far, attempt to produce the scrap stock and abnormal gain accounts yourself, before you look at the accounts which follow.

Solution

Scrap stock account

	£		£
Process – normal loss	250	Bank/debtors: (50 – 20) × £5	150
		Abnormal gain	100
	250		250

Abnormal gain account

	£		£
Scrap stock	100	Process	433
Profit and loss	333		
	433		433

Note that the balance carried down in the scrap stock account is only £150. This represents the cash available from the sale of the loss. The loss which actually occurred was only 30 kg.

In the abnormal gain account the balance of £333 represents the net benefit of producing a smaller loss than expected (this is after deducting the scrap sale proceeds which would have been received if the normal loss had occurred).

6.3.5 Closing work in progress: the concept of equivalent units

To calculate a unit cost of production it is necessary to know how many units were produced in the period. If some units were only partly processed at the end of the period, then these must be taken into account in the calculation of production output. The concept of equivalent units provides a basis for doing this. The work in progress (the partly finished units) is expressed in terms of how many equivalent complete units it represents. For example, if there are 500 units in progress which are 25 per cent complete, these units would be treated as the equivalent of $500 \times 25\% = 125$ complete units.

A further complication arises if the work in progress has reached different degrees of completion in respect of each cost element. For example, you might stop the process of cooking a casserole just as you were about to put the dish in the oven. The casserole would probably be complete in respect of ingredients, almost complete in respect of labour, but most of the overhead cost would be still to come in terms of the cost of the power to cook the casserole.

It is common in many processes for the materials to be added in full at the start of processing and for them to be converted into the final product by the actions of labour and related overhead costs. For this reason, labour and overhead costs are often referred to as conversion costs.

Conversion cost is 'the cost of converting material into finished products, that is, direct labour, direct expense and production overhead.' *CIMA Terminology*

To overcome the problem of costs being incurred at different stages in the process, a separate equivalent units calculation is performed for each cost element. An example will help to make this clear. For simplicity, losses have been ignored. These will be introduced in the next example.

Example

Input materials	1,000 kg @ £9 per kg
Labour cost	£4,800
Overhead cost	£5,580
Outputs	Finished goods: 900 kg
	Closing work in progress: 100 kg

The work in progress is completed:

100% as to material
60% as to labour
30% as to overhead

Now that you are beginning to learn about more complications in process costing, this is a good point to get into the habit of producing an input/output reconciliation as the first stage in your workings. This could be done within the process account, by balancing off the quantity columns in the way that we have done so far in this chapter. However, with more complex examples it is better to have total quantity columns in your working paper and do the 'balancing off' there.

In the workings table which follows, the first stage is to balance the input and output quantities, that is, check that the total kg input is equal to the total kg output. Then, each part of the output can be analysed to show how many equivalent kg of each cost element it represents.

				Equivalent kg to absorb cost		
Input	*kg*	*Output*	*kg*	*Materials*	*Labour*	*Overhead*
Materials	1,000	Finished goods	900	900	900	900
		Closing WIP	100	(100%) 100	(60%) 60	(30%) 30
	1,000		1,000	1,000	960	930
		Costs		£9,000	£4,800	£5,580
		Cost/eq. unit		£9	£5	£6

For the equivalent unit calculations there is a separate column for each cost element. The number of equivalent units is found by multiplying the percentage completion by the number of kg in progress. For example, equivalent kg of labour in progress is 100 kg $\times$ 60% = 60 equivalent kg.

The number of equivalent units is then totalled for each cost element and a cost per equivalent unit is calculated.

These costs per equivalent unit are then used to value the finished output and the closing work in progress.

The process account is shown below, together with the calculation of the value of the closing work in progress. Note that this method may be used to value the finished output, but it is easier to total the equivalent unit costs (£9 + £5 + £6) and use the total cost of £20 multiplied by the finished output of 900 kg.

Closing WIP valuation		£
Materials	100 equivalent units $\times$ £9	900
Labour	60 equivalent units $\times$ £5	300
Overheads	30 equivalent units $\times$ £6	180
		1,380

Process account

	kg	£		*kg*	*£/kg*	£
Materials	1,000	9,000	Finished goods	900	20.00	18,000
Labour		4,800	WIP	100	13.80	1,380
O/Hds		5,580				
	1,000	19,380		1,000		19,380

The next example follows the same principles but it includes process losses. Work through the equivalent units table carefully and ensure that you understand where each figure comes from.

Example: Closing work in progress

Data concerning process 2 last month was as follows:

Transfer from process 1	400 kg at a cost of	£2,150
Materials added	3,000 kg	£6,120
Conversion costs		£2,344
Output to finished goods		2,800 kg
Output scrapped		400 kg
Normal loss		10 per cent of materials added in the period

The scrapped units were complete in materials added but only 50 per cent complete in respect of conversion costs. All scrapped units have a value of £2 each.

There was no opening work in progress, but 200 kg were in progress at the end of the month, at the following stages of completion:

80% complete in materials added

40% complete in conversion costs

You are required to write up the accounts for the process.

Solution

The first step is to produce an input/output reconciliation as in the last example. Notice that the losses are not complete. You will need to take account of this in the equivalent units columns. And remember that the normal loss units do not absorb any of the process costs. They are valued at their scrap value only, so they must not be included as part of the output to absorb costs.

				Equivalent kg to absorb cost		
				Process 1	*Materials*	*Conversion*
Input	*kg*	*Output*	*kg*	*transfer*	*added*	*costs*
Process 1 transfer	400	Finished goods	2,800	2,800	2,800	2,800
Material added	3,000	Normal loss	300	–	–	–
		Abnormal loss[1]	100	100	100	50
		Work in progress	200	200	160	80
	3,400		3,400	3,100	3,060	2,930
		Costs		£	£	£
		Incurred in period		2,150	6,120	2,344
		Scrap value of normal loss[2]		(600)		
				1,550	6,120	2,344
		Cost per unit	£3.30	0.50	2.00	0.80

Notes:

1. The abnormal loss is inserted in the output column as a balancing figure. Losses are 50 per cent complete in conversion costs. Therefore, the 100 kg of abnormal loss represents 50 equivalent complete kg in respect of conversion costs.
2. By convention, the scrap value of normal loss is usually deducted from the first cost element.

For each cost element the costs incurred are divided by the figure for equivalent kg produced. For example: the cost per kg for materials added = £6,120/3,060 = £2 per kg.

The unit rates can now be used to value each part of the output. For example the 160 equivalent kg of materials added in the work in progress are valued at $160 \times £2 = £320$. The 80 equivalent kg of conversion costs in work in progress are valued at $80\ \text{kg} \times £0.80 = £64$.

		Process 1	*Materials*	*Conversion*
Valuation	*Total*	*transfer*	*added*	*costs*
	£	£	£	£
Finished goods	9,240	1,400	5,600	2,240
Abnormal loss	290	50	200	40
Work in progress	484	100	320	64

It is now possible to draw up the relevant accounts using these valuations of each part of the process output.

Exercise 6.3

See if you can complete the process accounts before looking at the rest of the solution. Remember that the normal loss is valued at its scrap value.

Solution

Process 2 account

	kg	£		kg	£
Process 1	400	2,150	Finished goods	2,800	9,240
Materials added	3,000	6,120	Normal loss	300	600
Conversion costs		2,344	Abnormal loss	100	290
			Work in progress	200	484
	3,400	10,614		3,400	10,614

Abnormal loss account

	£		£
Process 2	290	Scrap stock	200
		Profit and loss	90
	290		290

Scrap account

	£		£
Process 2	600	Bank/debtors: (300 + 100) × £2	800
Abnormal loss account	200		
	800		800

6.3.6 Previous process costs

A common problem that students experience when studying process costing is understanding how to deal with previous process costs. An important point that you should have grasped by now is that production passes through a number of sequential processes. Unless the process is the last in the series, the output of one process becomes the input of the next. A common mistake is to forget to include the previous process cost as an input cost in the subsequent process.

You should also realise that all of the costs of the previous process (materials, labour and overhead) are combined together as a single cost of 'input material' or 'previous process costs' in the subsequent process.

In the workings for the example in Section 6.3.5 we assumed that the work in progress must be 100 per cent complete in respect of Process 1 costs. This is also an important point to grasp. Even if the Process 2 work had only just begun on these units, there cannot now be any more cost to add in respect of Process 1. Otherwise the units would not yet have been transferred out of Process 1 into Process 2.

6.3.7 Opening work in progress

Opening work in progress consists of incomplete units in process at the beginning of the period. Your *Management Accounting Fundamentals* syllabus requires you to know how to value work in progress using the average cost method. With this method, opening work in progress is treated as follows:

1. The opening work in progress is listed as an additional part of the input to the process for the period.
2. The cost of the opening WIP is added to the costs incurred in the period.
3. The cost per equivalent unit of each cost element is calculated as before, and this is used to value each part of the output. The output value is based on the average cost per equivalent unit, hence the name of this method.

The best way to see how this is done is to work through some examples. The next two examples in this chapter include some opening work in progress. Work through them carefully, and try to learn the layout of the working paper so that you can use it quickly to do any workings that you need in the assessment. It will save you valuable time!

Example: Opening work in progress

The following information is available for Process 3 in June:

			Degree of completion and cost					
			Process 2 input		*Materials added in Process 3*		*Conversion costs*	
	Units	*Cost*						
		£	%	£	%	£	%	£
Opening stock	100	692	100	176	60	300	30	216
Closing stock	80		100		70		55	
Input costs:								
Input from process 2	900	1,600						
Materials added in process 3		3,294						
Conversion costs		4,190						

Normal loss is 10 per cent of input from process 2; 70 units were scrapped in the month, and all scrap units realise £0.20 each.

Output to the next process was 850 units.

You are required to complete the account for process 3 in June.

Solution

As before, the first step is to complete an input/output reconciliation and then to extend this to calculate the number of equivalent units for each cost element.

				Equivalent units to absorb cost		
				Process 2	*Materials*	*Conversion*
Input	*Units*	*Output*	*Units*	*input*	*added*	*costs*
Opening stock[1]	100	To process 4	850	850	850	850
Process 2[2]	900	Normal loss	90	–	–	–
		Abnormal gain[3]	(20)	(20)	(20)	(20)
		Closing stock[4]	80	80	56	44
	1,000		1,000	910	886	874

Costs	£	£	£
Opening stock[5]	176	300	216
Input costs	1,600	3,294	4,190
Normal loss value	(18)		
	1,758	3,594	4,406

	£	£	£	£
Cost per unit	11.029	1.932	4.056	5.041
Evaluation[6]				
To process 4	9,375	1,642	3,448	4,285
Abnormal gain	(221)	(39)	(81)	(101)
Closing stock	604	155	227	222

Notes:

1. The opening stock is included as part of the input in the input/output reconciliation. The degree of completion of the opening stock is not relevant, because we are going to average its cost over all units produced in the period.
2. Note that we are not told the quantity of material added because it does not affect the number of basic units processed.
3. The number of units scrapped is less than the normal loss. There is thus an abnormal gain.
4. The equivalent units of closing stock takes account of the degree of completion for each cost element.
5. The opening stock is included in the statement of costs, so that its value is averaged over the equivalent units produced in the period.
6. In the evaluation section, the unit rate for each cost element is multiplied by the number of equivalent units in each part of the output. These values can then be used to complete the process account.

Process 3 account

	Units	£		*Units*	£
Opening stock	100	692	Process 4	850	9,375
Process 2	900	1,600	Normal loss	90	18
Materials added		3,294	Closing stock	80	604
Conversion costs		4,190			
Abnormal gain	20	221			
	1,020	9,997		1,020	9,997

Exercise 6.4

To give yourself some extra practice, draw up the abnormal gain account and the scrap account.

Solution

Abnormal gain account

	£		£
Scrap stock (20 × £0.20)	4	Process 3	221
Profit and loss account	217		
	221		221

Scrap account

	£		£
Normal loss	18	Bank/debtor: (90 − 20) × £0.20	14
		Abnormal gain	4
	18		18

6.3.8 Process costing: a further example

You must try to get as much practice as possible in preparing process cost accounts and you will find it much easier if you use a standard format for the working papers. Although you will not be required to reproduce the workings in the assessment, for your own benefit you need to work quickly through the available data to produce the required answer.

Work carefully through the next example – or better still try it for yourself before looking at the suggested solution. Notice that the scrapped units are not complete. You will need to take account of this in the equivalent units calculations.

Example

The following information is available for process 2 in October:

			Degree of completion and cost					
			Process 1 input		*Materials added in process 2*		*Conversion costs*	
	Units	*Cost*						
		£	%	£	%	£	%	£
Opening stock	600	1,480	100	810	80	450	40	220
Closing stock	350		100		90		30	
Input costs:								
Input from process 1	4,000	6,280						
Materials added in process 2		3,109						
Conversion costs		4,698						

Normal loss is 5 per cent of input from process 1.

300 units were scrapped in the month. The scrapped units had reached the following degrees of completion.

Materials added	90%
Conversion cost	60%

All scrapped units realised £1 each.

Output to the next process was 3,950 units.

You are required to complete the account for process 2 and for the abnormal loss or gain in October.

Solution

The first step is to prepare an input/output reconciliation to see if there was an abnormal loss or abnormal gain. This is found as a balancing figure in the output column.

				Equivalent units to absorb cost		
				Process 1	*Materials*	*Conversion*
Input	*Units*	*Output*	*Units*	*input*	*added*	*costs*
Opening stock	600	To process 3	3,950	3,950	3,950	3,950
Process 1	4,000	Normal loss	200	–	–	–
		Abnormal loss	100	100	90	60
		Closing stock	350	350	315	105
	4,600		4,600	4,400	4,355	4,115
		Costs		£	£	£
		Opening stock		810	450	220
		Input costs		6,280	3,109	4,698
		Normal loss value		(200)		
				6,890	3,559	4,918
			£	£	£	£
		Cost per unit	3.578	1.566	0.817	1.195
		Evaluation				
		To process 3	14,133	6,186	3,227	4,720
		Abnormal loss	303	157	74	72
		Closing stock	931	548	257	126

Process 2 account

	Units	£		Units	£
Opening stock	600	1,480	Process 3	3,950	14,133
Process 1	4,000	6,280	Normal loss	200	200
Materials added		3,109	Abnormal loss	100	303
Conversion costs		4,698	Closing stock	350	931
	4,600	15,567		4,600	15,567

Abnormal loss account

	£		£
Process 2	303	Scrap stock	100
		Profit and loss	203
	303		303

Scrap account

	£		£
Normal loss	200	Bank/debtors: (200 + 100) × £1	300
Abnormal loss	100		
	300		300

6.4 Joint products and by-products

Joint products are defined by CIMA as 'two or more products produced by the same process and separated in processing, each having a sufficiently high saleable value to merit recognition as a main product'.

Examples of joint products could be the output from oil refining: the various grades of petrol, diesel, paraffin and so on. Each of these products has a significant value compared with the other.

In contrast, a by-product is defined as 'output of some value produced incidentally in manufacturing something else (main product)'.

The key word in this definition is probably 'incidentally'. The by-product has some value but the process was not set up primarily for its manufacture. Its value is small and incidental when compared with that of the main product or products.

An example of a by-product could be the sawdust which is produced in a sawmill when timber is being processed. This has a small sales value compared with the value of the main product – the timber.

The distinction between a by-product and a joint product is important because the accounting treatments differ.

Note that you are required to understand only general principles – not computational techniques – relating to joint products and by-products.

6.4.1 Accounting for joint products

Joint products are accounted for separately as far as is possible. The point at which the products become individually recognisable is known as the separation point or split-off point. Costs incurred in the process up to this point are known as common costs, joint costs or pre-separation costs. These common costs are shared out or apportioned among the products in some way, in order to find the apparent profit on each product and to value product stocks. The most common bases of apportionment are:

- weight or volume of output;
- final sales value, net of the cost of any further processing beyond the separation point;
- sales value at the separation point.

The problem with the last of these bases is that the products may not be saleable at the separation point, that is, they may need further processing to put them into a saleable state. In this situation, any further processing costs of the respective joint products are deducted from their final sales value to determine their net realisable value at the separation point.

Notice that above we referred to the *apparent* profit on each product. An important point for you to grasp is that the apportionment of common costs results in an arbitrary cost for each joint product. The product costs, and therefore the apparent profit from each joint product, depend on the share of costs apportioned to the other products. The resulting product costs are therefore of limited use for management decision-making. Managers need to focus on what happens to the products *after* they have been separated: for example should additional costs be incurred to further increase their sales value, or should they be sold immediately after separation?

6.4.2 Accounting for by-products

None of the costs of the main process are attributed to the by-product. It is usually valued at its saleable value, less any further processing costs required to put it into a saleable state.

Notice that a by-product is effectively treated in the same way as a normal loss which has a scrap value.

6.5 Summary

Having read this chapter the main points that you should understand are as follows.

1. Continuous operation costing methods are appropriate for organisations that produce a continuous flow of identical units. The costs incurred are averaged over the number of units produced in the period in order to determine the cost per unit.
2. Service costing often involves the use of a composite cost unit. The service costing method can be applied to internal services and functions as well as to services supplied to customers outside the business.
3. There may be more than one process involved in process costing. The output of one process becomes the input of the next process in the sequence.
4. A normal loss is the expected level of loss for the period. The normal loss does not absorb any process costs. If it is saleable it is valued at its scrap value, otherwise the normal loss will have zero value.
5. The scrap value of the normal loss is conventionally deducted from the cost of the first cost element in the analysis, which is usually either materials cost or previous process cost.
6. If losses are greater than the normal loss, the extra loss is called an abnormal loss. If losses are lower than the normal loss the difference is called an abnormal gain.
7. Abnormal losses and gains are valued at the same unit rate as good output. Their scrap values do not affect the main process account but are accounted for in a separate abnormal loss or abnormal gain account.
8. Where there are incomplete units in the process at the end of the period, that is, when there is closing work in progress, it is necessary to determine the number of equivalent units of production in order to calculate the production cost per unit.
9. Joint products are two or more products produced in the same process and each has a significant sales value compared to the other.
10. A by-product is produced in the same process as the main product but its value is incidental compared with the value of the main product.
11. The point in the process at which joint or by-products become individually recognisable is known as the separation point or split-off point. Costs incurred in the process up to this point are known as common costs, joint costs or pre-separation costs.
12. Common costs may be apportioned to individual joint products on the basis of their weight or volume at the separation point, their sales value at the separation point or their final sales value, net of the cost of any further processing beyond the separation point.
13. A by-product is usually valued at its net realisable value at the separation point.

Revision Questions

6

Question 1 Multiple choice

1.1 State which of the following are characteristics of service costing:

(i) high levels of indirect costs as a proportion of total costs.
(ii) use of composite cost units.
(iii) use of equivalent units.

(A) (i) only.
(B) (i) and (ii) only.
(C) (ii) only.
(D) (ii) and (iii) only.

1.2 Process B had no opening stock. 13,500 units of raw material were transferred in at £4.50 per unit. Additional material at £1.25 per unit was added in process. Labour and overheads were £6.25 per completed unit and £2.50 per unit incomplete. If 11,750 completed units were transferred out, what was the closing stock in process B?

(A) £77,625
(B) £14,437.50
(C) £141,000
(D) £21,000

1.3 In a process account, abnormal losses are valued:

(A) at their scrap value.
(B) the same as good production.
(C) at the cost of raw materials.
(D) at good production cost less scrap value.

1.4 A chemical process has a normal wastage of 10 per cent of input. In a period, 2,500 kg of material were input and there was an abnormal loss of 75 kg.

What quantity of good production was achieved?

(A) 2,175 kg
(B) 2,250 kg
(C) 2,325 kg
(D) 2,475 kg

1.5 In process costing, where losses have a positive scrap value, when an abnormal gain arises the abnormal gain account is:

(A) credited with the normal production cost of the abnormal gain units.
(B) debited with the normal production cost of the abnormal gain units and credited with the scrap value of the abnormal gain units.
(C) credited with the normal production cost of the abnormal gain units and debited with the scrap value of the abnormal gain units.
(D) credited with the normal production cost of the abnormal gain units and credited with the scrap value of the abnormal gain units.

Data for questions 1.6–1.8
X plc makes one product, which passes through a single process. Details of the process are as follows:

Materials: 5,000 kg at 50 p per kg
Labour: £800
Production overheads 200% of labour

Normal losses are 20 per cent of input in the process, and without further processing any losses can be sold as scrap for 30 p per kg.

The output for the period was 3,800 kg from the process.

There was no work in progress at the beginning or end of the period.

1.6 What value will be credited to the process account for the scrap value of the normal loss?

(A) £300
(B) £530
(C) £980
(D) £1,021

1.7 What is the value of the abnormal loss?

(A) £60
(B) £196
(C) £230
(D) £245

1.8 What is the value of the output?

(A) £3,724
(B) £4,370
(C) £4,655
(D) £4,900

Data for questions 1.9–1.11
A product is manufactured as a result of two processes, A and B. Details of process B for the month of August were as follows:

Materials transferred from process A	10,000 kg valued at £40,500
Labour costs	1,000 hours @ £5.616 per hour
Overheads	50% of labour costs
Output transferred to finished goods	8,000 kg
Closing work in progress	900 kg

Normal loss is 10 per cent of input and losses do not have a scrap value.

Closing work in progress is 100 per cent complete for material, and 75 per cent complete for both labour and overheads.

1.9 What is the value of the abnormal loss (to the nearest £)?

(A) Nil
(B) £489
(C) £544
(D) £546

1.10 What is the value of the output (to the nearest £)?

(A) £39,139
(B) £43,488
(C) £43,680
(D) £43,977

1.11 What is the value of the closing work in progress (to the nearest £)?

(A) £4,403
(B) £4,698
(C) £4,892
(D) £4,947

Data for questions 1.12 and 1.13

The following data relates to a process for the latest period:

Opening work in process	1,000 litres valued at £1,500
Input	30,000 litres costing £15,000
Conversion costs	£10,000
Output	24,000 litres
Closing work in process	3,500 litres

Losses in process are expected to be 10 per cent of period input. They are complete as to input material costs but are discovered after 60 per cent conversion. Losses have a scrap value of £0.20 per litre.

Closing work in process is complete as to input materials and 80 per cent complete as to conversion.

1.12 The number of material-equivalent units was:

(A) 24,000
(B) 28,000
(C) 30,000
(D) 31,000

1.13 The number of conversion-equivalent units was:

(A) 27,100
(B) 27,300
(C) 28,000
(D) 30,100

Data for questions 1.14 and 1.15

PP Ltd makes one product, which passes through a single process. The details of the process for period 2 were as follows.

There were 400 units of opening work in progress, valued as follows:

Material	£49,000
Labour	£23,000
Production overheads	£3,800

No losses are expected in the process.

During the period, 900 units were added to the process, and the following costs occurred:

Material	£198,000 (900 units)
Labour	£139,500
Production overheads	£79,200

There were 500 units of closing work in progress, which were 100 per cent complete for material, 90 per cent complete for labour and 40 per cent complete for overheads. No losses were incurred in the process.

PP Ltd uses weighted average costing.

1.14 How many equivalent units are used when calculating the cost per unit in relation to labour?

(A) 450
(B) 850
(C) 1,250
(D) 1,300

1.15 The value of completed output for the period was

(A) £171,555
(B) £201,500
(C) £274,488
(D) £322,400

1.16 In process costing, a joint product is:

(A) a product which is later divided into many parts.
(B) a product which is jointly produced with other products but which is of incidental value.
(C) a product which is produced simultaneously with other products and is of similar value to at least one of the other products.
(D) a product produced jointly with another organisation.

? **Question 2** Short objective-test questions

2.1 Match the organisations with the most appropriate cost unit by writing (a), (b), (c), (d) or (e) in the box provided.

Organisations

- Hotel ☐
- Transport service ☐
- College ☐
- Restaurant ☐
- Accountancy service ☐

Cost units

(a) Enrolled student
(b) Meal served
(c) Chargeable hour
(d) Room night
(e) Tonne-kilometre

2.2 When the actual loss in a process is less than the expected loss for the period, there is an:

abnormal loss ☐
abnormal gain ☐

2.3 Input to a process last period was 5,000 kg. There was no opening work in progress but 800 kg were in process at the end of the period. Normal loss is 20 per cent of input. During the period 4,100 kg were transferred to the next process.

(a) During the period there was an:

abnormal loss ☐
abnormal gain ☐

(b) The abnormal loss/gain amounted to ☐ kg

2.4 Last period, an abnormal gain of 50 kg arose in process 1. Normal loss was 400 kg. The cost of good output from process 1, after allowing for the abnormal gain, was £3.50 per kg. Scrap from process 1 can be sold for £0.20 per kg.

The scrap account in respect of process 1 for the period is shown below.

Scrap account

	£		£
Process 1	**A**	Abnormal gain	**B**
		Balance c/d	**C**

The values to be entered as A, B and C in the scrap account are:
A ☐ B ☐ C ☐

2.5 In process 2 at the end of a period, 200 units are in progress. They are 100 per cent complete in respect of materials, 50 per cent complete in respect of labour and 20 per cent complete in respect of overhead. The cost of an equivalent complete unit for the period was £4 for materials, £3 for labour and £2 for overhead. Complete the following table to show the value of the work in progress at the end of the period.

	Equivalent units in progress	*Valuation £*
Materials	☐	☐
Labour	☐	☐
Overhead	☐	☐
		☐

2.6 In the following process, all losses were fully processed and scrap units from the process can be sold for £3 per unit.

The values to be entered as A and B in the process account below are:
A ☐ B ☐

Process account [extract]

	Units	*£*
Finished goods	4,000	88,000
Normal loss	90	**A**
Abnormal loss	50	**B**

2.7 The following four terms are to be inserted in the text below. Write (1), (2), (3) or (4) in the appropriate boxes within the text.

(1) By-product
(2) Joint product
(3) Common costs
(4) Separation point

A product which is produced in the same process as one or more other products and which has a significant sales value compared with the other products is known as a ☐. A product which has some value but which is produced incidentally in manufacturing something else is known as a ☐. The point at which the products become separately identifiable is known as the ☐ and costs incurred up to this point are known as ☐.

2.8 When deciding whether or not to subject a joint product to further processing after the separation point, which of the following is/are relevant to the decision.

	Relevant	Not relevant
The share of the common costs apportioned to the joint product	☐	☐
The sales value at the separation point	☐	☐
The sales value after further processing	☐	☐
The further processing costs incurred after the separation point	☐	☐

? **Question 3** Service costing

Happy Returns Ltd operates a haulage business with three vehicles. The following estimated operating costs and performance data are available:

Petrol	£0.50 per km on average
Repairs	£0.30 per km
Depreciation	£1.00 per km, plus £50 per week per vehicle
Drivers' wages	£300.00 per week per vehicle
Supervision costs	£550.00 per week
Loading costs	£6.00 per tonne

During week 26 it is expected that all three vehicles will be used, 280 tonnes will be loaded and a total of 3,950 km travelled (including return journeys when empty) as shown in the following table:

Journey	*Tonnes carried (one way)*	*Kilometres (one way)*
1	34	180
2	28	265
3	40	390
4	32	115
5	26	220
6	40	480
7	29	90
8	26	100
9	25	135
	280	1,975

Requirements

(a) The total variable operating cost incurred in week 26 was £[ ]

(b) The total fixed operating cost incurred in week 26 was £[ ]

(c) The total cost for week 26, including administration cost, amounted to £13,265. To the nearest penny, the average total cost per tonne-kilometre for week 26 was £[ ]

? **Question 4** Service costing

The Ludford Hotel and Conference Centre is used for conference bookings and private guest bookings. Conference bookings use some bedrooms each week, the balance being available for private guests.

Data has been collected relating to private guest bookings (i.e., non-conference bookings) which are summarised below for a 10-week period.

Week	*Double rooms available for private guest bookings*	*Number of guests*	*Average stay (nights)*
1	55	198	2.1
2	60	170	2.6
3	72	462	1.4
4	80	381	3.2
5	44	83	5.6
6	62	164	3.4
7	80	348	2.6
8	54	205	1.7
9	80	442	1.8
10	24	84	3.2

Some of the costs for private guest bookings vary with the number of guests, regardless of the length of their stay, while others vary with the number of rooms available in any week.

Variable cost per guest	£17.50
Variable cost per week per room available	£56.00

The general fixed cost for private guest bookings per week is £8,100.

Requirements

(a) To the nearest penny, the total costs for private guests' bookings for the 10-week period is £[ ]

(b) To the nearest whole number, the number of private guest-nights achieved in the 10-week period is [ ]

(c) The number of private guest-nights available for the 10-week period is [ ]

? **Question 5** Process costing

A firm operates a process, the details of which for the period were as follows:

- There was no opening work in progress.
- During the period 8,250 units were received from the previous process at a value of £453,750, labour and overheads were £350,060 and material introduced was £24,750.
- At the end of the period the closing work-in-progress was 1,600 units, which were 100 per cent complete in respect of materials, and 60 per cent complete in respect of labour and overheads.
- The balance of units were transferred to finished goods.

Requirements

(a) The number of equivalent units of labour and overheads produced during the period was [ ]

(b) In the process account for the period, the following values will be credited:

(i) finished goods value: £ [ ]

(ii) closing work in progress value: £ [ ]

? **Question 6** Process costing with abnormal losses

Chemical Processors manufacture Wonderchem using two processes – mixing and distillation. The following details relate to the distillation process for a period:

No opening work in progress	
Input from mixing	36,000 kg at a cost of £166,000
Labour for period	£43,800
Overheads for period	£29,200

Closing WIP of 8,000 kg, which was 100 per cent complete for materials and 50 per cent complete for labour and overheads.

The normal loss in distillation is 10 per cent of fully complete production. Actual loss in the period was 3,600 kg, fully complete, which was scrapped.

Requirements

(a) The abnormal loss for the period was ☐ kg.

(b) The number of equivalent kg produced during the period was:
materials: ☐ equivalent kg.
labour and overhead: ☐ equivalent kg.

(c) (i) The value of the abnormal loss is £☐
(ii) (*Tick the correct box*): This value is entered in the process account as a:
debit ☐
credit ☐

(d) The values to be credited in the process account in respect of the following outputs for the period are:
finished goods £☐
normal loss £☐
closing work in progress £☐

? **Question 7** Process costing with opening work in progress

A company operates an expensive processing plant to produce a single product from one process. At the beginning of October, 3,400 completed units were still in the processing plant awaiting transfer to finished stock. They were valued as follows:

	£	
Direct material	25,500	
Direct wages	10,200	
Production overhead	20,400	(200% of direct wages)

During October, 37,000 further units were put into process and the following costs charged to the process:

	£
Direct materials	276,340
Direct wages	112,000
Production overhead	224,000

A total of 36,000 units were transferred to finished stock and 3,200 units remained in work-in-progress at the end of October, which were complete as to material and half complete as to labour and production overhead. The normal level of scrap (1,200 units) occurred during the process.

Requirements

(a) The number of equivalent units produced during the period was:
materials ☐
labour and overhead ☐

(b) The value of the outputs from the process during the period was:
finished goods £☐
closing work in progress £☐

? Question 8 Process account

Complete the following account for process 3 last period. The work in progress was complete as to materials and 50 per cent complete as to labour and overhead.

Process 3 account

	Units	*£*		*Units*	*£*
Process 2 input	2,000	8,000	Finished goods	1,800	☐
Labour and overhead		3,800	Work in progress	200	☐
	2,000	11,800		2,000	11,800

Solutions to Revision Questions

6

Solution 1

- For some of these multiple-choice questions you will need to use some fairly extensive workings. In the assessment you will not be awarded marks for the workings, but do not be tempted to rush them: they are an important part of answering the question, and they will be of no use to you if you cannot read them!

1.1 Answer: (B)

In service industries it is often difficult to identify the cost unit; for this reason, composite cost units are used – for example, guest-nights in a hotel, tonne-kilometres for a transport company. Equivalent units are more likely to be used in product costing.

1.2 Answer: (B)

Closing stock in process B = (13,500 − 11,750) units = 1,750 units

Unit value = £4.50 + £1.25 + £2.50 = £8.25

Closing stock value = £8.25 × 1,750 = £14,437.50

1.3 Answer: (B)

Abnormal losses are valued at the same rate as good production, so that their occurrence does not affect the cost of good production.

1.4 Answer: (A)

	kg
Input	2,500
Normal loss (10%)	(250)
Abnormal loss	(75)
Good production	2,175

1.5 Answer: (C)

The abnormal gain account shows the net benefit of the abnormal gain. The scrap value must be debited to the abnormal gain account to allow for the 'forgone' scrap value of the normal loss units which did not arise.

1.6 Answer: (A)

Normal loss 5,000 kg × 20% = 1,000 kg @ 30 p = £300

1.7 Answer: (C)

Abnormal loss	*kg*
Input	5,000
Normal loss	(1,000)
Output	(3,800)
Abnormal loss	200
Production costs	*£*
Materials	2,500
Labour	800
Production overheads	1,600
	4,900

$$\text{Cost per unit} = \frac{£4{,}900 - £300}{4{,}000^*} = £1.15 \text{ per unit}$$

*Output 3,800 + abnormal loss 200 = 4,000 units

Abnormal loss £1.15 × 200 kg = £230.

1.8 Answer: (B)

Value of output = £1.15 × 3,800 kg = £4,370.

Equivalent unit table for 1.9–1.11

	Units	*Materials*		*Labour/overheads*	
		%	*EU*	%	*EU*
Output	8,000	100	8,000	100	8,000
Normal loss	1,000		–		–
Abnormal loss	100	100	100	100	100
Closing work in progress	900	100	900	75	675
Total equivalent units	10,000		9,000		8,775
Costs			£40,500		£8,424
Equivalent unit cost			£4.50		£0.96

1.9 Answer: (D)

Value of abnormal loss = 100 × (£4.50 + £0.96) = £546.

1.10 Answer: (C)

Value of output = 8,000 × (£4.50 + £0.96) = £43,680.

1.11 Answer: (B)

Closing work in progress:	£
900 × £4.50	4,050
675 × £0.96	648
	4,698

1.12 Answer: (B)

Workings for 1.12 are shown as part of solution 1.13.

1.13 Answer: (A)

					Equivalent litres		
				Input			*Conversion*
Input	*Litres*	*Output*	*Litres*	*material*			*costs*
Opening WIP	1,000	Finished output	24,000	24,000			24,000
Input	30,000	Normal loss	3,000	–			–
		Abnormal loss	500	500		(60%)	300
		Closing WIP	3,500	3,500		(80%)	2,800
	31,000		31,000	28,000			27,100

1.14 Answer: (C)

Workings are shown as part of solution 1.15.

1.15 Answer: (D)

Equivalent unit table

		Materials		*Labour*		*Production o/h*	
Description	*Units*	%	*EU*	%	*EU*	%	*EU*
Output	800	100	800	100	800	100	800
Opening WIP	500	100	500	90	450	40	200
EU			1,300		1,250		1,000
			£		£		£
Costs – Period			198,000		139,500		79,200
Opening WIP			49,000		23,000		3,800
Total cost			247,000		162,500		83,000
Cost per equivalent unit			190		130		83

Value of completed output = 800 × (£190 + £130 + £83) = £322,400.

1.16 Answer: (C)

Option B describes a by-product because it has an insignificant value compared with the main product(s).

Solution 2

2.1

- Hotel (d)
- Transport service (e)
- College (a)
- Restaurant (b)
- Accountancy service (c)

2.2 When the actual loss in a process is less than the expected loss for the period, there is an *abnormal gain*.

2.3

	kg
Transferred to next process	4,100
Normal loss (20% × 5,000)	1,000
Closing work in process	800
Abnormal gain	**(900)**
	5,000

2.4 A £80; B £10; C £70.

Scrap account

	£		£
Process 1 – normal loss		Abnormal gain	**10**
(400 kg × £0.20)	**80**	(50 × £0.20)	
		Balance c/d	**70**
	80		**80**
Balance b/d	70		

2.5

	Equivalent units in progress	*Valuation £*
Materials	**200** (× £4)	800
Labour	**100** (× £3)	300
Overhead	**40** (× £2)	80
		1,180

2.6 A £270; B £1,100

Process account [extract]

	Units		£
Finished goods	4,000		88,000
Normal loss	90	(× £3)	**270**
Abnormal loss	50	(× £22*)	**1,100**

*Abnormal loss units are valued at the same rate as good output (£88,000/4,000 = £22).

2.7 A product which is produced in the same process as one or more other products and which has a significant sales value compared with the other products is known as a *joint product*. A product which has some value but which is produced incidentally in manufacturing something else is known as a *by-product*. The point at which products become separately identifiable is known as the *separation point* and costs incurred up to this point are known as *common costs*.

2.8

	Relevant	*Not relevant*
The share of the common costs apportioned to the joint product		✔
The sales value at the separation point	✔	
The sales value after further processing	✔	
The further processing costs incurred after the separation point	✔	

☑ Solution 3

- This question provides an example of the use of a composite cost unit. The cost per tonne-kilometre is the cost of transporting 1 tonne for 1 km.

(a) £8,790
(b) £1,600
(c) £0.20

Workings:

Tonne-kilometres

Journey	*Tonnes carried*	*km*	*tonne-km*
1	34	180	6,120
2	28	265	7,420
3	40	390	15,600
4	32	115	3,680
5	26	220	5,720
6	40	480	19,200
7	29	90	2,610
8	26	100	2,600
9	25	135	3,375
	280	1,975	66,325

		£
Variable operating costs		
Loading: 280 × £6 =		1,680
	£ per km	
Running costs: Petrol	0.50	
Repairs	0.30	
Depreciation	1.00	
	1.80 × 3,950	7,110
		8,790
Fixed operating costs	£	
Depreciation (3 × £50)	150	
Supervision	550	
Drivers' wages (3 × £300)	900	
		1,600
Total cost		10,390

Average total cost per tonne-kilometre $= \frac{£13,265}{66,325} = £0.20$

Solution 4

- You will be using a composite cost unit in this question as well: a guest night. The cost per guest night is the cost incurred by the hotel for one guest to stay for one night. In this example, the number of guest nights is calculated as:

  No. of guest nights = no. of guests × average no. of nights stayed

- You will need to prepare some preliminary workings in part (a). The totals to be calculated for the 10-week period are:
  (i) the number of rooms available (you need this in order to calculate the costs incurred);
  (ii) the number of guests (this is also needed for the cost calculation);

(a) £159,613.50
(b) 6,064
(c) 8,554

Workings:

Week	*Rooms*	*Guests*	*Average stay*	*Guest nights*
1	55	198	2.1	415.8
2	60	170	2.6	442.0
3	72	462	1.4	646.8
4	80	381	3.2	1,219.2
5	44	83	5.6	464.8
6	62	164	3.4	557.6
7	80	348	2.6	904.8
8	54	205	1.7	348.5
9	80	442	1.8	795.6
10	24	84	3.2	268.8
	611	2,537		6,063.9

Total costs for private guests' bookings = (611 × £56) + (2,537 × £17.50) + (10 × £8,100) = £159,613.50
Guest nights available = 611 rooms × 7 nights × 2 guests = 8,554.

Solution 5

- You can use the standard layout for the working paper that you should have become accustomed to when working through this chapter. You can then pick out the relevant parts that you need for your answers.
- There are no losses, therefore the question is quite straightforward.
- The transfer to finished goods is calculated as follows: 8,250 units input, less 1,600 units in progress, equals 6,650 units to finished stock.

(a) 7,610
(b) (i) £691,600

(ii) £136,960

Workings:

				Equivalent units produced		
				Previous	*Materials*	*Labour*
Input	*Units*	*Output*	*Units*	*process*	*added*	*and o/h*
Previous process	8,250	Finished goods	6,650	6,650	6,650	6,650
		Closing WIP	1,600	1,600	1,600	960(60%)
	8,250	Equiv. units produced	8,250	8,250	8,250	7,610
		Costs	£	£	£	£
		Period costs		453,750	24,750	350,060
		Cost per equiv. unit	104	55	3	46
		Valuation				
		Finished goods	691,600			
		Closing WIP	136,960	88,000 (1,600 × £55)	4,800 (1,600 × £3)	44,160 (960 × £46)

Solution 6

- Read the question carefully. The normal loss calculation is based on the completed production rather than on the more usual basis of input to the process.
- The losses are completely processed, therefore you can use the total cost per unit to value the abnormal loss.

(a) The abnormal loss for the period was 800 kg.
Workings:

	kg
Input	36,000
Less: Closing WIP	(8,000)
Production	28,000
Normal loss:	2,800
10% × 28,000 kg	
Actual loss	3,600
∴ Abnormal loss	800

(b) Materials: 33,200 equivalent kg.
Labour and overhead: 29,200 equivalent kg.

(c) (i) £6,000
(ii) Credit.

(d) Finished goods: £183,000
Normal loss: £0
Closing work in progress: £50,000
Workings:

				Equivalent units		
			Total	*Material*	*Labour*	*Overhead*
Input	*kg*	*Output*	*kg*	*kg*	*kg*	*kg*
From mixing	36,000	Finished goods	24,400	24,400	24,400	24,400
		Abnormal loss	800	800	800	800
			25,200	25,200	25,200	25,200
		Normal loss	2,800	–	–	–
		Closing WIP:				
		Materials (100%)	8,000	8,000		
		Labour (50%)			4,000	
		Overheads (50%)				4,000
			36,000	33,200	29,200	29,200
		Cost (£)	239,000	166,000	43,800	29,200
		Cost per unit (£)	7.50	5.00	1.50	1.00
		Evaluation (£)				
		Finished goods	183,000			
		Abnormal loss	6,000			
		Closing WIP	50,000	40,000	6,000	4,000

☑ Solution 7

- There is opening work in progress to deal with in this question, so you will probably find it easiest to use the full working schedule, beginning with an input/output reconciliation. Although you will not be awarded any marks for these workings, they will help you to achieve the required 100 per cent accuracy.

- Do not be confused by the fact that the opening work in progress consists of complete units. Simply deal with it using the method that you learned in this chapter, that is include it as part of the input and include its value in the cost section of your working schedule.

(a) Materials: 39,200
Labour and overhead: 37,600.

(b) Finished goods: £628,200
Closing work in progress: £40,240.

Workings:

				Equivalent units produced		
Input	*Units*	*Output*	*Units*	*Materials*	*Labour*	*Overhead*
Opening WIP	3,400	Finished goods	36,000	36,000	36,000	36,000
Further units	37,000	Normal loss	1,200	–	–	–
		Closing WIP	3,200	3,200	1,600	1,600
	40,400		40,400	39,200	37,600	37,600
		Cost	£	£	£	£
		Opening WIP	56,100	25,500	10,200	20,400
		Period costs	612,340	276,340	112,000	224,000
			668,440	301,840	122,200	244,400
		Cost per unit	17.45	7.70	3.25	6.50
		Evaluation				
		Finished goods	628,200			
		Closing WIP	40,240	24,640	5,200	10,400

☑ Solution 8

- You will need to prepare a statement of equivalent units and calculate the cost per equivalent unit.
- There are no losses to be accounted for, so all of the cost incurred is to be divided over the completed units and the units in progress.
- Be accurate with your workings. Although they will not be awarded marks, they will help you to achieve the necessary 100 per cent accuracy.

				Equivalent units to absorb cost	
Input	*Units*	*Output*	*Units*	*Materials*	*Labour/OH*
Process 2 input	2,000	Finished goods	1,800	1,800	1,800
		Closing WIP	200	200	(50%) 100
	2,000		2,000	2,000	1,900
		Costs	£	£	£
		Incurred in period		8,000	3,800
		Cost per unit	6	4	2
		Evaluation			
		Finished goods (1,800 × £6)	10,800		
		Closing WIP	1,000	800	200

Process 3 account

	Units	£		*Units*	£
Process 2 input	2,000	8,000	Finished goods	1,800	10,800
Labour and overhead		3,800	Work in progress	200	1,000
	2,000	11,800		2,000	11,800

Integrated and Non-integrated Accounting Systems

7

Learning Outcomes

After completing this chapter, you should be able to:

- prepare accounting entries for an integrated accounting system;
- explain the difference between integrated and interlocking accounting systems.

7.1 Introduction

The systems that are used to account for costs will vary between organisations. Each organisation will design its system to suit its own needs, taking into account factors such as statutory accounting requirements and management information needs. The accounting systems that are in use range from very simple manual systems to sophisticated computerised systems capable of producing detailed reports on a regular or an *ad hoc* basis.

Notwithstanding the wide variety of features which individual systems may have, most of them can be classified as one of two types: integrated systems and non-integrated (interlocking) systems.

In this chapter we will be reviewing both types of system and their advantages and disadvantages. You will learn in detail about the accounting entries within integrated systems and you will also be studying the differences between interlocking and integrated systems.

In Chapter 12 of this *Study System* you will build on your knowledge of integrated systems by studying the operation of an integrated accounting system using standard costs.

7.2 The differences between integrated and non-integrated accounting systems

The CIMA *Terminology* defines integrated accounts as 'a set of accounting records which provides both financial and cost accounts using a common input of data for all accounting purposes'.

Therefore, in an integrated system the cost accounting function and the financial accounting function are combined in one system.

A non-integrated or interlocking system is 'a system in which the cost accounts are distinct from the financial accounts, the two sets of accounts being kept continuously in agreement by the use of control accounts or reconciled by other means'.

Therefore, in an interlocking system two sets of ledgers are kept. One ledger (the cost ledger) records only those transactions which concern the operational aspects of the business. The other ledger (the financial ledger) records all transactions.

7.2.1 The advantages and disadvantages of an integrated system

The main advantages of integrated systems are as follows:

(a) Duplication of effort is avoided and there is less work involved in maintaining the system.
(b) There is no need for the periodic reconciliations of the two sets of accounts which are necessary with non-integrated systems.
(c) Maintaining a single set of accounts avoids the confusion that can arise when two sets of accounts are in existence which each contain different profit figures.

The main disadvantage of integrated accounts is that a single system is used to provide information both for external and internal reporting requirements. The need to provide information for statutory purposes may influence the quality of information which can be made available for management purposes. For example, it may be more useful for management purposes to have stock valued on a LIFO basis. However, this would not be acceptable for external reporting purposes and the latter requirement may prevail to the detriment of management information.

7.2.2 The advantages and disadvantages of an interlocking system

The main advantages of interlocking systems are as follows:

(a) Management attention can be concentrated on the operational aspects of the business so that future performance can be improved.
(b) The cost accounts can analyse information in a way which is useful to managers, without the restrictions imposed on the financial accounts due to the need to conform to statutory reporting requirements.

An interlocking system has a number of disadvantages:

(a) Managers may be confused by the existence of two different sets of accounting information.
(b) Effort is duplicated as relevant data is input into two separate systems.
(c) There is a need to perform regular reconciliations of the two systems which can be time-consuming.

7.3 Integrated accounts

The following example will demonstrate the double-entry principles involved in an integrated system. Make sure that you understand which accounts are used to record each type of transaction, before you move on to the next example, which contains figures.

7.3.1 Example: the main accounting entries in an integrated system

Figure 7.1 shows the flow of accounting entries within an integrated system for the following transactions:

(i) The purchase of raw materials on credit terms.

Debit Raw materials control
Credit Payables (creditors) control

(ii) The issue to production of part of the consignment received in (i) above.

Debit Work in progress control
Credit Raw materials control

Direct materials costs are charged to the work in progress account.

(iii) The issue, as indirect materials, of part of the consignment received in (i) above.

Debit Production overhead control
Credit Raw materials control

Indirect production costs (in this case indirect materials costs) are collected in the production overhead control account for later absorption into production costs.

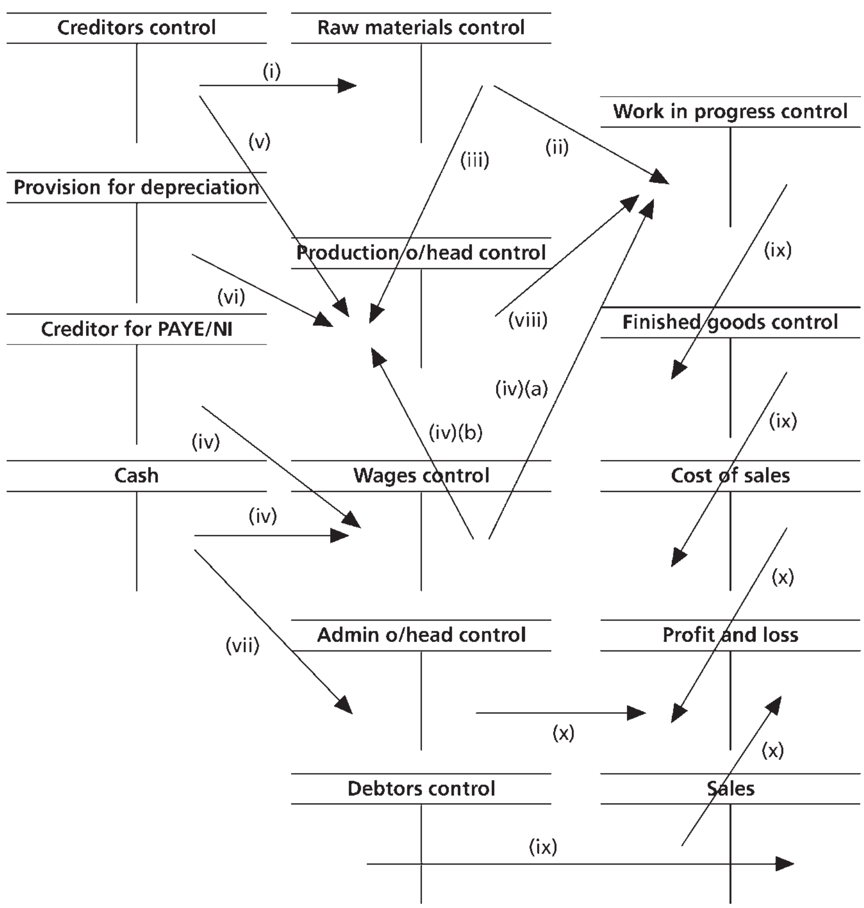

Figure 7.1 Some of the accounting entries in an integrated system

(iv) A cash payment of wages, after deduction of PAYE and National Insurance (a) to direct workers; and (b) to indirect workers associated with production.

Debit Wages control
Credit Cash account

with the net amount of wages actually paid, after deductions.

Debit Wages control
Credit PAYE/NI payable

with the deductions for PAYE and National Insurance.

The wages control account has now been debited with the gross amount of total wages. This gross amount must then be charged out according to whether it is direct or indirect wages. The direct wages are charged to work in progress (a). The indirect wages are collected with other indirect costs in the production overhead control account (b) for later absorption into production costs.

Later in the period when the payment is made to the creditor for PAYE/NI, the relevant entries will be:

Debit PAYE/NI payable
Credit Cash/Bank

(v) Electricity for production purposes, obtained on credit.

Debit Production overhead control
Credit Payables (creditors) control

(vi) Depreciation of machinery used for production.

Debit Production overhead control
Credit Provision for depreciation

These last two items are both production overhead costs which are being accumulated for later absorption into production costs.

(vii) Cash paid for office expenses.

Debit Administration overhead control
Credit Cash account

(viii) Absorption of production overhead, using a predetermined rate.

Debit Work in progress control
Credit Production overhead control

Once all of the production overhead has been accumulated in the overhead control account, a predetermined rate is used to absorb it into the cost of work in progress. The work in progress account now contains charges for direct costs and for production overheads.

(ix) The sale, on credit, of all goods produced in the month.

Debit Receivables (debtors) control
Credit Sales account

with the sales value achieved.

Debit Finished goods control
Credit Work in progress control

This transfers the cost of the completed goods to the finished goods inventory (stock) account. This is usually done in stages as production is completed during the month. For demonstration purposes this has been simplified to show one transfer at the end of the month.

Debit Cost of sales account
Credit Finished goods control

This transfers the cost of the goods sold from the inventory (stock) account. This is also usually done in stages as stock is sold during the month.

(x) The summary income statement (profit and loss account) is prepared for the month.

Debit Profit and loss account
Credit Cost of sales account

Debit Profit and loss account
Credit Administration overhead control

(Alternatively, the administration overhead control account balance may first be transferred to the cost of sales account and from there to the profit and loss account.)

This transfers the costs for the month to the profit and loss account, to be offset against the sales revenue which is transferred from the sales account:

Debit Sales account
Credit Profit and loss account

The balance on the production overhead control account represents the amount of production overhead which is under-absorbed (debit balance) or over-absorbed (credit balance). This may be written off against the profit for the month or alternatively it may be carried forward to be written off at the year end.

This illustration has been simplified to demonstrate the main accounting flows. For example, in practice there would be more items of production overhead and administration overhead. There would also be expenditure on other types of overhead such as selling and distribution costs. Control accounts would be opened for these costs and they would be dealt with in the same way as the administration overhead in this example.

7.3.2 Example: integrated accounts

You should now be in a position to tackle a fully worked example on integrated accounts.

This example will also give you some useful practice in dealing with the ledger accounts for a process costing system. Although you would not be required to prepare a full set of ledger accounts in your assessment, it is still important for you to work carefully through the example. This will ensure that you have a sound knowledge of how to account for all of the main transactions in an integrated accounting system.

Exercise 7.1

See if you can complete the relevant ledger accounts yourself before looking at the solution.

IA Ltd operates an integrated accounting system and, based on the data given below, you are required to prepare the relevant ledger accounts for the month ended 31 October, year 2.

Account balances at 1 October, year 2

	£	£
Debtors		60,000
Creditors		75,000
Provision for depreciation, plant and machinery		60,000
Stocks:		
Raw materials		350,000
Work in process 1:		
direct materials	35,300	
direct wages	24,200	
production overhead	60,500	
		120,000
Work in process 2:		
direct materials	63,500	
direct wages	34,600	
production overhead	51,900	
		150,000
Finished goods		30,000
Bank		31,000
Sales		500,000
Cost of sales		370,000
Abnormal loss		4,500
Administration overhead		60,000
Selling and distribution overhead		40,000
Production overhead, over-/under-absorbed (credit balance brought forward)		10,500

Transactions for the month ended 31 October, year 2 included:

	£
Direct wages incurred:	
Process 1	42,400
Process 2	64,600
Direct wages paid	100,000
Production salaries paid	85,000
Production expenses paid	125,000
Paid to creditors	165,000
Received from debtors	570,000
Administration overhead paid	54,000
Selling and distribution overhead paid	42,000
Materials purchased on credit	105,000

	£
Materials returned to suppliers	5,000
Materials issued to:	
Process 1	68,000
Process 2	22,000
Goods sold on credit:	
At sales prices	550,000
At cost	422,400

	Direct materials	*Direct wages*
	£	£
Abnormal loss in:		
Process 1	800	600
Process 2	1,400	800
Transfer from process 1 to process 2	76,300	47,400
Transfer from process 2	273,900	69,800

Provision for depreciation of plant and machinery is £4,000 for the month.

Solution

The first step is to open a ledger account for each balance listed. Enter the opening balances, which are all labelled as item 1 in the solution which follows. All of the other transaction numbers relate to the explanatory notes which you will find at the end of the ledger accounts.

Debtors

	£		£
1 Balance b/f	60,000	Bank	570,000
7 Sales	550,000	Balance c/f	40,000
	610,000		610,000

Creditors

	£		£
Bank	165,000	1 Balance b/f	75,000
Raw materials	5,000	Raw materials	105,000
Balance c/f	10,000		
	180,000		180,000

Provision for depreciation

	£		£
Balance c/f	64,000	1 Balance b/f	60,000
		11 Production o/h control	4,000
	64,000		64,000

Raw materials stock

	£		£
1 Balance b/f	350,000	Creditors	5,000
Creditors	105,000	6 Process 1	68,000
		6 Process 2	22,000
		Balance c/f	360,000
	455,000		455,000

Finished goods stock

	£		£
1 Balance b/f	30,000	8 Cost of sales	422,400
10 Process 2	448,400	Balance c/f	56,000
	478,400		478,400

Work in process 1

	£		£
1 Balance b/f	120,000	9 Abnormal loss	2,900
2 Wages control	42,400	10 Process 2	242,200
6 Raw materials	68,000	Balance c/f	91,300
12 Overhead control	106,000		
	336,400		336,400

In this answer, the detail of the WIP value for each element is not shown. An alternative presentation is to have a 'wider' account with a debit and a credit column for each cost element.

Work in process 2

	£		£
1 Balance b/f	150,000	9 Abnormal loss	3,400
2 Wages control	64,600	10 Finished goods	448,400
6 Raw materials	22,000	Balance c/f	123,900
10 Process 1	242,200		
12 Overhead control	96,900		
	575,700		575,700

Bank

	£		£
1 Balance b/f	31,000	3 Wages control	100,000
Debtors	570,000	4 Production overhead control	85,000
		5 Production overhead control	125,000
		Creditors	165,000
		Admin. overhead	54,000
		Selling overhead	42,000
		Balance c/f	30,000
	601,000		601,000

Sales

	£		£
Balance c/f	1,050,000	1 Balance b/f	500,000
		7 Debtors	550,000
	1,050,000		1,050,000

Cost of sales

	£		£
1 Balance b/f	370,000	Balance c/f	792,400
8 Finished goods	422,400		
	792,400		792,400

Abnormal loss

	£		£
1 Balance b/f	4,500	Balance c/f	10,800
9 Process 1	2,900		
9 Process 2	3,400		
	10,800		10,800

Administration overhead

	£		£
1 Balance b/f	60,000	Balance c/f	114,000
Bank	54,000		
	114,000		114,000

Selling and distribution overhead

	£		£
1 Balance b/f	40,000	Balance c/f	82,000
Bank	42,000		
	82,000		82,000

Production overhead over-/under-absorbed

	£		£
13 Overhead control	11,100	1 Balance b/f	10,500
		Balance c/f	600
	11,100		11,100

Wages control

	£		£
3 Bank	100,000	2 Process 1	42,400
Balance c/f	7,000	2 Process 2	64,600
	107,000		107,000

The control accounts for wages and for production overheads are opened as 'collecting places' for these costs. The wages can then be analysed and charged out as appropriate. The production overhead can be absorbed into the work in progress accounts.

Production overhead control

	£		£
4 Bank	85,000	12 Process 1	106,000
5 Bank	125,000	12 Process 2	96,900
11 Depreciation	4,000	13 Under-absorbed	11,100
	214,000		214,000

Explanatory notes

1. These are the opening balances as given in the trial balance.
2. Direct wages incurred are credited to the wages control account and debited to the relevant work in process account. This looks strange at first because there is not yet any debit entry in the wages control account.
3. Now that the direct wages actually paid have been debited to the control account, you can see that there is a difference of £7,000 between the wages paid and wages incurred. This represents a £7,000 accrual for direct wages owing, which is carried down as a credit balance.

4. Production salaries are charged to the production overhead control account for later absorption into work in process costs.

   The production salaries could alternatively have been charged first to the wages control account. They would then be transferred from there to the production overhead account, so the net effect is the same.
5. Production expenses are also collected in the production overhead control account for later absorption into work in process costs.
6. Direct materials issued from inventory (stock) are charged to the relevant work in process account.

   Materials used for indirect production purposes (there are none in this example) would be debited to the production overhead control account.
7. The sales value of goods sold is credited to the sales account and debited to receivables (debtors).
8. The cost of the goods sold is transferred from finished goods inventory (stock) to the cost of sales account.
9. The transaction data give only the material and wages cost of the abnormal loss, but we need to know the full cost including the production overhead content. Therefore, we need to know how to absorb the production overhead. The only information which we have on this is contained within the data for the opening work in progress for each process. This information can be used to determine the absorption rate based on a direct wages percentage.

$$\text{Process 1 absorption rate} = \frac{£60{,}500}{£24{,}200} \times 100\% = 250\% \text{ of direct wages}$$

$$\text{Process 2 absorption rate} = \frac{£51{,}900}{£34{,}600} \times 100\% = 150\% \text{ of direct wages}$$

   Therefore, the full cost of the abnormal loss in each process is as follows:

	Materials	*Wages*		*Production overhead*	*Total*
	£	£		£	£
Process 1	800	600	(× 250%)	1,500	2,900
Process 2	1,400	800	(× 150%)	1,200	3,400

10. The same overhead absorption rates can be used to determine the full production cost of the transfers from each of the processes:

	Materials	*Wages*		*Production overhead*	*Total*
	£	£		£	£
Process 1	76,300	47,400	(× 250%)	118,500	242,200
Process 2	273,900	69,800	(× 150%)	104,700	448,400

   The output from process 2 is transferred to the finished goods inventory (stock) account.
11. The depreciation provision for plant and machinery is a production overhead cost. It must therefore be collected in the production overhead control account for later absorption into work in progress costs.

12. Once all of the transactions from the question data have been entered, the next step is to absorb the production overhead into the two work in process accounts. Use the predetermined overhead absorption rates that you calculated in note 9.

    Process 1: Wages £42,400 × 250% = £106,000
    Process 2: Wages £64,600 × 150% = £96,900.

13. The last control account to be dealt with is the one which you opened as a collecting place for production overhead costs. All of the production overhead costs incurred, including depreciation, have been debited to this account. The production overheads have been absorbed into the work in process accounts using the predetermined rates. Therefore, the balance on this account represents the under- or over-absorbed production overhead for the period. In this example it is transferred to a separate account and accumulated to be offset against the under- or over-absorbed balances for future periods.

    The debit balance on the production overhead control account means that the overhead was under-absorbed for this month.

How did you get on?

If this is the first time that you have studied integrated accounts, it is important that you understand all of the entries in this example. Once you have checked each one carefully and understood it, put the example aside for a few days and then return to try it again without looking at the solution. You should be able to work all the way through without any errors (!)

7.4 Interlocking accounts

Interlocking or non-integrated accounting systems contain two sets of accounts: one for the financial accounts and one for the cost accounts. Many different types of interlocking accounting systems exist but they all follow the same basic principles.

The main accounting entries in the cost accounts in the cost ledger are basically the same as in an integrated accounts system.

7.4.1 Using interlocking accounts

The financial ledger contains all of the accounts normally found in a financial accounting system and it is operated in the usual way following double entry principles.

Relevant operational data is then input to the cost ledger, which usually contains the following main accounts:

- Raw materials control
- Work in progress control
- Finished goods control
- Wages control
- Production overhead control
- Administration overhead control
- Selling and distribution overhead control
- Cost of sales
- Sales

- Cost accounts income statement (profit and loss account)
- Cost ledger control.

If you look at this list of accounts you will see that there are none of the 'financial' type of accounts, for example those related to the balance sheet such as non-current (fixed) assets, receivables (debtors) and payables (creditors), and those concerned with financing issues such as dividends and interest. This type of account is contained within the financial ledger.

The cost ledger control account is used to record all of the information which is passed to and from the financial ledger. Effectively it is used instead of all of the accounts which are not included in the cost ledger, to make the ledger self-balancing.

The cost ledger control account is sometimes called the general ledger control account, or the financial ledger control account.

7.4.2 Performing reconciliations in interlocking systems

The two sets of accounts in an interlocking system must be reconciled regularly to ensure that no errors have occurred in either set. There are a number of factors which can cause differences:

(a) *Items affecting the financial accounts profit which are not included in the cost accounts.*
This would include financial items such as dividend and interest or profits and losses on the sale of non-current (fixed) assets.

(b) *Items affecting the cost accounts profit which are not included in the financial accounts.*
This would include notional charges for rent and interest. If an organisation owns its factory premises the cost accountant may make a notional charge for rent, even though it is a cost which is not actually paid by the organisation. The aim is to show the full cost of occupying the premises. One advantage is that the unit costs of production at that factory can then be compared with those at a factory which is rented. Also, the manager of the owned factory would have a complete picture of the true cost of running the factory.

Notional interest may be charged in the cost accounts on the capital tied up in inventories (stocks), even though interest is not paid specifically for the investment in the stock. The aim is to draw managers' attention to the full cost of holding the stocks.

(c) *Items which are treated differently in the two sets of accounts.*
The cost accounts are designed to suit internal management purposes whereas the financial accounts are more likely to conform to external reporting requirements. This means that certain items may be treated differently in the two sets of accounts, causing differences in the profit figures.

For example, the financial accounts would probably conform to the requirements of accounting standards, valuing stocks on a FIFO or weighted average price basis. The cost accounts may use another method which is more suited to the particular requirements of the company management, for example LIFO or replacement price.

Another item which may be treated differently is depreciation. For example the cost accountant may use a machine hour method when the financial accountant is applying a straight-line basis.

Note that you will not be required to perform reconciliations in the assessment. You simply need to be aware of the requirement to perform a periodic reconciliation, and of the differences that can arise between the two types of system.

7.5 Computerised accounting systems

In a well-designed computerised system, an appropriate coding structure can make it possible for transactions to be recorded only once as in an integrated system, but the same basic data can be analysed and presented in different ways for different purposes. For example the inventories (stocks) may be valued differently depending upon the user of the report. The successful operation of such a system depends on the existence of an efficient coding system to correctly analyse the source data.

The result is a sort of hybrid system which combines the best features of integrated and non-integrated systems without the excessive administrative costs. The best management information can be obtained as well as the necessary reports for external reporting purposes.

7.6 Summary

Having read this chapter the main points that you should understand are as follows.

1. An integrated accounting system contains both financial and cost accounts and uses the same data for all accounting purposes.
2. A non-integrated or interlocking system contains separate ledgers for financial accounts and cost accounts. Within the cost ledger, a cost ledger control account is used to replace the financial accounts such as payables (creditors) and cash that are not contained within the cost ledger.
3. When an interlocking system is used it is necessary to perform a periodic reconciliation between the profits reported by each set of accounts. Items that may be treated differently in the two ledgers include inventory (stock) valuations, depreciation calculations, notional charges and financial items such as dividend and interest.

Revision Questions

7

Question 1 Multiple choice

1.1 A firm operates an integrated cost and financial accounting system. The accounting entries for an issue of direct materials to production would be:

	Debit	*Credit*
(A)	Work in progress control account	Stores control account
(B)	Finished goods account	Stores control account
(C)	Stores control account	Work in progress control account
(D)	Cost of sales account	Work in progress control account

1.2 During a period £35,750 was incurred for indirect labour. In a typical cost ledger, the double entry for this is:

	Debit	*Credit*
(A)	Wages control account	Overhead control account
(B)	WIP control account	Wages control account
(C)	Overhead control account	Wages control account
(D)	Wages control account	WIP control account

1.3 In an integrated cost and financial accounting system, the accounting entries for factory overhead absorbed would be:

	Debit	*Credit*
(A)	Work in progress control account	Overhead control account
(B)	Overhead control account	Work in progress control account
(C)	Overhead control account	Cost of sales account
(D)	Cost of sales account	Overhead control account

1.4 At the end of a period, in an integrated cost and financial accounting system the accounting entries for £18,000 overheads under-absorbed would be:

	Debit	*Credit*
(A)	Work in progress control account	Overhead control account
(B)	Profit and loss account	Work in progress control account
(C)	Profit and loss account	Overhead control account
(D)	Overhead control account	Profit and loss account

1.5 In the cost ledger the factory cost of finished production for a period was £873,190. The double entry for this is

	Debit	*Credit*
(A)	Cost of sales account	Finished goods control account
(B)	Finished goods control account	Work in progress control account
(C)	Costing profit and loss account	Finished goods control account
(D)	Work in progress control account	Finished goods control account

1.6 XYZ Ltd operates an integrated accounting system. The material control account at 31 March shows the following information:

Material control account

	£		£
Balance b/d	50,000	Production overhead control account	10,000
Creditors	100,000	?	125,000
Bank	25,000	Balance c/d	40,000
	175,000		175,000

The £125,000 credit entry represents the value of the transfer to the

(A) cost of sales account.
(B) finished goods account.
(C) profit and loss account.
(D) work in progress account.

1.7 In an integrated cost and financial accounting system the correct entries for the provision for depreciation of production machinery are:

	Debit	*Credit*
(A)	Provision for depreciation account	Work in progress account
(B)	Work in progress account	Provision for depreciation account
(C)	Overhead control account	Provision for depreciation account
(D)	Provision for depreciation account	Overhead control account.

1.8 Data for the finishing department for the last quarter are as follows.

Budgeted cost centre overhead	£320,000
Actual cost centre overhead	£311,250
Budgeted direct labour hours	40,000
Actual direct labour hours	41,500

The accounting entries to record the under- or over-absorbed overhead for the quarter would be:

	Debit		*Credit*
(A)	Overhead control account	£20,750	Profit and loss account £20,750
(B)	Overhead control account	£8,750	Profit and loss account £8,750
(C)	Profit and loss account	£20,750	Overhead control account £20,750
(D)	Profit and loss account	£8,750	Overhead control account £8,750

? **Question 2** Short objective-test questions

2.1 *Tick the correct box.*

A system in which the cost accounts are distinct from the financial accounts is called an:

integrated system ☐
interlocking system ☐

2.2 A company purchased materials costing £30,000. Of these, materials worth £1,000 were issued to the maintenance department and materials worth £22,000 were issued to the production department. Which of the following accounting entries would arise as a result of these transactions? (*Tick all that are correct.*)

			£	
(a)	Debit	Raw materials control	29,000	☐
(b)	Debit	Raw materials control	30,000	☐
(c)	Debit	Work in progress control	22,000	☐
(d)	Debit	Work in progress control	23,000	☐
(e)	Debit	Work in progress control	30,000	☐
(f)	Debit	Production overhead control	1,000	☐
(g)	Credit	Raw materials control	23,000	☐
(h)	Credit	Raw materials control	30,000	☐

2.3 Look at the following account and then identify whether statements (a) to (c) are true or false.

Wages control account

	£		£
Bank	82,500	Work in progress control	52,500
PAYE/NI creditor	9,500	Production overhead control	39,500
	92,000		92,000

	True	False
(a) Gross wages for the period amounted to £82,500.	☐	☐
(b) Indirect wages incurred amounted to £39,500.	☐	☐
(c) Direct wages incurred amounted to £92,000.	☐	☐

2.4 The production overhead absorption rate is £3 per direct labour hour. During the period 23,000 direct labour hours were worked.

Production overhead control account

	£		£
Wages control	44,000	Work in progress control	A
Bank	22,000		
Depreciation	8,000		
Raw materials control	2,000		
	76,000		

(a) In the production overhead control account for the period shown above, the value to be inserted at A is £☐

(b) Production overhead for the period was:

under-absorbed ☐
over-absorbed ☐

(c) The value of the under/over absorption was £☐

2.5 AS Ltd operates an interlocking accounting system. Tick the relevant boxes to indicate which of the following items would be included in the cost accounts and which would be included in the financial accounts. Some items may be included in both sets of accounts.

	Included in cost accounts	*Included in financial accounts*
(a) Notional interest on the investment in stock	☐	☐
(b) Direct wages paid	☐	☐
(c) Interest received	☐	☐
(d) Production overhead paid	☐	☐
(e) Raw material purchases	☐	☐

2.6 Details of the production wages for a company last period are as follows.

	Gross wages	*PAYE/NI*	
	£000	*£000*	*£000*
Direct wages paid	40	10	30
Indirect wages paid	20	6	14

Which of the following accounting entries would be used to record this data? (*Tick all that are correct.*)

			£000	
(a)	Debit	Wages control	44	☐
(b)	Debit	Work in progress	30	☐
(c)	Debit	Work in progress	40	☐
(d)	Debit	Production overhead control	14	☐
(e)	Debit	Production overhead control	20	☐
(f)	Debit	Wages control	16	☐
(g)	Debit	Wages control	60	☐
(h)	Credit	Bank	44	☐
(i)	Credit	Wages control	60	☐
(j)	Credit	PAYE/NI creditor	16	☐
(k)	Credit	Bank	60	☐

? **Question 3** Cost bookkeeping

D Ltd operates an integrated accounting system, preparing its annual accounts to 31 March each year. The following balances have been extracted from its trial balance at 31 October, year 3:

	£
Raw material control account	34,789 Dr
Wages control account	5,862 Cr
Production overhead control account	3,674 Cr
Work in progress control account	13,479 Dr

During the first week of November, year 3, the following transactions occurred:

	£
Purchased materials on credit	4,320
Incurred wages	6,450
Issued direct materials to production	2,890
Issued indirect materials to production	560
Incurred production overheads on credit	1,870
Absorbed production overhead cost	3,800
Cost of units completed	12,480
Paid wages	5,900

An analysis of the wages incurred shows that £5,200 is direct wages.

Requirements

(a) The balance shown on the production overhead control account means that the production overhead at 31 October was:

under-absorbed ☐
over-absorbed ☐

(b) The raw material control account has been prepared for the first week of November:

Raw material control account

	£		£
Balance b/d	34,789	Work in progress	B
Creditors	A	Production overhead	C
		Balance c/d	35,659

The values that would be entered as A, B and C would be:

A £ ☐
B £ ☐
C £ ☐

(c) The wages control account has been prepared for the first week of November:

Wages control account

	£		£
Bank	A	Balance b/d	5,862
		Work in progress	B
		Production overhead	C

The values that would be entered as A, B and C would be:

A £☐
B £☐
C £☐

(d) At the end of the week, the balance brought down on the production overhead control account will be a:

debit balance ☐
credit balance ☐

The value of the balance will be £☐

(e) The work in progress control account has been prepared for the first week of November:

Work in progress control account

	£		£
Balance b/d	13,479	Finished goods	D
Raw materials	A	Balance c/d	12,889
Wages	B		
Production overhead	C		

The values shown in the account as A, B, C and D are:

A £☐
B £☐
C £☐
D £☐

Solutions to Revision Questions

7

✓ Solution 1

- If you are having trouble identifying the correct entries for each type of transaction, look back to the flowchart of entries at the beginning of this chapter to refresh your memory.
- Take your time and think carefully before selecting the correct option. In many cases, one of the distractors states the correct accounts but the entries are the 'wrong way round'. It is easy to rush into selecting the wrong option.

1.1 Answer: (A)

Direct costs of production are debited to the work in progress control account.

1.2 Answer: (C)

Indirect costs, including indirect labour, are collected in the debit side of the overhead control account pending their later absorption into work in progress.

1.3 Answer: (A)

The factory overhead is first collected in the overhead control account. It is then absorbed into production costs by debiting the work in progress account using the predetermined overhead absorption rate.

1.4 Answer: (C)

Under-absorbed overhead is transferred from the overhead control account as a debit to the income statement (profit and loss account).

1.5 Answer: (B)

Answer (A) is the double entry for the production cost of goods sold. Answer (C) is also the entry for the production cost of goods sold, if a cost of sales account is not used. Answer (D) has entries in the correct accounts but they are reversed.

1.6 Answer: (D)

Materials are issued from stores as either direct materials (to work in progress) or indirect materials (charged to the production overhead control account). The entry for the issue of indirect materials is already shown (£10,000 to production overhead). Therefore, the £125,000 must be the value of the issue of direct materials to work in progress.

1.7 Answer: (C)

The provision for depreciation is a production overhead cost. Therefore, it is debited to the production overhead control account to be accumulated with all other production overheads for the period. At the end of the period the production overhead will be absorbed into work in progress using the predetermined overhead absorption rate.

1.8 Answer: (A)
Overhead absorption rate = £320,000/40,000 = £8 per direct labour hour

	£
Overhead absorbed = £8 × 41,500	332,000
Overhead incurred	311,250
Over absorption	20,750

The over absorption is credited to the income statement (profit and loss account) and debited to the overhead control account.

Solution 2

2.1 A system in which the cost accounts are distinct from the financial accounts is called an *interlocking* system.

2.2 The correct entries are:

(b) The purchased materials are debited in the raw materials control account.
(c) The direct materials are issued to the production department (work in progress).
(f) Materials issued to maintenance are indirect materials, debited to the production overhead control account.
(g) The total amount of materials issued is credited in the materials control account.

2.3 (a) *False*. Gross wages are £92,000.
(b) *True*. Indirect wages are transferred to the production overhead control account.
(c) *False*. Direct wages are £52,500: the amount transferred to work in progress.

2.4 (a) The value to be inserted at A is **£69,000** (£3 × 23,000 hours)
(b) Production overhead for the period was *under-absorbed* (see workings in (c)).

(c)

	£
Overhead incurred	76,000
Overhead absorbed into production	69,000
Overhead under-absorbed	7,000

2.5

	Included in cost accounts	*Included in financial accounts*
(a) Notional interest on the investment in stock	✔	
(b) Direct wages paid	✔	✔
(c) Interest received		✔
(d) Production overhead paid	✔	✔
(e) Raw material purchases	✔	✔

2.6 Remember that the wages control account acts as a collecting place for the gross wages before they are transferred to work in progress or to production overhead control, according to whether they are direct wages or indirect wages. The gross wages are made up of two parts: the net wages that are paid from the bank, plus the PAYE/NI deductions.

The correct entries are:

(a) and (h) The net wages paid are 'collected' in the wages control account and credited to the bank.

(f) and (j) The deductions are 'collected' in the wages control account and credited to the PAYE/NI creditor.

The total gross wages have now been debited to the wages control account.

(c), (e) and (i) The gross wages are transferred to work in progress or to production overhead control according to whether they are direct or indirect wages.

Solution 3

- Use the flowchart of entries at the beginning of this chapter if you need help with remembering the correct double entry for each item.

(a) The credit balance shown on the production overhead control account means that there was *over-absorption* of production overhead at 31 October. A debit balance would have indicated an under-absorption of production overheads at that date.

(b) A £4,320
B £2,890
C £560

(c) A £5,900
B £5,200
C £1,250

Workings:

	£
Wages incurred	6,450
Direct wages to WIP	5,200
Indirect wages to production overhead	1,250

(d) At the end of the week, the balance on the production overhead control account will be a *credit* balance of **£3,794**.

Working:

Production overhead control account

	£		£
Raw materials	560	Balance b/d	3,674
Wages	1,250	Work in progress*	3,800
Creditors	1,870		
Balance c/d	3,794		
	7,474		7,474

*Production overhead absorbed is transferred to work in progress. The over-absorbed balance is now £3,794, which is carried down to the next week.

(e) A £2,890
B £5,200
C £3,800
D £12,480.

Absorption Costing and Marginal Costing

8

LEARNING OUTCOMES

After completing this chapter, you should be able to:

- prepare profit and loss accounts from the same data under absorption costing and marginal costing, and reconcile and explain the differences in reported profits;
- compare and contrast absorption and marginal costing.

8.1 Introduction

So far in this text we have worked within the framework of an absorption costing system. With absorption costing, all inventory (stock) items are valued at their full production cost. This includes fixed production overhead which has been absorbed using one of the bases which you learned about in Chapter 4.

In contrast, marginal costing values all stock items at their variable or marginal production cost only. Fixed costs are treated as period costs and are written off in full against the profit for the period.

In this chapter you will learn how to prepare profit statements using both absorption costing and marginal costing and you will review the advantages and disadvantages of each method.

Since the two methods value stocks differently, it follows that each will report a different profit figure for the period if stocks alter. You will therefore be learning how to reconcile the profit figures reported by each method.

8.2 Marginal costing and contribution

The terms marginal cost and variable cost tend to be used interchangeably. In marginal costing the variable costs are matched against the sales value for the period to highlight an important performance measure: *contribution*.

$$\text{Contribution} = \text{sales value} - \text{variable costs}$$

It is called contribution because it literally does contribute towards fixed costs and profit. Once the contribution has been calculated for the period, fixed costs are deducted to determine the profit for the period.

8.3 Preparing profit statements using each method

The best way to demonstrate how profit statements are prepared for each of the methods is to look at a worked example.

Example

Using the information below, prepare profit statements for June and July using (a) marginal costing and (b) absorption costing.

A company produces and sells one product only, which sells for £50 per unit. There were no stocks at the end of May and other information is as follows:

	£
Standard cost per unit:	
Direct material and wages	22
Variable production overhead	3
Budgeted and actual costs per month:	
Fixed production overhead	99,000
Fixed selling and admin. expenses	40,000
Variable selling expenses	10% of sales value

Normal capacity is 11,000 units per month.
The number of units produced and sold was:

	June *Units*	*July* *Units*
Sales	12,800	11,000
Production	14,000	10,200

8.3.1 Profit statements using marginal costing

A marginal costing system values units at the variable production cost of £25 per unit (£22 + £3).

Profit statements using marginal costing

	June		*July*	
	£000	*£000*	*£000*	*£000*
Sales revenue		640		550
Less variable cost of sales:				
Opening stock	–		30	
Variable production cost				
(14,000 × £25)	350			
(10,200 × £25)			255	
	350		285	
Closing stock				
(1,200 × £25)	30			
(400 × £25)			10	
Variable production of sales	320		275	
Variable selling expenses	64		55	
Variable cost of sales		384		330
Contribution		256		220
Less fixed overhead:				
Fixed production overhead	99		99	
Fixed selling and admin. expenses	40	139	40	139
Profit		117		81

8.3.2 Profit statements using absorption costing

Fixed production overheads are absorbed on the basis of normal capacity which is often the same as budgeted capacity. You should recall that predetermined rates are used partly to avoid the fluctuations in unit cost rates which arise if production levels fluctuate.

$$\text{Fixed production overhead per unit} = \frac{£99{,}000}{11{,}000} = £9 \text{ per unit}$$

$$\text{Full production cost per unit} = £25 \text{ variable cost} + £9 \text{ fixed cost} = £34 \text{ per unit}$$

This full production cost of £34 per unit will be used to value all units under absorption costing.

Since the production level is not equal to the normal capacity in either June or July there will be under- or over-absorbed fixed production overhead in both months. It is probably easier to calculate this before commencing on the profit statements.

	June	*July*
	£000	*£000*
Fixed production overhead absorbed		
(14,000 units × £9)	126	
(10,200 units × £9)		91.8
Fixed production overhead incurred	99	99.0
Over/(under) absorption	27	(7.2)

Profit statements using absorption costing

	June		*July*	
	£000	*£000*	*£000*	*£000*
Sales revenue		640.0		550.0
Less full production cost of sales:				
Opening stock	–		40.8	
Full production cost				
(14,000 × £34)	476.0			
(10,200 × £34)			346.8	
	476.0		387.6	
Closing stock				
(1,200 × £34)	40.8			
(400 × £34)			13.6	
	435.2		374.0	
(Over-)/under-absorbed fixed production overhead (note 1)	(27.0)		7.2	
Full production cost of sales		408.2		381.2
Gross profit		231.8		168.8
Less selling/admin. expenses:				
Variable selling expenses	64.0		55.0	
Fixed selling and admin. expenses	40.0	104.0	40.0	95.0
Net profit		127.8		73.8

Note 1: If overheads have been over-absorbed then too much has been charged as a cost of production. This amount is therefore deducted to derive the full production cost of sales. If overheads are under-absorbed, the amount is added to increase the production cost of sales.

8.4 Reconciling the profit figures

As well as preparing profit statements using absorption costing and marginal costing, you also need to be able to reconcile the profits given by each method for the same period and by the same method for different periods.

8.4.1 Reconciling the profits given by the different methods

The profit differences are caused by the different valuations given to the closing inventories (stocks) in each period. With absorption costing, an amount of fixed production overhead is carried forward in stock to be charged against sales of later periods.

If stocks increase, then absorption costing profits will be higher than marginal costing profits. This is because some of the fixed overhead is carried forward in stock instead of being written off against sales for the period.

If stocks reduce, then marginal costing profits will be higher than absorption costing profits. This is because the fixed overhead which had been carried forward in stock with absorption costing is now being released to be charged against the sales for the period.

A profit reconciliation for the previous example might look like this:

	June *£000*	*July* *£000*
Marginal costing profit	117.0	81.0
Adjust for fixed overhead in stock:		
Stock increase 1,200 units × £9 per unit	10.8	
Stock decrease 800 units × £9 per unit		(7.2)
Absorption costing profit	127.8	(73.8)

This type of reconciliation lends itself well to an objective testing situation and has been a favourite topic in the multiple choice questions on past papers. Make sure that you practice all the questions at the end of this chapter so that you are well prepared if this topic comes up in your assessment.

8.4.2 Reconciling the profits for different periods

You should also know how to reconcile the profits for different periods using the same method.

(a) For marginal costing, the unit rates and the amount of fixed costs charged each period are constant. Therefore the only thing which could have caused the profit difference was the change in sales volume. The lower sales volume in July resulted in a lower contribution and therefore a lower profit (since the amount of fixed cost remained constant).

The contribution per unit is £20 as follows:

	£ per unit
Selling price	50
Variable production cost	(25)
Variable selling cost	(5)
Contribution	20

The marginal costing profit figures can be reconciled as follows:

	£000
Marginal costing profit for June	117
Decrease in sales volume for July	
1,800 units × £20 contribution	36
Marginal costing profit for July	81

(b) For absorption costing the major part of the profit difference is caused by the change in sales volume. However, a further difference is caused by the adjustments for under- and over-absorbed fixed production overhead in each of the two periods.

The profit per unit with absorption costing is £11 as follows:

	£ per unit
Selling price	50
Total production cost	(34)
Variable selling cost	(5)
Profit	11

The absorption costing profit figures can be reconciled as follows:

	£000
Absorption costing profit for June	127.8
Decrease in sales volume for July	
1,800 units × £11 profit	(19.8)
Adjustments for under-/over-absorption:	
June	(27.0)
July	(7.2)
Absorption costing profit for July	73.8

This may look confusing because both the under- and over-absorptions are deducted. This is because the over-absorption for June made profit for that month higher, therefore it must be deducted to arrive at July's profit. Similarly, the under-absorption in July made July's profit lower than June's, therefore it must also be deducted in the reconciliation.

8.4.3 Profit differences in the long term

The two different costing methods produce profit differences only in the short term when stocks fluctuate. If stocks remain constant then there will be no profit differences between the two methods.

In the long term, the total reported profit will be the same whichever method is used. This is because all of the costs incurred will eventually be charged against sales; it is merely the timing of the sales that causes the profit differences from period to period.

8.5 Marginal costing or absorption costing?

There is no absolutely correct answer as to when marginal costing or absorption costing is preferable. However, as we shall see in the next chapter it is generally accepted that marginal costing statements provide the best information for the purposes of management decision-making.

Supporters of absorption costing argue that fixed production overheads are a necessary cost of production and they should therefore be included in the unit cost used for stock valuation. Accounting standards require the use of absorption costing for external reporting purposes.

If stocks are built up for sale in a future period, for example, in distilling, then absorption costing smooths out profits by carrying forward the fixed production overheads to be matched against the sales as they are made.

Supporters of marginal costing argue that management attention is concentrated on the more controllable measure of contribution. They say that the apportionment of fixed production overhead to individual units is carried out on a purely arbitrary basis, is of little use for decision-making and can be misleading.

8.6 Summary

Having read this chapter the main points that you should understand are as follows.

1. In a marginal costing system, all inventory (stock) units are valued at variable production cost. Fixed production overheads are treated as period costs and are written off against the sales revenue for the period in which they are incurred.
2. A marginal costing profit statement highlights the contribution for the period, which is the difference between the sales value and the variable or marginal cost of sales.
3. In an absorption costing system, the fixed production overheads are absorbed into product costs on the basis of normal activity. As a result, under- or over-absorption of fixed production overheads may arise in an absorption costing system.
4. If stock levels increase, the profit reported under absorption costing will be higher than that under marginal costing. This is because some of the fixed production overheads are carried forward in the increased stock, when absorption costing is applied. The reverse is true if stock levels reduce. If stock levels do not alter the two systems will report the same profit for the period.
5. The difference in reported profit is calculated as (change in stock units $\times$ fixed production overhead cost per unit).
6. There are a number of arguments for and against the use of each of the systems and each may be appropriate in different situations.

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Revision Questions 8

Question 1 Multiple choice

1.1 When comparing the profits reported under marginal and absorption costing during a period when the level of stocks increased:

(A) absorption costing profits will be higher and closing stock valuations lower than those under marginal costing.
(B) absorption costing profits will be higher and closing stock valuations higher than those under marginal costing.
(C) marginal costing profits will be higher and closing stock valuations lower than those under absorption costing.
(D) marginal costing profits will be lower and closing stock valuations higher than those under absorption costing.

1.2 A company made 17,500 units at a total cost of £16 each. Three-quarters of the costs were variable and one-quarter fixed. A total of 15,000 units were sold at £25 each. There were no opening stocks.

By how much will the profit calculated using absorption costing principles differ from the profit if marginal costing principles had been used?

(A) the absorption costing profit would be £22,500 less.
(B) the absorption costing profit would be £10,000 greater.
(C) the absorption costing profit would be £135,000 greater.
(D) the absorption costing profit would be £10,000 less.

1.3 In a period where opening stocks were 15,000 units and closing stocks 20,000, a firm had a profit of £130,000 using absorption costing. If the fixed overhead absorption rate was £8 per unit, the profit using marginal costing would be:

(A) £90,000
(B) £130,000
(C) £170,000
(D) impossible to calculate without more information.

1.4 A manufacturing company produces a single product which has a selling price of £19 per unit and a unit cost of £14 as follows:

	£ per unit
Direct material	5
Direct labour	4
Variable production overhead	2
Fixed production overhead	3
	14

Last period, the opening stock was 3,000 units and 13,000 units were produced. Sales were 14,000 units and the profits reported using marginal costing were £67,000. The profits reported under an absorption costing system would be:

(A) £64,000
(B) £65,000
(C) £70,000
(D) impossible to determine without more information.

Question 2 Short objective-test questions

2.1 The standard variable production cost per unit of product X is £7. Fixed production overhead of £33,000 is incurred each period and the normal capacity is 11,000 units of X. Variable selling expenses are £2 per unit and fixed selling, administration and distribution expenses amount to £8,000 each period. Last period there was no opening stock of product X. Production volume amounted to 13,000 units, of which 12,000 units were sold.

Complete the following profit statement, which is prepared using absorption costing principles.

	£000	*£000*
Sales £25 per unit		300
Production cost of units produced	☐	
Less closing stock	☐	
	☐	
Fixed production overhead under-/(over-)absorbed	☐	
Production cost of sales		☐
Gross profit		☐
Less: variable selling expenses	☐	
fixed selling, admin. and distribution expenses	☐	
		☐
Net profit for the period		☐

2.2 Using the data from question 2.1, the net profit for the period using a marginal costing system is £☐.

2.3 Is the following statement *true* or *false*?

In absorption costing systems, stocks at the end of the period are valued at a unit rate which includes all fixed overheads absorbed on the basis of normal capacity.

True ☐
False ☐

2.4 Which of the following are arguments in favour of the use of absorption costing in preference to marginal costing? Tick the box(es) of all statements that are valid.

(a) Fixed production overheads are a necessary cost of production and they should logically be included in the unit cost for stock valuation. ☐
(b) Absorption costing information provides the best information for the purposes of management decision-making. ☐

(c) Accounting standards require the use of absorption costing for external reporting purposes. ☐
(d) If stocks are built up for sale in a future period, absorption costing smooths out profits by carrying forward fixed production overheads to be matched against the sales when they are made. ☐

2.5 *Tick the correct box.*

If sales volume exceeds production volume in a period, absorption costing profit will be *higher* ☐/*lower* ☐ than the profit reported under a marginal costing system.

2.6 A company produces a single product which sells for £26 per unit. The unit production cost is as follows.

	£ per unit
Direct materials and labour	11
Variable production overhead	4
Fixed production overhead	3
	18

The normal capacity is 2,500 units per month but in January 2,700 units were produced and sold. Fixed production overheads of £8,000 and general overheads of £3,800 were incurred and the variable selling cost was £2 per unit.

(a) Using absorption costing, the gross profit for January was £☐
(b) Using marginal costing, the contribution for January was £☐

Question 3 Profit statements and non-production costs

X Ltd commenced business on 1 March making one product only, the standard cost of which is as follows:

	£
Direct labour	5
Direct material	8
Variable production overhead	2
Fixed production overhead	5
Standard production cost	20

The fixed production overhead figure has been calculated on the basis of a budgeted normal output of 36,000 units per annum.

You are to assume that actual costs were the same as standard costs and that all the budgeted fixed expenses are incurred evenly through the year.

Selling, distribution and administration expenses are:

Fixed	£120,000 per annum
Variable	15% of the sales values

The selling price per unit is £35 and the number of units produced and sold were:

	March (units)	*April (units)*
Production	2,000	3,200
Sales	1,500	3,000

Requirements

(a) In profit statements prepared using marginal costing principles, the following figures would be shown:

(i) March:	Contribution	£	
	Profit/(loss)	£	
(ii) April:	Contribution	£	
	Profit/(loss)	£	

(b) In profit statements prepared using absorption costing principles, the following figures would be shown:

(i) March:	Gross profit	£	
	Net Profit/(loss)	£	
(ii) April:	Gross profit	£	
	Net Profit/(loss)	£	

Solutions to Revision Questions

8

Solution 1

- It is always possible to determine the difference in reported profits using marginal costing compared with absorption costing as follows:

$$\text{Profit difference} = \text{Change in stock units} \times \text{Fixed production overhead absorption rate per unit}$$

- If stock increases, the absorption costing profit is higher than the marginal costing profit, because more fixed overheads are carried forward in the stock value.
- If stock decreases, the absorption costing profit is lower than the marginal costing profit, because more fixed overheads are 'released' from stock to be charged against sales.

1.1 Answer: (B)

Since absorption costing carries some fixed overhead forward in stock, absorption costing stock valuations will be higher than those under marginal costing. If stocks increase, more overheads are carried forward in stock, whereas with marginal costing they are written off as period costs, thus reducing profits.

1.2 Answer: (B)

Fixed overhead per unit = £16/4 = £4 per unit

Fixed overhead in absorption costing stock valuation = £4 × 2,500 units = £10,000.

Since stocks increased during the period, the absorption costing profit would be higher because some fixed overheads would be carried forward in stock. With marginal costing, all fixed overheads are written off as period costs.

1.3 Answer: (A)

Change in stocks = 5,000 units increase, therefore marginal costing profit is less than absorption costing profit

$$\text{Marginal costing profit} = £130,000 - (5,000 \times £8) = £90,000.$$

1.4 Answer: (A)

Since sales volume exceeded production volume by 1,000 units, we know that stock levels fell and therefore that the absorption costing profit must be lower than the marginal costing profit. Using good 'multiple-choice technique' we can eliminate option C because that indicates a higher profit.

$$\text{Difference in profit} = \text{Change in stock units} \times \text{Fixed overhead per unit}$$
$$= 1,000 \times £3 = £3,000$$

Absorption costing profit = £67,000 − £3,000 = £64,000.

Solution 2

2.1 Total production cost per unit = £7 + (£33,000/11,000) = £10

	£000	£000
Sales @ £25 per unit		300
Production cost of units produced (13,000 × £10)	130	
Less closing stock (1,000 × £10)	10	
	120	
Fixed production overhead under-/(over-)absorbed (2,000 × £3)	(6)	
Production cost of sales		114
Gross profit		186
Less: variable selling expenses (12,000 × £2)	24	
fixed selling, admin. and distribution expenses	8	
		32
Net profit for the period		154

2.2 *Marginal costing profit*

	£000
Absorption costing profit	154
Fixed production overheads carried forward in stock (1,000 units × £3)	(3)
Marginal costing profit	151

2.3 *False*. The unit rate used for stock valuation includes only fixed production overheads, not all fixed overheads.

2.4 (a), (c) and (d) are arguments in favour of absorption costing. It is generally accepted that marginal costing produces better information for the purposes of management decision-making.

2.5 If sales volume exceeds production volume in a period, absorption costing profit will be *lower* than the profit reported under a marginal costing system.

2.6 (a) Using absorption costing, the gross profit for January was £21,700.
(b) Using marginal costing, the contribution for January was £24,300.

Workings

(a) Fixed production overhead absorbed = 2,700 units × £3 = £8,100
Fixed production overhead incurred £8,000
Over-absorption £100

Gross profit = 2,700 units × £(26 − 18) + over-absorption £100 = £21,700.

(b) Contribution = 2,700 units × £(26 − 11 − 4 − 2) = £24,300.

If you find it difficult to use this short cut method to calculate the profit and contribution you might find it easier to quickly sketch out a full profit statement to derive your answer. The next question will give you some practice at this but you should also have a go at deriving the correct answers using the short cut method.

✓ Solution 3

- This question will give you a chance to practise quickly producing profit statements as a part of your workings.
- Students often do not know how to treat variable non-production costs, in this case, the variable selling, distribution and administration expenses. In the marginal costing statement they should be added to the variable costs of production before contribution is calculated. In the absorption costing statement they are deducted from the gross profit figure along with the fixed selling overheads. Selling overheads should never be included in the stock valuation, since they cannot have been incurred on behalf of a unit which is still in stock. Study the solution carefully to make sure that you know what to do.
- In this question the answers to the later parts depend on the answers to the earlier parts. This will not happen in the actual assessment, where each part will be independent of all others. However, this is a useful practice question to give you confidence in calculating marginal and absorption costing profits.

(a) (i) March: Contribution £22,125; loss £2,875
(ii) April: Contribution £44,250; profit £19,250

Workings:

	March		*April*	
	£	£	£	£
Sales: 1,500 at £35		52,500		
3,000 at £35				105,000
Less variable cost of sales				
Opening stock	–		7,500	
Variable mfg cost:				
2,000 × £15	30,000			
3,200 × £15			48,000	
			55,500	
Less: Closing stock:				
500 × £15	7,500			
700 × £15			10,500	
	22,500		45,000	
Variable selling, distribution and administration:				
15% of sales	7,875		15,750	
		30,375		60,750
Contribution		22,125		44,250
Less: Fixed costs:				
Production	15,000		15,000	
Selling, distribution and administration	10,000		10,000	
		25,000		25,000
Profit/(loss)		(2,875)		19,250

(b) (i) March: Gross profit £17,500; net loss £375
(ii) April: Gross profit £46,000; net profit £20,250

Workings:

	March		*April*	
	£	£	£	£
Sales: 1,500 at £35		52,500		
3,000 at £35				105,000
Less cost of sales				
Opening stock	–		10,000	
Production cost				
2,000 × £20	40,000			
3,200 × £20			64,000	
			74,000	
Less: Closing stock:				
500 × £20	10,000			
700 × £20			14,000	
	30,000		60,000	
Fixed prod'n o/h under-/(over-) absorbed	5,000		(1,000)	
Production cost of sales		35,000		59,000
Gross profit		17,500		46,000
Less: selling, distn. and admin.				
Variable: 15% of sales	7,875		15,750	
Fixed	10,000		10,000	
		17,875		25,750
(Loss)/Profit		(375)		20,250

Breakeven Analysis and Decision-making

9

Learning Outcomes

After completing this chapter, you should be able to:

- identify relevant costs and revenues;
- explain the contribution concept;
- calculate and interpret the breakeven point, profit target, margin of safety and profit–volume ratio for a single product;
- prepare breakeven charts and profit–volume graphs for a single product;
- calculate the profit-maximising sales mix for a company with a single resource constraint;
- discuss cost–volume–profit analysis.

9.1 Introduction

In the last chapter you were introduced to the concept of marginal costing. You saw that one of the arguments in favour of the use of marginal costing is that it concentrates management attention on the variable costs and on the more controllable performance measure of contribution.

In this chapter you will see how an understanding of cost behaviour patterns and a focus on identifying the costs that will alter as the result of a course of action are important in providing effective information as the basis for management decision-making.

9.2 Breakeven or cost–volume–profit analysis

Cost–volume–profit (CVP) analysis is defined in CIMA's *Official Terminology* as 'the study of the effects on future profit of changes in fixed cost, variable cost, sales price, quantity and mix'.

A more common term used for this type of analysis is *breakeven analysis*. However, this is somewhat misleading, since it implies that the focus of the analysis is the *breakeven point* – that is, the level of activity which produces neither profit nor loss. You will see in this chapter that the scope of CVP analysis is much wider than this, as indicated in the definition. However, you should be aware that the terms 'breakeven analysis' and 'CVP analysis' tend to be used interchangeably.

9.2.1 Calculating the breakeven point

In the previous chapter you learned that contribution is so called because it literally does contribute towards fixed costs and profit. As sales revenues grow from zero, the contribution also grows until it just covers the fixed costs. This is the breakeven point where neither profits nor losses are made.

It follows that to break even the amount of contribution must exactly match the amount of fixed costs. If we know how much contribution is earned from each unit sold, then we can calculate the number of units required to break even as follows:

$$\text{Breakeven point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

For example, suppose that an organisation manufactures a single product, incurring variable costs of £30 per unit and fixed costs of £20,000 per month. If the product sells for £50 per unit, then the breakeven point can be calculated as follows:

$$\text{Breakeven point in units} = \frac{£20{,}000}{£50 - £30} = 1{,}000 \text{ units per month}$$

9.3 The margin of safety

The margin of safety is the difference between the expected level of sales and the breakeven point. The larger the margin of safety, the more likely it is that a profit will be made, that is, if sales start to fall there is more leeway before the organisation begins to incur losses. (Obviously, this statement is made on the assumption that projected sales volumes are above the breakeven point.)

In the above example, if forecast sales are 1,700 units per month, the margin of safety can be easily calculated.

$$\begin{aligned}\text{Margin of safety} &= \text{projected sales} - \text{breakeven point}\\ &= 1{,}700 \text{ units} - 1{,}000 \text{ units}\\ &= 700 \text{ units per month, or } 41\% \text{ of sales } (700/1{,}700 \times 100\%)\end{aligned}$$

The margin of safety should be expressed as a percentage of projected sales to put it in perspective. To quote a margin of safety of 700 units without relating it to the projected sales figure is not giving the full picture.

The margin of safety can also be used as one route to a profit calculation. We have seen that the contribution goes towards fixed costs and profit. Once breakeven point is reached the fixed costs have been covered. After the breakeven point there are no more fixed costs to be covered and all of the contribution goes towards making profits grow.

In our example the monthly profit from sales of 1,700 units would be £14,000.

$$\begin{aligned}\text{Margin of safety} &= 700 \text{ units per month}\\ \text{Monthly profit} &= 700 \times \text{contribution per unit}\\ &= 700 \times £20\\ &= £14{,}000.\end{aligned}$$

9.4 The contribution to sales (C/S) ratio

The contribution to sales ratio is usually expressed as a percentage. It can be calculated for the product in our example as follows.

$$\begin{aligned}\text{Contribution to sales ratio (C/S ratio)} &= £20/£50 \times 100\%\\ &= 40\%\end{aligned}$$

A higher contribution to sales ratio means that contribution grows more quickly as sales levels increase. Once the breakeven point has been passed, profits will accumulate more quickly than for a product with a lower contribution to sales ratio.

You might sometimes see this ratio referred to as the profit–volume (P/V) ratio.

If we can assume that a unit's variable cost and selling price remain constant then the C/S ratio will also remain constant. It can be used to calculate the breakeven point as follows (using the data from the earlier example):

$$\text{Breakeven point in sales value} = \frac{\text{Fixed costs}}{\text{C/S ratio}} = \frac{£20{,}000}{0.40} = £50{,}000$$

This can be converted to 1,000 units as before by dividing by the selling price of £50 per unit.

Exercise 9.1

A company manufactures and sells a single product which has the following cost and selling price structure:

	£/unit	*£/unit*
Selling price		120
Direct material	22	
Direct labour	36	
Variable overhead	14	
Fixed overhead	12	
		84
Profit per unit		36

The fixed overhead absorption rate is based on the normal capacity of 2,000 units per month. Assume that the same amount is spent each month on fixed overheads.

Budgeted sales for next month are 2,200 units.

You are required to calculate:

(i) the breakeven point, in sales units per month;
(ii) the margin of safety for next month;
(iii) the budgeted profit for next month;
(iv) the sales required to achieve a profit of £96,000 in a month.

Solution

(i) The key to calculating the breakeven point is to determine the contribution per unit.

$$\text{Contribution per unit} = £120 - (£22 + £36 + £14) = £48$$

$$\text{Breakeven point} = \frac{\text{Fixed overhead}}{\text{Contribution per unit}}$$
$$= \frac{£12 \times 2{,}000}{£48} = 500 \text{ units}$$

(ii) Margin of safety = budgeted sales − breakeven point
= 2,200 − 500
= 1,700 units (or 1,700/2,200 × 100% = 77% of budgeted sales)

(iii) Once breakeven point has been reached, all of the contribution goes towards profits because all of the fixed costs have been covered.

Budgeted profit = 1,700 units margin of safety × £48 contribution per unit
= £81,600

(iv) To achieve the desired level of profit, sufficient units must be sold to earn a contribution which covers the fixed costs and leaves the desired profit for the month.

$$\text{Number of sales units required} = \frac{\text{Fixed overhead} + \text{desired profit}}{\text{Contribution per unit}}$$
$$= \frac{(£12 \times 2{,}000) + £96{,}000}{£48} = 2{,}500 \text{ units.}$$

9.5 Drawing a basic breakeven chart

A basic breakeven chart records costs and revenues on the vertical axis and the level of activity on the horizontal axis. Lines are drawn on the chart to represent costs and sales revenue. The breakeven point can be read off where the sales revenue line cuts the total cost line.

We will use our basic example to demonstrate how to draw a breakeven chart. The data is:

Selling price	£50 per unit
Variable cost	£30 per unit
Fixed costs	£20,000 per month
Forecast sales	1,700 units per month

While you will not be required to draw a graph to scale in the assessment, you may need to do so in your working life or in future examinations for other subjects. Learning to draw a chart to scale will provide a firm foundation for your understanding of breakeven charts. To give yourself some practice, it would be a good idea to follow the step-by-step guide which follows to produce your own chart on a piece of graph paper.

- *Step 1. Select appropriate scales for the axes and draw and label them.* Your graph should fill as much of the page as possible. This will make it clearer and easier to read. You can make sure that you do this by putting the extremes of the axes right at the end of the available space.

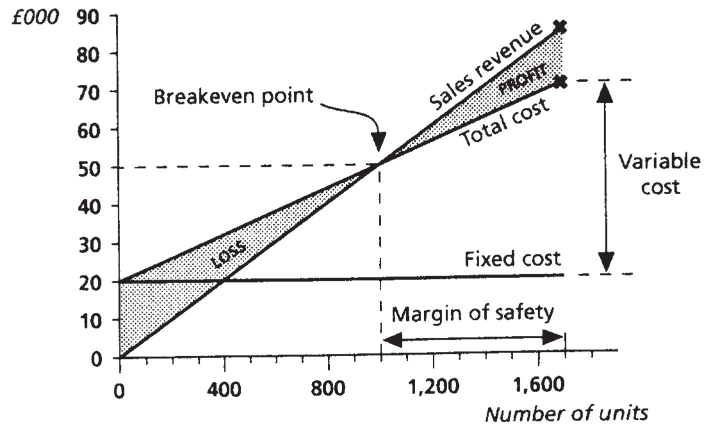

Figure 9.1 Basic breakeven chart

The furthest point on the vertical axis will be the monthly sales revenue, that is

1,700 units × £50 = £85,000

The furthest point on the horizontal axis will be monthly sales volume of 1,700 units.

Make sure that you do not need to read data for volumes higher than 1,700 units before you set these extremes for your scales.

- *Step 2. Draw the fixed cost line and label it.* This will be a straight line parallel to the horizontal axis at the £20,000 level.

  The £20,000 fixed costs are incurred in the short term even with zero activity.
- *Step 3. Draw the total cost line and label it.* The best way to do this is to calculate the total costs for the maximum sales level, which is 1,700 units in our example. Mark this point on the graph and join it to the cost incurred at zero activity, that is, £20,000

	£
Variable costs for 1,700 units (1,700 × £30)	51,000
Fixed costs	20,000
Total cost for 1,700 units	71,000

- *Step 4. Draw the revenue line and label it.* Once again, the best way is to plot the extreme points. The revenue at maximum activity in our example is 1,700 × £50 = £85,000. This point can be joined to the origin, since at zero activity there will be no sales revenue.
- *Step 5. Mark any required information on the chart and read off solutions as required.* Check that your chart is accurate by reading off the measures that we have already calculated in this chapter: the breakeven point, the margin of safety, the profit for sales of 1,700 units.

The completed graph is shown in Figure 9.1.

! Your own graph should be considerably larger than this: a full A4 graph-ruled sheet is recommended to facilitate ease of interpretation.

9.6 The contribution breakeven chart

One of the problems with the conventional or basic breakeven chart is that it is not possible to read contribution directly from the chart. A contribution breakeven chart is

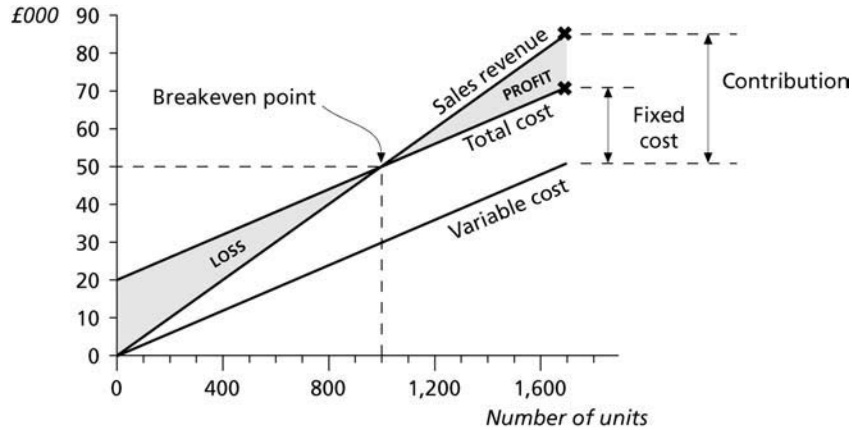

Figure 9.2 Contribution breakeven chart

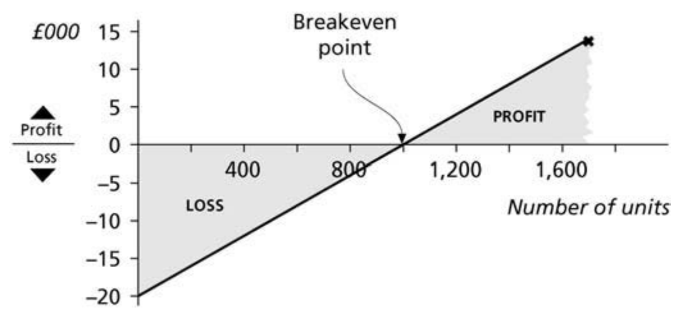

Figure 9.3 Profit–volume chart

based on the same principles but it shows the variable cost line instead of the fixed cost line (Figure 9.2). The same lines for total cost and sales revenue are shown so the breakeven point and profit can be read off in the same way as with a conventional chart. However, it is possible also to read the contribution for any level of activity.

Using the same basic example as for the conventional chart, the total variable cost for an output of 1,700 units is 1,700 × £30 = £51,000. This point can be joined to the origin since the variable cost is nil at zero activity.

The contribution can be read as the difference between the sales revenue line and the variable cost line.

This form of presentation might be used when it is desirable to highlight the importance of contribution and to focus attention on the variable costs.

9.7 The profit–volume chart

Another form of breakeven chart is the profit–volume chart. This chart plots a single line depicting the profit or loss at each level of activity. The breakeven point is where this line cuts the horizontal axis. A profit–volume graph for our example will look like Figure 9.3.

The vertical axis shows profits and losses and the horizontal axis is drawn at zero profit or loss.

At zero activity the loss is equal to £20,000, that is, the amount of fixed costs. The second point used to draw the line could be the calculated breakeven point or the calculated profit for sales of 1,700 units.

The profit–volume graph is also called a profit graph or a contribution–volume graph.

Exercise 9.2

Make sure that you are clear about the extremes of the chart axes. Practise drawing this chart to scale on a piece of graph paper.

9.7.1 The advantage of the profit–volume chart

The main advantage of the profit–volume chart is that it is capable of depicting clearly the effect on profit and breakeven point of any changes in the variables. An example will show how this can be done.

Example

A company manufactures a single product which incurs fixed costs of £30,000 per annum. Annual sales are budgeted to be 70,000 units at a sales price of £30 per unit. Variable costs are £28.50 per unit.

(a) Draw a profit–volume graph, and use it to determine the breakeven point.
The company is now considering improving the quality of the product and increasing the selling price to £35 per unit. Sales volume will be unaffected, but fixed costs will increase to £45,000 per annum and variable costs to £33 per unit.
(b) Draw, on the same graph as for part (a), a second profit–volume graph and comment on the results.

Solution

The profit–volume chart is shown in Figure 9.4.

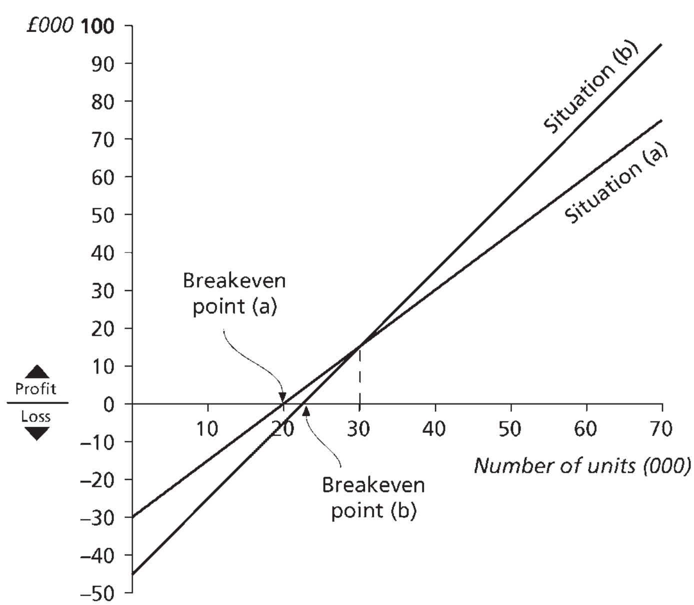

Figure 9.4 Showing changes with a profit–volume chart

The two lines have been drawn as follows:

- *Situation (a)*. The profit for sales of 70,000 units is £75,000.

	£000
Contribution 70,000 × £(30 – 28.50)	105
Fixed costs	30
Profit	75

This point is joined to the loss at zero activity, £30,000, that is, the fixed costs.

- *Situation (b)*. The profit for sales of 70,000 units is £95,000.

	£000
Contribution 70,000 × £(35 – 33)	140
Fixed costs	45
Profit	95

This point is joined to the loss at zero activity, £45,000, that is, the fixed costs.

Comment on the results. The graph depicts clearly the larger profits available from option (b). It also shows that the breakeven point increases from 20,000 units to 22,500 units but that this is not a large increase when viewed in the context of the projected sales volume. It is also possible to see that for sales volumes above 30,000 units the profit achieved will be higher with option (b). For sales volumes below 30,000 units option (a) will yield higher profits (or lower losses).

The profit–volume graph is the clearest way of presenting information like this. If we attempted to draw two conventional breakeven charts on one set of axes the result would be a jumble, which is very difficult to interpret.

9.8 The limitations of breakeven (or CVP) analysis

The limitations of the practical applicability of breakeven analysis and breakeven charts stem mostly from the assumptions which underlie the analysis:

(a) Costs are assumed to behave in a linear fashion. Unit variable costs are assumed to remain constant and fixed costs are assumed to be unaffected by changes in activity levels. The charts can in fact be adjusted to cope with non-linear variable costs or steps in fixed costs but too many changes in behaviour patterns can make the charts very cluttered and difficult to use.

(b) Sales revenues are assumed to be constant for each unit sold. This may be unrealistic because of the necessity to reduce the selling price to achieve higher sales volumes. Once again the analysis can be adapted for some changes in selling price but too many changes can make the charts unwieldy.

(c) There is assumed to be no change in inventories (stocks). We saw in the last chapter how reported profits can vary if absorption costing is used and there are changes in stock levels.

(d) It is assumed that activity is the only factor affecting costs, and factors such as inflation are ignored. This is one of the reasons why the analysis is limited to being essentially a short-term decision aid.

(e) Apart from the unrealistic situation of a constant product mix, the charts can only be applied to a single product or service. Not many organisations have a single product or service and if there is more than one, then the apportionment of fixed costs between them becomes arbitrary.

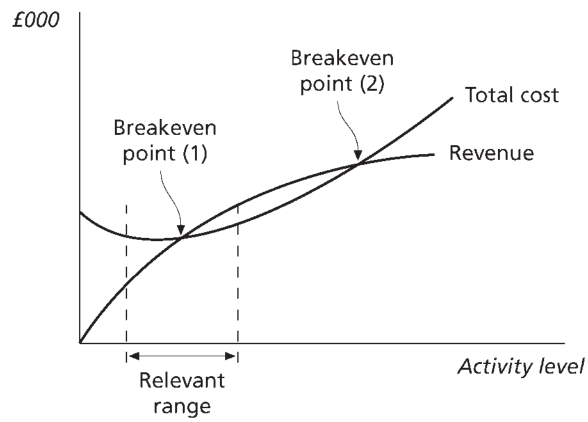

Figure 9.5 The economist's breakeven chart

(f) The analysis seems to suggest that as long as the activity level is above the breakeven point, then a profit will be achieved. In reality certain changes in the cost and revenue patterns may result in a second breakeven point after which losses are made. This situation will be depicted in the next section of this chapter.

9.9 The economist's breakeven chart

An economist would probably depict a breakeven chart as shown in Figure 9.5.

The total cost line is not a straight line which climbs steadily as in the accountant's chart. Instead it begins to reduce initially as output increases because of the effect of economies of scale. Later it begins to climb upwards according to the law of diminishing returns.

The revenue line is not a straight line as in the accountant's chart. The line becomes less steep to depict the need to give discounts to achieve higher sales volumes.

However, you will see that within the middle range the economist's chart does look very similar to the accountant's breakeven chart. This area is marked as the relevant range in Figure 9.5.

For this reason, it is unreliable to assume that the cost–volume–profit relationships depicted in breakeven analysis are relevant across a wide range of activity. In particular, Figure 9.5 shows that the constant cost and price assumptions are likely to be unreliable at very high or very low levels of activity. Managers should therefore ensure that they work within the relevant range, that is, within the range over which the depicted cost and revenue relationships are more reliable.

! You may recall that we discussed the relevant range in the context of cost behaviour patterns in Chapter 1.

9.10 Using costs for decision-making

Most management decisions involve a change in the level, method or mix of activities in order to maximise profits. The only costs that should be considered in decision-making are those which will be altered as a result of the decision. Those costs which will be affected by the decision may be referred to as *relevant costs*, while others are non-relevant and should be ignored in the analysis.

It is often the case that variable costs are relevant whereas fixed costs are not, unless the decision affects the cost structure of the organisation. Thus, information for decision-making should always be based on marginal costing principles, since marginal costing focuses on the variable costs and is not concerned with arbitrary apportionment of fixed costs that will be incurred anyway.

9.10.1 Short-term decision-making

An important point that you should appreciate for all of the decision-making techniques that you learn about in this chapter is that they are usually most relevant to short-term, one-off decisions. Furthermore, as you will see with the example of the minimum price quotation, the analysis provides only a starting point for management decisions. The financial figures are only part of the information needed for a fully informed decision. It is also important to consider the non-financial factors which might be relevant to the decision.

9.11 Evaluating proposals

As an introduction to using cost information to evaluate proposals, use your understanding of breakeven analysis and cost behaviour patterns to evaluate the proposals in the following exercise.

Exercise 9.3

A summary of a manufacturing company's budgeted profit statement for its next financial year, when it expects to be operating at 75 per cent of capacity, is given below.

	£	£
Sales 9,000 units at £32		288,000
Less:		
direct materials	54,000	
direct wages	72,000	
production overhead – fixed	42,000	
– variable	18,000	
		186,000
Gross profit		102,000
Less: admin., selling and dist'n costs:		
– fixed	36,000	
– varying with sales volume	27,000	
		63,000
Net profit		39,000

It has been estimated that:

(i) if the selling price per unit were reduced to £28, the increased demand would utilise 90 per cent of the company's capacity without any additional advertising expenditure;
(ii) to attract sufficient demand to utilise full capacity would require a 15 per cent reduction in the current selling price and a £5,000 special advertising campaign.

You are required to:

(a) calculate the breakeven point in units, based on the original budget;
(b) calculate the profits and breakeven points which would result from each of the two alternatives and compare them with the original budget.

Solution

(a) First calculate the current contribution per unit.

	£000	*£000*
Sales revenue		288
Direct materials	54	
Direct wages	72	
Variable production overhead	18	
Variable administration etc.	27	
		171
Contribution		117
Contribution per unit (÷9,000 units)		£13

Now you can use the formula to calculate the breakeven point.

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{£42{,}000 + £36{,}000}{£13} = 6{,}000 \text{ units}$$

(b) *Alternative (i)*

Budgeted contribution per unit	£13
Reduction in selling price (£32 − £28)	£4
Revised contribution per unit	£9
Revised breakeven point = £78,000/£9	8,667 units
Revised sales volume = 9,000 × (90/75)	10,800 units
Revised contribution = 10,800 × £9	£97,200
Less fixed costs	£78,000
Revised profit	£19,200

Alternative (ii)

Budgeted contribution per unit	£13.00
Reduction in selling price (15% × £32)	£4.80
Revised contribution per unit	£8.20
Revised breakeven point = $\frac{£78,000+£5,000}{£8.20}$	10,122 units
Revised sales volume = 9,000 units × (100/75)	12,000 units
Revised contribution = 12,000 × £8.20	£98,400
Less fixed costs	£83,000
Revised profit	£15,400

Neither of the two alternative proposals is worthwhile. They both result in lower forecast profits. In addition, they will both increase the breakeven point and will therefore increase the risk associated with the company's operations.

This exercise has shown you how an understanding of cost behaviour patterns and the manipulation of contribution can enable the rapid evaluation of the financial effects of a proposal. We can now expand it to demonstrate another aspect of the application of marginal costing techniques to short-term decision-making.

Exercise 9.4

The manufacturing company decided to proceed with the original budget and has asked you to determine how many units must be sold to achieve a profit of £45,500.

Solution

Once again, the key is the required contribution. This time the contribution must be sufficient to cover both the fixed costs and the required profit. If we then divide this amount by the contribution earned from each unit, we can determine the required sales volume.

$$\text{Required sales} = \frac{\text{Fixed costs+required profit}}{\text{Contribution per unit}}$$

$$= \frac{(£42{,}000 + £36{,}000 + £45{,}500)}{£13} = 9{,}500 \text{ units}$$

Now we will move from this very basic analysis to consider specific types of cost which may assist management decision-making.

9.12 Relevant costs

Relevant costs are those which will be affected by the decision being taken. All relevant costs should be considered in management decision-making. If a cost will remain unaltered regardless of the decision being taken, then it is called a non-relevant cost.

9.12.1 Non-relevant costs

Costs which are not usually relevant in management decisions include the following:

(a) Sunk or past costs, which is money already spent, and which cannot be recovered now. An example of a sunk cost is expenditure which has been incurred in developing a new product. The money cannot be recovered even if a decision is taken to abandon further development of the new product. The cost is therefore not relevant to future decisions concerning the product.

(b) Absorbed fixed overheads which will not increase or decrease as a result of the decision being taken. The amount of overhead to be absorbed by a particular cost unit might alter because of the decision; however, this is a result of the company's cost accounting procedures for overheads. If the actual amount of overhead incurred by the company will not alter, then the overhead is not a relevant cost.

(c) Expenditure which will be incurred in the future, but as a result of decisions taken in the past which cannot now be changed. These are known as committed costs. They can sometimes cause confusion because they are future costs. However, a committed cost will be incurred regardless of the decision being taken and therefore it is not relevant. An example of this type of cost could be expenditure on special packaging for a new product, where the packaging has been ordered and delivered but not yet paid for. The company is obliged to pay for the packaging even if they decide not to proceed with the product; therefore it is not a relevant cost.

(d) Historical cost depreciation which has been calculated in the conventional manner. Such depreciation calculations do not result in any future cash flows. They are merely the book entries which are designed to spread the original cost of an asset over its useful life.

(e) Notional costs such as notional rent and notional interest. These are only relevant if they represent an identified lost opportunity to use the premises or the finance for some alternative purpose.

In these circumstances, the notional costs would be opportunity costs. This explanation will become clearer when you learn more about opportunity costs later in this chapter.

Exercise 9.5

Test your understanding of relevant and non-relevant costs by seeing if you can identify which of the following costs are relevant:

(a) The salary to be paid to a market researcher who will oversee the development of a new product. This is a new post to be created specially for the new product but the £12,000 salary will be a fixed cost. Is this cost relevant to the decision to proceed with the development of the product?

(b) The £2,500 additional monthly running costs of a new machine to be purchased to manufacture an established product. Since the new machine will save on labour time, the fixed overhead to be absorbed by the product will reduce by £100 per month. Are these costs relevant to the decision to purchase the new machine?

(c) Office cleaning expenses of £125 for next month. The office is cleaned by contractors and the contract can be cancelled by giving one month's notice. Is this cost relevant to a decision to close the office?

(d) Expenses of £75 paid to the marketing manager. This was to reimburse the manager for the cost of travelling to meet a client with whom the company is currently negotiating a major contract. Is this cost relevant to the decision to continue negotiations?

Solution

(a) The salary is a relevant cost of £12,000. Do not be fooled by the mention of the fact that it is a fixed cost. The cost may be fixed in total but it is definitely a cost which is relevant to the decision to proceed with the future development of the new product. This is an example of a directly attributable fixed cost.

A directly attributable fixed cost may also be called a product-specific fixed cost.

(b) The £2,500 additional running costs are relevant to the decision to purchase the new machine. The saving in overhead absorption is not relevant since we are not told that the *total* overhead expenditure will be altered. The saving in labour cost would be relevant but we will assume that this has been accounted for in determining the additional monthly running costs.

(c) This is not a relevant cost for next month since it will be incurred even if the contract is cancelled today. If a decision is being made to close the office, this cost cannot be included as a saving to be made next month. However, it will be saved in the months after that so it will become a relevant cost saving from month two onwards.

(d) This is not a relevant cost of the decision to continue with the contract. The £75 is sunk and cannot be recovered even if the company does not proceed with the negotiations.

Conclusion

It is essential to look to the future when deciding which costs are relevant to a decision. Costs which have already been incurred or which will not be altered in the future as a result of the decision being taken are not relevant costs.

9.13 Opportunity costs

An opportunity cost is a special type of relevant cost. It is defined in the CIMA *Terminology* as 'the value of the benefit sacrificed when one course of action is chosen, in preference to an alternative. The opportunity cost is represented by the forgone potential benefit from the best rejected course of action'.

With opportunity costs we are concerned with identifying the value of any benefit forgone as the result of choosing one course of action in preference to another.

9.13.1 Examples of opportunity costs

The best way to demonstrate opportunity costs is to consider some examples:

(a) A company has some obsolete material in its stores which it is considering using for a special contract. If the material is not used on the contract it can either be sold back to the supplier for £2 per tonne or it can be used on another contract in place of a different material which would usually cost £2.20 per tonne.

The opportunity cost of using the material on the special contract is £2.20 per tonne. This is the value of the next best alternative use for the material, or the benefit forgone by not using it for the other contract.

(b) Chris is deciding whether or not to take a skiing holiday this year. The travel agent is quoting an all-inclusive holiday cost of £675 for a week. Chris will lose the chance to earn £200 for a part-time job during the week that the holiday would be taken.

The relevant cost of taking the holiday is £875. This is made up of the out-of-pocket cost of £675, plus the £200 opportunity cost which is the part-time wages forgone.

9.13.2 Notional costs and opportunity costs

Notional costs and opportunity costs are, in fact, very similar. This is particularly noticeable in the case of notional rent. The notional rent could be the rental which the company is forgoing by occupying the premises itself, that is, it could be an opportunity cost. However, it is only a true opportunity cost if the company can actually identify a forgone opportunity to rent the premises. If nobody is willing to pay the rent, then it is not an opportunity cost.

9.14 Avoidable, differential and incremental costs

There are two other types of relevant cost which you will need to know about: avoidable costs and differential/incremental costs.

9.14.1 Avoidable costs

CIMA defines avoidable costs as 'the specific costs of an activity or sector of a business which would be avoided if that activity or sector did not exist'.

For example, if a company is considering shutting down a department, then the avoidable costs are those which would be saved as a result of the shutdown. Such costs might include the labour costs of those employed in the department and the rental cost of the space occupied by the department. The latter is an example of an attributable or specific fixed cost. Costs such as apportioned head office costs which would not be saved as a result of the shutdown are unavoidable costs. They are not relevant to the decision.

9.14.2 Differential/incremental costs

CIMA defines a differential/incremental cost as 'the difference in total cost between alternatives; calculated to assist decision-making'.

For example, if the relevant cost of contract X is £5,700 and the relevant cost of contract Y is £6,200 we would say that the differential or incremental cost is £500, that is, the extra cost of contract Y is £500.

9.14.3 Using incremental costs

Incremental costs can be useful if the cost accountant wishes to highlight the consequences of taking sequential steps in a decision. For example, the accountant might be providing cost information for a decision about whether to increase the number of employees in a department. Instead of quoting several different total cost figures, it might be more useful to say 'the incremental cost per five employees will be £5,800 per month'.

Remember that only relevant costs should be used in the calculations.

9.14.4 Incremental revenues

Just as incremental costs are the differences in cost between alternatives, incremental revenues are the differences in revenues between the alternatives. Matching the incremental costs against the incremental revenues will produce a figure for the incremental gain or loss between the alternatives.

Exercise 9.6

To consolidate the material so far on relevant costs and opportunity costs, work through the following exercise to identify the relevant costs of the decision. Try to work out the relevant cost of each item before you look at the solution.

ABC Limited is deciding whether or not to proceed with a special order. Use the details below to determine the relevant cost of the order.

(a) Materials P and Q will be used for the contract. One hundred tonnes of material P will be needed and sufficient material is already held in the stores because the material is in common use in the company. The original cost of the material in the stores is £1 per tonne but it would cost £1.20 per tonne to replace if it is used for this contract. The material Q required is in already held in the stores as a result of previous over-purchasing. This material originally cost £500 but it has no other use. The material is toxic and if it is not used on this contract, then ABC must pay £280 to have it disposed of.
(b) The contract requires 200 hours of labour at £5 per hour. Employees possessing the necessary skills are currently employed by the company but they are idle at present due to a lull in the company's normal business.
(c) Overhead will be absorbed by the contract at a rate of £10 per labour hour, which consists of £7 for fixed overhead and £3 for variable.
(d) The contract will require the use of a storage unit for three months. ABC is committed to rent the unit for one year at a rental of £50 per month. The unit is not in use at present. A neighbouring business has recently approached ABC offering to rent the unit from them for £70 per month.
(e) Total fixed overheads are not expected to increase as a result of the contract.

Solution

(a) The relevant cost of a material which is used regularly is its replacement cost. This will ensure that the business profits are unaffected by the use of the material for this contract. The relevant cost of material P is therefore £1.20 per tonne.

Material Q has a 'negative' cost if used for the contract. This is the saving which will be made through not having to pay the disposal cost of £280.
(b) The relevant cost of labour is zero. The labour cost is being paid anyway and no extra cost will be incurred as a result of this contract.
(c) The fixed overhead is not relevant because we are told that fixed overheads are not expected to increase. The relevant variable overhead cost is: £3 per hour × 200 hours = £600.
(d) The rental cost of £50 per month is not relevant because it will not be affected by the contract. The relevant cost of using the storage unit is the forgone rental income of £70 per month.

Summary of relevant costs

		£
(i)	Material P	120
	Material Q	(280)
(ii)	Labour	–
(iii)	Variable overhead	600
(iv)	Rent forgone	210
	Total relevant cost	650

9.14.5 Minimum price quotations for special orders

The previous example determined the relevant cost of the special order. This cost represents the minimum price which the company should charge for the order if they wish to make neither a profit nor a loss. As long as the customer pays £650 for the order the company profits will not be affected.

Obviously, this represents the absolute minimum price which could be charged. It is unlikely that ABC Limited would actually charge this amount. They would probably wish to add a profit margin to improve the company's profits.

However, this absolute minimum value does give managers a starting point for their pricing decision. They know that the company will be worse off if the price is less than £650. If perhaps ABC Limited is tendering for the order in competition with other suppliers they may try to obtain some information on the likely prices to be tendered by their competitors. If these prices are less than or close to £650, then ABC knows that they will not be able to offer a competitive price. On the other hand, if competitors are likely to tender a much higher price, then the managers know that they are able to price competitively.

9.15 Limiting factor decision-making

A limiting factor is any factor which is in scarce supply and which stops the organisation from expanding its activities further, that is, it limits the organisation's activities.

The limiting factor for many trading organisations is sales volume because they cannot sell as much as they would like. However, other factors may also be limited, especially in the short term. For example, machine capacity or the supply of skilled labour may be limited for one or two periods until some action can be taken to alleviate the shortage.

9.15.1 Decisions involving a single limiting factor

If an organisation is faced with a single limiting factor, for example, machine capacity, then it must ensure that a production plan is established which maximises the profit from the use of the available capacity. Assuming that fixed costs remain constant, this is the same as saying that the contribution must be maximised from the use of the available capacity. The machine capacity must be allocated to those products which earn the most contribution per machine hour.

This decision rule can be stated as 'maximising the contribution per unit of limiting factor'.

Example

LMN Ltd manufactures three products L, M and N. The company which supplies the two raw materials which are used in all three products has informed LMN that their employees are refusing to work overtime. This means that supply of the materials is limited to the following quantities for the next period:

Material A	1,030 kg
Material B	1,220 kg

No other source of supply can be found for the next period.
Information relating to the three products manufactured by LMN Ltd is as follows:

	L	*M*	*N*
Quantity of material used per unit manufactured:			
Material A (kg)	2	1	4
Material B (kg)	5	3	7
Maximum sales demand (units)	120	160	110
Contribution per unit sold	£15	£12	£17.50

Owing to the perishable nature of the products, no finished goods are held.

Requirements

(a) Recommend a production mix which will maximise the profits of LMN Ltd for the forthcoming period.
(b) LMN Ltd has a valued customer to whom they wish to guarantee the supply of 50 units of each product next period. Would this alter your recommended production plan?

Solution

(a) The first step is to check whether the supply of each material is adequate or whether either or both of them represent a limiting factor.

	L	*M*	*N*	*Total*
Maximum sales demand (units)	120	160	110	
Material A required per unit (kg)	2	1	4	
Total material A required (kg)	240	160	440	840
Material B required per unit (kg)	5	3	7	
Total material B required (kg)	600	480	770	1,850

There will be sufficient material A to satisfy the maximum demand for the products but material B will be a limiting factor.

The next step is to rank the products in order of their contribution per unit of limiting factor. The available material B can then be allocated according to this ranking.

	L	*M*	*N*
Contribution per unit sold	£15	£12	£17.50
Material B consumed (kg)	5	3	7
Contribution per kg of material B	£3	£4	£2.50
Ranking	2	1	3

The available material B will be allocated to the products according to this ranking, to give the optimum production plan for the next period.

Product	*Recommended production (units)*	*Material B utilised (kg)*
M	160 (maximum)	480
L	120 (maximum)	600
N	20	140 (balance)
		1,220

The available material B is allocated to satisfy the maximum market demand for products M and L. The balance of available material is allocated to the last product in the ranking, product N.

(b) The recommended production plan in part (a) does not include sufficient product N to satisfy the requirement of 50 units for the valued customer. Some of the material allocated to product L (second in the ranking) must be allocated to product N. The recommended production plan will now be as follows:

Product	*Recommended production (units)*	*Material B utilised (kg)*	
N	50	350	
M	160	480	
L	78	390	(balance)
		1,220	

This recommendation makes the best use of the available material B within the restriction of the market requirements for each product.

The identification of a limiting factor and the ranking of products to maximise profitability has been a favourite topic in the multiple-choice questions on past papers. Make sure that you are well prepared in case this topic comes up in your assessment.

Exercise 9.7

Gill Ltd manufactures three products E, F and G. The products are all finished on the same machine. This is the only mechanised part of the process. During the next period the production manager is planning an essential major maintenance overhaul of the machine. This will restrict the available machine hours to 1,400 hours for the next period. Data for the three products are:

	Product E £ *per unit*	*Product F* £ *per unit*	*Product G* £ *per unit*
Selling price	30	17	21.00
Variable cost	13	6	9.00
Fixed production cost	10	8	6.00
Other fixed cost	2	1	3.50
Profit	5	2	2.50
Maximum demand (units/period)	250	140	130

No inventories (stocks) are held.

Fixed production costs are absorbed using a machine hour rate of £2 per machine hour.

You are required to determine the production plan that will maximise profit for the forthcoming period.

Solution

The first step is to calculate how many machine hours are required for each product. We can then determine whether machine hours are really a limiting factor.

	Product E	*Product F*	*Product G*	*Total*
Fixed production cost per unit @ £2 per hour	£10	£8	£6	
Machine hours per unit	5	4	3	
Maximum demand (units)	250	140	130	
Maximum hours required	1,250	560	390	2,200

Since 2,200 machine hours are required and only 1,400 hours are available, machine hours are a limiting factor.

The optimum production plan is the plan which maximises the *contribution* from the *limiting factor*.

Do not make the common mistake of allocating the available hours according to the profit per unit of product or according to the profit per hour.

The next step is to calculate the contribution per hour from each of the products.

	Product E	*Product F*	*Product G*
	£	£	£
Selling price per unit	30	17	21
Variable cost per unit	13	6	9
Contribution per unit	17	11	12
Machine hours per unit	5	4	3
Contribution per hour	£3.40	£2.75	£4.00
Ranking	2	3	1

The available hours can be allocated according to this ranking.

	Units to be produced	*Machines hours required*
Product G (maximum demand)	130	390
Product E (balance of hours)	202	1,010
		1,400

9.16 Summary

Having read this chapter the main points that you should understand are as follows.

1. Cost–volume–profit (CVP) analysis is the study of the effect on profit of changes in costs and sales price, quantity and mix. Another common term used in this context is breakeven analysis.
2. The ratio of a cost unit's contribution to its selling price is usually assumed to be constant. This ratio may be referred to as the contribution to sales (C/S) ratio or the profit–volume (P/V) ratio, both of which are usually expressed as a percentage.
3. The breakeven point can be calculated as (fixed costs/contribution per unit) or (fixed costs/PV ratio).
4. The margin of safety is the difference between the expected level of sales and the breakeven point. It may be expressed as a percentage of the expected sales.

5. Contribution required to achieve a target profit = fixed costs + target profit.
6. A breakeven chart is a pictorial representation of costs and revenues depicting the profit or loss for the relevant range of activity.
7. A contribution breakeven chart shows the variable cost line instead of the fixed cost line, so that contribution can be read directly from the chart.
8. A profit–volume (PV) chart depicts a single line indicating the profit or loss for the relevant range of activity. It is particularly useful for demonstrating the effect on profit of changes in costs or revenues.
9. Breakeven or CVP analysis has a number of limitations and managers should be aware of these if they are to apply the technique effectively.
10. Relevant costs are those that will be affected by the decision being taken.
11. A sunk or past cost is not a relevant cost because the money has already been spent and cannot be recovered now.
12. An opportunity cost is the benefit forgone by choosing one course of action in preference to an alternative.
13. An avoidable cost is a cost that could be saved if the activity under consideration did not exist.
14. An incremental or differential cost is the difference in total cost between alternatives.
15. A limiting factor is any factor which is in scarce supply and stops the organisation from expanding its activities further. The decision rule in this situation is to maximise the contribution per unit of limiting factor.
16. The financial figures are only part of the information needed for a fully informed decision. It is also important to consider any relevant non-financial factors.

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Revision Questions

9

Question 1 Multiple choice

1.1 When comparing the profitability of different branches, a firm charges rent as an expense in all the branch operating statements even when the particular branch premises are owned and not rented. In these circumstances the rent is:

(A) an avoidable cost.
(B) a relevant cost.
(C) a notional cost.
(D) a fixed cost.

1.2 The most relevant costs to be used in decision-making are:

(A) costs already incurred which are known with certainty.
(B) current costs.
(C) estimated future costs.
(D) notional costs.

1.3 A sunk cost is:

(A) a cost committed to be spent in the current period.
(B) a cost which is irrelevant for decision-making.
(C) a cost connected with oil exploration in the North Sea.
(D) a cost unaffected by fluctuations in the level of activity.

1.4 A Ltd has fixed costs of £60,000 per annum. It manufactures a single product which it sells for £20 per unit. Its contribution to sales ratio is 40 per cent.

A Ltd's breakeven point in units is:

(A) 1,200
(B) 3,000
(C) 5,000
(D) 7,500.

1.5 B Ltd manufactures a single product which it sells for £9 per unit. Fixed costs are £54,000 per month and the product has a variable cost of £6 per unit.

In a period when actual sales were £180,000, B Ltd's margin of safety, in units, was:

(A) 2,000
(B) 14,000
(C) 18,000
(D) 20,000.

1.6 E plc operates a marginal costing system. For the forthcoming year, variable costs are budgeted to be 60 per cent of sales value and fixed costs are budgeted to be 10 per cent of sales value.

If E plc increases its selling prices by 10 per cent, but if fixed costs, variable costs per unit and sales volume remain unchanged, the effect on E plc's contribution would be:

(A) a decrease of 2 per cent.
(B) an increase of 5 per cent.
(C) an increase of 10 per cent.
(D) an increase of 25 per cent.

1.7 An organisation currently produces one product. The cost per unit of that product is as follows:

	£
Selling price	130
Direct materials	22
Direct labour	15
Direct expenses	3
Variable overheads	10
Total variable cost	50

Total fixed costs for the period amount to £1,600,000. How many units (to the nearest whole unit) will the organisation need to produce and sell to generate a profit of £250,000?

(A) 20,000
(B) 20,555
(C) 23,125
(D) 26,428.

1.8 P Ltd is considering accepting a contract. The materials required for the contract are currently held in the stores at a book value of £3,000. The materials are not regularly used by the organisation and currently have a scrap value of £500. Current replacement cost for the materials is £4,500. What is the relevant cost to P Ltd of using the materials on this contract?

(A) £500
(B) £3,500
(C) £4,500
(D) £5,000.

1.9 A company is launching a new product. In order to manufacture this new product, two types of labour are required – skilled and semi-skilled. The new product requires 5 hours of skilled labour and 5 hours of semi-skilled labour.

A skilled employee is available and is currently paid £10 per hour. A replacement would, however, have to be obtained at a rate of £9 per hour, for the work which would otherwise be done by the skilled employee. The current rate for semi-skilled workers is £5 per hour and an additional employee would be appointed for this work.

The relevant cost of labour to be used in making one unit of the new product would be

(A) £25
(B) £70
(C) £75
(D) £120.

1.10 Z Ltd manufactures three products, the selling price and cost details of which are given below:

	Product X	*Product Y*	*Product Z*
	£	£	£
Selling price per unit	75	95	95
Costs per unit:			
Direct materials (£5/kg)	10	5	15
Direct labour (£4/hour)	16	24	20
Variable overhead	8	12	10
Fixed overhead	24	36	30

In a period when direct materials are restricted in supply, the most and the least profitable uses of direct materials are:

	Most profitable	*Least profitable*
(A)	X	Z
(B)	Y	Z
(C)	Z	Y
(D)	Y	X

Question 2 Short objective-test questions

2.1 OT Ltd plans to produce and sell 4,000 units of product C each month, at a selling price of £18 per unit. The unit cost of product C is as follows:

	£ per unit
Variable cost	8
Fixed cost	4
	12

To the nearest whole number, the monthly margin of safety, as a percentage of planned sales is ☐%.

2.2 The P/V ratio is the ratio of profit generated to the volume of sales.

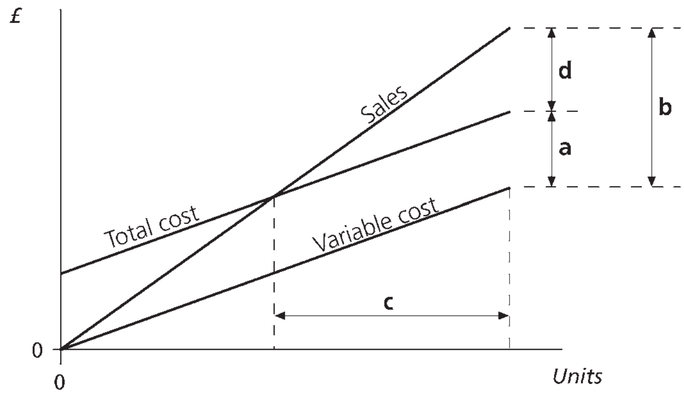
True ☐
False ☐

2.3 Product J generates a contribution to sales ratio of 30 per cent. Fixed costs directly attributable to product J amount to £75,000 per month. The sales revenue required to achieve a monthly profit of £15,000 is £ ☐.

2.4 Match the following terms with the labels **a** to **d** on the graph. Write a, b, c or d in the relevant boxes.

☐ Margin of safety
☐ Fixed cost

☐ Contribution
☐ Profit



2.5 Select *true* or *false* for each of the following statements about a profit–volume chart.

(a) The profit line passes through the origin.

True ☐
False ☐

(b) Other things being equal, the angle of the profit line becomes steeper when the selling price increases.

True ☐
False ☐

(c) Contribution cannot be read directly from the chart.

True ☐
False ☐

(d) The point where the profit line crosses the vertical axis is the breakeven point.

True ☐
False ☐

(e) Fixed costs are shown as a line parallel to the horizontal axis.

True ☐
False ☐

2.6 (a) Printing costs of £30 are incurred in putting together a proposal for a new client. Is this cost relevant to the decision to continue negotiating to obtain the client's business?

Relevant ☐
Not relevant ☐

(b) In order to carry out a contract, additional premises will have to be rented at a cost of £2,000 per month. It is company policy to allocate rental costs to general fixed overheads. Is this rental cost relevant to the decision to accept the contract?

Relevant ☐
Not relevant ☐

(c) Some material currently held in stores can be used on a particular job. The material has no other use but it could be sold for scrap for £1 per kilogram. Is the scrap value of the material a relevant cost of this job?

Relevant ☐
Not relevant ☐

2.7 PH Ltd has spare capacity in its factory. A supermarket chain has offered to buy a number of units of product XZ each month, and this would utilise the spare capacity. The supermarket is offering a price of £8 per unit and the cost structure of XZ is as follows:

	£ per unit
Direct material	3
Direct labour	2
Variable overhead	1
Fixed overhead	3
	9

Fixed costs would not be affected.
On a purely financial basis, should the supermarket's offer be accepted or rejected?

Accept the offer ☐
Reject the offer ☐

2.8 (a) If a raw material item held in stores is regularly used, the relevant cost of using the item for a particular job is its:

original purchase price ☐
replacement price ☐

(b) If a raw material item held in stores is not regularly used, and would not be replaced if it were used for a particular job, the relevant cost of using the item is the lower of its resale value and its value from an alternative use.

True ☐
False ☐

2.9 The following tasks are undertaken when deciding on the optimum production plan when a limiting factor exists. Write 1, 2, 3 or 4 in the boxes to indicate the correct sequence of tasks.

☐ Rank the products according to the contribution per unit of limiting factor used.
☐ Calculate each product's contribution per unit of limiting factor used.
☐ Identify the limiting factor.
☐ Allocate the limited resource according to the ranking.

? **Question 3** Profit statements and breakeven analysis

BSE Veterinary Services is a specialist laboratory carrying out tests on cattle to ascertain whether the cattle have any infection. At present, the laboratory carries out 12,000 tests each period but, because of current difficulties with the beef herd, demand is expected to increase to 18,000 tests a period, which would require an additional shift to be worked.

The current cost of carrying out a full test is:

	£ per test
Materials	115
Technicians' wages	30
Variable overhead	12
Fixed overhead	50

Working the additional shift would:

(i) require a shift premium of 50 per cent to be paid to the technicians on the additional shift;
(ii) enable a quantity discount of 20 per cent to be obtained for all materials if an order was placed to cover 18,000 tests;
(iii) increase fixed costs by £700,000 per period.

The current fee per test is £300.

Requirements

(a) The profit for the period at the current capacity of 12,000 tests is £ ☐.
(b) A framework for a profit statement if the additional shift was worked and 18,000 tests were carried out is as follows (complete the boxes to derive the period profit):

	£000
(i) Sales	☐
(ii) Direct materials	☐
(iii) Direct labour	☐
(iv) Variable overhead	☐
(v) Fixed costs	☐
(vi) Profit	☐

(c) It has been determined that for a capacity of 15,000 tests per period, the test fee would be £300. Variable costs per test would amount to £140, and period fixed costs would be £1,200,000. The breakeven number of tests at this capacity level is ☐ tests.

? **Question 4** Profit–volume graphs

MC Limited manufactures one product only, and for the last accounting period has produced the simplified profit and loss statement below:

	£	£
Sales		300,000
Costs:		
Direct materials	60,000	
Direct wages	40,000	
Prime cost	100,000	
Variable production overhead	10,000	
Fixed production overhead	40,000	
Fixed administration overhead	60,000	
Variable selling overhead	40,000	
Fixed selling overhead	20,000	
		270,000
Net profit		30,000

Requirements

(a) A profit–volume graph is to be drawn for MC Ltd's product.

(i) The profit line drawn on the graph would cut the vertical axis (y-axis) at the point where y is equal to £ ☐.

(ii) The profit line drawn on the graph would cut the horizontal axis (x-axis) at the point where x is equal to £ ☐.

(iii) The margin of safety indicated by the graph would be £ ☐.

(b) The effect of various changes in variables is to be indicated separately on the profit–volume graph. For each change, indicate whether the angle of the profit line and the breakeven point will increase, decrease or remain unchanged.

Variable changed	*The angle of the profit line will:*		
	Increase	*Decrease*	*Remain unchanged*
(i) Increase in selling price	☐	☐	☐
(ii) Increase in fixed cost	☐	☐	☐
(iii) Decrease in variable cost per unit	☐	☐	☐

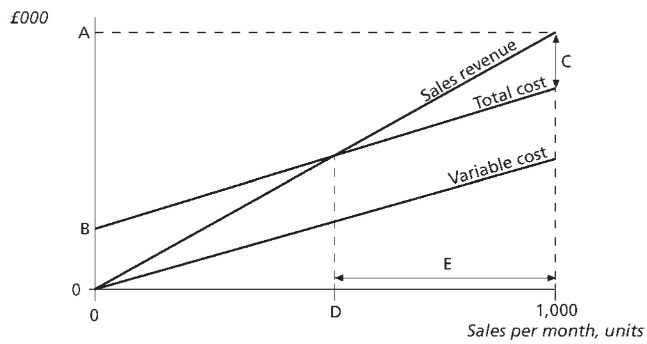
	The breakeven point will:		
	Increase	*Decrease*	*Remain unchanged*
(i) Increase in selling price	☐	☐	☐
(ii) Increase in fixed cost	☐	☐	☐
(iii) Decrease in variable cost per unit	☐	☐	☐

? **Question 5** Breakeven charts

The following data is available concerning HF Ltd's single product Q.

	£ per unit	*£ per unit*
Selling price		50
Variable cost		
Direct material	7	
Direct labour	8	
Variable overhead	5	
		20
Contribution		30
Fixed overhead		15
Profit		15

1,000 units of product Q are produced and sold each month.



Requirements

The management accountant of HF Ltd has prepared the above contribution breakeven chart for product Q:

The values or quantities indicated by A to E on the chart are:

A £[ ]
B £[ ]
C £[ ]
D [ ] units
E [ ] units

Question 6 Decision-making, limiting factor

ABC Ltd makes three products, all of which use the same machine, which is available for 50,000 hours per period.

The standard costs of the product, per unit, are:

	Product A	*Product B*	*Product C*
	£	£	£
Direct materials	70	40	80
Direct labour:			
Machinists (£8/hour)	48	32	56
Assemblers (£6/hour)	36	40	42
Total variable cost	154	112	178
Selling price per unit	200	158	224
Maximum demand (units)	3,000	2,500	5,000

Fixed costs are £300,000 per period.

Requirements

(a) The deficiency in machine hours for the next period is [ ] hours.

(b) The optimum production plan that will maximise ABC Ltd's profit for the next period is:

Product A [ ] units
Product B [ ] units
Product C [ ] units.

Solutions to Revision Questions

9

Solution 1

- Do not forget to eliminate the unlikely options if you have to guess. This advice applies particularly to the narrative questions, 1.1–1.3.
- Question 1.6 is quite tricky. Try setting up a table of the selling price, variable cost and contribution before and after the change, perhaps using a selling price of £100. Remember that fixed costs are not relevant because they do not affect contribution.

1.1 Answer: (C)

The description given is of notional rent, which is not a real cost but is included to aid performance comparison.

1.2 Answer: (C)

Decision-making information must be based on what is likely to happen in the future as a result of a decision taken now. Option A describes a sunk or past cost. Current costs (option B) may serve as a guide to costs likely to be incurred in future, but they are not the most relevant costs to be used in decision-making. Option D, notional costs, are relevant to a decision only if they are an estimate of *future* notional costs.

1.3 Answer: (B)

A sunk cost is a past cost, that is, it has already been incurred and is not relevant for decision-making. It is hoped that you managed to eliminate the incorrect option, C!

1.4 Answer: (D)

Contribution per unit = 40% of selling price = £8

$$\text{Breakeven point} = \frac{£60{,}000}{£8} = 7{,}500 \text{ units}$$

1.5 Answer: (A)

Contribution per unit = £9 − £6 = £3

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{£54{,}000}{£3} = 18{,}000 \text{ units}$$

$$\text{Margin of safety} = \text{Actual sales} - \text{breakeven sales} = \frac{£180{,}000}{£9} - 18{,}000 = 2{,}000 \text{ units}$$

1.6 Answer: (D)

Fixed costs are not relevant because they do not affect contribution. Taking a selling price of, say, £100 per unit, the cost structures will look like this:

	Before change *£ per unit*		*After change* *£ per unit*
Sales price	100	+ 10%	110
Variable cost	60		60
Contribution	40		50

Contribution per unit increases by 25 per cent. If sales volume remains unchanged then total contribution will also increase by 25 per cent.

1.7 Answer: (C)

$$\frac{£1{,}600{,}000 + £250{,}000}{£80} = 23{,}125 \text{ units}$$

Working:

Contribution per unit	*£*
Selling price	130
Variable cost	(50)
Contribution/unit	80

1.8 Answer: (A)

Book value is historical and therefore not relevant. Replacement cost is not relevant as the materials are not regularly used and will therefore not be replaced. The relevant cost is the scrap value of £500.

1.9 Answer: (B)

	£
Skilled labour replacement: 5 hours × £9	45
Semi-skilled labour: 5 hours × £5	25
Relevant cost	70

1.10 Answer: (B)

Product	*X*	*Y*	*Z*
Contribution/unit	£41	£54	£50
Materials (kg/unit)	2	1	3
Contribution/kg	£20.50	£54	£16.66
Ranking	2	1	3

✓ Solution 2

2.1 Monthly fixed costs = 4,000 units × £4 = £16,000.

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{£16{,}000}{£18 - £8} = 1{,}600 \text{ units}$$

$$\text{Margin of safety \%} = \frac{\text{Planned sales} - \text{breakeven sales}}{\text{Planned sales}} \times 100\%$$
$$= \frac{4{,}000 - 1{,}600}{4{,}000} \times 100\% = 60\%.$$

2.2 *False*. The P/V ratio is another term for the C/S ratio. It measures the ratio of the contribution to sales.

2.3 $$\text{Required sales revenue} = \frac{\text{Required contribution}}{\text{C/S ratio}} = \frac{£75{,}000 + £15{,}000}{0.30} = £300{,}000.$$

2.4 **c** Margin of safety
a Fixed cost
b Contribution
d Profit.

2.5 (a) *False*. The profit line passes through the breakeven point on the horizontal axis, and cuts the vertical axis at the point where the loss is equal to the fixed costs.
(b) *True*. Profits increase at a faster rate if the selling price is higher.
(c) *True*. A contribution breakeven chart is needed for this.
(d) *False*. The breakeven point is where the profit line cuts the horizontal axis.
(e) *False*. No fixed cost line is shown on a profit–volume chart.

2.6 (a) *Not relevant*. This is a sunk cost that will not be affected by a decision to continue negotiations.
(b) *Relevant*. Although the rental cost will be treated as a general fixed overhead, it is an incremental cost that will be incurred if the contract is accepted.
(c) *Relevant*. The opportunity cost of using the material on the contract is the scrap value forgone of £1 per kilogram.

2.7 *Accept the offer*. On a purely financial basis, the price of £8 per unit exceeds the incremental variable cost of £6 per unit.

2.8 (a) If a material stock item is regularly used in a business, the relevant cost of using the item for a particular job is its *replacement* price. (The original purchase price is a sunk or past cost.)
(b) *False*. If a material stock item is not regularly used in a business, and would not be replaced if it were used for a particular job, the relevant cost of using the item is the *higher* of its resale value and its value from an alternative use. (This is the opportunity cost of using the stock item on this job.)

2.9 1. Identify the limiting factor.
2. Calculate each product's contribution per unit of limiting factor used.

3. Rank the products according to the contribution per unit of limiting factor used.
4. Allocate the limited resource according to the ranking.

Solution 3

- In part (b) do not be tempted to use unit rates to calculate the new level of fixed costs. The current level of fixed costs is £600,000 *per period*. This will increase by £700,000.
- Also in part (b), notice that the shift premium applies only to the technicians working on the additional shift. It does not apply to all technicians' wages.

(a) £1,116,000

Workings: profit statement for current 12,000 capacity

		£000
Sales	12,000 tests @ £300/test	3,600
Direct materials	12,000 tests @ £115/test	(1,380)
Direct labour	12,000 tests @ £30/test	(360)
Variable overhead	12,000 tests @ £12/test	(144)
Contribution		1,716
Fixed costs	12,000 tests @ £50/test	(600)
Profit		1,116

(b) *Profit statement for 18,000 capacity, with additional shift*

		£000	£000	
Sales	18,000 tests @ £300/test		5,400	**(i)**
Direct materials	18,000 tests @ £92/test		(1,656)	**(ii)**
Direct labour	12,000 tests @ £30/test	(360)		
	6,000 tests @ £45/test	(270)		
			(630)	**(iii)**
Variable overhead	18,000 tests @ £12/test		(216)	**(iv)**
Contribution			2,898	
Fixed costs			(1,300)	**(v)**
Profit			1,598	**(vi)**

(c) Breakeven volume $= \dfrac{£1{,}200{,}000}{(£300 - £140)} = 7{,}500$ tests.

Solution 4

- The profit line cuts the vertical axis at the point equal to the fixed costs, that is, the loss when no sale is made.
- The profit line cuts the horizontal axis at the breakeven point. Therefore, for (a)(ii) you will need to calculate the breakeven point. For (a)(iii), the margin of safety is the difference between £300,000 sales and the breakeven point.

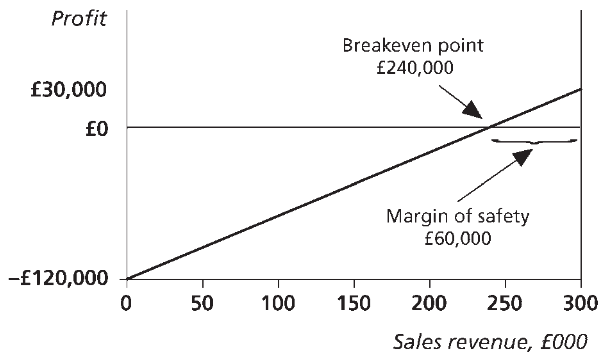
(a) (i) $-$ £120,000
(ii) £240,000
(iii) £60,000.

Workings:

$$\text{Contribution-to-sales ratio} = \frac{£(300{,}000 - 100{,}000 - 10{,}000 - 40{,}000)}{£300{,}000} \times 100 = 50\%$$

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{C/S ratio}} = \frac{£(40{,}000 + 60{,}000 + 20{,}000)}{0.5} = £240{,}000$$

$$\text{Margin of safety} = £(300{,}000 - 240{,}000) = £60{,}000$$



(b)

	The angle of the profit line will:	*The breakeven point will:*
(i) Increase in selling price	Increase	Decrease
(ii) Increase in fixed cost	Remain unchanged	Increase
(iii) Decrease in variable cost per unit	Increase	Decrease

☑ Solution 5

- Remember that a contribution breakeven chart shows the variable cost line instead of the fixed cost line.
- This means that contribution can be read directly from the chart, as the difference between the sales value and the variable cost. This is the main advantage of the contribution breakeven chart.

A £50,000 (1,000 units × £50 selling price)
B £15,000 (fixed cost at zero activity)
C £15,000 (profit for 1,000 units – see below)
D 500 units (breakeven point – see below)
E 500 units (margin of safety (1,000 units $-$ 500 units breakeven)

Workings:

	£	£
Sales value for 1,000 units 1,000 × £50		50,000
Total cost for 1,000 units:		
variable cost 1,000 × £20	20,000	
fixed cost 1,000 × £15	15,000	
		35,000
Profit for 1,000 units		15,000

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{£15{,}000}{£30} = 500 \text{ units}$$

Solution 6

- In part (b) remember to rank the products according to their contribution per machine hour. Then allocate the available machine hours according to this ranking.

(a) The deficiency in machine hours for the next period is 13,000 hours.
(b) Product A 3,000 units
Product B 2,500 units
Product C 3,142 units

Workings:
(a) Deficiency in machine hours for next period

	Product A	*Product B*	*Product C*	*Total*
Machine hours required per unit	48/8 = 6	32/8 = 4	56/8 = 7	
Maximum demand (units)	3,000	2,500	5,000	
Total machine hours to meet maximum demand	18,000	10,000	35,000	63,000
Machine hours available				50,000
Deficiency of machine hours				13,000

(b)

	Product A	*Product B*	*Product C*
	£	£	£
Selling price per unit	200	158	224
Variable cost per unit	(154)	(112)	(178)
Contribution per unit	46	46	46
Machine hours required per unit	6	4	7
Contribution per machine hour	£7.67	£11.50	£6.57
Order of production	2	1	3

Therefore, make:

	Machine hours
2,500 units of product B, using machine hours of (4 × 2,500)	10,000
3,000 units of product A, using machine hours of (6 × 3,000)	18,000
	28,000
Machine hours left to make product C	22,000
	50,000

Therefore, the company should make 3,142, that is, (22,000/7) units of product C.

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Budgetary Planning and Control

10

LEARNING OUTCOMES

After completing this chapter, you should be able to:

- explain how and why organisations prepare budgets;
- explain the use of IT in the budget process;
- prepare functional budgets, budgeted profit and loss account, budgeted balance sheet and a simple cash budget;
- prepare simple reports showing actual and budgeted results;
- explain the differences between fixed and flexible budgets;
- prepare a fixed and a flexible budget;
- calculate expenditure, volume and total budget variances.

10.1 Introduction

In this chapter you will learn about budgets: what they are for, how they are prepared, and their use in planning and controlling the activities of an organisation.

10.2 The purposes of budgeting

Budgets have two main roles:

(a) they act as authorities to spend, that is, they give authority to budget managers to incur expenditure in their part of the organisation;
(b) they act as comparators for current performance, by providing a yardstick against which current activities can be monitored.

These two roles are combined in a system of budgetary planning and control.

10.2.1 Budgetary planning and control

Planning the activities of an organisation ensures that the organisation sets out in the right direction. Individuals within the organisation will have definite targets which they will aim to achieve. Without a formalised plan the organisation will lack direction and managers will not be aware of their own targets and responsibilities. Neither will they appreciate how their activities relate to those of other managers within the organisation.

A formalised plan will help to ensure a coordinated approach and the planning process itself will force managers to continually think ahead, planning and reviewing their activities in advance.

However, the budgetary process should not stop with the plan. The organisation has started out in the right direction but to ensure that it continues on course it is the management's responsibility to exercise control.

Control is best achieved by comparison of the actual results with the original plan. Appropriate action can then be taken to correct any deviations from the plan.

The comparison of actual results with a budgetary plan, and the taking of action to correct deviations, is known as feedback control.

The two activities of planning and control must go hand in hand. Carrying out the budgetary planning exercise without using the plan for control purposes is performing only part of the task.

10.2.2 What is a budget?

A budget could be defined as 'a quantified plan of action relating to a given period of time'.

For a budget to be useful it must be quantified. For example, it would not be particularly useful for the purposes of planning and control if a budget was set as follows:

'We plan to spend as little as possible in running the printing department this year'; or 'We plan to produce as many units as we can possibly sell this quarter'.

These are merely vague indicators of intended direction; they are not quantified plans. They will not provide much assistance in management's task of planning and controlling the organisation.

These 'budgets' could perhaps be modified as follows:

'Budgeted revenue expenditure for the printing department this year is £60,000'; and 'Budgeted production for the quarter is 4,700 units'.

The quantification of the budgets has provided:

(a) a definite target for planning purposes; and
(b) a yardstick for control purposes.

10.2.3 The budget period

You may have noticed that in each of these 'budgets' the time period was different. The first budget was prepared for a year and the second budget was for a quarter. The time period for which a budget is prepared and used is called the budget period. It can be any length to suit management purposes but it is usually 1 year.

The length of time chosen for the budget period will depend on many factors, including the nature of the organisation and the type of expenditure being considered. Each budget period can be subdivided into control periods, also of varying lengths, depending on the level of control which management wishes to exercise. The usual length of a control period is 1 month.

10.2.4 Strategic planning, budgetary planning and operational planning

It will be useful at this stage to distinguish in broad terms between three different types of planning:

- strategic planning;
- budgetary planning;
- operational planning.

These three forms of planning are interrelated. The main distinction between them relates to their timespan which may be short term, medium term or long term.

The short term for one organisation may be the medium or long term for another, depending on the type of activity in which it is involved.

Strategic planning

Strategic planning is concerned with preparing long-term action plans to attain the organisation's objectives.

Strategic planning is also known as corporate planning or long-range planning.

Budgetary planning

Budgetary planning is concerned with preparing the short- to medium-term plans of the organisation. It will be carried out within the framework of the strategic plan. An organisation's annual budget could be seen as an interim step towards achieving the long-term or strategic plan.

Operational planning

Operational planning refers to the short-term or day-to-day planning process. It is concerned with planning the utilisation of resources and will be carried out within the framework set by the budgetary plan. Each stage in the operational planning process can be seen as an interim step towards achieving the budget for the period.

Operational planning is also known as tactical planning.

Remember that the full benefit of any planning exercise is not realised unless the plan is also used for control purposes. Each of these types of planning should be accompanied by the appropriate control exercise covering the same time span.

10.3 The preparation of budgets

The process of preparing and using budgets will differ from organisation to organisation. However there are a number of key requirements in the design of a budgetary planning and control process.

10.3.1 Coordination: the budget committee

The need for coordination in the planning process is paramount. The interrelationship between the functional budgets (e.g. sales, production, purchasing) means that one budget cannot be completed without reference to several others.

For example, the purchasing budget cannot be prepared without reference to the production budget, and it may be necessary to prepare the sales budget before the production budget can be prepared. The best way to achieve this coordination is to set up a budget committee. The budget committee should comprise representatives from all functions in the organisation. There should be a representative from sales, a representative from marketing, a representative from personnel, and so on.

The budget committee should meet regularly to review the progress of the budgetary planning process and to resolve problems that have arisen. These meetings will effectively bring together the whole organisation in one room, to ensure a coordinated approach to budget preparation.

10.3.2 Participative budgeting

CIMA defines participative budgeting as 'a budgeting system in which all budget holders are given the opportunity to participate in setting their own budgets'. This may also be referred to as 'bottom-up budgeting'. It contrasts with imposed or top-down budgets where the ultimate budget holder does not have the opportunity to participate in the budgeting process. The advantages of participative budgeting are as follows:

- *Improved quality of forecasts* to use as the basis for the budget. Managers who are doing a job on a day-to-day basis are likely to have a better idea of what is achievable, what is likely to happen in the forthcoming period, local trading conditions, etc.
- *Improved motivation*. Budget holders are more likely to want to work to achieve a budget that they have been involved in setting themselves, rather than one that has been imposed on them from above. They will own the budget and accept responsibility for the achievement of the targets contained therein.

Detail on the behavioural aspects of budgeting is outside the scope of the *Management Accounting Fundamentals* syllabus.

The main disadvantage of participative budgeting is that it tends to result in a more extended and complex budgetary process. However, the advantages are generally accepted to outweigh this.

10.3.3 Information: the budget manual

Effective budgetary planning relies on the provision of adequate information to the individuals involved in the planning process.

Many of these information needs are contained in the budget manual.

A budget manual is a collection of documents which contains key information for those involved in the planning process. Typical contents could include the following:

(a) An introductory explanation of the budgetary planning and control process including a statement of the budgetary objective and desired results.

    Participants should be made aware of the advantages to them and to the organisation of an efficient planning and control process. This introduction should give participants an understanding of the workings of the planning process, and of the sort of information that they can expect to receive as part of the control process.

(b) A form of organisation chart to show who is responsible for the preparation of each functional budget and the way in which the budgets are interrelated.

(c) A timetable for the preparation of each budget. This will prevent the formation of a 'bottleneck', with the late preparation of one budget holding up the preparation of all others.

(d) Copies of all forms to be completed by those responsible for preparing budgets, with explanations concerning their completion.
(e) A list of the organisation's account codes, with full explanations of how to use them.
(f) Information concerning key assumptions to be made by managers in their budgets, for example, the rate of inflation, key exchange rates, etc.
(g) The name and location of the person to be contacted concerning any problems encountered in preparing budgetary plans. This will usually be the coordinator of the budget committee (the budget officer) and will probably be a senior accountant.

10.3.4 Early identification of the principal budget factor

The principal budget (key budget) factor is the factor which limits the activities of the organisation. The early identification of this factor is important in the budgetary planning process because it indicates which budget should be prepared first.

The principal budget factor was referred to in Chapter 9 as the limiting factor.

For example, if sales volume is the principal budget factor, then the sales budget must be prepared first, based on the available sales forecasts. All other budgets should then be linked to this.

Alternatively machine capacity may be limited for the forthcoming period and therefore machine capacity is the principal budget factor. In this case the production budget must be prepared first and all other budgets must be linked to this.

Failure to identify the principal budget factor at an early stage could lead to delays later on when managers realise that the targets they have been working with are not feasible.

10.3.5 The interrelationship of budgets

The critical importance of the principal budget factor stems from the fact that all budgets are interrelated. For example, if sales is the principal budget factor this is the first budget to be prepared. This will then provide the basis for the preparation of several other budgets including the selling expenses budget and the production budget.

However, the production budget cannot be prepared directly from the sales budget without a consideration of stockholding policy. For example, management may plan to increase finished goods inventory (stock) in anticipation of a sales drive. Production quantities would then have to be higher than the budgeted sales level. Similarly, if a decision is taken to reduce the level of material stocks held, it would not be necessary to purchase all of the materials required for production.

10.3.6 Using computers in budget preparation

A vast amount of data is involved in the budgetary planning process and managing this volume of data in a manual system is an onerous and cumbersome task.

A computerised budgetary planning system will have the following advantages over a manual system:

- computers can easily handle the volume of data involved;
- a computerised system can process the data more rapidly than a manual system;
- a computerised system can process the data more accurately than a manual system;
- computers can quickly and accurately access and manipulate the data in the system.

Organisations may use specially designed budgeting software. Alternatively, a well-designed spreadsheet model can take account of all of the budget interrelationships described above.

The model will contain variables for all of the factors about which decisions must be made in the planning process, for example, sales volume, unit costs, credit periods and stock volumes.

If managers wish to assess the effect on the budget results of a change in one of the decision variables, this can be accommodated easily by amending the relevant variable in the spreadsheet model. The effect of the change on all of the budgets will be calculated instantly so that managers can make better informed planning decisions.

This process of reviewing the effect of changes in the decision variables is called 'what-if?' analysis. For example, managers can rapidly obtain the answer to the question, 'What if sales volumes are 10 per cent lower than expected?'.

Budgetary planning is an iterative process. Once the first set of budgets has been prepared, those budgets will be considered by senior managers. The criteria used to assess the suitability of budgets may include adherence to the organisation's long-term objectives, profitability and liquidity. Computerised spreadsheet models then provide managers with the ability to amend the budgets rapidly, and adjust decision variables until they feel that they have achieved the optimum plan for the organisation for the forthcoming period.

10.3.7 The master budget

The master budget is a summary of all the functional budgets. It usually comprises the budgeted income statement (profit and loss account), budgeted balance sheet and budgeted cash flow statement.

It is this master budget which is submitted to senior managers for approval because they should not be burdened with an excessive amount of detail. The master budget is designed to give the summarised information that they need to determine whether the budget is an acceptable plan for the forthcoming period.

10.4 Preparation of functional budgets

The best way to see how budgets are prepared is to work through an example.

Example: Preparing a functional budget

A company manufactures two products, Aye and Bee. Standard cost data for the products for next year are as follows:

	Product Aye per unit	*Product Bee per unit*
Direct materials:		
X at £2 per kg	24 kg	30 kg
Y at £5 per kg	10 kg	8 kg
Z at £6 per kg	5 kg	10 kg

	Product Aye per unit	Product Bee per unit
Direct wages:		
Unskilled at £3 per hour	10 hours	5 hours
Skilled at £5 per hour	6 hours	5 hours

Budgeted inventories (stocks) for next year are as follows:

	Product Aye units	Product Bee units	
1 January	400	800	
31 December	500	1,100	
	Material X kg	*Material Y kg*	*Material Z kg*
1 January	30,000	25,000	12,000
31 December	35,000	27,000	12,500

Budgeted sales for next year: product Aye 2,400 units; product Bee 3,200 units.
You are required to prepare the following budgets for next year:

(a) production budget, in units;
(b) material purchases budget, in kilos and £;
(c) direct labour budget, in hours and £.

Solution

(a) *Production budget for next year*

	Product Aye units	Product Bee units
Sales units required	2,400	3,200
Closing stock at end of year	500	1,100
	2,900	4,300
Less opening stock	400	800
Production units required	2,500	3,500

(b) Material purchases budget for next year

	Material X kg	Material Y kg	Material Z kg	Total
Requirements for production:				
Product Aye[1]	60,000	25,000	12,500	
Product Bee	105,000	28,000	35,000	
	165,000	53,000	47,500	
Closing stock at end of year	35,000	27,000	12,500	
	200,000	80,000	60,000	
Less opening stock	30,000	25,000	12,000	
Material purchases required	170,000	55,000	48,000	
Standard price per kg	£2	£5	£6	
Material purchases value	£340,000	£275,000	£288,000	£903,000

Note 1: Material X for product Aye:
2,500 units produced × 24 kg = 60,000 kg
The other material requirements are calculated in the same way.

(c) *Direct labour budget for next year*

	Unskilled labour hours	*Skilled labour hours*	*Total*
Requirements for production:			
Product Aye[1]	25,000	15,000	
Product Bee	17,500	17,500	
Total hours required	42,500	32,500	
Standard rate per hour	£3	£5	
Direct labour cost	£127,500	£162,500	£290,000

Note 1: Unskilled labour for product Aye:
2,500 units produced $\times$ 10 hours = 25,000 hours
The other labour requirements are calculated in the same way.

10.4.1 Budget interrelationships

This example has demonstrated how the data from one functional budget becomes an input in the preparation of another budget. The last budget in the sequence, the direct labour budget, would now be used as an input to other budgets. The material purchases budget will also provide input data for other budgets.

For example, the material purchases budget would probably be used in preparing the payables (creditors) budget, taking account of the company's intended policy on the payment of suppliers. The creditors budget would indicate the payments to be made to creditors, which would then become an input for the cash budget, and so on.

The cash budget is the subject of the next section of this chapter.

10.5 The cash budget

The cash budget is one of the most vital planning documents in an organisation. It will show the cash effect of all of the decisions taken in the planning process.

Management decisions will have been taken concerning such factors as stockholding policy, credit policy, selling price policy and so on. All of these plans will be designed to meet the objectives of the organisation. However, if there are insufficient cash resources to finance the plans they may need to be modified or perhaps action might be taken to alleviate the cash restraint.

A cash budget can give forewarning of potential problems that could arise so that managers can be prepared for the situation or take action to avoid it.

The use of forecasts to modify actions so that potential threats are avoided or opportunities exploited is known as feedforward control.

There are four possible cash positions that could arise:

Cash position	Possible management action
• *Short-term deficit*	Arrange a bank overdraft, reduce receivables (debtors) and inventories (stocks), increase payables (creditors)
• *Long-term deficit*	Raise long-term finance, such as loan capital or share capital
• *Short-term surplus*	Invest short term, increase debtors and stocks to boost sales, pay creditors early to obtain cash discount
• *Long-term surplus*	Expand or diversify operations, replace or update non-current (fixed) assets

A detailed understanding of cash management is outside the scope of the *Management Accounting Fundamentals* syllabus. However, you should notice that the type of action taken by management will depend not only on whether a deficit or a surplus is expected, but also on how long the situation is expected to last.

For example, management would not wish to use surplus cash to purchase non-current (fixed) assets, if the surplus was only short term and the cash would soon be required again for day-to-day operations.

Cash budgets therefore forewarn managers of whether there will be cash surpluses or cash deficits, and how long the surpluses or deficits are expected to last.

10.5.1 Preparing cash budgets

Before we work through a full example of the preparation of a cash budget, it will be useful to discuss a few basic principles.

(a) The format for cash budgets

There is no definitive format which should be used for a cash budget. However, whichever format you decide to use it should include the following:

(i) *A clear distinction between the cash receipts and cash payments for each control period.* Your budget should not consist of a jumble of cash flows. It should be logically arranged with a subtotal for receipts and a subtotal for payments.

(ii) *A figure for the net cash flow for each period.* It could be argued that this is not an essential feature of a cash budget. However, you will find it easier to prepare and use a cash budget if you include the net cash flow. Also, managers find in practice that a figure for the net cash flow helps to draw attention to the cash flow implications of their actions during the period.

(iii) *The closing cash balance for each control period.* The closing balance for each period will be the opening balance for the following period.

(b) Depreciation is not included in cash budgets

Remember that depreciation is not a cash flow. It may be included in your data for overheads and must therefore be excluded before the overheads are inserted into the cash budget.

(c) Allowance must be made for bad and doubtful debts

Bad debts will never be received in cash and doubtful debts may not be received. When you are forecasting the cash receipts from customers you must remember to adjust for these items, if necessary.

Example: cash budget

Watson Ltd is preparing its budgets for the next quarter. The following information has been drawn from the budgets prepared in the planning exercise so far:

Sales value	June (estimate)	£12,500
	July (budget)	£13,600
	August	£17,000
	September	£16,800
Direct wages	£1,300 per month	
Direct material purchases	June (estimate)	£3,450
	July (budget)	£3,780
	August	£2,890
	September	£3,150

Other information

- Watson sells 10 per cent of its goods for cash. The remainder of customers receive one month's credit.
- Payments to creditors are made in the month following purchase.
- Wages are paid as they are incurred.
- Watson takes one month's credit on all overheads.
- Production overheads are £3,200 per month.
- Selling, distribution and administration overheads amount to £1,890 per month.
- Included in the amounts for overhead given above are depreciation charges of £300 and £190, respectively.
- Watson expects to purchase a delivery vehicle in August for a cash payment of £9,870.
- The cash balance at the end of June is forecast to be £1,235.

You are required to prepare a cash budget for each of the months July to September.

Solution

Watson Ltd cash budget for July to September

	July	*August*	*September*
	£	£	£
Sales receipts:			
10% in cash	1,360	1,700	1,680
90% in one month	11,250	12,240	15,300
Total receipts	12,610	13,940	16,980
Payments			
Material purchases (one month credit)	3,450	3,780	2,890
Direct wages	1,300	1,300	1,300
Production overheads[1]	2,900	2,900	2,900
Selling, distribution and administration overhead[1]	1,700	1,700	1,700
Delivery vehicle	–	9,870	–
Total payments	9,350	19,550	8,790
Net cash inflow/(outflow)	3,260	(5,610)	8,190
Opening cash balance	1,235	4,495	(1,115)
Closing cash balance at the end of the month	4,495	(1,115)	7,075

Note 1: Depreciation has been excluded from the overhead payment figures because it is not a cash item.

10.5.2 Interpretation of the cash budget

This cash budget forewarns the management of Watson Limited that their plans will lead to a cash deficit of £1,115 at the end of August. They can also see that it will be a short-term deficit and can take appropriate action.

They may decide to delay the purchase of the delivery vehicle or perhaps negotiate a period of credit before the payment will be due. Alternatively overdraft facilities may be arranged for the appropriate period.

If it is decided that overdraft facilities are to be arranged, it is important that due account is taken of the timing of the receipts and payments within each month.

For example, all of the payments in August may be made at the beginning of the month but receipts may not be expected until nearer the end of the month. The cash deficit could then be considerably greater than it appears from looking only at the month-end balance.

If the worst possible situation arose, the overdrawn balance during August could become as large as £4,495 – £19,550 = £15,055. If management had used the month-end balances as a guide to the overdraft requirement during the period then they would not have arranged a large enough overdraft facility with the bank. It is important therefore that they look in detail at the information revealed by the cash budget, and not simply at the closing cash balances.

Exercise 10.1

Practise what you have just learned about cash budgets by attempting this exercise before you look at the solution.

The following information relates to XY Ltd:

Month	*Wages incurred* *£000*	*Materials purchases* *£000*	*Overhead* *£000*	*Sales* *£000*
February	6	20	10	30
March	8	30	12	40
April	10	25	16	60
May	9	35	14	50
June	12	30	18	70
July	10	25	16	60
August	9	25	14	50
September	9	30	14	50

(a) It is expected that the cash balance on 31 May will be £22,000.
(b) The wages may be assumed to be paid within the month they are incurred.
(c) It is company policy to pay suppliers for materials three months after receipt.
(d) Credit customers are expected to pay two months after delivery.
(e) Included in the overhead figure is £2,000 per month which represents depreciation on two cars and one delivery van.
(f) There is a 1-month delay in paying the overhead expenses.
(g) Ten per cent of the monthly sales are for cash and 90 per cent are sold on credit.

(h) A commission of 5 per cent is paid to agents on all the sales on credit but this is not paid until the month following the sales to which it relates; this expense is not included in the overhead figures shown.
(i) It is intended to repay a loan of £25,000 on 30 June.
(j) Delivery is expected in July of a new machine costing £45,000 of which £15,000 will be paid on delivery and £15,000 in each of the following 2 months.
(k) Assume that overdraft facilities are available if required.

You are required to prepare a cash budget for each of June, July and August.

Solution

Cash budget for June, July and August

	June	*July*	*August*
	£	£	£
Receipts			
Receipts from credit sales[1]	54,000	45,000	63,000
Cash sales[2]	7,000	6,000	5,000
	61,000	51,000	68,000
Payments			
Wages	12,000	10,000	9,000
Materials[3]	30,000	25,000	35,000
Overhead[4]	12,000	16,000	14,000
Commission[5]	2,250	3,150	2,700
Loan repayment	25,000		
Payments for new machine		15,000	15,000
	81,250	69,150	75,700
Net cash inflow/(outflow)	(20,250)	(18,150)	(7,700)
Opening balance	22,000	1,750	(16,400)
Closing balance	1,750	(16,400)	(24,100)

Explanatory notes

1. The cash received from credit sales is 90 per cent of the sales made two months before, that is, for June, 90 per cent of April sales = 90 per cent × £60,000.
2. Cash sales are 10 per cent of the sales made in the month.
3. March purchases are paid for three months later in June, and so on.
4. May overheads, less depreciation = £14,000 – £2,000 = £12,000. These are paid in cash in June, and so on.
5.

	May	*June*	*July*
Credit sales (90%)	£45,000	£63,000	£54,000
5% commission	£2,250	£3,150	£2,700

These amounts for commission are paid one month later, that is, in June, July and August.

10.6 A complete exercise

Now that you have seen how to prepare functional budgets and cash budgets, have a go at the following exercise. It requires you to work from basic data to produce a number of functional budgets, as well as the master budget, that is, budgeted cash flow, income statement (profit and loss account) and balance sheet.

Exercise 10.2

C Ltd make two products, Alpha and Beta. The following data is relevant for year 3:

Material prices:	Material M	£2 per unit
	Material N	£3 per unit

Direct labour is paid £5 per hour.

Production overhead cost is estimated to be £200,000, which includes £25,000 for depreciation of property and equipment. Production overhead cost is absorbed into product costs using a direct labour hour absorption rate.

Each unit of finished product requires:

	Alpha	*Beta*
Material M	12 units	12 units
Material N	6 units	8 units
Direct labour	7 hours	10 hours

The sales director has forecast that sales of Alpha and Beta will be 5,000 and 1,000 units, respectively, during year 3. The selling prices will be:

Alpha	£130 per unit
Beta	£115 per unit

She estimates that the inventory (stock) at 1 January, year 3, will be 100 units of Alpha and 200 units of Beta. At the end of year 3 she requires the stock level to be 150 units of each product.

The production director estimates that the raw material stocks on 1 January, year 3, will be 3,000 units of material M and 4,000 units of material N. At the end of year 3 the stocks of these raw materials are to be:

M:	4,000 units
N:	2,000 units

The finance director advises that the rate of tax to be paid on profits during year 3 is likely to be 30 per cent. Selling and administration overhead is budgeted to be £75,000 in year 3, which includes £5,000 for depreciation of equipment.

A quarterly cash-flow forecast has already been completed and is set out below:

Quarter, year 3	*1* £	*2* £	*3* £	*4* £
Receipts	140,000	160,000	170,000	240,000
Payments:				
Materials	22,000	37,000	40,000	60,000
Direct wages	50,000	55,250	60,500	58,500
Overhead	45,000	50,000	70,000	65,000
Taxation	5,000			
Machinery purchase			20,000	

The company's balance sheet at 1 January, year 3, is expected to be as follows:

	£ *Cost*	£ *Depreciation*	£ *Net*
Fixed assets			
Land	50,000	–	50,000
Buildings and equipment	400,000	75,000	325,000
	450,000	75,000	375,000
Current assets			
Stocks			
– raw materials	20,000		
– finished goods	15,000		
		35,000	
Debtors		25,000	
Cash at bank		10,000	
		70,000	
Current liabilities			
Creditors	9,000		
Taxation	5,000		
		14,000	
			56,000
			431,000
Financed by			
Ordinary shares			350,000
Retained profits			81,000
			431,000

You are required to prepare the company's budgets for year 3 including a budgeted profit and loss account for the year and a balance sheet at 31 December, year 3.

☑ Solution

Note the order in which the budgets are prepared. The sales budget determines production requirements, which in turn determines materials usage, which in turn determines materials purchases and then payments to suppliers. Since the sales budget is prepared first, sales are termed the principal budget (key budget) factor.

Sales budget for the year ended 31 December, year 3

	Alpha	*Beta*	*Total*
Sales volume	5,000	1,000	
Selling price	£130	£115	
Sales revenue	£650,000	£115,000	£765,000

Production budget for the year ended 31 December, year 3

	Alpha *units*	*Beta* *units*
Required by sales	5,000	1,000
Required closing stock	150	150
	5,150	1,150
Less expected opening stock	100	200
Production required	5,050	950

Raw materials usage budget for the year ended 31 December, year 3

	Material M *units*	*Material N* *units*
Required by production of Alpha[1]	60,600	30,300
Required by production of Beta	11,400	7,600
Total raw material usage	72,000	37,900

Note 1: The material usage for Alpha is determined as follows:

	Units
Material M: 5,050 × 12	60,600
Material N: 5,050 × 6	30,300

The material requirements for Beta are calculated in the same way.

Raw materials purchases budget for the year ended 31 December, year 3

	Material M *units*	*Material N* *units*	*Total*
Raw materials required by production	72,000	37,900	
Required closing stock	4,000	2,000	
	76,000	39,900	
Less expected opening stock	3,000	4,000	
Quantity to be purchased	73,000	35,900	
Price per unit	£2	£3	
Value of purchases	£146,000	£107,700	£253,700

Direct labour budget for the year ended 31 December, year 3

	Labour hours	*Rate per hour*	*Labour cost*
		£	£
Product Alpha – 5,050 units	35,350	5	176,750
Product Beta – 950 units	9,500	5	47,500
	44,850		224,250

Production cost budget: preliminary workings

$$\text{Production overhead absorption rate} = \frac{£200{,}000}{44{,}850} = £4.459 \text{ per labour hour}$$

Overhead absorbed by Alpha = 35,350 hours × £4.459 = £157,626
Overhead absorbed by Beta = 9,500 hours × £4.459 = £42,361

Production cost budget for the year ended 31 December, year 3

	Alpha	*Beta*
	£	£
Direct materials		
– M[2]	121,200	22,800
– N	90,900	22,800
Direct wages	176,750	47,500
Production overhead	157,626	42,361
	546,476	135,461
Cost per unit (used for closing stock valuation)	£108.21	£142.59

Note 2: The direct material cost for Alpha is determined as follows:

Material	*Usage (units)*	£
M	60,600 @ £2	121,200
N	30,300 @ £3	90,900

The material cost for Beta is calculated in the same way.

Cash budget for the year ended 31 December, year 3

Quarter	*1*	*2*	*3*	*4*
	£	£	£	£
Receipts	140,000	160,000	170,000	240,000
Payments:				
Materials	22,000	37,000	40,000	60,000
Direct wages	50,000	55,250	60,500	58,500
Overhead	45,000	50,000	70,000	65,000
Taxation	5,000			
Machinery purchase			20,000	
Total payments	122,000	142,250	190,500	183,500
Net cash inflow/(outflow)	18,000	17,750	(20,500)	56,500
Balance b/fwd[3]	10,000	28,000	45,750	25,250
Balance c/fwd	28,000	45,750	25,250	81,750

Note 3: The balance b/fwd in quarter 1 is the cash at bank on the forecast balance sheet for 1 January, year 3.

Budgeted profit and loss account for the year ended 31 December, year 3

	£	£
Sales		765,000
Opening stock of raw materials[4]	20,000	
Purchases of raw materials	253,700	
	273,700	
Closing stock of raw materials[5]	14,000	
	259,700	
Direct wages	224,250	
Production overhead	200,000	
Production cost of goods completed	683,950	
Opening stock of finished goods[4]	15,000	
	698,950	
Closing stock of finished goods[5]	37,620	
Production cost of goods sold		661,330
Gross profit		103,670
Selling and administration overhead		75,000
Net profit before taxation		28,670
Taxation		8,601
		20,069
Retained profit b/f		81,000
Retained profit c/f		101,069

Note 4: The opening stock figures for raw materials and finished goods are taken from the opening balance sheet.
Note 5: The closing stocks are calculated as follows:

	£
Raw materials:	
M: 4,000 × £2	8,000
N: 2,000 × £3	6,000
	14,000
Finished goods:	
Alpha: 150 × £108.21	16,231.50
Beta: 150 × £142.59	21,388.50
	37,620.00

Budgeted balance sheet at 31 December, year 3

	Cost £	*Depreciation* £	*Net* £
Fixed assets			
Land	50,000	–	50,000
Buildings and equipment[6]	420,000	105,000	315,000
	470,000	105,000	365,000
Current assets			
Stocks			
– raw materials	14,000		
– finished goods	37,620		
		51,620	
Debtors[7]		80,000	
Cash at bank		81,750	
		213,370	
Current liabilities			
Creditors[8]	118,700		
Taxation	8,601		
		127,301	
			86,069
			451,069
Financed by			
Ordinary shares			350,000
Retained profits			101,069
			451,069

	£000
Note 6: Property and equipment	
Opening cost balance	400
Purchases during year	20
	420
Opening depreciation balance	75
Production depreciation	25
Selling depreciation	5
	105
Note 7: Debtors	
Opening balance	25
Sales	765
Receipts (cash budget)	(710)
	80

	£	£
Note 8: Closing creditor balance		
Opening balance of creditors		9,000
Material purchases from budget		253,700
Overhead, excluding depreciation:*		
Production		175,000
Selling and administration		70,000
		507,700
Less payments (from cash budget):		
Materials	159,000	
Overhead	230,000	
		389,000
Closing balance of creditors		118,700

* The depreciation must be excluded from the overhead because it is not a cash item, i.e. it is not a payment which must be made to suppliers.

10.7 Rolling budgets

The CIMA *Terminology* defines a rolling budget as 'a budget continuously updated by adding a further accounting period (month or quarter) when the earliest accounting period has expired. Its use is particularly beneficial where future costs and/or activities cannot be forecast accurately'.

For example, a budget may initially be prepared for January to December, year 1. At the end of the first quarter, that is, at the end of March, year 1, the first quarter's budget is deleted. A further quarter is then added to the end of the remaining budget, for January to March, year 2. The remaining portion of the original budget is updated in the light of current conditions. This means that managers have a full year's budget always available and the rolling process forces them to continually plan ahead.

A system of rolling budgets is also known as *continuous budgeting*. Rolling budgets can be particularly useful when future events cannot be forecast reliably.

It is not necessary for all of the budgets in a system to be prepared on a rolling basis. For example, many organisations will use a rolling system for the cash budget only.

In practice, most organisations carry out some form of updating process on all their budgets, so that the budgets represent a realistic target for planning and control purposes. The formalised budgetary planning process will still be performed on a regular basis to ensure a coordinated approach to budgetary planning.

10.8 Budgets for non-operating functions

So far in this chapter we have been concentrating mainly on budgets for operating functions. You have seen that once the principal budget factor has been identified and budgeted, most of the operating budgets can be linked to and coordinated with this one. The level of expenditure is thus directly linked to the level of activity.

Budgets for non-operating functions such as computer services and research and development are only indirectly linked to activity levels. Determining the level of expenditure to be included in these non-operating budgets is not quite so straightforward.

10.8.1 Incremental budgeting

Many non-operating budgets are set using an incremental approach. This means that the budget for each period is based on the budget for the previous period, adjusting the previous period's budget to take account of any expected changes.

This approach is unlikely to result in the optimum allocation of resources. It tends to perpetuate inefficient and unnecessary practices, and may result in *budget slack*, which is unnecessary expenditure built into the budget.

10.8.2 Zero-based budgeting

Zero-based budgeting (ZBB) was developed as an alternative to the incremental approach.

The CIMA *Terminology* defines ZBB as 'a method of budgeting which requires each cost element to be specifically justified, as though the activities to which the budget relates were being undertaken for the first time. Without approval, the budget allowance is zero'.

Zero-based budgeting is so called because it requires each budget to be prepared and justified from zero, instead of simply using last year's budget as a base. Incremental levels of expenditure on each activity are evaluated according to the resulting incremental benefits. Available resources are then allocated where they can be used most effectively.

The major advantage of ZBB exercises is that managers are forced to consider alternative ways of achieving the objectives for their activity and they are required to justify the activities which they currently undertake. This helps to eliminate or reduce the incidence of *budget slack*, which is the intentional overestimation of expenses and/or underestimation of revenues in the budgeting process.

A detailed discussion of ZBB is outside the scope of your *Management Accounting Fundamentals* syllabus, but you should be aware that there are a number of different approaches to budgetary planning.

10.9 Budgetary control information

You have now learned about the basic principles underlying the budgetary planning process. You have seen how budgets are created to guide and coordinate the activities of individuals within the organisation, to ensure that the organisation starts out in the right direction.

In the remainder of this chapter you will see how budgets are used for control purposes to ensure that the organisation continues in the right direction.

Budgetary control is achieved by comparing the actual results with the budget. The differences are calculated as variances and management action may be taken to investigate and correct the variances if necessary or appropriate.

- If costs are higher or revenues are lower than the budget, then the difference is an adverse variance.
- If costs are lower or revenues are higher than the budget, then the difference is a favourable variance.

10.9.1 Budget centres

The CIMA *Terminology* defines a budget centre as 'a section of an entity for which control may be exercised and budgets prepared'. Each budget centre will have its own budget and a manager will be responsible for managing the centre and controlling the budget. This manager is often referred to as the budget holder. Regular budgetary control reports will be sent to each budget holder so that they may monitor their centre's activities and take control action if necessary.

10.9.2 Budgetary control reports

If managers are to use the budgets to control effectively, they must receive regular control information.

The budgetary control reports should be:

(a) *Timely*. The information should be made available as soon as possible after the end of the control period. Corrective action will be much more effective if it is taken soon after the event, and adverse trends could continue unchecked if budgetary reporting systems are slow.

(b) *Accurate*. Inaccurate control information could lead to inappropriate management action. There is often a conflict between the need for timeliness and the need for accuracy. More accurate information might take longer to produce. The design of budgetary reporting systems should allow for sufficient accuracy for the purpose to be fulfilled.

(c) *Relevant to the recipient*. Busy managers should not be swamped with information that is not relevant to them. They should not need to search through a lot of irrelevant information to reach the part which relates to their area of responsibility. The natural reaction of managers in this situation could be to ignore the information altogether.

The budgetary reporting system should ideally be based on the *exception principle* which means that management attention is focused on those areas where performance is significantly different from budget. Subsidiary information could be provided on those items which are in line with the budget.

Many control reports also segregate controllable and non-controllable costs and revenues, that is, the costs and revenues over which managers can exercise control are highlighted separately in the reports.

A number of accounting packages have the facility to record actual and budget details against each account code for each budget centre. These may then be printed in the form of a report.

(d) *Communicated to the correct manager*. Control information should be directed to the manager who has the responsibility and authority to act upon it. If the information is communicated to the wrong manager its value will be immediately lost and any adverse trends may continue uncorrected. Individual budget holders' responsibilities must be clearly defined and kept up to date in respect of any changes.

10.10 Fixed and flexible budgets

When managers are comparing the actual results with the budget for a period, it is important to ensure that they are making a valid comparison. The use of flexible budgets can help to ensure that actual results are monitored against realistic targets.

10.10.1 Flexible budgets: an example

An example will demonstrate how flexible budgets may be used.

A company manufactures a single product and the following data show the actual results for costs for the month of April compared with the budgeted figures.

Operating statement for April

	Actual	*Budget*	*Variance*
Units produced	1,000	1,200	(200)
	£	£	£
Direct material	16,490	19,200	2,710
Direct labour	12,380	13,200	820
Production overhead	24,120	24,000	(120)
Administration overhead	21,600	21,000	(600)
Selling and distribution o/head	16,200	16,400	200
Total cost	90,790	93,800	3,010

Note: Variances in brackets are *adverse.*

Looking at the costs incurred in April, a cost saving of £3,010 has been made compared with the budget. However, the number of units produced and sold was 200 less than budget so some savings in expenditure might be expected. It is not possible to tell from this comparison how much of the saving is due to efficient cost control, and how much is the result of the reduction in activity.

The type of budget being used here is a fixed budget. A fixed budget is one which remains unchanged regardless of the actual level of activity. In situations where activity levels are likely to change, and there is a significant proportion of variable costs, it is difficult to control expenditure satisfactorily with a fixed budget.

If costs are mostly fixed, then changes in activity levels will not cause problems for cost comparisons with fixed budgets.

A flexible budget can help managers to make more valid comparisons. It is designed to show the allowed expenditure for the actual number of units produced and sold. Comparing this flexible budget with the actual expenditure it is possible to distinguish genuine efficiencies.

10.10.2 Preparing a flexible budget

Before a flexible budget can be prepared managers must identify which costs are fixed and which are variable. The allowed expenditure on variable costs can then be increased or decreased as the level of activity changes. You will recall that fixed costs are those costs which will not increase or decrease over the relevant range of activity. The allowance for these items will therefore remain constant.

We can now continue with the example.

Management has identified that the following budgeted costs are fixed:

	£
Direct labour	8,400
Production overhead	18,000
Administration overhead	21,000
Selling and distribution overhead	14,000

It is now possible to identify the expected variable cost per unit produced.

	Original budget (a)	*Fixed cost (b)*	*Variable cost (c) = (a) − (b)*	*V'ble cost per unit = (c)/1,200*
Units produced	1,200			
	£	£	£	£
Direct material	19,200	–	19,200	16
Direct labour	13,200	8,400	4,800	4
Production overhead	24,000	18,000	6,000	5
Administration overhead	21,000	21,000	–	–
Selling and distribution o/head	16,400	14,000	2,400	2
	93,800	61,400	32,400	27

Now that managers are aware of the fixed costs and the variable costs per unit it is possible to 'flex' the original budget to produce a budget cost allowance for 1,000 units produced.

The budget cost allowance for each item is calculated as follows:

$$\text{Cost allowance} = \text{Budgeted fixed cost} + (\text{number of units produced} \times \text{variable cost per unit})$$

For the costs that are wholly fixed or wholly variable, the calculation of the budget cost allowance is fairly straightforward. The remaining costs are semi-variable, which you will recall means that they are partly fixed and partly variable. For example, the budget cost allowance for direct labour is calculated as follows:

$$\text{Cost allowance for direct labour} = £8{,}400 + (1{,}000 \times £4) = £12{,}400$$

A full flexible budget can now be produced.

Flexible budget comparison for April

	Cost allowances				
	Fixed	*Variable*	*Total*	*Actual cost*	*Variance*
	£	£	£	£	£
Direct material	–	16,000	16,000	16,490	(490)
Direct labour	8,400	4,000	12,400	12,380	20
Production overhead	18,000	5,000	23,000	24,120	(1,120)
Administration overhead	21,000	–	21,000	21,600	(600)
Selling and distn. o/h	14,000	2,000	16,000	16,200	(200)
Total cost	61,400	27,000	88,400	90,790	(2,390)

Note: Variances in brackets are adverse.

This revised analysis shows that in fact the cost was £2,390 higher than would have been expected from a production volume of 1,000 units.

The cost variances in the flexible budget comparison are almost all adverse. These overspendings were not revealed when a fixed budget was used and managers may have been under the false impression that costs were being adequately controlled.

10.10.3 The total budget variance

If we now produce a statement showing the fixed budget, the flexible budget and the actual results together, it is possible to analyse the total variance between the original budget and the actual results.

	Fixed budget	*Flexible budget*	*Actual results*	*Expenditure variances*
	£	£	£	£
Direct material	19,200	16,000	16,490	(490)
Direct labour	13,200	12,400	12,380	20
Production overhead	24,000	23,000	24,120	(1,120)
Administrative overhead	21,000	21,000	21,600	(600)
Selling and distribution overhead	16,400	16,000	16,200	(200)
	93,800	88,400	90,790	(2,390)

5,400 Volume variance

(2,390) Expenditure variance

3,010 Total variance

The total variance is therefore made up of two parts:

- the volume variance of £5,400 favourable, which is the expected cost saving resulting from producing 200 units less than budgeted;
- the expenditure variance of £2,390 adverse, which is the net total of the over- and under-expenditure on each of the costs for the actual output of 1,000 units.

! Notice that the volume variance is the saving in standard variable cost: 200 units × £27 per unit = £5,400.

In the next chapter you will learn how some of the expenditure variances can be analysed between their price and usage elements – for example, how much of the variance is caused by paying the wrong price per hour of labour, or per kilogram of material, and how much is caused by using the wrong quantity of material or labour.

10.10.4 Using flexible budgets for planning

You should appreciate that while flexible budgets can be useful for control purposes they are not particularly useful for planning. The original budget must contain a single target level of activity so that managers can plan such factors as the resource requirements and the product pricing policy. This would not be possible if they were faced with a range of possible activity levels – although managers will of course consider a range of possible activity levels *before* they select the target budgeted activity level.

The budget can be designed so that the fixed costs are distinguished from the variable costs. This will facilitate the preparation of a budget cost allowance for control purposes at the end of each period, when the actual activity is known.

10.10.5 Flexible budgets: another example

Now that you have got the idea of how a flexible budget can be prepared, work through the following example to consolidate your understanding.

In this example, as in practice, you will need to investigate the cost behaviour patterns to determine which costs are fixed, which are variable and which are semi-variable.

The first step in investigating cost behaviour patterns is to look at the cost data. You should be able to easily spot any fixed costs because they remain constant when activity levels change.

The easiest way to identify the behaviour patterns of non-fixed costs is to divide each cost figure by the related activity level. If the cost is a linear variable cost, then the cost per unit will remain constant. For a semi-variable cost the unit rate will reduce as the activity level increases, because the same basic amount of fixed costs is being spread over a greater number of units.

You will then need to recall how to use the high–low method to determine the fixed and variable elements of any semi-variable costs. Look back to Chapter 1 if you have forgotten how the high–low method works.

Example

Lawrence Ltd operates a system of flexible budgets and the flexed budgets for expenditure for the first two quarters of year 3 were as follows:

Flexed budgets – quarters 1 and 2

	Quarter 1	*Quarter 2*
Activity		
Sales units	9,000	14,000
Production units	10,000	13,000
Budget cost allowances	£	£
Direct materials	130,000	169,000
Production labour	74,000	81,500
Production overhead	88,000	109,000
Administration overhead	26,000	26,000
Selling and distribution overhead	29,700	36,200
Total budget cost allowance	347,700	421,700

Despite a projected increase in activity, the cost structures in quarters 1 and 2 are expected to continue during quarter 3 as follows:

(a) The variable cost elements behave in a linear fashion in direct proportion to volume. However, for production output in excess of 14,000 units the unit variable cost for production labour increases by 50 per cent. This is due to a requirement for overtime working and the extra amount is payable only on the production above 14,000 units.
(b) The fixed cost elements are not affected by changes in activity levels.
(c) The variable elements of production costs are directly related to production volume.
(d) The variable element of selling and distribution overhead is directly related to sales volume.

You are required to prepare a statement of the budget cost allowances for quarter 3, when sales were 14,500 units and production was 15,000 units.

Solution

If you divide each cost figure by the relevant activity figure, you will find that the only wholly variable cost is direct material, at £13 per unit.

You can also see that the only wholly fixed cost is administration overhead since this is a constant amount for both activity levels, £26,000.

For the remaining costs you will need to use the high–low method to determine the fixed and variable elements.

Production labour

	Production, units	£
Quarter 2	13,000	81,500
Quarter 1	10,000	74,000
Change	3,000	7,500

$$\text{Variable cost per unit} = \frac{£7{,}500}{3{,}000} = £2.50 \text{ per unit}$$

$$\text{Fixed cost} = £81{,}500 - (£2.50 \times 13{,}000) = £49{,}000$$

Production overhead

	Production, units	£
Quarter 2	13,000	109,000
Quarter 1	10,000	88,000
Change	3,000	21,000

$$\text{Variable cost per unit} = \frac{£21{,}000}{3{,}000} = £7 \text{ per unit}$$

$$\text{Fixed cost} = £109{,}000 - (£7 \times 13{,}000) = £18{,}000$$

Selling and distribution overhead

Note that the example data says that selling and distribution overhead is related to sales volume.

	Sales, units	£
Quarter 2	14,000	36,200
Quarter 1	9,000	29,700
	5,000	6,500

$$\text{Variable cost per unit sold} = \frac{£6{,}500}{5{,}000} = £1.30 \text{ per unit}$$

$$\text{Fixed cost} = £36{,}200 - (£1.30 \times 14{,}000) = £18{,}000.$$

We can now prepare a statement of the budget cost allowances for quarter 3.

	Quarter 3 Budget cost allowance £	£
Direct material (15,000 units × £13)		195,000
Production labour:[1]		
Fixed	49,000	
Variable up to 14,000 units (14,000 × £2.50)	35,000	
Variable above 14,000 units (1,000 × £3.75)	3,750	
		87,750
Production overhead:		
Fixed	18,000	
Variable (15,000 × £7)	105,000	
		123,000
Administration overhead: fixed		26,000
Selling and distribution overhead:		
Fixed	18,000	
Variable (14,500 × £1.30)[2]	18,850	
		36,850
Total budget cost allowance		468,600

Note 1: The unit variable cost for production labour increases by 50 per cent for production over 14,000 units.

Note 2: The flexible budget allowance for selling and distribution overhead must be based on the sales volume of 14,500 units.

10.10.6 Extrapolating outside the relevant range

In the preceding example you were told that the cost structures would remain unaltered despite the increase in activity. In practice, if you need to do a similar extrapolation outside the range for which you have available data, you should always state the assumption that the observed behaviour patterns will still be applicable.

10.11 Summary

Having read this chapter the main points that you should understand are as follows.

1. A budget is a quantified plan of action relating to a given period of time. An organisation's annual budget is set within the framework of the long-term strategic plans.
2. The budget committee coordinates the preparation of budgets and issues the budget manual which provides information to those involved in the planning and control process.
3. The principal (key) budget factor is the factor which limits the activities of the organisation. The budget for the principal factor should be prepared first.
4. The master budget is the summary of all the functional budgets, usually including a budgeted income statement (profit and loss account), balance sheet and cash flow statement.
5. Cash budgets allow for feedforward control to forewarn managers of the cash effect of all their planning decisions.
6. Rolling or continuous budgets are continuously updated by adding a further period when the earliest period has expired.
7. Incremental budgeting involves using the prior period's budget as a basis for the next year's budget. Zero-based budgeting begins each year's budget from scratch.
8. A fixed budget is prepared for a single activity level. A flexible budget is more useful for control because it recognises cost behaviour patterns and the budget cost allowance for each cost is designed to change as the volume of activity changes.

Revision Questions 10

Question 1 Multiple choice

1.1 When preparing a production budget, the quantity to be produced equals:

(A) sales quantity + opening stock + closing stock.
(B) sales quantity – opening stock + closing stock.
(C) sales quantity – opening stock – closing stock.
(D) sales quantity + opening stock – closing stock.

1.2 A job requires 2,400 actual labour hours for completion and it is anticipated that there will be 20 per cent idle time. If the wage rate is £10 per hour, what is the budgeted labour cost for the job?

(A) £19,200
(B) £24,000
(C) £28,800
(D) £30,000.

1.3 The term 'budget slack' refers to:

(A) the extended lead time between the preparation of the functional budgets and the master budget.
(B) the difference between the budgeted output and the breakeven output.
(C) the additional capacity available which can be budgeted for.
(D) the deliberate overestimation of costs and underestimation of revenues in a budget.

1.4 Of the four costs shown below, which would not be included in the cash budget of an insurance firm?

(A) depreciation of fixed assets
(B) commission paid to agents
(C) office salaries
(D) capital cost of a new computer.

1.5 The following details have been extracted from the debtor collection records of C Limited:

Invoice paid in the month after sale	60%
Invoice paid in the second month after sale	25%
Invoice paid in the third month after sale	12%
Bad debts	3%

Invoices are issued on the last day of each month.

Customers paying in the month after sale are entitled to deduct a 2 per cent settlement discount.

Credit sales values for June to September are budgeted as follows:

June	*July*	*August*	*September*
£35,000	£40,000	£60,000	£45,000

The amount budgeted to be received from credit sales in September is

(A) £47,280
(B) £47,680
(C) £48,850
(D) £49,480.

1.6 A flexible budget is:

(A) a budget which, by recognising different cost behaviour patterns, is designed to change as the volume of activity changes.
(B) a budget for a defined period of time which includes planned revenues, expenses, assets, liabilities and cash flow.
(C) a budget which is prepared for a period of one year which is reviewed monthly, whereby each time actual results are reported, a further forecast period is added and the intermediate period forecasts are updated.
(D) a budget of semi-variable production costs only.

1.7 The following extract is taken from the production cost budget of S Limited:

Production (units)	2,000	3,000
Production cost (£)	11,100	12,900

The budget cost allowance for an activity level of 4,000 units is

(A) £7,200
(B) £14,700
(C) £17,200
(D) £22,200.

1.8 A master budget comprises:

(A) the budgeted profit and loss account.
(B) the budgeted cash flow, budgeted profit and loss account and budgeted balance sheet.
(C) the budgeted cash flow.
(D) the entire set of budgets prepared.

? **Question 2** Short objective-test questions

2.1 *Tick the correct box.*

A participative budgeting system may also be described as a:

bottom-up budget ☐
top-down budget ☐

2.2 Which of the following items of information would be contained in the budget manual? (Tick *all* that are correct.)

(a) An organisation chart. ☐
(b) The timetable for budget preparation. ☐
(c) The master budget. ☐
(d) A list of account codes. ☐
(e) Sample forms to be completed during the budgetary process. ☐

2.3 Is the following statement *true* or *false?*
The principal budget factor is always the forecast sales volume.

True ☐
False ☐

2.4 Assuming that sales volume is the principal budget factor, place the following budgets in the order that they would be prepared in the budgetary planning process. Indicate the correct order by writing 1, 2, 3, etc. in the boxes provided.

☐ Sales budget
☐ Materials purchases budget
☐ Materials stock budget
☐ Production budget
☐ Finished goods stock budget
☐ Materials usage budget.

2.5 PR Ltd's cash budget forewarns of a short-term surplus. Which of the following would be appropriate actions to take in this situation? (Select **all** that are correct).

(a) Increase debtors and stock to boost sales. ☐
(b) Purchase new fixed assets. ☐
(c) Repay long-term loans. ☐
(d) Pay creditors early to obtain a cash discount. ☐

2.6 Each finished unit of product H contains 3 litres of liquid L. Ten per cent of the input of liquid L is lost through evaporation in the production process. Budgeted output of product H for June is 3,000 units. Budgeted stocks of liquid L are:

- Opening stock, 1 June 1,200 litres
- Closing stock, 30 June 900 litres

The required purchases of liquid L for June are ☐ litres.

2.7 *Tick the correct box.*
A system of budgeting whereby the budget is continuously updated by adding a further accounting period when the earliest accounting period has expired, is known as a system of:

rolling budgets ☐
incremental budgets ☐

2.8 The totals from KM Ltd's budgetary control report for February are as follows;

	Fixed budget	*Flexible budget*	*Actual results*
Total expenditure	£93,480	£98,450	£97,920

Complete the following table, ticking the box to indicate whether the variance is adverse or favourable.

	£	Adverse	Favourable
Volume variance	☐	☐	☐
Expenditure variance	☐	☐	☐
Total budget variance	☐	☐	☐

2.9 Which of the following best describes the principle of reporting by exception?

Sending budget reports only to those exceptional managers who are able to understand their content. ☐

Providing detailed reports only on those areas of the business that are performing exceptionally well and providing only subsidiary information about other areas of the business. ☐

Providing detailed reports only on those areas of the business that are not performing according to budget and providing only subsidiary information about aspects that are in line with budget. ☐

2.10 F Limited uses a flexible budgeting system to control the costs incurred in its staff canteen.

The budget cost allowance for consumable materials is flexed according to the average number of employees during the period.

Complete the following equation by inserting '+', '−' or 'x' as appropriate in the boxes:

Flexible budget cost allowance for consumable materials = budgeted fixed cost ☐ (budgeted variable cost per employee ☐ average no. of employees)

2.11 The following extract is taken from the catering costs budget of a company that provides training courses.

Number of delegates	120	170
Catering cost	£1,470	£2,020

In a flexible budget for 185 delegates, the budget cost allowance for catering costs will be £☐

Question 3 Functional budgets

An ice cream manufacturer is in the process of preparing budgets for the next few months, and the following draft figures are available:

Sales forecast	
June	6,000 cases
July	7,500 cases
August	8,500 cases
September	7,000 cases
October	6,500 cases

Each case uses 2.5 kg of ingredients and it is policy to have stocks of ingredients at the end of each month to cover 50 per cent of next month's production.

There are 750 cases of finished ice cream in stock on 1 June and it is policy to have stocks at the end of each month to cover 10 per cent of the next month's sales.

Requirements

(a) The production budget (in cases) for June and July will be:

June ☐
July ☐

(b) The ingredient purchases budget (in kg) for August will be ☐

Question 4 Cash budget

A small manufacturing firm is to commence operations on 1 July. The following estimates have been prepared:

	July	*August*	*September*
Sales (units)	10	36	60
Production (units)	40	50	50
Opening stock (units) NIL			

It is planned to have raw material stocks of £10,000 at the end of July, and to maintain stocks at that level thereafter.

Selling prices, costs and other information:

	Per unit
	£
Selling price	900
Material cost	280
Labour cost	160
Variable overheads	40

Fixed overheads are expected to be £5,000 per month, including £1,000 depreciation.

Settlement terms on sales: 10 per cent cash, the balance payable the month following sale. Labour is paid in the month incurred, and all other expenditures the following month.

Requirements

(a) The budgeted cash receipts from sales are:

July	£☐
August	£☐
September	£☐

(b) The budgeted cash payments for raw materials are:

July	£☐
August	£☐
September	£☐

(c) The total of the budgeted cash payments for labour and overhead in August is £☐.

(d) A cash budget can be used to give forewarning of potential cash problems that could arise so that managers can take action to avoid them. This is known as:

feedforward control ☐
feedback control ☐

(e) A cash budget is continuously updated to reflect recent events and changes to forecast events. This type of budget is known as a:

flexible budget ☐
rolling budget ☐

? **Question 5** Flexible budget

The Arcadian Hotel operates a budgeting system and budgets expenditure over eight budget centres as shown below. Analysis of past expenditure patterns indicates that variable costs in some budget centres vary according to occupied room nights (ORN), while in others the variable proportion of costs varies according to the number of visitors (V).

The budgeted expenditures for a period with 2,000 ORN and 4,300 V were as follows:

	Variable costs vary with:	*Budgeted expenditure*	*Partial cost anlaysis*
			Budget expenditure includes:
Budget centre		£	
Cleaning	ORN	13,250	£2.50 per ORN
Laundry	V	15,025	£1.75 per V
Reception	ORN	13,100	£12,100 fixed
Maintenance	ORN	11,100	£0.80 per ORN
Housekeeping	V	19,600	£11,000 fixed
Administration	ORN	7,700	£0.20 per ORN
Catering	V	21,460	£2.20 per V
General overheads	–	11,250	all fixed
		112,485	

In period 9, with 1,850 ORN and 4,575 V, actual expenditures were as follows:

Budget centre	*Actual expenditure*
	£
Cleaning	13,292
Laundry	14,574
Reception	13,855
Maintenance	10,462
Housekeeping	19,580
Administration	7,930
Catering	23,053
General overheads	11,325
	114,071

Requirements

(a) The total budget cost allowances for the following costs in the flexible budget for period 9 are:

	£
Cleaning	☐
Laundry	☐
Reception	☐
Maintenance	☐
Housekeeping	☐
General overheads	☐

The total budget cost allowance in the flexible budget for period 9 is £113,521.

(b) The volume variance for period 9 is £ ☐. The variance is:

adverse ☐
favourable ☐

(c) The total expenditure variance for period 9 is £ ☐. The variance is:

adverse ☐
favourable ☐

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Solutions to Revision Questions 10

Solution 1

- In question 1.2 you cannot simply add 20 per cent to the actual labour hours to allow for the idle time. The idle time is 20 per cent of the hours to be paid for, so you will need to think more carefully about how to make the adjustment.
- In question 1.5 remember that the 3 per cent bad debts will never be received in cash.

1.1 Answer: (B)

Requirements for closing stock increase the amount to be produced, so these must be added. Stock available in opening stock reduces production requirements, so this must be deducted.

1.2 Answer: (D)

Idle time is 20 per cent of the total hours to be paid for. Therefore, hours to be paid for $= 2{,}400/0.8 = 3{,}000$. Budgeted labour cost $= 3{,}000 \times £10 = £30{,}000$.

1.3 Answer: (D)

A manager might build some slack into a budget to provide some 'leeway' to disguise unnecessary spending.

1.4 Answer: (A)

Depreciation is not a cash flow.

1.5 Answer: (D)

Amount to be received in September is:

	£
60% of August sales less 2% discount:	
£60,000 × 60% × 98%	35,280
25% of July sales: £40,000 × 25%	10,000
12% of June sales: £35,000 × 12%	4,200
	49,480

1.6 Answer: (A)

A flexible budget is designed to show the budgeted costs and revenues at different levels of activity.

1.7 Answer: (B)

Increase in cost	£1,800
Increase in production	1,000 units
Variable costs: £1,800/1,000	£1.80/unit

	£
Variable cost of 2,000 units	3,600
Total cost of 2,000 units	11,100
Fixed cost	7,500
Variable cost of 4,000 units	7,200
Fixed cost	7,500
	14,700

1.8 Answer: (B).

☑ Solution 2

2.1 A participative budgeting system may also be described as a *bottom-up* budget.

2.2 (a), (b), (d) and (e) would be contained in a budget manual. The master budget (c) is the end result of the budgetary planning process.

2.3 *False*. The forecast sales volume will often be the principal budget factor or limiting factor, but this is not always the case.

2.4
1. Sales budget
2. Finished goods stock budget
3. Production budget
4. Materials usage budget
5. Materials stock budget
6. Materials purchases budget

2.5 (a) and (d) would be appropriate actions in this situation. Actions (b) and (c) would not be appropriate because they would involve investing the surplus funds for too long.

2.6

	Litres
Liquid L required for finished output (3,000 units × 3 litres)	9,000
Evaporation loss ($\times \frac{10}{90}$)*	1,000
Total required input of liquid L	10,000
Less: reduction in stock	300
Required purchases of liquid L	9,700

* evaporation loss is 10 per cent of *input*

2.7 A system of budgeting whereby the budget is continuously updated by adding a further accounting period when the earliest accounting period has expired is known as a system of *rolling budgets*. It is also known as a *continuous budgeting* system.

2.8

	£	
Volume variance (£93,480 – £98,450)	4,970	adverse
Expenditure variance (£98,450 – £97,920)	530	favourable
Total budget variance	4,440	adverse

2.9 Exception reporting involves providing detailed reports only on those areas of the business that are not performing according to budget and providing only subsidiary information about aspects that are in line with budget. This ensures that management do not receive too much information and that their attention is focused where control action is most needed.

2.10

Flexible budget cost allowance for consumable materials	=	budgeted fixed cost	$\boxed{+}$	(budgeted variable (cost per employee	$\boxed{\times}$	average no.) of employees)

2.11 In a flexible budget for 185 delegates the budget cost allowance for catering costs will be **£2,185**

Delegates	£
170	2,020
120	1,470
50	550

Variable catering cost per delegate = £550/50 = £11
Fixed catering cost = £2,020 – £(170 × 11) = £150
Budget cost allowance for 185 delegates = £150 + £(185 × 11) = £2,185.

Solution 3

- Use a clear columnar layout for your budget workings. Although your workings will not earn marks, clear workings help you to avoid arithmetical errors because 100 per cent accuracy is vital.
- Do not forget to adjust for the budgeted movement in stock in parts (a) and (b). A common error is to get the opening and closing stock calculations the wrong way round.

(a) June:	6,000
July:	7,600
(b) August:	19,125

Workings:
Production budget (in cases)

	June	*July*	*August*	*September*
Cases to be sold	6,000	7,500	8,500	7,000
Closing stock	(7,500 × 10%) 750	(8,500 × 10%) 850	(7,000 × 10%) 700	(6,500 × 10%) 650
Opening stock	(750)	(750)	(850)	(700)
Production budget	6,000	7,600	8,350	6,950

Ingredients purchases budget (in kg)

		August
Quantity to be used	(8,350 × 2.5)	20,875
Quantity in closing stock	(6,950 × 2.5 × 50%)	8,687.5
Quantity in opening stock	(8,350 × 2.5 × 50%)	(10,437.5)
Ingredients purchases budget		19,125.0

✓ Solution 4

- Remember to exclude depreciation from the fixed overhead figures. Depreciation is not a cash flow.
- Read the wording of the question carefully to determine the timing of each cash flow.

(a) July £900
August £11,340
September £34,560

Workings:

	£	£
July: 10% × (10 × £900)		900
August: 90% × July sales (10 × £900)	8,100	
10% × August sales(36 × £900)	3,240	
		11,340
September: 90% × August sales(36 × £900)	29,160	
10% × September sales(60 × £900)	5,400	
		34,560

(b) July £0
August £21,200
September £14,000

Workings:
Cash payments each month are for the previous month's purchases. Therefore, no payments are made in July.

	£	£
August: payment for July closing stock	10,000	
payment for July usage (40 × £280)	11,200	
		21,200
September: payment for August usage (50 × £280)		14,000

(c) £13,600

Workings:

	£
August labour cost paid in month incurred (50 × £160)	8,000
July variable overhead cost paid in August (40 × £40)	1,600
Fixed overhead cash cost (£5,000–£1,000 depreciation)	4,000
	13,600

(d) This is known as *feedforward* control.
(e) This type of budget is known as a *rolling* budget.

Solution 5

- A common error in this type of question is to calculate the expenditure variance (part (c)) by comparing the actual results with the budget supplied in the question. This is the budget for quite different activity levels, so the flexible budget should be used instead.

(a)

	£
Cleaning	12,875
Laundry	15,506
Reception	13,025
Maintenance	10,980
Housekeeping	20,150
General overheads	11,250

Workings:

	Activity (*ORN*/*V*)	*Variable cost per unit*	*Variable cost allowance*	*Fixed cost allowance*	*Total budget cost allowance*
		£	£	£	£
Cleaning	1,850	2.50	4,625	8,250[1]	12,875
Laundry	4,575	1.75	8,006	7,500[2]	15,506
Reception	1,850	0.50[3]	925	12,100	13,025
Maintenance	1,850	0.80	1,480	9,500[4]	10,980
Housekeeping	4,575	2.00[5]	9,150	11,000	20,150
General o/heads	–	–	–	11,250	11,250

1.

	£
Total budget cost allowance for 2,000 ORN	13,250
Less variable allowance (2,000 × £2.50)	5,000
Fixed cost allowance	8,250

2. £15,025 − (4,300 × £1.75) = £7,500

3.

	£
Total budget cost allowance for 2,000 ORN	13,100
Less fixed allowance	12,100
Variable cost allowance for 2,000 ORN	1,000
Variable cost allowance for ORN: $\frac{£1,000}{2,000}$	£0.50

4. £11,100 − (2,000 × £0.80) = £9,500

5. $\frac{(£19{,}600-£11{,}000)}{4{,}300}$ = £2 per visitor

(b) £1,036 adverse

Workings:

	£	
Fixed budget expenditure	112,485	
Flexible budget expenditure	113,521	
Volume variance	1,036	adverse

(c) £550 adverse

Workings:

	£	
Flexible budget expenditure	113,521	
Actual expenditure	114,071	
Expenditure variance	550	adverse

Standard Costing and Variance Analysis

11

LEARNING OUTCOMES

After completing this chapter, you should be able to:

- explain the principles of standard costing;
- prepare the standard cost for a product or service;
- calculate and interpret variances for materials, labour, variable overheads and fixed overheads.

11.1 Introduction

In this chapter we will be looking at standard costs: how they are set and how they are used as the basis of variance analysis to monitor and control an organisation's performance.

The CIMA *Terminology* defines standard costing as 'a control technique which compares standard costs and revenues with actual results to obtain variances which are used to stimulate improved performance'.

You will see from this definition that there are very close relationships between standard costing and budgetary control. They both compare the actual results with the expected performance to identify any variances.

The difference is that with standard costing the comparison is usually made at a unit level, i.e. the actual cost per unit is compared with the standard cost per unit. The resulting variances may be analysed to show their causes and we will see how this is done later in this chapter and in the next chapter.

11.2 What is a standard cost?

A standard cost is a carefully predetermined unit cost which is prepared for each cost unit. It contains details of the standard amount and price of each resource that will be utilised in providing the service or manufacturing the product.

In order to be able to apply standard costing it must be possible to identify a measurable cost unit. This can be a unit of product or service but it must be capable of standardising, for example, standardised tasks must be involved in its creation. The cost units themselves do not necessarily have to be identical, for example, standard costing can be applied in some job costing situations where every cost unit is unique. However, the jobs must include standardised tasks for which a standard time and cost can be determined for monitoring purposes.

It can be difficult to apply standard costing in some types of service organisation, where cost units may not be standardised and they are more difficult to measure.

The standard cost may be stored on a standard cost card like the one shown below but nowadays it is more likely to be stored on a computer, perhaps in a database. Alternatively it may be stored as part of a spreadsheet so that it can be used in the calculation of variances.

The standard cost may be prepared using either absorption costing principles or marginal costing principles. The example that follows is based on absorption costing.

Standard cost card: product 176

	£ per unit
Direct materials: 30 kg @ £4.30	129.00
Direct wages: 12 hours @ £11.80	141.60
Prime cost	270.60
Variable production overhead:	
12 hours @ £0.75	9.00
Variable production cost	279.60
Fixed production overhead:	
12 hours @ £5.80	69.60
Total production cost	349.20
Selling and distribution overhead	15.00
Administration overhead	12.00
Total cost	376.20

For every variable cost the standard amount of resource to be used is stated, as well as the standard price of the resource. This standard data provides the information for a detailed variance analysis, as long as the actual data is collected in the same level of detail.

Standard costs and standard prices provide the basic unit information which is needed for valuing budgets and for determining total expenditures and revenues.

Exercise 11.1

From the information given below, prepare a standard cost card for one unit and enter on the standard cost card the costs to show subtotals for:

(a) prime cost;
(b) variable production cost;
(c) total production cost;
(d) total cost.

The following data is given:

Budgeted output for the year 9,800 units

Standard details for one unit:

Direct materials: 40 square metres @ £6.48/sq m

Direct wages:

Bonding department – 48 hours @ £12.50/hour

Finishing department – 30 hours @ £11.90/hour

Budgeted costs and labour hours per annum:	*£*	*hours*
Variable production overhead:		
Bonding department	375,000	500,000
Finishing department	150,000	300,000
Fixed overhead:		
Production	392,000	
Selling and distribution	196,000	
Administration	98,000	

Solution

Standard cost card

	£ per unit
Direct materials: 40 sq m @ £6.48	259.20
Direct wages:	
Bonding – 48 hours @ £12.50	600.00
Finishing – 30 hours @ £11.90	357.00
Prime cost	1,216.20
Variable production overhead:	
Bonding – 48 hours @ £0.75	36.00
Finishing – 30 hours @ £0.50	15.00
Variable production cost	1,267.20
Fixed production overhead	40.00
Total production cost	1,307.20
Selling and distribution overhead	20.00
Administration overhead	10.00
Total cost	1,337.20

11.3 Performance levels

11.3.1 A standard

CIMA's *Terminology* defines a standard as 'a benchmark measurement of resource usage, set in defined conditions'. The definition goes on to describe a number of bases which can be used to set the standard. These bases include:

- a prior period level of performance by the same organisation;
- the level of performance achieved by comparable organisations;
- the level of performance required to meet organisational objectives.

Use of the first basis indicates that management feels that performance levels in a prior period have been acceptable. They will then use this performance level as a target and control level for the forthcoming period.

When using the second basis management is being more outward looking, perhaps attempting to monitor their organisation's performance against 'the best of the rest'.

The third basis sets a performance level which will be sufficient to achieve the objectives which the organisation has set for itself.

11.3.2 Ideal standard

Standards may be set at ideal levels, which make no allowance for normal losses, waste and machine downtime. This type of ideal standard can be used if managers wish to highlight and monitor the full cost of factors such as waste, etc. However, this type of standard will almost always result in adverse variances since a certain amount of waste, etc., is usually unavoidable. This can be very demotivating for individuals who feel that an adverse variance suggests that they have performed badly.

11.3.3 Attainable standard

Standards may also be set at attainable levels which assume efficient levels of operation, but which include allowances for factors such as normal loss, waste and machine downtime. This type of standard does not have the negative motivational impact that can arise with an ideal standard because it makes some allowance for unavoidable inefficiencies. Adverse variances will reveal whether inefficiencies have exceeded this unavoidable amount.

11.3.4 Current standard

Standards based on current performance levels (current wastage, current inefficiencies) are known as current standards. Their disadvantage is that they do not encourage any attempt to improve on current levels of efficiency.

11.3.5 Basic standard

A basic standard is one which is kept unchanged over a period of time. It is used as the basis for preparing more up-to-date standards for control purposes. A basic standard may be used to show the trend in costs over a period of time.

11.4 Setting standard costs

You have already seen that each element of a unit's standard cost has details of the price and quantity of the resources to be used. In this section of the chapter we will list some of the sources of information which may be used in setting the standard costs.

11.4.1 Standard material price

Sources of information include:

(a) quotations and estimates received from potential suppliers;
(b) trend information obtained from past data on material prices;

(c) details of any bulk discounts which may be available;
(d) information on any charges which will be made for packaging and carriage inwards;
(e) the quality of material to be used: this may affect the price to be paid;
(f) for internally manufactured components, the predetermined standard cost for the component will be used as the standard price.

11.4.2 Standard material usage

Sources of information include:

(a) the basis to be used for the level of performance (see Section 11.3);
(b) if an attainable standard is to be used, the allowance to be made for losses, wastage, etc. (work study techniques may be used to determine this);
(c) technical specifications of the material to be used.

11.4.3 Standard labour rate

Sources of information include:

(a) the personnel department, for the wage rates for employees of the required grades with the required skills;
(b) forecasts of the likely outcome of any trades union negotiations currently in progress;
(c) details of any bonus schemes in operation.

11.4.4 Standard labour times

Sources of information include:

(a) the basis to be used for the level of performance (see Section 11.3);
(b) if an attainable standard is to be used, the allowance to be made for downtime, etc.;
(c) technical specifications of the tasks required to manufacture the product or provide the service;
(d) the results of work study exercises which are set up to determine the standard time to perform the required tasks and the grades of labour to be employed.

11.4.5 Production overhead costs

In Chapter 4 you learned how predetermined hourly rates were derived for production overhead. These overhead absorption rates represent the standard hourly rates for overhead in each cost centre. They can be applied to the standard labour hours or machine hours for each cost unit.

The overheads will usually be analysed into their fixed and variable components so that a separate rate is available for fixed production overhead and for variable production overhead.

11.5 Updating standards

The main purpose of standard costs is to provide a yardstick against which actual performance can be monitored. If the comparison between actual and standard cost is to be meaningful, then the standard must be valid and relevant.

It follows that the standard cost should be kept as up to date as possible. This may necessitate frequent updating of standards to ensure that they fairly represent the latest methods and operations, and the latest prices which must be paid for the resources being used.

The standards may not be updated for *every* small change: however, any significant changes should be adjusted as soon as possible.

11.6 Standard costing in the modern business environment

There has recently been some criticism of the appropriateness of standard costing in the modern business environment. The main criticisms include the following:

(a) Standard costing was developed when the business environment was more stable and operating conditions were less prone to change. In the present dynamic environment, such stable conditions cannot be assumed.

If conditions are not stable, then it is difficult to set a standard cost which can be used to control costs over a period of time.

(b) Performance to standard used to be judged as satisfactory, but in today's climate constant improvement must be aimed for in order to remain competitive.

(c) The emphasis on labour variances is no longer appropriate with the increasing use of automated production methods.

An organisation's decision to use standard costing depends on its effectiveness in helping managers to make the correct decisions. It can be used in areas of most organisations, whether they are involved with manufacturing, or with services such as hospitals or insurance. For example, a predetermined standard could be set for the labour time to process an insurance claim.

Standard costing may still be useful even where the final product or service is not standardised. It may be possible to identify a number of standard components and activities for which standards may be set and used effectively for planning and control purposes. In addition, the use of demanding performance levels in standard costs may help to encourage continuous improvement.

11.7 What is variance analysis?

You already know that a variance is the difference between the expected standard cost and the actual cost incurred. You also know that a unit standard cost contains detail concerning both the usage of resources and the price to be paid for the resources.

Variance analysis involves breaking down the total variance to explain how much of it is caused by the usage of resources being different from the standard, and how much of it is caused by the price of resources being different from the standard. These variances can be combined to reconcile the total cost difference revealed by the comparison of the actual and standard cost.

11.8 Variable cost variances

We will use a simple example to demonstrate how the variances are calculated for direct material, direct labour and variable overhead.

Example

A company manufactures a single product for which the standard variable cost is:

	£ *per unit*
Direct material: 81 kg × £7 per kg	567
Direct labour: 97 hours × £8 per hour	776
Variable overhead: 97 hours × £3 per hour	291
	1,634

During January, 530 units were produced and the costs incurred were as follows:

Direct material:	42,845 kg purchased and used; cost £308,484
Direct labour:	51,380 hours worked; cost £400,764
Variable overhead:	cost £156,709

You are required to calculate the variable cost variances for January.

11.8.1 Direct material cost variances

(a) Direct material total variance

	£	
530 units should cost (× £567)	300,510	
But did cost	308,484	
Total direct material cost variance	7,974	adverse

You should always remember to indicate whether a variance is adverse or favourable.

This direct material total variance can now be analysed into its 'price' and 'quantity' elements.

(b) Direct material price variance

The direct material price variance reveals how much of the direct material total variance was caused by paying a different price for the materials used.

	£	
42,845 kg purchased should have cost (×£ 7)	299,915	
But did cost	308,484	
Direct material price variance	8,569	adverse

The adverse price variance indicates that expenditure was £8,569 more than standard because a higher than standard price was paid for each kilogram of material.

(c) Direct material usage variance

The direct material usage variance reveals how much of the direct material total variance was caused by using a different quantity of material, compared with the standard allowance for the production achieved.

	kg	
530 units produced should have used (× 81 kg)	42,930	
But did use	42,845	
Variance in kg	85	favourable
× standard price per kg (£7):		
Direct material usage variance	£595	favourable

The favourable usage variance of £595 is the saving in material cost (at standard prices) resulting from using a lower amount of material than the standard expected for this level of output.

Check: £8,569 adverse + £595 favourable = £7,974 adverse (the correct total variance).

! All of the 'quantity' variances are always valued at the standard price. Later in this example you will see that the 'quantity' variances for labour and for variable overhead – the efficiency variances – are valued at the standard rate per hour.

11.8.2 The direct material price variance and inventory (stock) valuation

One slight complication sometimes arises with the calculation of the direct material price variance. In this example the problem did not arise because the amount of material purchased was equal to the amount used.

However, when the two amounts are not equal then the direct material price variance could be based either on the material purchased or on the material used. In the example we used the following method – we will call it method (A):

(A) Direct material price variance

	£
Material purchased should have cost	X
But did cost	X
Direct material price variance	X

Alternatively, we could have calculated the variance as follows – we will call it method (B).

(B) Direct material price variance

	£
Material used should have cost	X
But did cost	X
Direct material price variance	X

Obviously, if the purchase quantity is different from the usage quantity, then the two methods will give different results.

So how do you know which method to use? The answer lies in the stock valuation method.

If stock is valued at standard cost, then method A is used. This will ensure that all of the variance is eliminated as soon as purchases are made and the stock will be held at standard cost.

If stock is valued at actual cost, then method B is used. This means that the variance is calculated and eliminated on each bit of stock as it is used up. The remainder of the stock will then be held at actual price, with its price variance still 'attached', until it is used and the price variance is calculated.

If this seems confusing you might find it easier to return and consider the reasoning after you have studied standard cost bookkeeping in the next chapter, when you will learn which method is generally preferred.

11.8.3 Direct labour cost variances

(a) Direct labour total variance

	£	
530 units should cost (× £776)	411,280	
But did cost	400,764	
Total direct labour cost variance	10,516	favourable

This variance can now be analysed into its 'price' and 'quantity' elements. The 'price' part is called the labour rate variance and the 'quantity' part is called the labour efficiency variance.

(b) Direct labour rate variance

The direct labour rate variance reveals how much of the direct labour total variance was caused by paying a different rate per hour for the labour hours worked.

	£	
51,380 hours should have cost (× £8)	411,040	
But did cost	400,764	
Direct labour rate variance	10,276	favourable

The favourable rate variance indicates that expenditure was £10,276 less than standard because a lower than standard rate was paid for each hour of labour.

! Notice the similarity between the method used to calculate the labour rate variance and the method used to calculate the material price variance.

(c) Direct labour efficiency variance

The direct labour efficiency variance reveals how much of the direct labour total variance was caused by using a different number of hours of labour, compared with the standard allowance for the production achieved.

	Hours	
530 units produced should take (× 97 hours)	51,410	
But did take	51,380	
Variance in hours	30	favourable
× standard labour rate per hour (£8)		
Direct labour efficiency variance	£240	favourable

The favourable efficiency variance of £240 is the saving in labour cost (at standard rates) resulting from using fewer labour hours than the standard expected for this level of output.

Check: £10,276 favourable + £240 favourable = £10,516 favourable (the correct total variance).

! In the next chapter you will see that a further analysis of the efficiency variance can be carried out when idle time occurs.

11.8.4 Variable overhead cost variances

(a) Variable overhead total variance

	£	
530 units should cost (× £291)	154,230	
But did cost	156,709	
Total variable overhead cost variance	2,479	adverse

This variance can now be analysed into its 'price' and 'quantity' elements. The 'price' part is called the variable overhead expenditure variance and the 'quantity' part is called the variable overhead efficiency variance.

(b) Variable overhead expenditure variance

The variable overhead expenditure variance reveals how much of the variable overhead total variance was caused by paying a different hourly rate of overhead for the hours worked.

	£	
51,380 hours of variable overhead should cost (× £3)	154,140	
But did cost	156,709	
Variable overhead expenditure variance	2,569	adverse

The adverse expenditure variance indicates that expenditure was £2,569 more than standard because a higher than standard hourly rate was paid for variable overhead.

(c) Variable overhead efficiency variance

The variable overhead efficiency variance reveals how much of the variable overhead total variance was caused by using a different number of hours of labour, compared with the standard allowance for the production achieved. Its calculation is very similar to the calculation of the labour efficiency variance.

Variance in hours (from labour efficiency variance)	30 hours	favourable
× standard variable overhead rate per hour (£3)		
Variable overhead efficiency variance	£90	favourable

The favourable efficiency variance of £90 is the saving in variable overhead cost (at standard rates) resulting from using fewer labour hours than the standard expected for this level of output.

Check: £2,569 adverse + £90 favourable = £2,479 adverse (the correct total variance)

! Notice that the method used to calculate the variable overhead variances is identical to the method used to calculate the direct labour variances. In the next chapter you will see that the calculation of the variable overhead efficiency variance may be affected by idle time.

11.9 Fixed production overhead variances

In this chapter you will learn about the fixed production overhead variances in an absorption costing system. The variances in a marginal costing system will be covered in the next chapter.

The most important point to grasp about fixed production overhead variances is:

The total fixed production overhead variance is equal to the under- or over-absorbed fixed production overhead for the period.

When you are analysing the total fixed production overhead variance you are therefore trying to explain the reasons for the over- or under-absorption. Factors which could lead to under-absorption will cause adverse fixed overhead variances. Factors which could lead to over-absorption will cause favourable fixed overhead variances.

11.9.1 The reasons for under- or over-absorption of overhead

There are basically two reasons why fixed overheads are under- or over-absorbed and they are both linked to the calculation of the overhead absorption rate:

$$\text{Overhead absorption rate} = \frac{\text{budgeted fixed overhead}}{\text{budgeted activity level}}$$

The overhead will be under- or over-absorbed for either or both of the following reasons:

(a) The actual overhead expenditure was different from budget (this difference is expressed by the overhead expenditure variance);
(b) The actual activity level was different from budget (this difference is expressed by the overhead volume variance).

Notice that for fixed overheads (in an absorption costing system) there are two variances: a 'price' variance (the expenditure variance) and a 'quantity' variance (the volume variance), as for all the costs we have considered so far.

It is easiest to look at an example to see how the variances are calculated.

Example

A company manufactures a single product. Budget and actual data for the latest period are as follows:

- *Budget*. Fixed production overhead expenditure £103,000. Production output 10,300 units.
- *Actual*. Fixed production overhead expenditure £108,540. Production output 10,605 units.

11.9.2 The fixed production overhead total variance

You have already learned that this is equal to the over- or under-absorption of overhead.

Exercise 11.2

Try calculating this variance before looking at the solution.

Solution

$$\text{Predetermined overhead absorption rate} = \frac{£103{,}000}{10{,}300 \text{ units}} = £10 \text{ per unit}$$

	£	
Overhead absorbed during period £10 × 10,605 units	106,050	
Actual overhead incurred	108,540	
Fixed production overhead total variance	2,490	adverse

An adverse total variance represents under-absorbed overhead.

11.9.3 The fixed production overhead expenditure variance

This is the amount of the total variance which is caused by the expenditure on overheads being different from the budgeted amount.

	£	
Budgeted fixed production overhead expenditure	103,000	
Actual fixed production overhead expenditure	108,540	
Fixed production overhead expenditure variance	5,540	adverse

Stop for a moment and look at the difference between the expenditure variances for fixed overhead and for variable overhead. With the variable overhead expenditure variance an allowance is made for the actual number of hours worked (i.e. the budget is flexed to the actual activity level). With the fixed overhead expenditure variance the allowance is not flexed because fixed overhead expenditure should not change if activity levels alter.

11.9.4 The fixed production overhead volume variance

This is the amount of the total variance which is caused by the activity level being different from the budget.

	Units	
Actual activity level	10,605	
Budgeted activity level	10,300	
Difference	305	
× fixed production overhead absorption rate (£10)		
Fixed production overhead volume variance	£3,050	favourable

Check: £5,540 adverse + £3,050 favourable = £2,490 adverse (the correct total variance).

It is common for students to misinterpret the volume variance. In this example, the variance is favourable because the actual activity level was higher than budgeted. This meant that more overhead would have been absorbed, which results in a favourable variance.

11.10 Standard hour

Now you have seen how to analyse the under-/over-absorption, that is, the fixed production overhead total variance, in a situation where every unit is identical and therefore absorbs the same amount of fixed production overheads, on a unit-rate basis.

But what about a situation where every unit is not identical? How can we monitor activity and absorb fixed production overheads in this situation?

11.10.1 Monitoring output

Sometimes it can be difficult to measure the output of an organisation which manufactures a variety of dissimilar items. For example, if a company manufactures metal saucepans, utensils and candlesticks, it would not be meaningful to add together these dissimilar items to determine the total number of units produced. It is likely that each of the items takes a different amount of time to produce and utilises a different amount of resource.

A standard hour is a useful way of measuring output when a number of dissimilar items are manufactured. A standard hour or minute is the amount of work achievable, at standard efficiency levels, in an hour or minute.

The best way to see how this works is to look at an example.

Example

A company manufactures tables, chairs and shelf units. The standard labour times allowed to manufacture one unit of each of these are as follows:

	Standard labour hours per unit
Table	3 hours
Chair	1 hour
Shelf unit	5 hours

Production output during the first two periods of this year was as follows:

	Units produced	
	Period 1	*Period 2*
Table	7	4
Chair	5	2
Shelf unit	3	5

It would be difficult to monitor the trend in total production output based on the number of units produced. We can see that fifteen units were produced in total in period 1 and eleven units in period 2. However, it is not particularly meaningful to add together tables, chairs and shelf units because they are such dissimilar items. You can see that the mix of the three products changed over the two periods and the effect of this is not revealed by simply monitoring the total number of units produced.

Standard hours present a useful output measure which is not affected by the mix of products. The standard hours of output for the two periods can be calculated as follows:

		Period 1		*Period 2*	
	Standard hours per unit	*Units produced*	*Standard hours*	*Units produced*	*Standard hours*
Table	3	7	21	4	12
Chair	1	5	5	2	2
Shelf unit	5	3	15	5	25
Total standard labour hours produced			41		39

Expressing the output in terms of standard labour hours shows that in fact the output level for period 2 was very similar to that for period 1.

It is important for you to realise that the actual labour hours worked during each of these periods was probably different from the standard labour hours produced. The standard hours figure is simply an expression of how long the output should have taken to produce, to provide a common basis for measuring output.

! The difference between the actual labour hours worked and the standard labour hours produced will be evaluated as the labour efficiency variance.

11.10.2 Using standard hours as a basis for overhead absorption

If an organisation produces a number of dissimilar units then they cannot absorb fixed production overheads using a unit rate. For example, as we have seen, it may not be meaningful to add together the number of tables, chairs and shelf units produced.

In Chapter 4 you learnt that an organisation may use some sort of hourly rate basis to overcome this problem: perhaps a predetermined rate per labour hour. In a standard costing system the predetermined rate would be calculated per standard labour hour. This ensures that every unit of the same product (tables, chairs or shelf units in our example) absorbs the same amount of fixed production overhead, that is, the standard amount of fixed production overhead.

Example

The company in our previous example has budgeted as follows for each period:

Budgeted output	42 standard labour hours
Budgeted fixed production overhead	£1,260

During period 2, the actual fixed production overhead incurred was £1,430 and the actual output achieved was 39 standard hours, as calculated in the previous example.

You are required to calculate the following variances for period 2:

- fixed production overhead total;
- fixed production overhead expenditure;
- fixed production overhead volume.

Solution

The fixed production overhead total variance is equal to the over-/under-absorption of overhead:

$$\text{Predetermined overhead absorption rate} = \frac{£1{,}260}{42} = £30 \text{ per standard labour hour}$$

	£	
Overhead absorbed during period	1,170	
£30 × 39 standard hours produced		
Actual overhead incurred	1,430	
Fixed production overhead total variance	260	adverse

The adverse total variance represents under-absorbed overhead.

Now we are required to analyse the total variance between its constituent parts: the expenditure variance and the volume variance:

Fixed production overhead expenditure variance	£	
Budgeted fixed production overhead expenditure	1,260	
Actual fixed production overhead expenditure	1,430	
Fixed production overhead expenditure variance	170	adverse
Fixed production overhead volume variance		
Actual activity level	39	standard hours
Budgeted activity level	42	standard hours
Difference	3	standard hours
× fixed production overhead absorption rate (£30)		
Fixed production overhead volume variance	£90	adverse

The variance is adverse because the actual activity achieved was lower than the budgeted activity, which could have led to under-absorption of overheads.

Check: £170 adverse + £90 adverse = £260 adverse total variance.

11.10.3 Absorbing fixed production overheads in a standard absorption costing system

In a standard absorption costing system, fixed production overheads must be absorbed using either a standard unit rate basis (if units are identical) or a rate per standard hour produced. The use of a rate per actual hour worked would not be equitable because it could result in every unit of the same product being valued at a different cost.

11.11 Summary

Having read this chapter the main points that you should understand are as follows:

1. A standard cost is a carefully predetermined unit cost.
2. A number of different performance levels can be used in setting standards. The four most common are ideal, attainable, current and basic.
3. The difference between the standard cost and the actual result is called a variance.
4. The direct material total variance can be analysed between the direct material price variance and the direct material usage variance.
5. If inventories (stocks) are valued at standard cost then the material price variance should be based on the quantity purchased. If stocks are valued at actual cost the material price variance should be based on the quantity used during the period.

6. The direct labour total variance can be analysed between the direct labour rate variance and the direct labour efficiency variance.
7. The variable production overhead total variance can be analysed between the variable production overhead expenditure variance and the variable production overhead efficiency variance.
8. The fixed production overhead total variance is equal to the under- or over-absorbed fixed production overhead for the period. An under-absorption results in an adverse variance. An over-absorption results in a favourable variance.
9. The fixed production overhead total variance can be analysed between the fixed production overhead expenditure variance and the fixed production overhead volume variance.
10. The standard hour can be useful as a basis for monitoring output when a number of dissimilar items are produced and as an overhead absorption base in a standard absorption costing system.

Revision Questions 11

Question 1 Multiple choice

1.1 A standard cost is:

(A) the planned unit cost of a product, component or service in a period.
(B) the budgeted cost ascribed to the level of activity achieved in a budget centre in a control period.
(C) the budgeted production cost ascribed to the level of activity in a budget period.
(D) the budgeted non-production cost for a product, component or service in a period.

Data for questions 1.2–1.7

Budgeted production of product V is 650 units each period. The standard cost card for product V contains the following information.

		£ per unit
Ingredients	12 litres @ £4 per litre	48
Direct labour	3 hours @ £9 per hour	27
Variable production overhead	3 hours @ £2 per hour	6

During the latest period 670 units of product V were produced. The actual results recorded were as follows.

Ingredients purchased and used	8,015 litres	£33,663
Direct labour	2,090 hours	£17,765
Variable production overhead		£5,434

1.2 The ingredients price variance is:

(A) £1,503 favourable
(B) £1,503 adverse
(C) £1,603 favourable
(D) £1,603 adverse

1.3 The ingredients usage variance is:

(A) £100 favourable
(B) £100 adverse
(C) £105 favourable
(D) £860 adverse

1.4 The labour rate variance is

(A) £325 favourable
(B) £325 adverse
(C) £1,045 favourable
(D) £1,045 adverse

1.5 The labour efficiency variance is

(A) £680 adverse
(B) £720 adverse
(C) £720 favourable
(D) £1,260 adverse

1.6 The variable overhead expenditure variance is:

(A) £1,254 favourable
(B) £1,254 adverse
(C) £1,534 favourable
(D) £1,534 adverse

1.7 The variable overhead efficiency variance is:

(A) £151 adverse
(B) £160 adverse
(C) £160 favourable
(D) £280 adverse

Data for questions 1.8 and 1.9
A company has budgeted to produce and sell 6,000 units of a single product. The standard fixed production overhead cost per unit is £5.

In the period covered by the budget, the following actual results were recorded:

Production and sales	7,000 units
Fixed production overheads	£28,000

1.8 The fixed production overhead expenditure variance is:

(A) £2,000 favourable.
(B) £2,000 adverse.
(C) £7,000 favourable.
(D) £7,000 adverse.

1.9 The fixed production overhead volume variance is:

(A) £2,000 favourable.
(B) £2,000 adverse.
(C) £5,000 favourable.
(D) £5,000 adverse.

1.10 ABC Ltd uses standard costing. It purchases a small component for which the following data are available:

Actual purchase quantity	6,800 units
Standard allowance for actual production	5,440 units
Standard price	85p per unit
Purchase price variance (adverse)	(£544)

What was the actual purchase price per unit?

(A) 75p
(B) 77p
(C) 93p
(D) 95p.

1.11 During a period 17,500 labour hours were worked at a standard cost of £6.50 per hour. The labour efficiency variance was £7,800 favourable. How many standard hours were produced?

(A) 1,200
(B) 16,300
(C) 17,500
(D) 18,700.

1.12 XYZ Ltd uses standard costing. It makes an assembly for which the following standard data are available:

Standard labour hours per assembly	24
Standard labour cost per hour	£8

During a period 850 assemblies were made, there was a nil rate variance and an adverse efficiency variance of £4,400.

How many actual labour hours were worked?

(A) 19,850
(B) 20,400
(C) 20,950
(D) 35,200.

? **Question 2** Short objective-test questions

2.1 *Tick the correct box.*

A standard which assumes efficient levels of operation, but which includes allowances for factors such as waste and machine downtime, is known as an:

attainable standard ☐
ideal standard ☐

2.2 The standard cost card for product F shows that each unit requires 3 kg of material at a standard price of £9 per kilogram. Last period, 200 units of F were produced and £5,518 was paid for 620 kg of material that was bought and used. Calculate the following variances and tick the correct box to indicate whether each variance is adverse or favourable.

	Adverse	*Favourable*
(a) the direct material price variance is £ ☐	☐	☐
(b) the direct material usage variance is £ ☐	☐	☐

2.3 The standard cost card for product K shows that each unit requires four hours of direct labour at a standard rate of £8 per hour. Last period, 420 units were produced and the direct labour cost amounted to £15,300. The direct labour efficiency variance was £160 adverse.
The actual rate paid per direct labour hour is £ ☐.

2.4 Last period, fixed production overheads were under-absorbed by £50,000. The actual expenditure on fixed production overhead was £55,000 lower than the original budget.
The fixed production overhead volume variance for the period is £ ☐.
The variance is:

adverse ☐
favourable ☐

2.5 Is the following statement *true* or *false*?
Standard costing cannot be applied in a job-costing situation because every cost unit is unique.

True ☐
False ☐

Data for questions 2.6–2.9

SH uses standard costing and absorbs fixed production overhead using a standard rate of £5.60 per standard labour hour.

Data for the latest period are as follows.

Budgeted production (standard labour hours)	2,880
Actual labour hours worked	2,970
Standard labour hours produced	2,900
Actual fixed production overhead expenditure	£15,730

2.6 The fixed production overhead total variance is £ ☐

adverse ☐
favourable ☐

2.7 The fixed production overhead expenditure variance is £ ☐

adverse ☐
favourable ☐

2.8 The fixed production overhead volume variance is £ ☐

adverse ☐
favourable ☐

2.9 The direct labour efficiency variance is:

adverse ☐
favourable ☐

Question 3 Direct cost variances

XYZ Ltd is planning to make 120,000 units per period of a new product. The following standards have been set:

	Per unit
Direct material A	1.2 kg at £11 per kg
Direct material B	4.7 kg at £6 per kg
Direct labour:	
Operation 1	42 minutes
Operation 2	37 minutes
Operation 3	11 minutes

Overheads are absorbed at the rate of £30 per standard labour hour. All direct operatives are paid at the rate of £8 per hour. Attainable work hours are less than clock hours, so the 500 direct operatives have been budgeted for 400 hours each in the period.

Actual results for the period were:

Production	126,000 units
Direct labour	cost £1.7 m for 215,000 clock hours
Material A	cost £1.65 m for 150,000 kg
Material B	cost £3.6 m for 590,000 kg

Requirements

(a) The standard cost for one unit of the new product is £ ☐

(b) (i) A realistic labour efficiency variance for the period is £ ☐

adverse ☐
favourable ☐

(ii) The labour rate variance for the period is £ ☐

adverse ☐
favourable ☐

(c) (i) The material price variances for the period are

Material A	£ ☐	Material B	£ ☐
adverse	☐	adverse	☐
favourable	☐	favourable	☐

(ii) The material usage variances for the period are:

Material A	£ ☐	Material B	£ ☐
adverse	☐	adverse	☐
favourable	☐	favourable	☐

Solutions to Revision Questions

11

Solution 1

- Select your answer carefully from the available options. You may in haste select an option that has the correct absolute value for the variance but is adverse when you should have selected favourable, or vice versa.
- In some of the questions you will need to 'work backwards' from variance information to determine the actual results. This will enable you to test yourself to see if you really understand how the variances are calculated!
- The second question asks for an ingredients price variance. This is calculated in exactly the same way as a direct material price variance.

1.1 Answer: (A)

A standard cost is a carefully predetermined unit cost which is prepared for each cost unit.

1.2 Answer: (D)

	£	
8,015 litres should cost (× £4)	32,060	
But did cost	33,663	
Ingredients price variance	1,603	adverse

1.3 Answer: (A)

	Litres	
670 units produced should use (× 12)	8,040	
But did use	8,015	
Variance in litres	25	favourable
× standard price per litre (£4)		
Ingredients usage	£100	favourable

1.4 Answer: (C)

	£	
2,090 hours should cost (× £9)	18,810	
But did cost	17,765	
Labour rate variance	1,045	favourable

1.5 Answer: (B)

	Hours	
670 units produced should take (× 3)	2,010	
But did take	2,090	
Variance in hours	80	adverse
× standard labour rate per hour (£9)		
Labour efficiency variance	£720	adverse

1.6 Answer: (B)

	£	
2,090 hours should cost (× £2)	4,180	
But did cost	5,434	
Variable overhead expenditure variance	1,254	adverse

1.7 Answer: (B)

Variance in hours (from labour efficiency variance)	80 hours	adverse
× standard variable overhead rate per hour (£2)		
Variable overhead efficiency variance	£160	adverse

1.8 Answer: (A)

Fixed production overhead expenditure variance	£	
Actual expenditure	28,000	
Budgeted expenditure (6,000 units × £5)	30,000	
	2,000	favourable

1.9 Answer: (C)

Fixed production overhead volume variance	*Units*	
Actual volume	7,000	
Budgeted volume	6,000	
	1,000	favourable
1,000 units × £5	£5,000	favourable

1.10 Answer: (C)

Purchase price variance per unit purchased = £544/6,800 = 8p adverse per unit.
Actual purchase price = 85p standard + 8p = 93p per unit.

1.11 Answer: (D)

Standard hours saved = £7,800/£6.50 = 1,200.
Standard hours produced = 17,500 + 1,200 = 18,700.

1.12 Answer: (C)

Standard labour cost = 24 hours × 850 × £8 = £163,200
Actual cost = £163,200 + £4,400 = £167,600
@£8/hour = 20,950 hours

Solution 2

2.1 A standard which assumes efficient levels of operation, but which includes allowances for factors such as waste and machine downtime is known as an *attainable* standard.

2.2

	£	
620 kg should have cost (× £9)	5,580	
But did cost	5,518	
Direct material price variance	62	favourable

	Kg	
200 units produced should have used (× 3 kg)	600	
But did use	620	
Variance in kg	(20)	adverse
× standard price per kg (£9)		
Direct material usage variance	(£180)	adverse

2.3 Efficiency variance in hours = £160/£8 = 20 hours adverse
Actual hours worked = 20 + 1,680 standard hours (420 × 4) = 1,700
Actual rate paid per hour = £15,300/1,700 = £9 per hour

2.4

	£	
Total fixed production overhead variance (i.e. under-absorbed overhead)	(50,000)	adverse
Less fixed prod'n overhead expenditure variance	55,000	favourable
Fixed production overhead volume variance	(105,000)	adverse

2.5 *False*. Even though each job is unique, they could include standardised tasks for which a standard time and/or cost can be determined for control purposes.

2.6

	£	
Overhead absorbed during period £5.60 × 2,900	16,240	
Actual overhead incurred	15,730	
Fixed prodution overhead total variance	510	favourable

2.7

	£	
Budgeted fixed prod'n overhead expenditure £5.60 × 2,880	16,120	
Actual fixed production overhead expenditure	15,730	
Fixed prodution overhead expenditure variance	398	favourable

2.8

	Std. hours	
Actual activity level	2,900	
Budgeted activity level	2,880	
Difference	20	
× fixed production overhead absorption rate (£5.60)		
Fixed production overhead volume variance	£112	favourable

Check: expenditure variance £398F + volume variance £112F = total variance £510F

2.9 The direct labour efficiency is *adverse* because the actual labour hours worked were greater than the number of standard labour hours produced. Direct labour was therefore working below the standard level of efficiency.

☑ Solution 3

- There is an unusual request in part (b): for a *realistic* labour efficiency variance. This means that you need to take account of the difference between attainable work hours and actual clock hours. A realistic efficiency variance should be based on attainable hours rather than on clock hours.
- The question gives you a hint on the difference between attainable hours and clock hours: the clock hours budgeted for 120,000 units are more than the standard time allowance of 1.5 hours per unit. The difference is the lost time or idle time, for which an allowance should be made when the efficiency variance is calculated.
- Do not forget to indicate whether your calculated variances are adverse or favourable.

(a) £98.40

Workings:
Standard cost per unit

	£
Materials	
A: 1.2 kg × £11 =	13.20
B: 4.7 kg × £6 =	28.20
Labour	
1.5 hours × £8 =	12.00
Prime cost	53.40
Overheads	
1.5 standard hours × £30 =	45.00
Standard cost per unit	98.40

(b) (i) £36,000 adverse

(ii) £20,000 favourable

Workings:

Standard labour hours per unit $= (42 + 37 + 11)/60 = 1.5$ hours

Budgeted attainable work hours for the period = 120,000 units × 1.5 hours = 180,000 hours

Budgeted clock hours for the period = 500 operatives × 400 hours = 200,000 hours
Attainable hours = 90 per cent of clock hours

Labour efficiency variance

	Hours	
126,000 units should have taken (× 1.5 hours)	189,000	
But did take (215,000 × 90%)	193,500	
Variance in hours	4,500	adverse
× standard labour rate per hour (£8)		
Labour efficiency variance	£36,000	adverse

Labour rate variance

	£	
215,000 hours paid for should have cost (× £8)	1,720,000	
But did cost	1,700,000	
Labour rate variance	20,000	favourable

		Material A		Material B	
(c)	(i)	£0		£60,000	adverse
	(ii)	£13,200	favourable	£13,200	favourable

Workings:
Direct material price variance

Material A	£
150,000 kg should have cost (× £11)	1,650,000
And did cost	1,650,000
Direct material price variance	–

Material B	£	
590,000 kg should have cost (× £6)	3,540,000	
But did cost	3,600,000	
Direct material price variance	60,000	adverse

Direct material usage variance

Material A	*Kg*	
126,000 units produced should have used (× 1.2 kg)	151,200	
But did use	150,000	
Variance in kg	1,200	favourable
× standard price per kg (£11)		
Direct material usage variance	£13,200	favourable

Material B	*Kg*	
126,000 units produced should have used (× 4.7 kg)	592,200	
But did use	590,000	
Variance in kg	2,200	favourable
× standard price per kg (£6)		
Direct material usage variance	£13,200	favourable

Further Variance Analysis

12

LEARNING OUTCOMES

After completing this chapter, you should be able to:

- calculate and interpret variances for sales;
- prepare a report reconciling budget gross profit/contribution with actual profit;
- prepare accounting entries for an integrated accounting system using standard costs.

12.1 Introduction

In this chapter you will be continuing your studies of standard costing and variance analysis. You will learn how to calculate sales variances and how to put all the variances together in a statement which reconciles the budgeted gross profit for a period with the actual profit achieved.

You will be looking at the differences between the variances calculated in an absorption costing system and those calculated in a marginal costing system. Clearly, differences will only occur in those variances that are affected by the differing treatments of fixed production overhead.

You will also be learning how to interpret variances and how to record them in an integrated bookkeeping system.

12.2 Total sales margin variance

Now that we have seen how to analyse the cost variances in an absorption costing system, we will turn our attention to sales variances. Since the analysis of cost variances has already explained all of the variations caused by differences between standard costs and actual costs, the calculation of the sales margin variance is based on the standard cost, not on the actual cost.

Total sales margin variance = actual margin (based on standard unit costs)
− budgeted margin
= (actual sales value less standard cost of sales)
− (budgeted sales value less budgeted cost of sales)

Example

A company manufactures a single product. Budget and actual data for the latest period is as follows:

Budget	Sales and production volume	81,600 units
	Standard selling price	£59 per unit
	Standard variable cost	£24 per unit
	Standard fixed cost	£4 per unit
Actual results	Sales and production volume	82,400 units
	Actual selling price	£57 per unit
	Actual variable cost	£23 per unit
	Actual fixed cost	£6 per unit

Solution

	£	£	
Actual sales: £57 × 82,400 units	4,696,800		
Standard cost of units sold: £28 × 82,400	2,307,200		
Actual margin, based on standard unit costs		2,389,600	
Budgeted sales value: £59 × 81,600 units	4,814,400		
Budgeted cost of sales: £28 × 81,600 units	2,284,800		
		2,529,600	
Total sales margin variance		140,000	adverse

You can see from the basic data that the total sales margin variance results from a lower selling price than standard, offset to an extent by a higher sales volume than budgeted. However, further analysis of the total sales margin variance is outside the scope of your *Management Accounting Fundamentals* syllabus.

12.3 Reconciling actual profit with budgeted profit

Now that you have seen how to calculate all the main operating variances, you should be in a position to produce a statement which reconciles the actual and budget profit for the period.

First, to get some important practice, you should calculate all of the operating variances using the data given in the following example. Then you can learn to put all the variances together in a reconciliation statement like the one shown at the end of the solution.

Example

A company produces and sells one product only, the standard cost for which is:

	£ per unit
Direct material 11 litres at £2	22
Direct wages 5 hours at £6	30
Variable production overhead	10
Fixed production overhead	20
Total standard production cost	82
Standard gross profit	38
Standard selling price	120

The variable production overhead is incurred in direct proportion to the direct labour hours worked. The unit rate for fixed production overhead is based on an expected annual output of 24,000 units produced at an even rate throughout the year. Assume that each calendar month is equal and that the budgeted sales volume for May was 2,000 units.

The following were the actual results recorded during May:

Number of units produced and sold: 1,750

	£	£
Sales revenue		218,750
Direct materials: 19,540 litres purchased and used	41,034	
Direct labour: 8,722 hours	47,971	
Variable production overhead	26,166	
Fixed production overhead	37,410	
		152,581
Gross profit		66,169

You are required to calculate the operating variances and present them in a statement which reconciles the budget and actual gross profit for May.

Solution

Direct material price variance

	£	
19,540 litres purchased should have cost (× £2)	39,080	
But did cost	41,034	
Direct material price variance	1,954	adverse

Direct material usage variance

	Litres	
1,750 units produced should have used (× 11 litres)	19,250	
But did use	19,540	
Variance in litres	290	adverse
× standard price per litre (£2)		
Direct material usage variance	£580	adverse

Direct labour rate variance

	£	
8,722 hours should have cost (× £6)	52,332	
But did cost	47,971	
Direct labour rate variance	4,361	favourable

Direct labour efficiency variance

	Hours	
1,750 units produced should take (× 5 hours)	8,750	
But did take	8,722	
Variance in hours	28	favourable
× standard labour rate per hour (£6)		
Direct labour efficiency variance	£168	favourable

Variable production overhead expenditure variance

	£	
8,722 hours of variable production overhead should cost (× £2)	17,444	
But did cost	26,166	
Variable production overhead expenditure variance	8,722	adverse

Variable production overhead efficiency variance

Variance in hours (from labour efficiency variance)	28	favourable
× standard variable overhead rate per hour (£2)		
Variable production overhead efficiency variance	£56	favourable

Fixed production overhead expenditure variance

	£	
Budgeted fixed overhead (2,000 units × £20)	40,000	
Actual fixed overhead	37,410	
Fixed production overhead expenditure variance	2,590	favourable

Fixed production overhead volume variance

	Units	
Actual activity level	1,750	
Budgeted activity level (24,000 units/12)	2,000	
Difference	250	
× fixed production overhead absorption rate (£20)		
Fixed production overhead volume variance	£5,000	adverse

The volume variance is adverse because the shortfall in production would have resulted in under-absorption.

Total sales margin variance

	£	
Actual sales revenue	218,750	
Std. cost of units sold (1,750 × £82)	143,500	
Actual margin, based on standard unit costs	75,250	
Budgeted margin (2,000 × £38)	76,000	
Total sales margin variance	750	adverse

A reconciliation statement, known as an *operating statement*, begins with the original budgeted profit. It then adds or subtracts the variances (depending on whether they are favourable or adverse) to arrive at the actual profit for the month.

Profit reconciliation statement for May

		£	£
Original budgeted profit: 2,000 units × £38			76,000
Total sales margin variance			(750)
			75,250
Cost variances			
Direct material:	price	(1,954)	
	usage	(580)	
			(2,534)
Direct labour:	rate	4,361	
	efficiency	168	
			4,529
Variable production overhead:	expenditure	(8,722)	
	efficiency	56	
			(8,666)
Fixed production overhead:	expenditure	2,590	
	volume	(5,000)	
			(2,410)
Actual gross profit			66,169

Note: Variances in brackets are adverse.

12.4 Standard marginal costing

You should not be surprised to learn that the only variances in a standard marginal costing system which are different from those in a standard absorption costing system are those which involve fixed production overheads.

12.4.1 The fixed production overhead volume variance

This variance does not arise in a marginal costing system. In an absorption costing system it represents the value of the under- or over-absorbed fixed production overhead due to a change in production volume. Since under- or over-absorbed fixed overhead does not arise in a marginal costing system, there is no overhead volume variance.

12.4.2 The fixed production overhead expenditure variance

This is the only variance for fixed production overhead in a marginal costing system. It is calculated in exactly the same way as in an absorption costing system.

12.4.3 The total sales contribution variance

This is similar to the total sales margin variance in an absorption costing system, except that contribution is used in place of the profit margin.

$$\begin{aligned}\text{Total sales contribution variance} &= \text{actual contribution (based on standard unit costs)}\\ &\quad - \text{budgeted contribution}\\ &= (\text{actual sales value} - \text{standard variable cost of sales})\\ &\quad - (\text{budgeted sales value} - \text{budgeted variable cost of sales})\end{aligned}$$

In the previous example in Section 12.3, the standard contribution was £58 per unit.

	£ per unit
Standard selling price	120
Standard variable cost	62
Standard contribution	58

The total sales contribution variance is calculated as follows:

	£	
Actual sales revenue	218,750	
Std. variable cost of units sold (1,750 × £62)	108,500	
Actual contribution, based on standard unit costs	110,250	
Budgeted contribution (2,000 × £58)	116,000	
Total sales contribution variance	5,750	adverse

12.4.4 Reconciling actual and budgeted profit

The marginal costing variances can now be put together in a reconciliation statement. You should spend some time studying the statement which follows, noting the differences between this statement and the one prepared using absorption costing. Think carefully about the reasons for the differences and ensure that you understand each figure in the statement. The format of the statement is not prescriptive but it is a useful layout because it focuses the reader's attention on the contribution for the period.

Profit reconciliation statement for May: standard marginal costing

		£	£
Original budgeted contribution: 2,000 units × £58			116,000
Total sales contribution variance			(5,750)
Standard contribution from actual sales			110,250
Variable cost variances			
Direct material:	price	(1,954)	
	usage	(580)	
			(2,534)
Direct labour:	rate	4,361	
	efficiency	168	
			4,529
Variable production overhead:	expenditure	(8,722)	
	efficiency	56	
			(8,666)
Actual contribution			103,579
Fixed production overhead:	budget	40,000	
	expenditure variance	2,590	
			37,410
Actual gross profit			66,169

Note: Variances in brackets are adverse.

12.5 Idle time variances

You may come across a situation where idle time has occurred. Idle time is defined by CIMA as 'the period for which a workstation is available for production but is not used due to, e.g., shortage of tooling, material or operators (BS 5191)'.

During idle time, direct labour wages are being paid but no output is being produced. The cost of this can be highlighted separately in an idle time variance, so that it is not 'hidden' in an adverse labour efficiency variance. In this way, management attention can be directed towards the cost of idle time.

Variable production overhead variances can also be affected by idle time. It is usually assumed that variable production overhead expenditure is incurred in active hours only – for example, only when the machines are actually running, incurring power costs, etc. – therefore variable production overhead expenditure is not being incurred during idle hours. The variable production overhead efficiency variance is affected in the same way as the labour efficiency variance.

Example

To demonstrate this, suppose that in the last example you were given the following additional information about the actual results recorded during May.

Of the 8,722 hours of direct labour paid for, 500 hours were idle because of a shortage of material supplies.

An idle time variance could be calculated as follows:

Idle time variance

Idle hours $\times$ standard labour rate per hour

$$= 500 \times £6$$
$$= £3,000 \text{ adverse}$$

This is the standard cost of wages incurred during the idle time.

These idle hours must be eliminated from the calculation of the labour efficiency variance, so that the efficiency of labour is being measured only during the hours when they were actually working. This gives a much more meaningful measure of labour efficiency.

Direct labour efficiency variance

	Hours	
1,750 units produced should have taken ($\times$ 5 hours)	8,750	
But did take (active hours)	8,222	
Variance in hours	528	favourable
$\times$ standard labour rate per hour (£6)		
Direct labour efficiency variance	£3,168	favourable

The total of these two variances is the same as the original labour efficiency variance (£168 favourable). The effect on the variable production overhead variances would be as follows:

Variable production overhead expenditure variance

	£	
8,222 active hours of variable production overhead should cost ($\times$ £2)	16,444	
But did cost	26,166	
Variable production overhead expenditure variance	9,722	adverse

Variable production overhead efficiency variance

	Hours	
1,750 units produced should have taken (× 5 hours)	8,750	
But did take (active hours)	8,222	
Variance in hours	528	favourable
× standard variable overhead rate per hour (£2)		
Variable production overhead efficiency variance	£1,056	favourable

The total of £8,666 adverse for the two variable production overhead variances is not affected by the idle time (you should check this for yourself). However, we have now measured efficiency during active hours only, and we have allowed variable production overhead expenditure only for active hours.

12.6 Interpreting variances

12.6.1 The reasons for variances

There are many possible causes of variances, ranging from errors in setting the standard cost to efficiencies and inefficiencies of operations. Table 12.1 shows the possible causes of variances. This table is not exhaustive, but it will give you an idea of the range of possible causes.

In an assessment question, you should review the information given and select any feasible cause that is consistent with the variance in question: that is, if the variance is favourable you must select a cause that would result in a favourable variance.

12.6.2 The significance of variances

Once the variances have been calculated, management has the task of deciding which variances should be investigated. It would probably not be worth while or cost effective to investigate every single variance. Some criteria must be established to guide the decision as to whether or not to investigate a particular variance.

Factors which may be taken into account include the following:

(a) *The size of the variance*. Costs tend to fluctuate around a norm and therefore 'normal' variances may be expected on most costs. The problem is to decide how large a variance must be before it is considered 'abnormal' and worthy of investigation.

A rule of thumb may be established that any variance which exceeds, say, 5 per cent of its standard cost may be worthy of investigation. Alternatively, control limits may be set statistically and if a cost fluctuates outside these limits it should be investigated.

(b) *The likelihood of the variance being controllable*. Managers may know from experience that certain variances may not be controllable even if a lengthy investigation is undertaken to determine their causes. For example it may be argued that a material price variance is less easily controlled than a material usage variance because it is heavily influenced by external factors.

(c) *The likely cost of an investigation*. This cost would have to be weighed against the cost which would be incurred if the variance was allowed to continue in future periods.

(d) *The interrelationship of variances*. Adverse variances in one area of the organisation may be interrelated with favourable variances elsewhere. For example, if cheaper material is purchased this may produce a favourable material price variance. However, if the

Table 12.1 Causes of variances

Variance	Favourable	Adverse
Material price	Standard price set too high Unexpected discounts available Lower-quality material used Careful purchasing Gaining bulk discounts by buying larger quantities	Standard price set too low Unexpected general price increase Higher-quality material used Careless purchasing Losing bulk discounts by buying smaller quantities
Material usage	Standard usage set too high Higher-quality material used A higher grade of worker used the material more efficiently Stricter quality control	Standard usage set too low Lower-quality material used A lower grade of worker used the material less efficiently Theft
Labour rate	Standard rate set too high Lower grade of worker used	Standard rate set too low Higher grade of worker used Higher rate due to wage award
Labour efficiency	Standard hours set too high Higher grade of worker Higher grade of material was quicker to process More efficient working through improved motivation	Standard hours set too low Lower grade of worker Lower grade of material was slower to process Less efficient working due to poor motivation
Idle time		Shortage of work Machine breakdown Shortage of material
Variable overhead expenditure	Standard hourly rate set too high	Standard hourly rate set too low
	Overheads consist of a number of items: indirect materials, indirect labour, maintenance costs, power, etc., which may change because of rate changes or variations in consumption. Consequently, any meaningful interpretation of the expenditure variance must focus on individual cost items.	
Variable overhead efficiency	See labour efficiency variance	
Fixed overhead expenditure	Savings in costs, e.g. rates, rent Original budgeted expenditure too high	Increase in costs, e.g. rates, rent Original budgeted expenditure too low
Fixed overhead volume	Increase in demand leading to increased production levels Original budgeted activity too low	Fall in demand leading to lower production levels Original budgeted activity too high Production lost due to strike
Total sales margin	Higher quality product commanded higher selling price than standard Increased marketing activity led to higher than budgeted sales volumes	Increased competition forced a reduction in selling price below standard Quality control problems resulted in lower than budgeted sales volumes

cheaper material is of lower quality and difficult to process, this could result in adverse variances for material usage and labour efficiency.

(e) *The type of standard that was set.* You have already seen that an ideal standard will almost always result in some adverse variances, because of unavoidable waste, etc. Managers must decide on the 'normal' level of adverse variance which they would expect to see.

Another example is where a standard price is set at an average rate for the year. Assuming that inflation exists, favourable price variances might be expected at the beginning of the year, to be offset by adverse price variances towards the end of the year as actual prices begin to rise.

A detailed knowledge of the significance of variances is outside the scope of your *Management Accounting Fundamentals* syllabus. However, you should now be aware that the use of standard costing systems for control purposes does not end with the calculation of the variances.

12.7 Standard cost bookkeeping

In the remainder of this chapter you will learn how to record standard costs and variances in the ledger accounts. To be able to study this material effectively you must have a sound understanding of:

(a) the workings of an integrated accounting system;
(b) the calculation of cost variances in a standard costing system.

If you are not confident that you have a sound understanding of both of these subjects, then you should return and study them carefully before you begin on this section of the chapter.

12.8 Recording variances in the ledger accounts

A ledger account is usually kept for each cost variance. As a general rule, all variances are entered in the accounts at the point at which they arise. For example:

(a) labour rate variances arise when the wages are paid. Therefore, they are entered in the wages control account. An adverse variance is debited in the account for wage rate variance and credited in the wages control account. For a favourable variance the entries would be the opposite way round;
(b) labour efficiency variances arise as the employees are working. Therefore, the efficiency variance is entered in the work in progress account. An adverse variance is debited in the account for labour efficiency variance and credited in the work in progress account. For a favourable variance the entries would be the opposite way round.

12.8.1 General rules for recording variances

Although variations do exist, you will find the following general rules useful when you are recording variances in the ledger accounts:

(a) The materials price variance is recorded in the materials stock account. This is the procedure if the materials inventory (stock) is held at standard cost. We will learn more about this later in the chapter.
(b) The labour rate variance is recorded in the wages control account.
(c) The 'quantity' variances, that is, material usage, labour efficiency and variable production overhead efficiency, are recorded in the work in progress account.

(d) The variances for variable production overhead expenditure and for fixed production overhead are usually recorded in the production overhead control account.
(e) Sales values are usually recorded at actual amounts and the sales variances are not shown in the ledger accounts. The calculation of detailed sales variances is outside the scope of the *Management Accounting Fundamentals* syllabus.

Remember that the amount of variance is recorded in the relevant variance account (a debit for an adverse variance and a credit for a favourable variance). The 'other side' of the entries are those detailed in this list.

12.8.2 The income statement (profit and loss account)

You will see from this list that all of the variances are eliminated before any entries are made in the finished goods stock account. The finished goods stock is therefore held at standard cost and the transfer to the cost of sales account and to the profit and loss account will be made at standard cost.

At the end of the period the variance accounts are totalled and transferred to the profit and loss account. Adverse variances are debited to profit and loss and favourable variances are credited.

In this way the actual cost (standard cost, plus or minus the variances) is charged against the sales value in the profit and loss account for the period.

12.9 Standard cost bookkeeping: an example

Work carefully through the following example of integrated standard cost bookkeeping. It will also give you some useful practice at calculating cost variances.

JC Ltd produces and sells one product only, product J, the standard cost of which is as follows for one unit:

	£
Direct material X: 10 kg at £20	200
Direct material Y: 5 litres at £6	30
Direct wages: 5 hours at £6	30
Fixed production overhead	50
Total standard cost	310
Standard gross profit	90
Standard selling price	400

The fixed production overhead is based on an expected annual output of 10,800 units produced at an even flow throughout the year; assume each calendar month is equal.

The information about the even flow of production enables us to assume that the expected monthly output used for the calculation of the overhead absorption rate is 900 units ($\frac{10,800}{12}$).

During April, the first month of the financial year, the following were the actual results for an actual production of 800 units:

	£	£
Sales on credit: 800 units at £400		320,000
Direct materials:		
X 7,800 kg	159,900	
Y 4,300 litres	23,650	
Direct wages: 4,200 hours	24,150	
Fixed production overhead	47,000	
		254,700
Gross profit		65,300

The material price variance is extracted at the time of receipt and the raw materials stores control is maintained at standard prices. The purchases, bought on credit, during the month of April were:

X 9,000 kg at £20.50 per kg from K Ltd
Y 5,000 litres at £5.50 per litre from C plc

Assume no opening stocks.
Other information:

- Wages owing for March brought forward were £6,000.
- Wages paid during April (net) were £20,150.
- Deductions from wages owing to the Inland Revenue for PAYE and NI were £5,000 and the wages accrued for April were £5,000.
- The fixed production overhead of £47,000 was made up of expenses creditors of £33,000, none of which was paid in April, and depreciation of £14,000.
- The company operates an integrated accounting system.

You are required to:

(a) Calculate the cost variances for the month of April.
(b) Show all the accounting entries in T-accounts for the month of April. The work in progress account should be maintained at standard cost and each balance on the separate variance accounts is to be transferred to a profit and loss account which you are also required to show.
(c) Explain the reason for the difference between the actual gross profit given in the question and the profit shown in your profit and loss account.

Exercise 12.1

See if you can calculate all the variances before you look at the solution. You might also like to try to complete the bookkeeping entries yourself, using the earlier list of general rules to guide you.

Solution

(a) *Direct material price variance*

Material X	£	
9,000 kg purchased should have cost (× £20)	180,000	
But did cost (9,000 × £20.50)	184,500	
Direct material price variance	4,500	adverse

Material Y	£	
5,000 litres purchased should have cost (× £6)	30,000	
But did cost (5,000 × £5.50)	27,500	
Direct material price variance	2,500	favourable

Direct material usage variance

Material X	*kg*	
800 units produced should have used (× 10kg)	8,000	
But did use	7,800	
Variance in kg	200	favourable
× standard price per kg (£20)		
Direct material usage variance	£4,000	favourable

Material Y	*Litres*	
800 units produced should have used (× 5 litres)	4,000	
But did use	4,300	
Variance in litres	300	adverse
× standard price per litre (£6)		
Direct material usage variance	£1,800	adverse

Direct labour rate variance

	£	
4,200 hours should have cost (× £6)	25,200	
But did cost	24,150	
Direct labour rate variance	1,050	favourable

Direct labour efficiency variance

	Hours	
800 units produced should have taken (× 5 hours)	4,000	
But did take	4,200	
Variance in hours	200	adverse
× standard labour rate per hour (£6)		
Direct labour efficiency variance	£1,200	adverse

Fixed production overhead expenditure variance

	£	
Budgeted expenditure*	45,000	
Actual expenditure	47,000	
Overhead expenditure variance	2,000	adverse

*The budgeted overhead expenditure for the year = 10,800 × £50 = £540,000. Therefore, for one month it is £540,000/12 = £45,000.

Fixed production overhead volume variance

	Units	
Actual activity level	800	
Budgeted activity level	900	
Difference	100	
× fixed production overhead absorption rate (£50)		
Fixed overhead volume variance	£5,000	adverse

The budget output for one month is 10,800/12 = 900 units. The volume variance is adverse because the actual output was lower than budget. This would have led to under-absorption of overheads.

(b) The easiest way to approach this question is probably to follow the production through: deal first with the purchase and then the issue of the material; then move on to deal with the information about the wages. Lastly, prepare the control account for overheads, before dealing with the transfer from the work in progress account.

Numbers in brackets refer to the notes following the accounts.

Raw materials stores control

	£		£
K Ltd: material X (1)	184,500	Direct material price variance:	
C plc: material Y (2)	27,500	material X (1)	4,500
Direct material price variance:		Work in progress (3)	
material Y (2)	2,500	material X (7,800 × £20)	156,000
		material Y (4,300 × £6)	25,800
		Closing stock c/f	28,200
	214,500		214,500

K Ltd

	£		£
Balance c/f	184,500	Raw materials stores control (1)	184,500
	184,500		184,500

C plc

	£		£
Balance c/f	27,500	Raw materials stores control (2)	27,500

Work in progress stock control

	£		£
Raw material stores: (3)		Direct material usage variance: (3)	
material X	156,000	material Y	1,800
material Y	25,800	Direct labour efficiency variance (6)	1,200
Direct material usage variance: (3)		Finished goods stock: (8)	
material X	4,000	800 units × £310	248,000
Wages control (5)	25,200		
Production overhead control (7)	40,000		
	251,000		251,000

Wages control

	£		£
Bank (4)	20,150	Wages owing b/f	6,000
PAYE and NI creditor (4)	5,000	Work in progress (4,200 × £6) (5)	25,200
Wages owing c/f	5,000		
Labour rate variance (5)	1,050		
	31,200		31,200
		Wages owing b/f	5,000

Bank

	£		£
		Wages control (4)	20,150

PAYE & NI creditor

	£		£
		Wages control (4)	5,000

Production overhead control

	£		£
Expenses creditors	33,000	Work in progress: (7)	
Provision for depreciation	14,000	(800 units × £50)	40,000
		Fixed overhead variances: (7)	
		expenditure	2,000
		volume	5,000
	47,000		47,000

Expenses creditors

	£		£
		Production overhead control	33,000

Provision for depreciation

	£		£
		Production overhead control	14,000

Finished goods stock control

	£		£
Work in progress (8)	248,000	Cost of sales (8)	248,000

Cost of sales

	£		£
Finished goods stock (8)	248,000	Profit and loss (8)	248,000

Sales

	£		£
Profit and loss	320,000	Debtors	320,000

Debtors

	£		£
Sales	320,000		

Direct material price variance

	£		£
Raw material stores control (1)	4,500	Raw material stores control (2)	2,500
		Profit and loss (9)	2,000
	4,500		4,500

Direct material usage variance

	£		£
Work in progress: material Y (3)	1,800	Work in progress: material X (3)	4,000
Profit and loss (9)	2,200		
	4,000		4,000

Direct labour rate variance

	£		£
Profit and loss (9)	1,050	Wages control (5)	1,050

Direct labour efficiency variance

	£		£
Work in progress control (6)	1,200	Profit and loss (9)	1,200

Fixed production overhead expenditure variance

	£		£
Production overhead control (7)	2,000	Profit and loss (9)	2,000

Fixed production overhead volume variance

	£		£
Production overhead control (7)	5,000	Profit and loss (9)	5,000

The profit and loss account could also be shown as a T-account. However, a vertical presentation is probably preferable.

Profit and loss account for April

	£	£	£
Sales			320,000
Cost of sales (8)			248,000
			72,000
Cost variances			
Direct material price	(2,000)		
Direct material usage	2,200		
		200	
Direct labour rate	1,050		
Direct labour efficiency	(1,200)		
		(150)	
Fixed production overhead expenditure	(2,000)		
Fixed production overhead volume	(5,000)		
		(7,000)	
			(6,950)
Gross profit			65,050

Note: Variances in brackets are adverse.

Explanatory notes

1. The actual cost of material X purchases is debited to the raw materials stores control and credited to K Ltd. The adverse price variance is credited to the raw materials stores control and debited to the variance account. The net effect of these two entries is that the material is held in the stores account at standard cost.
2. The actual cost of material Y purchases is debited to the raw materials stores control and credited to C plc. To bring the stock value of material Y up to standard cost, the favourable price variance is debited to the stores control account and credited to the variance account.
3. The standard cost of the actual material usage is transferred from the raw materials stock to work in progress. The usage variances are transferred from work in progress to the material usage variance account. An adverse variance is debited to the variance account and credited to work in progress. A favourable variance is credited to the variance account and debited to work in progress.

   The net balance for materials cost in the work in progress account is now equal to the standard material cost for 800 units. Check this for yourself.
4. The two debit entries in the wages control account together make up the gross wages payable for April, after the adjustments for the month-end accruals.
5. The standard wages cost of the hours worked is debited to work in progress. The favourable labour rate variance is credited to the variance account.
6. The adverse labour efficiency variance is transferred from work in progress to the relevant variance account.

   The net balance for wages cost in the work in progress account is now equal to the standard wages cost for 800 units. Check this for yourself.
7. The standard fixed production overhead cost of 800 units produced is transferred from the overhead control account to work in progress. The fixed production overhead variances are both adverse and are therefore debited to the relevant variance accounts.
8. The standard production cost of 800 units is transferred from work in progress to finished goods stock. Since no stocks are held, this amount is transferred at the end of the month to cost of sales, and from there to the profit and loss account.

9. At the end of April, the balances on the variance accounts are transferred to the profit and loss account.

(c) The difference between the actual gross profit given in the question and the profit shown in the profit and loss account in the solution to part (b) is £250.

	£
Actual gross profit given in question	65,300
Profit shown in solution to part (b)	65,050
Difference	250

This difference is caused by the treatment of the direct material price variance.

In the actual results given in the question, the material price variance on only the material actually used has been charged against the sales value. In the bookkeeping entries in part (b), the material price variances on all of the purchases for the month have been recorded and transferred to the profit and loss account.

The difference is therefore represented by the price variance on the materials in inventory (stock) at the end of April.

Direct material	*Purchases*	*Usage*	*Stock balance*	*Price variance per unit*	*Price variance in stock £*
X	9,000 kg	7,800 kg	1,200 kg	£20 − £20.50 = (£0.50)	(600)
Y	5,000 litres	4,300 litres	700 litres	£6 − £5.50 = £0.50	350
					(250)

Note: Variances in brackets are adverse.

12.10 Valuing material inventory (stock) at actual cost

In chapter 11 you saw that the material price variance is calculated using a different method if stock is valued at actual cost. If material stock had been valued at actual cost in the previous example the material price variance would have been calculated as:

Direct material price variance

Material X	£	
7,800 kg used should have cost (× £20)	156,000	
But did cost	159,900	
Direct material price variance	3,900	adverse

Material Y	£	
4,300 litres used should have cost (× £6)	25,800	
But did cost	23,650	
Direct material price variance	2,150	favourable

The raw material stock account would look like this:

Raw materials stores control

	£		£
K Ltd: material X		Work in progress:	
(9,000 × £20.50)	184,500	material X (7,800 × £20)	156,000
C plc: material Y		material Y (4,300 × £6)	25,800
(5,000 × £5.50)	27,500	Direct material price variance:	
Direct material price variance:		material X	3,900
material Y	2,150	Closing stock c/f	28,450
	214,150		214,150

Notice that the transfer to the work in progress account is the same as before, therefore that account will not be altered by the raw material stock valuation method.

Check that the raw material stock balance carried forward into May is correctly valued at actual cost.

	£
Material X: 1,200 kg × £20.50	24,600
Material Y: 700 litres × £5.50	3,850
Actual cost of material stock	28,450

12.10.1 Which inventory (stock) valuation method is generally preferred?

It is generally accepted that it is better to value the raw material stock at standard cost, for the following reasons:

(a) The whole of the price variance is eliminated as soon as the raw materials are purchased. This means that stocks are valued at a uniform rate and that the price variances are highlighted earlier for management attention.

(b) Raw materials are often purchased in single batches, then broken into several smaller batches for issue to production. If raw materials stocks are valued at actual cost, then a separate variance calculation is required for each issue. With valuation at standard cost, one single calculation is required on purchase.

12.11 Summary

Having read this chapter the main points that you should understand are as follows.

1. The total sales margin variance measures the change in profit caused by the selling price or sales volume being different from the standard or budget.
2. In a standard marginal costing system there is no fixed production overhead volume variance and the total sales margin variance is replaced by the total sales contribution variance.
3. The idle time variance is always adverse. It is calculated as the number of hours idle multiplied by the standard labour rate per hour. If there is idle time then the variances

for labour efficiency, variable production overhead efficiency and variable production overhead expenditure should be based on active hours only.

4. As a general rule, in a standard cost bookkeeping system, variances are entered in the accounts at the point at which they arise. A favourable variance is credited in the relevant variance account. An adverse variance is debited in the relevant variance account.

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Revision Questions 12

Question 1 Multiple choice

1.1 Q Ltd uses an integrated standard costing system. In October, when 2,400 units of the finished product were made, the actual material cost details were:

Material purchased	5,000 units @ £4.50 each
Material used	4,850 units

The standard cost details are that two units of the material should be used for each unit of the completed product, and the standard price of each material unit is £4.70.

The entries made in the variance accounts would be:

	Material price variance account	*Material usage variance account*
(A)	Debit £970	Debit £225
(B)	Debit £1,000	Debit £225
(C)	Credit £970	Debit £235
(D)	Credit £1,000	Debit £235

1.2 The bookkeeping entries in a standard cost system when the actual price for raw materials is less than the standard price are:

	Debit	*Credit*
(A)	Raw materials control account	Raw materials price variance account
(B)	WIP control account	Raw materials control account
(C)	Raw materials price variance account	Raw materials control account
(D)	WIP control account	Raw materials price variance account

1.3 A firm uses standard costing and an integrated accounting system. The double entry for an adverse material usage variance is:

	Debit	*Credit*
(A)	Stores control account	Work in progress control account
(B)	Material usage variance account	Stores control account
(C)	Work in progress control account	Material usage variance account
(D)	Material usage variance account	Work in progress control account

1.4 In a standard cost bookkeeping system, when the actual hourly rate paid for labour is less than the standard hourly rate, the double entry to record this is:

(A) debit wages control account; credit labour rate variance account.
(B) debit work in progress control account; credit labour rate variance account.

(C) debit labour rate variance account; credit wages control account.
(D) debit labour rate variance account; credit work in progress control account.

1.5 D plc operates a standard absorption costing system. Its standard fixed overhead absorption rate, based on a monthly budget of 2,400 standard hours, is £5.00 per standard hour.

During October the actual fixed overhead cost incurred was £13,100 when the standard hours produced were 2,350.

The variance entries in D plc's ledgers are:

	Account name	*Debit* £	*Credit* £
(A)	Fixed overhead expenditure variance	1,100	
	Fixed overhead volume variance	250	
	Work in progress		1,350
(B)	Work in progress		850
	Fixed overhead expenditure variance	1,100	
	Fixed overhead volume variance		250
(C)	Fixed overhead expenditure variance	1,350	
	Fixed overhead volume variance		250
	Fixed overhead control		1,100
(D)	Fixed overhead expenditure variance	1,100	
	Fixed overhead volume variance	250	
	Fixed overhead control		1,350

1.6 A standard marginal costing system:

(i) calculates fixed overhead variances using the budgeted absorption rate per unit.
(ii) records adverse variances as debit entries in variance accounts within the ledger.
(iii) values finished goods stock at the standard variable cost of production.

Which of the above statements is/are correct?

(A) (i) and (iii) only.
(B) (ii) only.
(C) (ii) and (iii) only.
(D) (i) and (ii) only.

1.7 J Ltd uses a standard absorption costing system and has the following data relating to its product:

	£	£
Selling price		9.00
Variable costs	4.00	
Fixed costs	3.00	
		7.00
Standard profit per unit		2.00

Budgeted sales for October were 800 units, but the actual sales were 850 units. The revenue earned from these sales was £7,480.

The total sales margin variance for October was:

(A) £70 adverse
(B) £100 favourable
(C) £170 adverse
(D) £350 favourable.

? Question 2 Short objective-test questions

2.1 Is the following statement *true* or *false*?
If material stock is valued at standard cost then the material price variance calculation should be based on the materials actually used during the period.

True ☐
False ☐

2.2 The direct material usage variance for last period was £3,400 adverse. Which of the following reasons could have contributed to this variance? (Tick all that apply.)

(a) Output was higher than budgeted. ☐
(b) The purchasing department bought poor quality material. ☐
(c) The original standard usage was set too high. ☐
(d) Market prices for the material were higher than expected. ☐
(e) An old, inefficient machine was causing excess wastage. ☐

2.3 If employees are more skilled than had been allowed for in the original standard cost, which *five* of the following variances are most likely to result?

(a) favourable material usage; ☐
(b) adverse material usage; ☐
(c) favourable labour efficiency; ☐
(d) adverse labour efficiency; ☐
(e) favourable labour rate; ☐
(f) adverse labour rate; ☐
(g) favourable variable overhead efficiency; ☐
(h) adverse variable overhead efficiency; ☐
(i) favourable fixed overhead volume; ☐
(j) adverse fixed overhead volume. ☐

2.4 Stocks of material W are valued at their standard price of £7 per kilogram. Last period, 900 kg of W were purchased for £5,400, of which 800 kg were issued to production. Which of the following accounting entries would arise as a result of these transactions? (Tick all that apply.)

		£	
(a)	Raw material stock	5,400 debit	☐
(b)	Raw material stock	6,300 debit	☐
(c)	Work in progress	4,800 debit	☐
(d)	Work in progress	5,600 debit	☐
(e)	Material price variance	800 credit	☐

(f)	Material price variance	800 debit	☐
(g)	Material price variance	900 credit	☐
(h)	Material price variance	900 debit	☐

2.5 The budgeted contribution for last month was £43,900 but the following variances arose:

	£
Total sales contribution variance	4,200 adverse
Direct material price variance	1,986 favourable
Direct material usage variance	2,200 adverse
Direct labour rate variance	1,090 adverse
Direct labour efficiency variance	512 adverse
Variable overhead expenditure variance	2,106 favourable
Variable overhead efficiency variance	465 adverse
Fixed overhead expenditure variance	890 adverse

The actual contribution for last month was £ ☐

2.6 Extracts from the standard cost card for product N are as follows.

	£
Direct labour: 14 hours @ £11 per hour	154
Variable production overhead: 14 hours @ £3 per hour	42

During the latest period, 390 units of product N were produced. Details concerning direct labour and variable production overhead are as follows:

Direct labour: amount paid for 5,720 hours = £68,640
Variable production overhead cost incurred = £16,280

Of the 5,720 labour hours paid for, 170 hours were recorded as idle time due to a machine breakdown.

Calculate the following variances and tick the correct box to indicate whether each variance is adverse or favourable:

		Adverse	*Favourable*
(a)	the direct labour rate variance is £ ☐	☐	☐
(b)	the direct labour efficiency variance is £ ☐	☐	☐
(c)	the idle time variance is £ ☐	☐	☐
(d)	the variable production overhead expenditure variance is £ ☐	☐	☐
(e)	the variable production overhead efficiency variance is £ ☐	☐	☐

? Question 3 Standard costing in a service organisation

Carshine Services employs a number of people providing a car cleaning and valeting service which operates in the car parks of local supermarkets and railway stations. In an attempt to control costs and revenues the company has established the following standard cost and fee per car cleaned and valeted:

	£ per car
Materials: shampoo/polish: 0.5 litres @ £2.00 per litre	1.00
Labour: 0.75 hour @ £6 per hour	4.50
Fixed overhead	2.00
Total cost	7.50
Standard profit	2.50
Standard fee per car	10.00

The standard fixed overhead cost per car is based on fixed overhead costs of £6,000 per month. In March, a total of 2,800 cars were cleaned and the following costs and revenues were recorded:

	£	£
Sales revenue		28,050
Shampoo/polish: 1,460 litres	2,800	
Labour: 2,020 hours	12,726	
Fixed overhead	6,230	
		21,756
Profit		6,294

Requirements

The following cost and sales variances will be recorded for March. Tick the box to indicate whether each variance is adverse or favourable

		Adverse	*Favourable*
(a) material price:	£ ☐	☐	☐
(b) material usage:	£ ☐	☐	☐
(c) labour rate:	£ ☐	☐	☐
(d) labour efficiency:	£ ☐	☐	☐
(e) fixed overhead expenditure:	£ ☐	☐	☐
(f) fixed overhead volume:	£ ☐	☐	☐
(g) total sales margin:	£ ☐	☐	☐

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Solutions to Revision Questions 12

✓ Solution 1

- Some of these multiple-choice questions are quite lengthy, particularly where you need to calculate two variances for the answer. Remember to calculate your own answers first before you look at the available options.
- An adverse variance is always debited to the relevant variance account. A favourable variance is always credited to the variance account.

1.1 Answer: (D)

Price variance:	£
5,000 units should cost each	4.70
But actually cost	4.50
Saving	0.20

5,000 × £0.20 = £1,000 (F) – credited to variance account

Usage variance	*Material units*
2,400 finished units should use	4,800
Actual material usage	4,850
Which is an extra	50 units

50 units @ £4.70 (standard price) = £235(A) – debited to variance account

1.2 Answer: (A)

If the actual price for raw materials is less than the standard price then the raw material price variance is favourable. The variance account would therefore be credited. The corresponding debit entry is made in the raw materials control account.

1.3 Answer: (D)

An adverse variance is debited to the relevant variance account. This leaves us with options (B) or (D). The usage variance is eliminated where it arises, that is, in the work in progress account. Therefore, (D) is the correct answer.

1.4 Answer: (A)

The actual hourly rate is less than standard. Therefore, the rate variance is favourable and is credited to the variance account.

1.5 Answer: (D)

	£	
Budgeted fixed overhead: 2,400 std. hours × £5	12,000	
Actual fixed overhead	13,100	
Fixed overhead expenditure variance	1,100	adverse

This adverse variance is debited to the fixed overhead expenditure variance account and credited to the fixed overhead control account.

Budgeted standard hours of production	2,400
Actual standard hours produced	2,350
Shortfall	50

Fixed overhead volume variance (@ £5 per standard hour) = £250 adverse

This adverse variance is debited to the fixed overhead volume variance account and credited to the fixed overhead control account.

1.6 Answer: (C)

Fixed overheads are not absorbed in a marginal costing system. Therefore, statement (i) is incorrect. Adverse variances are always debit entries in the relevant variance accounts. Therefore statement (ii) is correct. Statement (iii) is also correct.

1.7 Answer: (A)

	£	
Actual sales revenue	7,480	
Standard cost of units sold (850 × £7)	5,950	
Actual margin, based on standard unit costs	1,530	
Budgeted margin (800 × £2)	1,600	
Total sales margin variance	70	adverse

☑ Solution 2

2.1 *False*. When material stock is valued at standard, the material price variance is based on the materials purchased.

2.2 (b) Poor quality material could have led to higher wastage.
(e) Excess wastage causes an adverse material usage variance.

A higher output (a) would not in itself cause an adverse usage variance, because the expected usage of material would be flexed according to the actual output achieved.

Setting the original standard usage too high (c) is likely to lead to favourable usage variances.

Higher market prices (d) would cause adverse material price variances.

2.3 (a) Highly skilled employees may use material more efficiently.
(c) Highly skilled employees may work more quickly.

(f) Highly skilled employees are likely to be paid a higher hourly rate.
(g) Highly skilled employees may work more quickly.
(i) Highly skilled employees may produce a higher output.

2.4 (b) Standard price of purchases is debited to the stock account (900 × £7).
(d) Standard price of material issues is debited to work in progress (800 × £7).
(g) Favourable material price variance is credited to variance account:

	£	
900 kg purchased should cost (× £7)	6,300	
But did cost	5,400	
Material price variance	900	favourable

2.5 The actual contribution for last month was £38,635.

Workings:

When working from the budgeted contribution to the actual contribution, adverse variances are deducted from the budgeted contribution; favourable variances are added to the budgeted contribution.

£(43,900 – 4,200 + 1,986 – 2,200 – 1,090 – 512 + 2,106 – 465 – 890) = £38,635.

2.6

(a) Direct labour rate variance = £5,720 adverse
(b) Direct labour efficiency variance = £990 adverse
(c) Idle time variance = £1,870 adverse
(d) Variable production overhead expenditure variance = £370 favourable
(e) Variable production overhead efficiency variance = £270 adverse

Workings

(a)

	£	
5,720 hours paid for should cost (× £11)	62,920	
But did cost	68,640	
Direct labour rate variance	5,720	favourable

(b)

	Hours	
390 units should take (× 14)	5,460	
But did take (active hours = 5,720 – 170)	5,550	
Variance in hours	90	adverse
× standard labour rate per hour (£11)		
Direct labour efficiency variance	£990	adverse

(c) Idle time variance = 170 hours × £11 standard rate = £1,870 adverse

(d)

	£	
Variable overhead cost of 5,550 active hours should be (× £3)	16,650	
Actual variable overhead cost	16,280	
Variable production overhead expenditure variance	370	favourable

(e)

Efficiency variance in hours (from labour efficiency variance)	90	adverse
× standard variable production overhead rate per hour	£3	
Variable production overhead efficiency variance	£270	adverse

Solution 3

- Do not be put off by the fact that this is a service organisation. An important point to learn from this question is that the variance calculations in a service organisation are no different from those in a manufacturing organisation.
- Once again, remember to indicate whether your calculated variances are adverse or favourable.

(a) £120 favourable
(b) £120 adverse
(c) £606 adverse
(d) £480 favourable
(e) £230 adverse
(f) £400 adverse
(g) £450 adverse.

Workings:
Material price variance

	£	
1,460 litres should have cost (× £2)	2,920	
But did cost	2,800	
Material price variance	120	favourable

Material usage variance

	Litres	
2,800 cars should have used (× 0.5 litres)	1,400	
But did use	1,460	
Variance in litres	60	adverse
× standard price per litre (£2)		
Material usage variance	£120	adverse

Labour rate variance

	£	
2,020 hours should have cost (× £6)	12,120	
But did cost	12,726	
Labour rate variance	606	adverse

Labour efficiency variance

	Hours	
2,800 cars should have taken (× 0.75 hour)	2,100	
But did take	2,020	
Variance in hours	80	favourable
× standard rate per hour (£6)		
Labour efficiency variance	£480	favourable

Fixed overhead expenditure variance

	£	
Budgeted fixed overhead	6,000	
Actual fixed overhead	6,230	
Fixed overhead expenditure variance	230	adverse

Fixed overhead volume variance

	Cars	
Actual activity level	2,800	
Budgeted activity level (£6,000/£2)*	3,000	
Difference	200	
× fixed overhead absorption rate (£2)		
Fixed overhead volume variance	£400	adverse

Total sales margin variance

	£	
Actual sales revenue	28,050	
Std cost of cars cleaned (2,800 × £7.50)	21,000	
Actual margin, based on std unit costs	7,050	
Budgeted margin (3,000* cars × £2.50)	7,500	
Total sales margin variance	450	adverse

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Preparing for the Assessment

This chapter is intended for use when you are ready to start revising for your assessment. It contains:

- Details of the format of the assessment.
- A summary of useful revision techniques.
- Guidance on how to tackle the assessment.
- A bank of assessment-standard revision questions and suggested solutions.
- Two mock assessments. These should be attempted when you consider yourself to be ready for the assessment, and you should simulate assessment conditions when you attempt them.

Format of the assessment

The assessment for *Management Accounting Fundamentals* is a 90-minute computer-based assessment (CBA) comprising 40 objective test questions with one or more parts. There will be no choice of questions and all questions should be attempted if time permits. There is no penalty for incorrect answers.

Objective questions are used. The most common type is multiple choice, where the candidate is required to select the correct answer from a list of possible options. Other types of objective question that may be used include true/false questions, matching pairs of text and graphic, sequencing and ranking, labelling diagrams and single and multiple numeric entry. Candidates answer the questions by pointing and clicking the mouse, moving objects around the screen, typing numbers, or a combination of these responses.

CIMA are continuously developing the question styles within the cba system and you are strongly advised to try the online demo at www.cimaglobal.com/cba. This will enable you to gain familiarity with the assessment software and to keep track of the latest style of questions being used. You are also advised to keep an eye on the articles in the 'Study Notes' section of *Financial Management* magazine which will forewarn of any changes in question styles.

Revision technique

Planning

The first thing to say about revision is that it is an addition to your initial studies, not a substitute for them. In other words, don't coast along early in your course in the hope of catching up during the revision phase. On the contrary, you should be studying and revising concurrently from the outset. At the end of each week, and at the end of each month, get into the habit of summarising the material you have covered to refresh your memory of it.

As with your initial studies, planning is important to maximise the value of your revision work. You need to balance the demands for study, professional work, family life and other commitments. To make this work, you will need to think carefully about how to make best use of your time.

Begin by comparing the estimated hours you will need to devote to revision with the hours available to you in the weeks leading up to the assessment. Prepare a written schedule setting out the areas you intend to cover during particular weeks, and break that down further into topics for each day's revision. To help focus on the key areas try to establish which areas you are weakest on, so that you can concentrate on the topics where effort is particularly needed.

Do not forget the need for relaxation, and for family commitments. Sustained intellectual effort is only possible for limited periods, and must be broken up at intervals by lighter activities. And do not continue your revision timetable right up to the moment when you enter the assessment room; you should aim to stop work a day or even two days before the assessment. Beyond this point, the most you should attempt is an occasional brief look at your notes to refresh your memory.

Getting down to work

By the time you begin your revision you should already have settled into a fixed work pattern: a regular time of day for doing the work, a particular location where you sit, particular equipment that you assemble before you begin and so on. If this is not already a matter of routine for you, think carefully about it now in the last vital weeks before the assessment.

You should have notes summarising the main points of each topic you have covered. Begin each session by reading through the relevant notes and trying to commit the important points to memory.

Usually this will be just your starting point. Unless the area is one where you already feel very confident, you will need to track back from your notes to the relevant chapter(s) in the *Study System*. This will refresh your memory on points not covered by your notes and fill in the detail that inevitably gets lost in the process of summarisation.

When you think you have understood and memorised the main principles and techniques, attempt some assessment questions. At this stage of your studies, you should normally be expecting to complete the questions in something close to the actual time allocation allowed in the assessment. After completing your effort, check the solution provided and add to your notes any extra points it reveals.

Tips for the final revision phase

As the assessment looms closer, consider the following list of techniques and make use of those that work for you:

- Summarise your notes into a more concise form, perhaps on index cards that you can carry with you for revision on the way to work.
- Go through your notes with a highlighter pen, marking key concepts and definitions.

- Summarise the main points in a key area by producing a wordlist, mind map or other mnemonic device.
- On areas that you find difficult, rework questions that you have already attempted, and compare your answers with those provided in the *Study System*.
- Rework questions you attempted earlier in your studies with a view to completing them within the time limits.
- In the week preceding the assessment, quickly go through any recent articles in the 'Study Notes' section of *Financial Management* magazine, paying particular attention to those relevant to your subject.
- Avoid late-night study, as your assessment is based on daytime performance, not night-time performance.
- Make sure that you cover the whole syllabus in your revision, as all questions in the assessment are compulsory.

How to tackle the assessment

Assessment day

- Before leaving for the assessment you should ensure that you know where you are going: plan your route and ensure that you have the necessary documentation and your calculator with you. It is advisable to bring a second calculator and some spare batteries!
- Arrive early and settle into your assessment environment. You will have enough nerves on the day without compounding them by arriving late.

The assessment

Multiple-choice questions

Multiple-choice questions (MCQs) are broken down into two parts; the problem or task to be solved, and the options you must choose from. There is only ever one correct answer: the other options are known as distractors.

Your approach to MCQs should be as follows:

- For numerical MCQs, in the majority of cases you will need to do some rough workings.
- Never rush to select your answer; some options might *initially* look plausible, but on closer scrutiny turn out to be distractors. Unless you are certain of the answer, look carefully at *all* the options before choosing.
- If you are finding the MCQ difficult and you are taking up too much time, move on to the next one.
- Time permitting, revisit those MCQs which you left unanswered and refer to your original workings.
- Remember: you must *never* omit to answer any question in the assessment as there is no penalty for an incorrect answer.

Other types of question

- Prepare neat workings where necessary *for your own benefit*. Only your final answers will be marked, not workings, methods or justifications. However, your workings will help you to achieve the necessary 100 per cent accuracy.
- Check your answer carefully. If you have typed in your answer, check the figures are typed correctly.
- *Never* omit to answer a question. There is no penalty for an incorrect answer.

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Revision Questions

The following table indicates the main learning outcome covered by each question in the bank that follows. Once you have revised each topic you can attempt the relevant question(s). However you should be aware that some questions relate to more than one learning outcome.

Learning outcome	**Question number(s)**
Explain raw material accounting and control procedures	5
Explain and calculate reorder quantity, reorder level, maximum stock, minimum stock and economic order quantity	7, 8, 11
Explain FIFO, LIFO and weighted average stock valuation methods	9, 10
Calculate stock, cost of sales and gross profit under LIFO, FIFO and weighted average	6, 12
Explain labour accounting and control procedures	13
Discuss and calculate factory incentive schemes for individuals and groups	14, 15
Explain absorption costing	16
Prepare cost statements for allocation and apportionment of overheads including reciprocal service departments	20, 21
Calculate and discuss overhead absorption rates	18, 20
Calculate under/over recovery of overheads	17, 19
Calculate product costs under absorption and marginal costing	40, 65
Compare and contrast absorption and marginal costing	38, 39
Explain the principles of standard costing	64
Prepare the standard cost for a product/service	65
Calculate and interpret variances for sales, material, labour, variable overheads and fixed overheads	66, 67, 68, 69, 70, 71, 72, 74, 75
Prepare a report reconciling gross profit/contribution with actual profit	73
Compare and contrast job, batch, contract and process costing systems	20, 22

Prepare ledger accounts for job, batch, contract and process costing systems	23, 24, 25, 26, 27, 28, 29, 30, 31
Prepare and contrast cost statements for service and manufacturing organisations	23, 32
Prepare profit and loss accounts from the same data under absorption and marginal costing and reconcile and explain the differences in reported profits	38, 40
Prepare accounting entries for an integrated accounting system using standard costs	76, 77
Explain the difference between integrated and interlocking accounting systems	33, 34, 35, 36, 37
Identify relevant costs and revenues	49, 50
Identify cost behaviour	1, 2, 4
Explain the contribution concept; calculate and interpret the breakeven point, profit target, margin of safety and profit/volume ratio for a single product; discuss CVP analysis	41, 42, 43, 46, 47
Prepare breakeven charts and profit/volume graphs for a single product	44, 45, 48
Calculate the profit-maximising sales mix for a company with a single resource constraint which has total freedom of action	51, 52
Explain why and how organisations prepare budgets	53, 54
Explain the use of IT in the budget process	55
Prepare functional budgets, profit and loss account, balance sheet and a simple cash budget	56, 57, 58, 59, 61, 62
Calculate simple cost estimates using high-low method and line of best fit	3
Prepare simple reports showing actual and budgeted results; prepare a fixed and flexible budget	63
Explain the differences between fixed and flexible budgets	60
Calculate expenditure, volume and total budget variances	63

? **Question 1** Cost behaviour

The following data have been collected for four cost types – W, X, Y, Z – at two activity levels:

	Cost 100 units	*Cost 140 units*
Cost type	*£*	*£*
W	8,000	10,560
X	5,000	5,000
Y	6,500	9,100
Z	6,700	8,580

Where V = variable, SV = semi-variable and F = fixed, assuming linearity, the four cost types W, X, Y and Z are, respectively:

	W	*X*	*Y*	*Z*
(A)	V	F	SV	V
(B)	SV	F	V	SV
(C)	V	F	V	V
(D)	SV	F	SV	SV

? **Question 2** Cost behaviour and overhead variances

The budgeted variable cost per unit was £2.75. When output was 18,000 units, total expenditure was £98,000 and it was found that fixed overheads were £11,000 over budget, while variable costs were in line with budget.

What was the amount budgeted for fixed costs?

(A) £37,500
(B) £48,500
(C) £49,500
(D) £87,000.

? **Question 3** High–low method

The following data relate to the overhead expenditure of a contract cleaners at two activity levels:

Square metres cleaned	12,750	15,100
Overheads	£73,950	£83,585

What is the estimate of the overheads if 16,200 square metres are to be cleaned?

(A) £88,095
(B) £89,674
(C) £93,960
(D) £98,095.

? **Question 4** Cost behaviour patterns

Select the correct equation below.

AG Ltd rents an office photocopier for £300 per month. In addition, the cost incurred per copy taken is 2 pence. If £ y = total photocopying cost for the month and x = the number of photocopies taken, the total photocopying cost for a month can be expressed as:

$y = 300 + 2x$ ☐
$y = 300x + 2$ ☐
$y = 300 + 0.02x$. ☐

? Question 5 Stock control

A perpetual inventory system means that:

(A) the stock is counted each time an issue is made.
(B) the physical balance is calculated after each issue or receipt.
(C) the issue price is recalculated every time there is a receipt.
(D) a replenishment order is automatically triggered when the reorder level is reached.

? Question 6 Stock valuation

ABC Ltd had an opening stock value of £880 (275 units valued at £3.20 each) on 1 April.

The following receipts and issues were recorded during April:

8 April	Receipts 600 units	£3.00 per unit
12 April	Issues 200 units	
15 April	Receipts 400 units	£3.40 per unit
30 April	Issues 925 units	

Using the FIFO or LIFO method, what was the total value of the issues on 30 April?

	FIFO	*LIFO*
A	£2,850	£2,935
B	£2,850	£2,960
C	£2,890	£2,935
D	£2,890	£2,960

? Question 7 Economic order quantity

The following data relate to stock item CDR345:

Ordering costs	£100 per order
Stockholding costs	£4 per unit per annum
Annual demand	5,000 units

The economic order quantity is:

(A) 250 units
(B) 354 units
(C) 500 units
(D) 1,000 units

? Question 8 Stock level calculations

The following data relate to stock item A452:

Average usage	100 units per day
Minimum usage	60 units per day
Maximum usage	130 units per day
Lead time	20–26 days
EOQ	4,000 units

The maximum stock level is:

(A) 3,380 units
(B) 5,080 units
(C) 5,380 units
(D) 6,180 units

? **Question 9** Stock valuation

The effect of using the last in, first out (LIFO) method of stock valuation rather than the first in, first out (FIFO) method in a period of rising prices is

(A) to report lower profits and a lower value of closing stock.
(B) to report higher profits and a higher value of closing stock.
(C) to report lower profits and a higher value of closing stock.
(D) to report higher profits and a lower value of closing stock.

? **Question 10** Stock valuation

Is the following statement *true* or *false*?

With all average price systems where it is required to keep prices up to date, the average price must be recalculated each time an issue is made from stock. True ☐ False ☐

? **Question 11** Stock control

A wholesaler has an order outstanding from his suppliers for 12,500 units of Part Number WX300. He has existing customers' orders on hand for 7,230 units and calculates that he has a free stock of 8,190 units.

The number of units of Part Number WX300 in stock is ☐.

? **Question 12** Stock valuation methods

The following extract is taken from the stores ledger card for material M:

Date		*Receipts*			*Issues*			*Balance*	
September	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*	*Qty*	*Price*	*£*
1							12		18.00
3	6	2.10	12.60				18		30.60
7	8	2.35	18.80				26		49.40
12				5		**A**			
14				8		**B**			**C**

The values that would be entered on the stores ledger card as A, B and C are:

(a) Using FIFO:
A £ ☐
B £ ☐
C £ ☐

(b) Using LIFO:
A £ ☐
B £ ☐
C £ ☐

(c) Using weighted average (AVCO):
A £ ☐
B £ ☐
C £ ☐

? Question 13 Labour cost analysis

Wages paid to which of the following would be accounted for as direct labour costs (tick all that apply):

- A driver in a taxi company ☐
- A carpenter in a construction company ☐
- An assistant in a factory canteen ☐
- A hair stylist in a beauty salon. ☐

? Question 14 Labour remuneration

A company operates a premium bonus system by which employees receive a bonus of 75 per cent of the time saved compared with a standard time allowance (at the normal hourly rate).

Details relating to employee X are shown below:

Actual hours worked	42
Hourly rate of pay	£10
Output achieved	400 units of product Y
Standard time allowed per unit of Y	7 minutes

The bonus payable to employee X (to the nearest £) is:

(A) £35
(B) £47
(C) £70
(D) £82.

? Question 15 Labour remuneration

An employee is paid at a rate of £9 per hour for a 35-hour week. If he works more than 35 hours in a week he is paid at a rate of time-and-a-half for hours in excess of 35.

His total earnings for a week when he works 42 hours are £______.

? Question 16 Cost attribution

A method of accounting for overheads involves attributing them to cost units using predetermined rates. This is known as

(A) overhead allocation.
(B) overhead apportionment.
(C) overhead absorption.
(D) overhead analysis.

? Question 17 Overhead absorption

A company absorbs overheads on standard machine hours which were budgeted at 11,250 with overheads of £258,750. Actual results were 10,980 standard machine hours with overheads of £254,692.

Overheads were:

(A) under-absorbed by £2,152.
(B) over-absorbed by £4,058.
(C) under-absorbed by £4,058.
(D) over-absorbed by £2,152.

? **Question 18** Overhead absorption rates

XX Ltd absorbs overheads based on units produced. In one period, 23,000 units were produced, actual overheads were £276,000 and there was £46,000 under absorption.

The budgeted overhead absorption rate per unit was:

(A) £10
(B) £12
(C) £13
(D) £14.

? **Question 19** Overhead absorption

Tick the box to indicate whether the overhead was over- or under-absorbed, and insert the value of the under or over absorption.

XY operates a standard absorption costing system. Data for last period are as follows:

Budgeted labour hours	48,500
Actual standard labour hours	49,775
Budgeted overheads	£691,125
Actual overheads	£746,625

To the nearest whole number, the overhead for the period was £ ☐

under-absorbed ☐
over-absorbed. ☐

? **Question 20** Overhead analysis

TRI-D Ltd has three production departments – Extrusion, Machining and Finishing – and a service department known as Production Services which works for the production departments in the ratio of 3:2:1.

The following data, which represent normal activity levels, have been budgeted for the period ending 31 December 20X6:

	Extrusion	*Machining*	*Finishing*	*Production Services*	*Total*
Direct labour hours	7,250	9,000	15,000		31,250
Machine hours	15,500	20,000	2,500	2,000	40,000
Floor area (m^2)	800	1,200	1,000	1,400	4,400
Fixed assets	£160,000	£140,000	£30,000	£70,000	£400,000
Employees	40	56	94	50	240

Requirements

(a) The template being used by the management accountant to analyse the overheads for the period is shown below:

Cost allocated	*Basis*	*Extrusion* £	*Machining* £	*Finishing* £	*Production Services* £	*Total* £
Indirect wages	Allocated					102,000
Apportioned						
Depreciation	Fixed asset val'n		**A**			84,000
Rates	Floor area	**B**				22,000
Power				**C**		180,000
Personnel					**D**	60,000
Other						48,000
					109,600	
Production services		**E**			(109,600)	
					–	496,000

The values that would be entered on the overhead analysis sheet in the boxes A to E are:

A ☐
B ☐
C ☐
D ☐
E ☐

(b) After completion of the allocation, apportionment and reapportionment exercise, the total departmental overheads are:

Extrusion	*Machining*	*Finishing*
£206,350	£213,730	£75,920

Calculate appropriate overhead absorption rates (to two decimal places) for the period ending 31 December 20X6 and tick the box to indicate in each case whether labour hours or machine hours are to be used as the absorption basis:

(i) Extrusion department: £☐ for each: labour hour ☐ machine hour ☐
(ii) Machining department: £☐ for each: labour hour ☐ machine hour ☐
(iii) Finishing department: £☐ for each: labour hour ☐ machine hour ☐

(c) Which of the following are specific order costing systems:
(i) Contract costing ☐
(ii) Batch costing ☐
(iii) Process costing ☐
(iv) Job costing. ☐

? **Question 21** Overhead analysis

(a) The management accountant of X Ltd is preparing the budgeted overhead analysis sheet for the year 20X2/X3. The company has two production cost centres (Machining and Assembly) and two service departments (Stores and Maintenance). The directly attributable production overheads have already been allocated to the cost centres but other costs need to be apportioned. A section of the template being used by the management accountant and other information are shown below:

Overhead analysis sheet 20X2/3

Costs	*Basis of apportionment*	*Machining* £	*Assembly* £	*Stores* £	*Maintenance* £	*Total* £
Various	Allocated	1,105,000	800,000	90,000	350,000	2,345,000
Rent	Area occupied		**A**			750,000
Personnel dept			**B**			60,000
Equipment dep'n		**C**				200,000

Other information

	Departments			
	Machining	*Assembly*	*Stores*	*Maintenance*
Employees	75	210	25	40
Area occupied (square metres)	10,000	6,000	3,000	1,000
Cost of equipment £	1,200,000	150,000	50,000	200,000
Machine hours	500,000	50,000		
Direct labour hours	30,000	120,000		

The values that would be entered on the overhead analysis sheet in the boxes A, B and C are:

A £☐
B £☐
C £☐

(b) When the allocation and apportionment exercise had been completed by the management accountant, the analysis showed:

	Machining £	*Assembly* £	*Stores* £	*Maintenance* £	*Total* £
Total	2,250,000	1,900,000	250,000	800,000	5,200,000

The management accountant has now established the workloads of the service departments. The service departments provide services to each other as well as to the production departments as shown below:

	Machining	*Assembly*	*Stores*	*Maintenance*
Stores	30%	30%	–	40%
Maintenance	45%	30%	25%	–

After the apportionment of the service department overheads to the production departments (and acknowledging the reciprocal servicing), the total overhead for the machining department will be £☐ (to the nearest £000).

(c) X Ltd uses a standard absorption costing system. For the year 20X0/X1, X Ltd recorded the following information:

	Machining Department		*Assembly Department*	
	Budget	*Actual*	*Budget*	*Actual*
Output (units)	50,000	45,000	30,000	35,000
Overheads (£)	3,000,000	2,640,000	2,400,000	2,900,000
Direct labour cost (£)	280,000	210,000	960,000	1,000,000
Direct labour hours	40,000	30,000	120,000	145,000
Machine hours	600,000	440,000	80,000	100,000

Complete the following statements by inserting values and ticking the correct box as relevant:

(i) The overhead absorption rate for the Machining Department was £☐ for each ☐ standard labour hour ☐ standard machine hour

(ii) At the end of the year, the overheads absorbed in the Assembly Department were: ☐ under absorbed ☐ over absorbed by £☐

Question 22 Specific order costing

PZ Ltd undertakes work to repair, maintain and construct roads. When a customer requests the company to do work, PZ Ltd supplies a fixed price to the customer, and allocates a works order number to the customer's request. This works order number is used as a reference number on material requisitions and timesheets to enable the costs of doing the work to be collected.

PZ Ltd's financial year ends on 31 December. At the end of December 20X1, the data shown against four of PZ Ltd's works orders were as follows:

Works order number	*488*	*517*	*518*	*519*
Date started	1.11.X0	1.10.X1	14.11.X1	20.11.X1
Estimated completion date	28.2.X2	30.7.X2	31.1.X2	31.1.X2
Selling price	£450,000	£135,000	£18,000	£9,000

The most appropriate costing method for accounting for each of the four works order numbers is:

Works order number	*Contract costing*	*Job costing*
(i) 488	☐	☐
(ii) 517	☐	☐
(iii) 518	☐	☐
(iv) 519	☐	☐

Question 23 Job costing

An accountant is to set up in private practice. She anticipates working a 35-hour week and taking four weeks' holiday per year. General expenses of the practice are expected to be £20,000 per year, and she has set herself a target of £30,000 a year salary.

Assuming that only 75 per cent of her time worked will be chargeable to clients, what should she quote (to the nearest £) for a job anticipated to take 50 hours?

(A) £794
(B) £1,831
(C) £1,984
(D) £2,172.

Question 24 Job costing

A company has been asked to quote for a job. The company aims to make a net profit of 30 per cent on sales. The estimated cost for the job is as follows:

Direct materials	10 kg @ £10 per kg
Direct labour	20 hours @ £5 per hour

Variable production overheads are recovered at the rate of £2 per labour hour.

Fixed production overheads for the company are budgeted to be £100,000 each year and are recovered on the basis of labour hours. There are 10,000 budgeted labour hours each year.

Other costs in relation to selling, distribution and administration are recovered at the rate of £50 per job.

The company quote for the job should be:

(A) £572
(B) £637
(C) £700
(D) £833.

Question 25 Job/batch costing

Acme Electronics Ltd makes specialist electronic equipment to order. There are three main departments: Preparation, Etching and Assembly. Preparation and Etching are departments which use a considerable amount of machinery while Assembly is mainly a manual operation using simple hand tools.

For period 7, the following budgets have been prepared:

Department	*Production overheads* £	*Activity*
Preparation	165,000	3,000 machine hours
Etching	98,000	1,400 machine hours
Assembly	48,600	1,800 labour hours

During the period, an enquiry is received for a batch of 200 control units for which the following estimates have been made:

Total direct materials £26,500

Preparation	260 machine hours
	90 labour hours at £8 per hour
Etching	84 machine hours
	130 labour hours at £7 per hour
Assembly	180 labour hours at £6 per hour

Requirements

(a) (i) The prime cost of the batch of 200 control units is £[ ]
(ii) The production overhead cost of the batch of 200 control units is:
Preparation Department overheads: £[ ]
Etching Department overheads: £[ ]
Assembly Department overheads: £[ ]

(b) After an addition has been made to the batch cost to cover administrative overheads, the total cost of the batch of 200 control units is £65,100.
If the company wishes to achieve a 30 per cent profit margin on sales, the price per control unit which should be quoted is £[ ].

Question 26 Specific order costing

SS Developments Ltd is currently converting a former hospital into residential apartments.

The contract commenced on 1 March 20X0 and is expected to take a year and a half to complete. The contract value is £10 million. SS Developments Ltd's financial year runs from 1 January to 31 December.

The contract account for the building of the apartments includes the following data at 31 December 20X0:

	£000
Materials delivered direct to site	1,200
Materials issued from head office stores	200
Plant delivered to site at cost	900
Value of work certified to date	5,400
Estimated costs to completion	2,640

Depreciation on plant is to be provided at the rate of 20 per cent on cost each year. The estimated value of the materials on site at 31 December 20X0 was £180,000.

The company recognises profit on contracts according to the proportion of the total contract value that is represented by the value of work certified to date.

Requirements

(a) The total materials cost of the contract to 31 December 20X0 is £[ ].
(b) The net book value of the plant on site at 31 December 20X0 is £[ ].
(c) The total cost of work certified to date, including the cost of materials and plant depreciation, is £3,360,000. The profit to be recognised on the contract is £[ ].

Question 27 Process costing

Data for sub-questions 27.1–27.3

A company produces a single product that passes through two processes. The details for process 1 are as follows:

Materials input	20,000 kg at £2.50 per kg
Direct labour	£15,000
Production overheads	150 per cent of direct labour

Normal losses are 15 per cent of input in process 1 and without further processing any losses can be sold as scrap for £1 per kg.

The output for the period was 18,500 kg from process 1.

There was no work in progress at the beginning or at the end of the period.

27.1 What value (to the nearest £) will be credited to the process 1 account in respect of the normal loss?

(A) Nil
(B) £3,000
(C) £4,070
(D) £5,250.

27.2 What is the value (to the nearest £) of the abnormal loss/gain for the period in process 1?

(A) £6,104
(B) £6,563
(C) £7,257
(D) £7,456.

27.3 What is the value (to the nearest £) of the output to process 2?

(A) £88,813
(B) £90,604
(C) £91,956
(D) £94,063.

? **Question 28** Joint products

A joint product is:

(i) the incidental product produced as a result of a process.
(ii) not saleable at the point of separation and must always be processed further.
(iii) one of two or more products separated during processing, each having a significant sales value.

Which of the above is/are correct?

(A) (iii) only.
(B) (i) and (iii) only.
(C) (ii) and (iii) only.
(D) (i), (ii) and (iii).

? **Question 29** Process costing

A cleansing detergent is manufactured by passing raw material through two processes. The details of the process costs for Process 1 for April were as follows:

Opening work-in-progress	5,000 litres valued as follows:	
	Material cost	£2,925
	Conversion costs	£6,600
Raw material input	50,000 litres valued at a cost of	£37,500
Conversion costs		£62,385

Normal loss is 3% of the input during the period and has a scrap value of £0.20 per litre. It is company policy to deduct the income from the sale of normal loss from that period's materials cost.

Actual output to Process 2	49,000 litres
Closing work-in-progress	4,000 litres, which were 100% complete for materials and 40% complete for conversion costs.

A template that could be used to calculate the cost of the output from Process 1 is shown below. The template has been partially completed.

	Costs	*Equivalent litres*	*Cost per equivalent litre*
	OWIP + Period = Total	Transfer out + Abnormal loss + CWIP = Total	
Materials	£2,925 + A	500	£0.75
Conversion	= £68,985	= 51,100	£1.35

OWIP = Opening work-in-progress
CWIP = Closing work-in-progress

(a) The value to be inserted in the table at **A** is £[ ]
(b) The total value of the transfers to process 2 is £[ ]
(c) The value of the abnormal loss is £[ ]
(d) The value of the closing work in progress is £[ ].

? **Question 30** Process costing

Industrial Solvents Ltd mixes together three chemicals – A, B and C – in the ratio 3:2:1 to produce Allklean, a specialised anti-static fluid. The chemicals cost £8, £6 and £3.90 per litre, respectively.

In a period, 12,000 litres in total were input to the mixing process. The normal process loss is 5 per cent of input and in the period there was an abnormal loss of 100 litres, while the completed production was 9,500 litres. There was no opening work in progress (WIP) and the closing WIP was 100 per cent complete for materials and 40 per cent complete for labour and overheads. Labour and overheads were £41,280 in total for the period. Materials lost in production are scrapped.

Requirements

(a) The number of equivalent litres of labour and overhead produced during the period was [ ] equivalent litres.
(b) The cost per equivalent litre of materials produced was £[ ].

? **Question 31** Process costing

A company manufactures a variety of liquids which pass through a number of processes. One of these products, P, passes through processes 1, 2 and 3 before being transferred to the finished goods warehouse.

The following process 3 data is available for October:

	£
Work in process at 1 October is 6,000 units, valued as:	
Transfer from process 2	14,400
Materials added	2,160
Wages and overhead	2,880
	19,440
Transfer from process 2 during October:	
48,000 units	110,400
Transferred to finished goods: 46,500 units	
Costs incurred:	
Materials added	27,180
Wages and overhead	54,720
Work in process at 31 October: 4,000 units	
Degree of completion:	
Materials added: 50%	
Wages and overhead: 30%	

Normal loss in process: 6% of units in opening stock *plus* transfers from process 2 *less* closing stock

At a certain stage in the process, it is convenient for the quality control inspector to examine the product and, where necessary, to reject it. Rejected products are sold for £0.80 per unit. During October an actual loss of 7 per cent was incurred, with product P having reached the following stage of production:

Direct materials added: 80%
Wages and overhead: 60%

Requirements

The cost per equivalent unit produced was:

(a) process 2 input: £☐ per equivalent unit
(b) material added: £☐ per equivalent unit
(c) wages and overhead: £☐ per equivalent unit.

? **Question 32** Service costing

Speedee Ltd has three main divisions – a motor-cycle courier service, a domestic parcel delivery service, and a bulk parcel service for industry.

The following information is available for a period:

	Courier service	*Domestic parcels*	*Bulk parcels*
Sales (£000)	205	316	262
Distance travelled (000 km)	168	82	54

Variable costs vary both with the distance travelled and also the type of vehicle used, and are £307,800 for the company as a whole. A technical estimate shows that the various vehicles used for the three services incur variable costs per kilometre in the ratio of 1:3:5, respectively, for the courier service, domestic parcels and bulk parcels.

Requirements

The contribution for each service for the period is:

(a) courier service: £ ☐
(b) domestic parcels: £ ☐
(c) bulk parcels: £ ☐.

? Question 33 Integrated and interlocking accounts

Tick the box(es) to indicate which of the following statements about interlocking accounts are correct:

(i) ☐ Interlocking accounts avoid the need for periodic reconciliations.
(ii) ☐ In an interlocking system the cost accounts are distinct from the financial accounts.
(iii) ☐ In an interlocking system the cost ledger control account is used to record all the information that is passed to and from the financial ledger.

? Question 34 Integrated accounts

A company operates an integrated cost and financial accounting system. The accounting entries for the return to stores of unused direct materials from production would be:

	Debit	*Credit*
(A)	Work in progress account	Stores control account
(B)	Stores control account	Work in progress account
(C)	Stores control account	Finished goods account
(D)	Cost of sales account	Work in progress account

? Question 35 Integrated accounts

ABC Ltd operates an integrated cost accounting system. The fixed production overhead account at 31 July, which is ABC Ltd's year end, showed the following information:

Fixed production overhead account

	£		£
Trade creditors	50,000	Work in progress	120,000
Bank	20,000	?	5,000
Depreciation	5,000		
Salaries	40,000		
Materials	10,000		
	125,000		125,000

The £5,000 credit entry represents the value of the transfer to:

(A) the profit and loss account for the under-recovery of fixed production overheads.
(B) the profit and loss account for the over-recovery of fixed production overheads.

(C) the work in progress account for the under-recovery of fixed production overheads.
(D) the following period.

? Question 36 Integrated accounts

Wages incurred last period amounted to £33,400, of which £27,400 were direct wages and £6,000 were indirect production wages. Wages paid in cash were £31,700.

Which of the following entries would arise as a result of these transactions? (Tick all that are correct.)

			£	
(a)	Debit	Wages control account	33,400	☐
(b)	Debit	Wages control account	31,700	☐
(c)	Debit	Work in progress account	27,400	☐
(d)	Debit	Production overhead control account	6,000	☐
(e)	Credit	Wages control account	33,400	☐
(f)	Credit	Wages control account	31,700	☐
(g)	Credit	Work in progress account	27,400	☐
(h)	Credit	Production overhead control account	6,000	☐

? Question 37 Integrated accounting system

WYZ Limited operates an integrated accounting system.

The following information was available for period 7:

	£
Cost of finished goods produced	1,241,500
Direct wages	173,400
Direct material issues	598,050
Indirect material issues	32,800
Direct material purchases on credit	617,300
Production overheads (actual expenditure)	359,725
Depreciation of production machinery	35,000

At the beginning of the period, the relevant account balances were:

Account	£
Work in progress control	125,750
Direct material stores control	48,250

Production overheads are absorbed on the basis of 280 per cent of direct wages cost. Any production overheads under- or over-absorbed for the period are transferred to the profit and loss account at the end of the period.

Requirements

(a)

Direct material stores control account (extract)

	£		£
Balance b/f	**A**	Work in progress	**B**
Creditors	**C**	Production overhead control	**D**

The values that would be entered as A–D in the above account extract are:

A £☐
B £☐
C £☐
D £☐

(b) (i) The production overheads for the period were:

under-absorbed ☐
over-absorbed ☐

(ii) The value of the under-/over-absorption was £☐

(iii) This amount will be transferred as a:

credit ☐
debit ☐

in the profit and loss account at the end of the period.

? **Question 38** Marginal versus absorption costing

When comparing the profits reported using marginal costing with those reported using absorption costing in a period when closing stock was 1,400 units, opening stock was 2,000 units, and the actual production was 11,200 units at a total cost of £4.50 per unit compared to a target cost of £5.00 per unit, which of the following statements is correct?

(A) Absorption costing reports profits £2,700 higher.
(B) Absorption costing reports profits £2,700 lower.
(C) Absorption costing reports profits £3,000 lower.
(D) There are insufficient data to calculate the difference between the reported profits.

? **Question 39** Marginal and absorption costing

Tick the correct boxes.

Last period the production volume exceeded the sales volume. If an absorption costing system is used, the closing stock valuation will be ☐ higher/☐ lower, than with marginal costing and the reported profit will be ☐ higher/☐ lower, than the profit reported with marginal costing.

? **Question 40** Marginal costing

Solo Ltd makes and sells a single product. The following data relate to periods 1–4:

	£
Variable cost per unit	30
Selling price per unit	55
Fixed production costs per period	6,000

Normal activity is 500 units and production and sales for the four periods are as follows:

	Period 1	*Period 2*	*Period 3*	*Period 4*
	units	*units*	*units*	*units*
Sales	500	400	550	450
Production	500	500	420	530

There were no opening stocks at the start of period 1.

Requirements

(a) The management accountant has partially prepared the following operating statement, based on marginal costing principles:

Operating statement based on marginal costing principles

	Period 1	*Period 2*	*Period 3*	*Period 4*
	£	£	£	£
Sales	27,500	22,000	30,250	24,750
Opening stock				
Production cost	**A**			
Closing stock		**C**		
Marginal cost of sales			16,500	
Contribution		10,000	13,750	
Fixed costs	**B**			
Net profit				

The values that would be entered in the marginal costing operating statement as A, B and C are:

A £[ ]
B £[ ]
C £[ ]

(b) The financial accountant has partially prepared the following operating statement, based on absorption costing principles.

Operating statement based on absorption costing principles

	Period 1	*Period 2*	*Period 3*	*Period 4*
	£	£	£	£
Sales	27,500	22,000	30,250	24,750
Opening stock				
Production cost	**A**			
Closing stock		**B**		
Total cost of sales				
Subtotal				
Over-/(under-)absorbed overheads			**C**	**D**
Net profit				

(i) The values that would be entered in the absorption costing operating statement as A and B are:

A £[ ]
B £[ ]

(ii) The values that would be entered in the absorption costing operating statement as C and D are (*use brackets to indicate under-absorbed overheads*):

C £☐
D £☐

(c) (i) Over the four periods, the difference between the total profit figures reported under the two costing systems will be £☐

(ii) The marginal costing profit will be:

higher ☐
lower ☐

than the profit reported under the absorption costing system.

Question 41 Breakeven analysis

Data for questions 41 and 42

JJ Ltd manufactures a product which has a selling price of £14, a variable cost of £6 per unit. The company incurs annual fixed costs of £24,400. Annual sales demand is 8,000 units.

New production methods are under consideration, which would cause a 30 per cent increase in fixed costs and a reduction in variable cost to £5 per unit. The new production methods would result in a superior product and would enable sales to be increased to 8,500 units per annum at a price of £15 each.

If the change in production methods were to take place, the breakeven output level would be:

(A) 122 units higher
(B) 372 units higher
(C) 610 units lower
(D) 915 units higher

Question 42 Breakeven analysis

If the organisation implements the new production methods and wishes to achieve the same profit as that under the existing method, how many units would need to be produced and sold annually to achieve this?

(A) 7,132 units
(B) 8,000 units
(C) 8,500 units
(D) 9,710 units

Question 43 Breakeven analysis

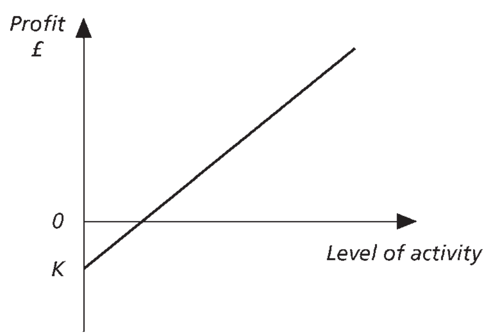
X Ltd produces and sells a single product, which has a contribution to sales ratio of 30 per cent. Fixed costs amount to £120,000 each year.

The number of units of sale required each year to break even:

(A) is 156,000.
(B) is 171,428.
(C) is 400,000.
(D) cannot be calculated from the data supplied.

Question 44 Breakeven graph

The following graph relates to questions 44 and 45



Point K on the graph indicates the value of:

(A) semi-variable cost.
(B) total cost.
(C) variable cost.
(D) fixed cost.

Question 45 Breakeven graph

This graph is known as a:

(A) conventional breakeven chart.
(B) contribution breakeven chart.
(C) semi-variable-cost chart.
(D) profit–volume chart.

Question 46 Cost analysis

A company makes a single product which generates a contribution to sales ratio of 30 per cent. In a period when fixed costs were £30,000 the net profit was £56,400. Direct wages are 20 per cent of variable costs.

The direct wages cost for the period was £[ ].

Question 47 Breakeven analysis

Tick the correct boxes.

A company makes and sells a single product. If the fixed costs incurred in making and selling the product increase:

	Increase	*Decrease*	*Stay the same*
(a) the breakeven point will	☐	☐	☐
(b) the contribution to sales ratio will	☐	☐	☐
(c) the margin of safety will	☐	☐	☐

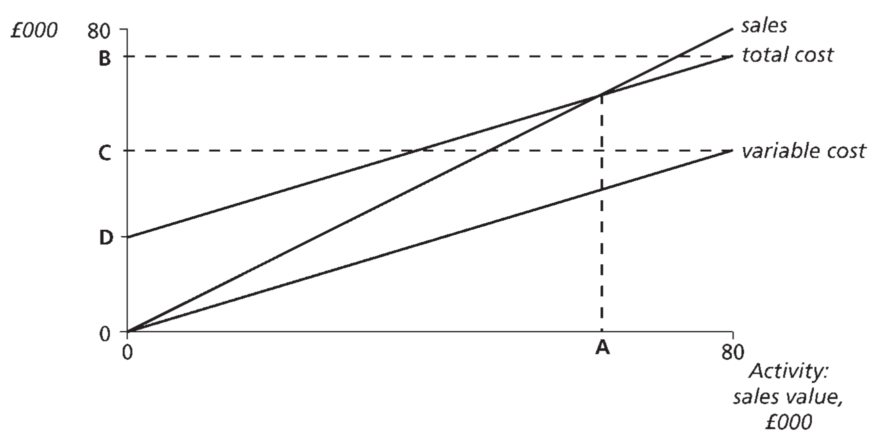
Question 48 Cost behaviour/breakeven chart

Z plc operates a single retail outlet selling direct to the public. Profit statements for August and September are as follows:

	August £	*September* £
Sales	80,000	90,000
Cost of sales	50,000	55,000
Gross profit	30,000	35,000
Less:		
Selling and distribution	8,000	9,000
Administration	15,000	15,000
Net profit	7,000	11,000

The data for August has been used to draw the following breakeven chart:

Contribution breakeven chart



Requirements

The values of A–D read from the chart would be:

A £☐
B £☐
C £☐
D £☐.

? Question 49 Relevant cost

An engineering company has been offered the opportunity to bid for a contract which requires a special component. Currently, the company has a component in stock, which has a net book value of £250. This component could be used in the contract, but would require modification at a cost of £50. There is no other foreseeable use for the component held in stock. Alternatively, the company could purchase a new specialist component for £280.

What is the relevant cost of using the component currently held in stock for this contract?

(A) £50
(B) £250
(C) £280
(D) £300.

? Question 50 Relevant costs

TP Ltd is a small company that specialises in servicing computers. The company operates a standard costing system and details of the standard cost of servicing a computer are shown below.

The figures were based on servicing 20,000 computers during the year.

Standard cost to service one computer:

		£
Material	One unit of X	10.00
	One unit of Y	5.00
Labour (service engineers)	2 hours @ £15 per hour	30.00
Variable overheads	2 hours @ £7.50 per hour	15.00
Fixed overheads	2 hour @ £15 per hour	30.00
Total service cost		90.00

The majority of work that TP Ltd undertakes is based on 3-year service contracts. However, PP Ltd, a new local company, has asked TP Ltd to quote for an urgent stand-alone job of servicing 150 computers. TP Ltd wants to win this order because it has some spare capacity, but knows that the standard price per service is more than PP Ltd is willing to pay.

The accountant of TP Ltd has ascertained the following information:

- Material X is regularly used. There is sufficient stock of Material X held, with a book value of £10 per unit. The replacement cost of Material X is £11 per unit.
- Material Y is regularly used. There are 100 units held in stock, with a book value of £5 per unit. The replacement cost of Material Y is £5.50 per unit.
- No additional engineers would be required to do this job. The service engineers are paid for a 35-hour week. Seventy per cent of the time required to complete this job can be undertaken within normal working hours; however, the remainder would have to be completed during overtime. Overtime is paid at time plus a half.
- There will be additional fixed costs incurred by this job.

Requirements

(a) The total relevant cost of Material X for this job would be £ ______
(b) The total relevant cost of Material Y for this job would be £ ______
(c) The total relevant cost of the labour for this job would be £ ______
(d) The total relevant cost of variable overheads for this job would be £ ______.

Question 51 Limiting factor

The following budgeted information is available for a company that manufactures four types of specialist paints:

	Product W per litre	*Product X per litre*	*Product Y per litre*	*Product Z per litre*
	£	£	£	£
Selling price	20.00	15.00	15.00	17.50
Variable overhead	9.60	6.00	9.60	8.50
Fixed overhead	3.60	3.00	2.10	2.10
Profit	6.80	6.00	3.30	6.90
Machine hours per litre	12	9	6	11

All four products use the same machine.

In a period when machine hours are in short supply, the product that makes the most profitable use of machine hours is:

(A) Product W
(B) Product X
(C) Product Y
(D) Product Z.

Question 52 Limiting factor decision-making

Triproduct Ltd makes and sells three types of electronic security systems for which the following information is available:

Standard cost and selling prices per unit

		Product	
	Day scan	*Night scan*	*Omni scan*
	£	£	£
Materials	70	110	155
Manufacturing labour	40	55	70
Installation labour	24	32	44
Variable overheads	16	20	28
Selling price	250	320	460

Fixed costs for the period are £450,000 and the installation labour, which is highly skilled, is available for 25,000 hours only in a period and is paid £8 per hour.

Both manufacturing and installation labour are variable costs.
The maximum demand for the products is:

Day scan	2,000 units
Night scan	3,000 units
Omni scan	1,800 units

Requirements

(a) The shortfall in hours of installation labour each period is ☐ hours.
(b) In order to maximise profits for the next period, the optimum production plan is:

Day scan	☐ units
Night scan	☐ units
Omni scan	☐ units.

? **Question 53** The role of budgets

Which of the following is *not* a main role of a budget?

(A) A budget gives authority to budget managers to incur expenditure in their area of responsibility.
(B) A budget provides a means for an organisation to expand its activities.
(C) A budget coordinates the activities of various parts of the organisation.
(D) A budget acts as a comparator for current performance.

? **Question 54** Principal budget factor

A principal budget factor is:

(A) the highest value item of cost.
(B) a factor which limits the activities of an undertaking.
(C) a factor common to all budget centres.
(D) a factor controllable by the manager of the budget centre.

? **Question 55** IT in the budget process

Which of the following are benefits of using a computerised budget system as opposed to a manual one (tick all that are correct):

(a) ☐ data used in drawing up the budget can be processed more quickly.
(b) ☐ budget targets will be more acceptable to the managers responsible for their achievement.
(c) ☐ changes in variables can be incorporated into the budget more quickly.
(d) ☐ the principal budget factor can be identified before budget preparation begins.
(e) ☐ continuous budgeting is only possible using a computerised system.

? **Question 56** Production budget

AB Ltd is currently preparing its production budget for product Z for the forthcoming year. The sales director has confirmed that he requires 120,000 units of product Z. Opening stock is estimated to be 13,000 units and the company wishes to reduce stock at the end of the year by 50 per cent. How many units of product Z will need to be produced?

(A) 113,500 units
(B) 120,000 units
(C) 126,500 units
(D) 133,000 units.

Question 57 Material budget

A company is currently preparing a material usage budget for the forthcoming year for material Z that will be used in product XX. The production director has confirmed that the production budget for product XX will be 10,000 units.

Each unit of product XX requires 4 kg of material Z. Opening stock of material Z is budgeted to be 3,000 kg and the company wishes to reduce stock at the end of the year by 25 per cent.

What is the *usage* budget for material Z for the forthcoming year?

(A) 34,750 kg
(B) 39,250 kg
(C) 40,000 kg
(D) 40,750 kg.

Question 58 Functional budgets

Budgeted sales of product P for next month are 4,000 units. Each unit of P requires 2 kg of raw material. Other budget information for next month is as follows:

Raw materials	
Opening stocks	3,000 kg
Closing stocks	4,500 kg
Finished product P	
Opening stocks	2,400 units
Closing stocks	1,800 units

The budgeted purchases of raw material for next month should be:

(A) 8,000 kg
(B) 8,300 kg
(C) 9,500 kg
(D) 12,500 kg.

Question 59 Cash budget

The following details have been extracted from the debtor collection records of X Ltd:

Invoices paid in the month after sale	60%
Invoices paid in the second month after sale	20%
Invoices paid in the third month after sale	15%
Bad debts	5%

Credit sales for June to August are budgeted as follows:

June	£100,000
July	£150,000
August	£130,000

Customers paying in the month after sale are entitled to deduct a 2 per cent settlement discount. Invoices are issued on the last day of the month. The amount budgeted to be received in September from credit sales is

(A) £115,190
(B) £116,750
(C) £121,440
(D) £123,000.

Question 60 Budgetary control

Tick the correct box.

A budget which is designed to show the allowed expenditure for the actual level of activity achieved is known as

a rolling budget ☐
a flexible budget ☐
a fixed budget ☐

Question 61 Functional budgets

RD Ltd is in the process of preparing its budgets for 20X2. The company produces and sells a single product, Z, which currently has a selling price of £100 for each unit.

The budgeted sales units for 20X2 are expected to be as follows:

J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
5,000	5,500	6,000	6,000	6,250	6,500	6,250	7,000	7,500	7,750	8,000	7,500

The company expects to sell 7,000 units in January 20X3.

The selling price for each unit will be increased by 15 per cent with effect from 1 March 20X2.

A total of 1,000 units of finished goods are expected to be in stock at the end of 20X1. It is company policy to hold a closing stock balance of finished goods equal to 20 per cent of the following month's sales.

Each unit of Z produced requires 3 kg of material X, which currently costs £5 per kg. This price is expected to increase by 10 per cent on 1 June 20X2.

Stock of raw material at the end of 20X1 is expected to be 3,750 kg. The company wishes to avoid any stock-outs and requires the closing stock of raw materials to be set at 20 per cent of the following month's production requirements.

The production of each unit of Z requires 4 hours of skilled labour and 2 hours of unskilled labour.

Requirements

(a) The sales budget for quarter 1 is £ ☐.
(b) The production budget for quarter 4 is ☐ units.

(c) The material usage budget for quarter 2 is ______ kg.
(d) The material purchase budget for quarter 1 is £______.
(e) The direct labour budget for quarter 3 is ______ hours.

Question 62 Cash budget

The following data and estimates are available for ABC Limited for June, July and August:

	June	*July*	*August*
	£	£	£
Sales	45,000	50,000	60,000
Wages	12,000	13,000	14,500
Overheads	8,500	9,500	9,000

The following information is available regarding direct materials:

	June	*July*	*August*	*September*
	£	£	£	£
Opening stock	5,000	3,500	6,000	4,000
Material usage	8,000	9,000	10,000	

Notes
1. Ten per cent of sales are for cash: the balance is received the following month.
2. Wages are paid in the month in which they are incurred.
3. Overheads include £1,500 per month for depreciation. Overheads are settled in the month following.
4. Purchases of direct materials are paid for in the month purchased.

Requirements

(a) The budget value of direct materials purchases is:

June: £______
July: £______
August: £______.

(b) The budgeted cash receivable from customers in August is £______.
(c) The budgeted cash payable for wages and overhead in July is £______.

Question 63 Flexible budgets

S Ltd makes a single product for which the budgeted costs and activity for a typical month are as follows:

Budgeted production	15,000 units
Budgeted unit costs	£
Direct labour	46
Direct materials	30
Variable overheads	24
Fixed overheads	80
	180

Requirements

(a) During October, only 13,600 units were produced. The total budget cost allowance contained in the flexed budget for October is £ [ ].

(b) During November, 14,500 units were produced, and the following actual costs were incurred:

	£
Direct labour	658,000
Direct materials	481,400
Variable overheads	334,600
Fixed overheads	1,340,000
	2,814,000

(i) The volume variance for November was £ [ ]

adverse ☐
favourable ☐.

(ii) The total expenditure variance for November was £ [ ]

adverse ☐
favourable ☐.

Question 64 Standard costing

Which of the following are *not* provided by a system of standard costing?

(A) Simplified stock recording systems.
(B) Unit standard costs for performance measurement.
(C) Actual unit costs to be incurred in the future.
(D) Unit standard costs for budgetary planning.

Question 65 Standard cost

JR Limited produces product H. The standard cost card indicates that each unit of H requires 4 kg of material W and 2 kg of material X at a standard price of £1 and £5 per kg, respectively.

Standard direct labour hours required per unit are 14 at a standard rate of £8 per hour.

Production overheads are absorbed at a rate of £4 per direct labour hour and general overhead is absorbed using a predetermined percentage of 10 per cent of total production cost.

The standard total production cost of one unit of product H is £ [ ].

Question 66 Variance analysis

Data for questions 66–68

PP Ltd has prepared the following standard cost information for one unit of product X:

Direct materials	2 kg @ £13/kg	£26.00
Direct labour	3.3 hours @ £4/hour	£13.20
Fixed overheads	4 hours @ £2.50	£10.00

The fixed overheads are based on budgeted expenditure of £180,000 and budgeted activity of 72,000 hours.

Actual results for the period were recorded as follows:

Production	12,000 units
Materials – 26,400 kg	£336,600
Labour – 40,200 hours	£168,840
Fixed overheads	£160,000

All of the materials were purchased and used during the period.

The direct material price and usage variances are:

	Material price	*Material usage*
(A)	£6,600F	£31,200A
(B)	£6,600F	£31,200F
(C)	£31,200F	£6,600A
(D)	£31,200A	£6,600A

? **Question 67** Variance analysis

The direct labour rate and efficiency variances are:

	Labour rate	*Labour efficiency*
(A)	£8,040A	£2,400A
(B)	£8,040A	£2,400F
(C)	£8,040F	£2,400A
(D)	£8,040F	£2,400F

? **Question 68** Variance analysis

The total fixed production overhead variance is:

(A) £20,000F
(B) £20,000A
(C) £40,000A
(D) £40,000F.

? **Question 69** Materials variances

In a period, 11,280 kg of material were used at a total standard cost of £46,248. The material usage variance was £492 adverse. What was the standard allowed weight of material for the period?

(A) 11,520 kg
(B) 11,280 kg
(C) 11,394 kg
(D) 11,160 kg.

? Question 70 Labour variances

In a period, 6,500 units were made and there was an adverse labour efficiency variance of £26,000. Workers were paid £8 per hour, total wages were £182,000 and there was a nil rate variance.

How many standard labour hours were allowed per unit?

(A) 3
(B) 3.5
(C) 4
(D) They cannot be calculated without more information.

? Question 71 Fixed overhead variances

F Ltd has the following budget and actual data:

Budget fixed overhead cost	£100,000
Budget production (standard labour hours)	20,000
Actual fixed overhead cost	£110,000
Actual production (standard labour hours)	19,500

The fixed overhead volume variance is:

(A) £500 adverse.
(B) £2,500 adverse.
(C) £10,000 adverse.
(D) £17,500 adverse.

? Question 72 Variance analysis

During a period, 25,600 labour hours were worked at a standard rate of £7.50 per hour. The direct labour efficiency variance was £8,250 adverse.

The number of standard hours produced was ______.

? Question 73 Profit reconciliation

The following variances have been calculated for the latest period:

	£
Total sales margin variance	11,245 (F)
Material usage variance	6,025 (F)
Labour rate variance	3,100 (A)
Fixed overhead volume variance	5,075 (F)
Fixed overhead expenditure variance	3,800 (A)
Variable overhead expenditure variance	2,415 (A)

All other variances were zero. The budgeted profit for the period was £475,000.

The actual profit reported for the period was £ ______.

Question 74 Variance interpretation I

The direct labour efficiency variance for the latest period was adverse. Which of the following reasons could have contributed to this variance? (*tick all that apply*).

(a) Output was higher than budgeted ☐
(b) The purchasing department bought poor quality material which was difficult to process ☐
(c) The original standard time for the output was set too low ☐
(d) The hourly labour rate was higher than had been expected when the standard was set ☐
(e) Employees were more skilled than specified in the standard ☐

Question 75 Variance interpretation II

The fixed production overhead volume variance for the latest period was favourable. Which of the following reasons could have contributed to this variance? (*tick all that apply*).

(a) A higher selling price led to a reduction in sales volumes ☐
(b) A major machine breakdown resulted in lost production ☐
(c) The rental cost of a packing machine was lower than budgeted ☐
(d) A new bonus scheme encouraged employees to achieve higher output levels ☐

Question 76 Standard cost bookkeeping

A company uses standard costing and an integrated accounting system. The double entry to record a favourable labour rate variance is:

	Debit	*Credit*
(A)	Work in progress account	Labour rate variance account
(B)	Labour rate variance account	Work in progress account
(C)	Wages control account	Labour rate variance account
(D)	Labour rate variance account	Wages control account

Question 77 Standard cost bookkeeping

STD Ltd operates an integrated standard costing system for its single product. All stocks are valued at standard price.

During a period the following variances were recorded:

	Favourable	*Adverse*
	£	£
Material price		3,950
Material usage	1,925	
Labour rate		1,325
Labour efficiency	1,750	
Production overhead expenditure		2,000
Production overhead volume		2,500

(a) Tick the correct boxes to show the entries that will be made to record the material price variance.

	Debit	*Credit*	*No entry in this account*
Materials control account	☐	☐	☐
Material price variance account	☐	☐	☐
Work in progress account	☐	☐	☐

(b) Tick the correct boxes to show the entries that will be made to record the material usage variance.

	Debit	*Credit*	*No entry in this account*
Materials control account	☐	☐	☐
Material usage variance account	☐	☐	☐
Work in progress account	☐	☐	☐

(c) The labour force was paid at a:

higher hourly rate than standard ☐
lower hourly rate than standard ☐.

(d) Production overhead for the period was:

under-absorbed ☐
over-absorbed ☐.

(e) Production output for the period was:

higher than budgeted ☐
lower than budgeted ☐.

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Solutions to Revision Questions

Solution 1

- Cost type X is clearly fixed for this range of activity levels.
- For the other costs, divide the total cost by the number of units at the head of the column. Variable costs result in a constant amount per unit of output. Semi-variable costs result in a varying amount per unit of output.

Answer: (B)

Cost type	*Cost per unit @ 100 units*	*Cost per unit @ 140 units*	
	£	£	
W	80	75.43	semi-variable
Y	65	65.00	variable
Z	67	61.29	semi-variable

Solution 2

- The fixed overheads were £11,000 over budget, so you need to subtract this amount from the actual fixed overhead cost to arrive at the budgeted cost.
- If you are reduced to guessing, you can eliminate option D straight away. A total of £87,000 is simply the difference between the total expenditure and the overspend on fixed overhead. It makes no allowance for variable costs.

Answer: (A)

	£	
Total expenditure	98,000	
Budgeted variable cost: 18,000 × £2.75	49,500	= actual variable costs
Actual fixed costs are therefore	48,500	
Fixed overhead expenditure variance	11,000	
Budgeted fixed costs	37,500	

Solution 3

- You need to be completely familiar with the high–low method. The data shows that the technique can be applied in service situations as well as in manufacturing.

Answer: (A)

1. Find the variable overheads per square metre:

   Extra m^2 cleaned = 15,100 − 12,750 = 2,350
   Extra overhead cost = £83,585 − £73,950 = £9,635
   Variable overhead per m^2 = £9,635/2,350 = £4.10

2. Find the fixed overhead:

		£
Total overheads of cleaning 12,750 m^2	=	73,950
Variable overheads = 12,750 × £4.10	=	52,275
Fixed overhead	=	21,675

3. Total overheads for 16,200 m^2:

		£
Variable overhead = 16,200 × £4.10	=	66,420
Fixed overhead	=	21,675
		88,095

Solution 4

- Do not be confused by the use of the y and x notation. You simply need to think through how to calculate the total cost of a semi-variable cost.
- Total semi-variable cost = fixed cost + (variable cost per unit × no. of units)

Answer: $y = 300 + 0.02x$

Solution 5

- Make sure you read all of the options before you select your answer. If you rushed this question you may have selected the incorrect option A, which omits to consider the receipt of stock.

Answer: (B)

Options C and D describe situations which may exist within a perpetual inventory system, but they are not in themselves descriptions of the system.

Solution 6

- You will need to produce some clear workings for your own benefit, since workings will not be awarded marks. You might like to draw up full stock records to ensure greater accuracy.

Answer: (D)

Under FIFO the 200 units issued on 12 April would have been priced at £3.20 from the opening stock. Therefore the remaining 75 units from the opening stock make up the first part of the batch issued on 30 April:

	£	
75 units at £3.20	240	
600 units at £3.00	1,800	
250 units at £3.40	850	
925	2,890	(FIFO)

Under LIFO the 200 units issued on 12 April would have been priced at £3.00 from the latest batch in stock at that date (received 8 April). Therefore, the 400 units remaining from the £3.00 batch received on 8 April will be a part of the issues made on 30 April:

	£	
400 units at £3.40	1,360	
400 units at £3.00	1,200	
125 units at £3.20	400	
925	2,960	(LIFO)

✓ Solution 7

- The EOQ formula is provided in the assessment. All you need to do is carefully slot the data provided into the formula.

Answer: (C)

$$\sqrt{\frac{2 \times £100 \times 5{,}000}{£4}} = 500 \text{ units.}$$

✓ Solution 8

- You will need to memorise the formulae for the maximum stock level and the reorder level. They are not provided in the assessment.

Answer: (D)

$$\begin{aligned}
\text{Maximum stock level} &= \text{Recorder level (ROL)} + \text{EOQ} \\
&\quad - (\text{Minimum rate of usage} \times \text{minimum lead time}) \\
\text{ROL} &= \text{Maximum usage} \times \text{Maximum lead time} \\
&= 130 \times 26 \\
&= 3{,}380 \text{ units} \\
\text{Maximum stock level} &= 3{,}380 + 4{,}000 - (60 \times 20) \\
&= 6{,}180 \text{ units}
\end{aligned}$$

Solution 9

- Read the question carefully to ascertain whether prices are rising or falling

Answer: (A)

The issues to production will have been charged at the most recent, higher prices–lower profit figure.

The remaining stock will be valued at the earlier, cheaper prices–lower stock value.

Solution 10

- Think before you answer! An issue of stock at the average price will not alter the average price of the items remaining in stock.

False. The average price must be recalculated each time a purchase is made at a different price.

Solution 11

- This is a relatively straightforward question if you have learned the relevant formula.
- This formula will *not* be provided in the assessment so you must learn it!

$$\begin{aligned}
\text{Free stock} &= \text{physical stock} + \text{stock on order with suppliers} \\
&\quad - \text{outstanding requirements unfulfilled} \\
8{,}190 &= \text{physical stock} + 12{,}500 - 7{,}230 \\
\text{Physical stock} &= 8{,}190 + 7{,}230 - 12{,}500 \\
&= 2{,}920 \text{ units}
\end{aligned}$$

Solution 12

- Remember the need for total accuracy. Prepare as many workings as you need to help you, but note that workings will not be awarded any marks. Our workings will help you to detect any errors you may have made.

			£
(a)	A	5 units × £1.50 (from opening stock)	**7.50**
	B	7 units × £1.50 (remaining units from opening stock)	10.50
		1 unit × £2.10 (from September 3 receipts)	2.10
		8	**12.60**
	C	5 units × £2.10 (remaining units from September 3)	10.50
		8 units × £2.35 (September 7 receipts)	18.80
			29.30

			£
(b)	A	5 units × £2.35 (from September 7 receipts)	**11.75**
	B	3 units × £2.35 (remaining units from September 7)	7.05
		5 units × £2.10 (from September 3 receipts)	10.50
		8	**17.55**
	C	1 unit × £2.10 (remaining unit from September 3)	2.10
		12 units × £1.50 (opening stock)	18.00
			20.10

(c) Weighted average price of stock on 7 September $= £\frac{49.40}{26} = £1.90$

A 5 units × £1.90 = **£9.50**
B 8 units × £1.90 = **£15.20**
C 13 units × £1.90 = **£24.70**.

Solution 13

- Direct wages are those paid to employees working directly on the organisation's output. Their wages can be traced to specific cost units.

The wages paid to the driver, carpenter and hair stylist are all direct labour costs. The wages paid to the canteen assistant are indirect wages because the assistant is not working directly on the organisation's output.

Solution 14

- First calculate the time allowed and compare this with the time taken. You can convert all times to minutes or to hours, whichever you find easier.
- Next read the question carefully to determine the bonus. Every bonus scheme is different, so do not assume that this one is calculated in the same way as the last scheme you met!

Answer: (A)

Time allowed = 400 units × 7 minutes	2,800 minutes
Time taken = 42 hours × 60 minutes	2,520 minutes
Time saved	280 minutes

Bonus payable = 75% × (280/60) × £10 = £35.

Solution 15

- Read the question carefully. You are asked to calculate the *total* earnings. It would be easy to rush in and calculate only the overtime premium.

	£
Basic wage 35 hours × £9	315.00
Overtime pay 7 hours × £13.50	94.50
Total earnings	409.50

Solution 16

- Take your time and read all the options. This is not a difficult question but it would be easy to rush and select the wrong answer.

Answer: (C)

Overhead allocation is the allotment of whole items of cost to cost units or cost centres. Overhead apportionment is the sharing out of costs over a number of cost centres according to the benefit used. Overhead analysis refers to the whole process of recording and accounting for overheads.

Solution 17

- First you need to calculate the overhead absorption rate per standard machine hour. Remember that this is always based on the budgeted data.
- Next you must use the absorption rate to calculate the overhead absorbed, and then compare this with the overhead incurred to determine the over or under absorption.

Answer: (A)

$$\text{Overhead absorption rate} = \frac{\pounds 258{,}750}{11{,}250} = \pounds 23 \text{ per standard machine hour}$$

	£
Overhead absorbed = 10,980 std. hours × £23	252,540
Overhead incurred	254,692
Under absorption	2,152

Solution 18

- Use the under absorption to adjust the actual overhead incurred, to determine the overhead absorbed. Since there was an under absorption, the actual overhead incurred must be greater than the overhead absorbed.
- Lastly, divide the overhead absorbed by the number of units produced.

Answer: (A)

	£000
Actual incurred	276
Under absorption	46
Absorbed	230
No. of units	23,000

Rate per unit = £230,000/23,000 = £10.

Solution 19

- Remember that the overhead absorption rate (OAR) is based on the budgeted data.
- Overheads absorbed for the period = OAR × actual standard labour hours achieved.

$$\text{OAR} = \frac{£691{,}125}{48{,}500} = £14.25$$

	£	
Overhead absorbed during period		
49,775 × £14.25	709,293.75	
Overhead incurred	746,625.00	
Overhead under-absorbed	37,331	(to nearest whole number).

Solution 20

- The basic data on labour and machine hours seems to indicate that the Extrusion and Machining departments are machine-intensive, so a machine hour rate would be most appropriate. The Finishing department appears to be labour-intensive, so a labour hour rate would be more suitable.

(a) A: $\frac{£140{,}000}{£400{,}000} \times £84{,}000 = \mathbf{£29{,}400}$

B: $\frac{800}{4{,}400} \times £22{,}000 = \mathbf{£4{,}000}$

C: $\frac{2{,}500}{40{,}000} \times £180{,}000 = \mathbf{£11{,}250}$

D: $\frac{50}{240} \times £60{,}000 = \mathbf{£12{,}500}$

E: $\frac{3}{(3+2+1)} \times £109{,}600 = \mathbf{£54{,}800}$.

(b) **Overhead absorption rates**

Extrusion $\frac{£206{,}350}{15{,}500 \text{ machine hours}} = $ **£13.31 for each machine hour**

Machining $\frac{£213{,}730}{20{,}000 \text{ machine hours}} = $ **£10.69 for each machine hour**

Labour hours $\frac{£75{,}920}{15{,}000 \text{ labour hours}} = $ **£5.06 for each labour hour**.

(c) (i) Contract costing
(ii) Batch costing
(iv) Job costing

Solution 21

- In part (c), notice that X Ltd uses a *standard* absorption costing system. This means that overheads must be absorbed on a *standard* hour basis.

(a) A: Rent cost apportioned to Assembly Department $= \frac{6{,}000}{20{,}000} \times £750{,}000 = \mathbf{£225{,}000}$

B: Personnel cost apportioned to Assembly Department $= \frac{210}{350} \times £60{,}000 = \mathbf{£36{,}000}$

C: Using an apportionment basis of cost of equipment, depreciation cost apportioned to Machining Department $= \frac{1{,}200{,}000}{1{,}600{,}000} \times £200{,}000 = \mathbf{£150{,}000}$

(b) **£2,850,000** (to the nearest 000)

Workings:

	Machining	*Assembly*	*Stores*	*Maintenance*
	£	£	£	£
Initial allocation	2,250,000	1,900,000	250,000	800,000
Apportion stores	75,000	75,000	(250,000)	100,000
Apportion maintenance	405,000	270,000	225,000	(900,000)
Apportion stores	67,500	67,500	(225,000)	90,000
Apportion maintenance	40,500	27,000	22,500	(90,000)
Apportion stores	6,750	6,750	(22,500)	9,000
Apportion maintenance	4,050	2,700	2,250	(9,000)
Apportion stores	675	675	(2,250)	900
Apportion maintenance	405	270	225	(900)
Apportion stores	68	67	(225)	90
Apportion maintenance	40	27	23	(90)
Total apportioned	2,849,988			

(c) (i) The Machining Department is machine-intensive, therefore a machine hour rate will be used. Overhead absorption rate $= £\frac{3{,}000{,}000}{600{,}000} = £5$ for each standard machine hour.

(ii) The overheads absorbed in the Assembly Department were *under-absorbed* by £100,000.

Workings:

Overhead absorption rate $= \frac{£2{,}400{,}000}{120{,}000} = £20$ per standard labour hour.

Standard labour hours produced $= \frac{120{,}000}{30{,}000} \times 35{,}000 = 140{,}000$.

	£
Overheads absorbed in Assembly Department $= £20 \times 140{,}000$	2,800,000
Overheads incurred	2,900,000
Overheads under-absorbed	100,000

✓ Solution 22

- Do not confuse the term 'works order number' with 'job number'. A reference number (in this case the works order number) is used in the recording of costs in any specific order costing system, whether it is a job, batch or contract system.
- After our answer we have included some discussion, so that you can understand the reasoning behind the answers, for revision purposes. You would not add any such discussion or workings in the actual assessment.

(i) Number 488 *contract* costing
(ii) Number 517 *contract* costing
(iii) Number 518 *job* costing
(iv) Number 519 *job* costing

Discussion
Works order 488. This should be accounted for as a long-term contract since it spans three accounting years, and because the sums of money involved in the contract are large.

Works order 517. This work spans a financial year-end with a significant sales value, so although the case for 'contract' status would not be as strong as for works order 488, this nevertheless would be appropriate.

Works orders 518 and 519. Both of these are of small value, and both have durations of approximately two months, although spanning a financial year-end. In neither case would the apportionment of profit over the two financial years be worthwhile, any profit being most likely to be taken at the end of the work. Should a loss be expected, however, this should be brought forward into the accounts of the first financial period covered. Long-term contract status would not be appropriate, however, so they should be accounted for using job costing.

✓ Solution 23

- Use the information provided to determine the number of chargeable hours each year.
- Calculate the hourly rate that the accountant needs to charge to cover her expenses and salary, based on the number of chargeable hours.
- Apply the hourly rate to the job in question.

Answer: (C)

Chargeable hours each year will be $(52 - 4$ weeks $=)$ 48 weeks $\times$ 35 hours per week $=$ 1,680 hours $\times$ 75% $=$ 1,260 hours.

In these 1,260 hours, she must make £50,000 to cover her salary and general expenses. Therefore, her charge rate should be

$$\frac{£50{,}000}{1{,}260} = £39.68254 \text{ per hour}$$

Thus, the quote for a 50-hour job should be £39.68254/hour $\times$ 50 $=$ £1,984.

✓ Solution 24

- Read the question carefully. Profit is calculated as a percentage of sales, not as a percentage of cost.

Answer: (C)

	£	
Direct materials 10 × £10	100	
Direct labour 20 × £5	100	
Prime cost	200	
Variable production overheads 20 × £2	40	
Fixed production overheads 20 × £10*	200	
Total production cost	440	
Other costs	50	
Total cost	490	70%
Profit	210	30%
Quote for the job	700	100%

* £100,000 overheads/10,000 hours = £10 per hour.

Solution 25

- Be careful when you are adding the profit percentage to the total cost in part (b). The question states that the company wishes to achieve 30 per cent profit margin on sales. Do not make the common mistake of simply adding 30 per cent to cost. This will not produce 30 per cent profit margin on sales.

(a) (i) **£29,210**

Workings:

	£	£
Direct materials		26,500
Labour		
Preparation: 90 × £8	720	
Etching: 130 × £7	910	
Assembly: 180 × £6	1,080	
		2,710
		29,210

(ii)

Preparation Department overheads	£14,300
Etching Department overheads	£5,880
Assembly Department overheads	£4,860

Workings:

Overhead absorption rates:

Preparation: $\frac{£165{,}000}{3{,}000} = £55$ per machine hour

Etching: $\frac{£98{,}000}{1{,}400} = £70$ per machine hour

Assembly: $\frac{£48{,}600}{1{,}800} = £27$ per labour hour

Overheads charged to batch

Preparation: 260 × £55	£14,300
Etching: 84 × £70	£5,880
Assembly: 180 × £27	£4,860

(b) **£465**

Workings:

	£
Batch cost	65,100
Profit (× 30/70)	27,900
Sales value of batch	93,000
Selling price per unit (93,000/200)	**£465**

✓ Solution 26

- When you are calculating the depreciation charge in part (b), don't forget that the contract has been in operation for only ten months.

(a) **£1,220,000**
(b) **£750,000**
(c) **£2,160,000**

Workings:

		£000
(a)	Materials delivered direct to site	1,200
	Materials issued from head office stores	200
		1,400
	Materials on site at 31 December 20X0	(180)
	Cost of material used on contract	1,220
(b)	Plant delivered to site at cost	900
	Depreciation $\left(900 \times 20\% \times \frac{10}{12}\right)$	150
	Net book value of plant at 31 December	750
(c)	Final contract value	10,000
	Cost of work certified	3,360
	Cost to completion	2,640
	Estimated contract profit	4,000

Profit to be recognised on contract = £4,000,000 × (5,400,000/10,000,000)
= £2,160,000.

✓ Solution 27

- You may be able to solve this question without producing a reconciliation of the input and output volumes. We have shown a reconciliation so that you can use it for revision purposes.

27.1 Answer: (B)

20,000 kg input × 15% = 3,000 kg normal loss × £1 = £3,000

27.2 Answer: (D)

Input	*Kg*	*Output*	*Kg*	*Kg to absorb cost*
Materials	20,000	To process 2	18,500	18,500
		Normal loss	3,000	–
		Abnormal gain	(1,500)	(1,500)
	20,000		20,000	17,000

Costs	£
Materials input	50,000
Direct labour	15,000
Production overheads	22,500
Scrap value normal loss	(3,000)
	84,500
Cost per kg £84,500/17,000	4.9706

Value of abnormal gain = 1,500 kg × £4.9706 = £7,456.

27.3 Answer: (C)

Value of output = 18,500 kg × £4.9706 = £91,956.

☑ Solution 28

- This is an easy question, if you have learned the definition of a joint product.

Answer: (A)

A joint product has a significant sales value and may be saleable at the point of separation, without further processing.

☑ Solution 29

- Do not be put off by the slightly different layout of the working template.
- The question is in fact very straightforward. To perform the necessary valuations you simply need to use the unit rates supplied in the template.

(a) £37,200

Working:

	£
Raw material input	37,500
Less scrap value of normal loss (50,000 litres × 3% × £0.20)	(300)
Material cost for the period	37,200

(b) £102,900

Working:

Value of transfer to process 2 = 49,000 litres × (£0.75 + £1.35) = £102,900.

(c) £1,050

Working:

Value of abnormal loss = 500 litres × £(0.75 + 1.35) = £1,050.

(d) £5,160

Working:

$$\begin{aligned}\text{Value of closing work in progress} &= (4{,}000 \text{ litres} \times £0.75)\\ &\quad + [(4{,}000 \times 40\%) \text{ litres} \times £1.35]\\ &= £3{,}000 + £2{,}160\\ &= £5{,}160.\end{aligned}$$

✓ Solution 30

- The materials lost in production are scrapped. Therefore, no value is allocated to the normal loss. A common error would be to attempt to allocate a monetary value to the normal loss.

  (a) 10,320 equivalent litres
  (b) £7.00 per equivalent litre

Workings:

Material cost:		£
A	3/6 × 12,000 × £8.00	48,000
B	2/6 × 12,000 × £6.00	24,000
C	1/6 × 12,000 × £3.90	7,800
		79,800

Statement of equivalent litres

	Total	*Materials*	*Labour and overheads*
Completed production	9,500	9,500	9,500
Abnormal loss	100	100	100
Normal loss	600	–	–
Closing WIP:			
Material	1,800	1,800	–
Labour and overheads (40% × 1,800)		–	720
Equivalent litres	12,000	11,400	10,320
Cost		£79,800	£41,280
Cost per equivalent litre	£11.00	£7.00	£4.00

✓ Solution 31

- You will find process costing questions much quicker and easier to answer if you learn a pro-forma layout for your working papers, but remember that you will earn no marks for your workings.

- When you are carrying out your equivalent units calculation, remember that any units that are now in process 3 must be complete as regards process 2 input.

The cost per equivalent unit produced was:

(a) process 2 input: £2.40 per equivalent unit
(b) material added: £0.60 per equivalent unit
(c) wages and overhead: £1.20 per equivalent unit

Workings:

Input	*Units*	*Output*	*Units*	*Process 2 input*	*Material added*	*Wages and overhead*
Opening stock	6,000	Finished goods	46,500	46,500	46,500	46,500
Process 2	48,000	Normal loss	3,000[1]	–	–	–
		Abnormal loss	500[2]	500	400	300
		Closing WIP	4,000	4,000	2,000	1,200
	54,000		54,000	51,000	48,900	48,000
		Costs	£	£	£	£
		Opening stock		14,400	2,160	2,880
		Input costs		110,400	27,180	54,720
		Normal loss value		(2,400)	–	–
				122,400	29,340	57,600
		Cost per unit	4.20	2.40	0.60	1.20

Notes:
1. Normal loss = 6% × (6,000 + 48,000 – 4,000) = 3,000 units.
2. The abnormal loss is found as a balancing figure in the input/output reconciliation.

☑ Solution 32

- We are told that the various vehicles incur variable costs per kilometre in the ratio 1:3:5. Therefore, we need to calculate a weighted total number of kilometres travelled, in order to fairly share out the total variable costs incurred. We cannot simply calculate the variable cost per kilometre as (costs incurred ÷ kilometres travelled), because a kilometre travelled by a motor-cycle costs less than a kilometre travelled by a bulk parcel van or lorry.

(a) Courier service £129,400
(b) Domestic parcels £205,300
(c) Bulk parcels £140,500

Workings:

Weighted total kilometres travelled

Weight	*Distance km*	*Weighted km*
1	168,000	168,000
3	82,000	246,000
5	54,000	270,000
		684,000

Total variable costs = £307,800

Therefore, variable costs per weighted km $= £\frac{307,800}{684,000} = £0.45$ per weighted km
Variable cost per service is therefore:

	£
Courier service: 168,000 × 0.45	75,600
Domestic parcels: 246,000 × 0.45	110,700
Bulk parcels: 270,000 × 0.45	121,500
	307,800

Thus, contribution per service is:

	Courier	*Domestic*	*Bulk*
	£	£	£
Sales	205,000	316,000	262,000
Variable costs	(75,600)	(110,700)	(121,500)
Contribution	129,400	205,300	140,500

✓ Solution 33

- Read the question carefully to ascertain whether you are required to tick the correct statements or the incorrect statements.

Statements (ii) and (iii) are correct. Statement (i) is incorrect because the two separate sets of accounts result in the need for periodic reconciliations.

✓ Solution 34

- Remember: if you are reduced to guessing, then eliminate first the options that are obviously incorrect. For example, option D must be incorrect because direct materials returned to stores unused cannot yet have become part of cost of sales.

Answer: (B)

This is the reverse of the entries that would have been made when the direct materials were first issued to production.

✓ Solution 35

- Ensure that you read the introduction to the question carefully. We need to know that this is the company's year end, in order to be able to select the correct entry.

Answer: (A)

Since this is the year end, the balance on the overhead control account would be transferred to the profit and loss account, rather than carried forward to the following period.

The debit side of the account (the overhead incurred) is greater than the credit side of the account (the overhead absorbed into work in progress). Therefore, the overhead is under-recovered or under-absorbed.

✓ Solution 36

- You might find it easiest to quickly sketch the T-accounts from the data provided, then you can simply pick out the correct journal entries and tick them.

- Wages incurred are higher than the wages paid, so there must be an accrual for the period, but you are not asked about the accounting entries for this element of the transactions.

The correct choices are:

(b) Debit wages control account: £31,700
Wages actually paid are debited to the wages control account and credited to the bank or cash account.
(c) Debit work in progress account: £27,400
(d) Debit production overhead control account: £6,000
(e) Credit wages control account: £33,400
Direct wages incurred are credited to the wages control account and debited to work in progress. Indirect wages incurred are credited to the wages control account and debited to the production overhead control account, pending their later absorption into work in progress.

Solution 37

- In part (b), you might like to draw up your own production overhead control account. Although you would not earn marks for this, it might help you to collect together all the information you need to calculate the under- or over-absorption.

(a) A £48,250
B £598,050 (direct materials issued to work in progress)
C £617,300
D £32,800 (indirect materials issued).

(b) The production overheads for the period were *over*-absorbed by £57,995. This amount will be transferred as a *credit* in the profit and loss account at the end of the period.

Working:

Production overhead control account

	£		£
Creditors	359,725	Work in progress (280% × £173,400)	485,520
Provision for depreciation	35,000		
Indirect materials	32,800		
Over-absorption to P&L	57,995		
	485,520		485,520

Solution 38

- Profits reported under the two systems will be different if there is a change in stock volume during the period.
- Difference in profits = change in stock units × fixed overhead absorption rate per unit.

Answer: (D)

There will be a difference between the reported profits because there is a change in the number of stock units held. As stock is decreasing, the profit reported under absorption costing will be lower than that reported under marginal costing. The difference will equal the change in stock units multiplied by the fixed overhead absorption rate per unit. (As this absorption rate is not given, the difference cannot be quantified.)

✓ Solution 39

- Stock valuations with absorption costing are always higher than those with marginal costing because of the inclusion of fixed production overheads in the stock valuation.
- Production volume exceeded the sales volume, therefore the stocks will have increased during the period.

Last period the production volume exceeded the sales volume. If an absorption costing system is used, the closing stock valuation will be *higher* than with marginal costing and the reported profit will be *higher* than the profit reported with marginal costing.

✓ Solution 40

- When using absorption costing in part (b) you will need to use the normal activity to determine the fixed costs per unit. This can then be added to the variable cost per unit to determine the total cost per unit for absorption costing.

(a) A: Production cost for period 2 = 500 units × £30 per unit variable cost = **£15,000**.
B: Fixed costs are charged in total as a period cost: **£6,000**.
C: Closing stock for period 2 = 100 units × £30 per unit variable cost = **£3,000**.

(b) (i) A: Full production cost for period 1 = 500 units × £42 (see workings) = **£21,000**.
B: Closing stock for period 2 = 100 units × £42 = **£4,200**.

Workings:
Fixed cost per unit = $\frac{£6,000}{500}$ units = £12.
Therefore full production cost per unit = £30 variable + £12 fixed = £42

(ii) C: Overheads absorbed = 420 units × £12 = £5,040.
Overheads incurred are £6,000.
Therefore overheads *under-absorbed* = (£960).
D: Overheads absorbed = 530 units × £12 = £6,360.
Overheads incurred are £6,000.
Therefore overheads *over-absorbed* = £360.

(c) (i) £600.
(ii) The marginal costing profit will be *lower* than the profit reported under the absorption costing system (*because £600 of fixed overheads is carried forward in the absorption costing stock valuation*).

Workings:

50 units closing stock × £12 per unit fixed overhead = £600.

Solution 41

- Calculate the breakeven point before and after the change in production methods, using the formula:

$$\text{Breakeven point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

Answer: (A)

Existing situation:

$$\text{Breakeven point} = \frac{£24{,}400}{£8} = 3{,}050 \text{ units}$$

Working:

Contribution per unit	£
Selling price	14
Variable cost	(6)
Contribution/unit	8

New production methods:

$$\text{Breakeven point} = \frac{£24{,}400 \times 1.3}{£10} = 3{,}172 \text{ units}$$

Working:

Contribution per unit	£
Selling price	15
Variable cost	(5)
Contribution/unit	10

Increase in number of units: 3,172 − 3,050 = 122.

Solution 42

- First calculate the existing profit level.
- Using the new cost and selling price, calculate the required sales volume using the formula:

$$\text{Required sales volume} = \frac{(\text{Fixed costs} + \text{required profit})}{\text{Contribution per unit}}$$

Answer: (A)

$$\frac{£31{,}720 + £39{,}600}{£15 - £5} = 7{,}132 \text{ units}$$

(Working for existing profit: 8,000 units × £8 = £64,000 contribution less fixed costs £24,400 = £39,600.)

Solution 43

- Do not rush this question. You can probably easily calculate the breakeven point in terms of sales value, but then you will need to stop and think carefully.

Answer: (D)

$$\text{Breakeven point in terms of sales value} = \frac{£120{,}000}{0.3} = £400{,}000.$$

This must now be divided by the selling price.

The breakeven point in terms of units cannot be derived because we do not know the unit selling price.

Solution 44

- The single line drawn on the graph represents profits or losses earned for a range of activity levels.

Answer: (D)

Point K indicates the loss incurred at zero activity. At this point, the loss incurred is equal to the fixed cost.

Solution 45

- Profit–volume chart is the name given to a graph which indicates the profits or losses earned for a range of activity levels.

Answer: (D)

Charts A and B would include lines for costs and revenues. Chart C would be depicted by a single line, starting at a point above the origin on the vertical axis. This point represents the total fixed cost incurred at zero activity.

Solution 46

- Remember that contribution for a period is equal to the fixed costs plus the profit for the period.
- Once you have calculated the contribution you can use the C/S ratio to derive the sales value, and that will lead you to the variable costs and thus the direct wages for the period.

$$\text{Contribution} = £30{,}000 + £56{,}400 = £86{,}400$$

$$\frac{\text{Contribution}}{\text{Sales}} = 0.3$$

$$\text{Sales} = \frac{£86{,}400}{0.3} = £288{,}000$$

$$\text{Variable costs} = \text{sales value} - \text{contribution} = £288{,}000 - £86{,}400 = £201{,}600$$

$$\text{Direct wages} = 20\% \times £201{,}600 = £40{,}320.$$

Solution 47

- For a given level of sales, the margin of safety and the breakeven point will always move in the 'opposite direction' to each other. If one increases then the other decreases.
- The contribution to sales ratio is not affected by the level of fixed costs incurred.

(a) The breakeven point will *increase*.
(b) The contribution to sales ratio will *stay the same*.
(c) The margin of safety will *decrease*.

Solution 48

- You will need to use the contribution to sales (C/S) ratio in this question, in calculating the breakeven sales value. Once you have calculated the variable costs as a percentage of sales value you should be able to use this to determine the C/S ratio.
- The contribution breakeven chart that has been drawn shows the variable cost line instead of the fixed cost line. This means that contribution can be read directly from the chart.

Workings:

	August	*September*	*Change*
	£	£	£
Sales	80,000	90,000	10,000
Cost of sales	50,000	55,000	5,000
Selling and distribution	8,000	9,000	1,000
Administration	15,000	15,000	nil

(i) Cost of sales:

Variable	£5,000/£10,000 = 50p/£1 of sales (50% of sales)
Fixed	£50,000 − (50% × £80,000) = £10,000

(ii) Selling and distribution:

Fixed	nil
Variable	£1,000/£10,000 = 10p/£1 of sales (10% of sales)

(iii) Administration:

Fixed	£15,000
Variable	nil

A: Breakeven sales value $= \dfrac{\text{Fixed costs}}{\text{C/S ratio}^*} = \dfrac{£25{,}000}{0.4} = \mathbf{£\,62{,}500}$

* Variable costs have been calculated to be 60 per cent of sales. Therefore, the C/S ratio is 40 per cent.

B: Total cost of £80,000 sales value = **£73,000** (from original data).

C: Total variable cost for £80,000 sales value = £80,000 × 0.6 = **£48,000**.

D: Total fixed cost = cost of sales £10,000 + administration £15,000 = **£25,000**.

Solution 49

- By asking for the relevant cost of the *component in stock*, the question gives you a hint that the replacement cost of £280 is not relevant.

Answer: (A)

The £250 net book value is a sunk cost and therefore not relevant. Therefore, the relevant cost is £50.

Solution 50

- The book value or original purchase price of material in stores is a sunk cost. It is never relevant to a decision concerning the future use of the materials.
- The relevant cost of a material that is in regular use is its replacement price.
- If material in stores has no other use then its relevant cost is its resale value or scrap value; if it is not saleable then the relevant cost is zero.
- If an alternative use of the material is possible then its relevant cost is the opportunity cost, which is the benefit forgone by using the materials for this contract instead of for the alternative use.

(a) £1,650

Working:

Material X £11.00 × 150 = £1,650

As Material X is regularly used, the relevant cost is the replacement cost. The book value is not relevant as it represents a sunk cost.

(b) £825

Working:

Material Y £5.50 × 150 = £825

As Material Y is regularly used, the relevant cost is the replacement cost. The book value is not relevant as it represents a sunk cost.

(c) £2,025

Working:

Relevant cost of labour:	
Hours required (2 × 150)	300 hours
Spare capacity (70% × 300)	210 hours
Overtime	90 hours @ (£15 × 1.5) = £2,025

As the skilled labour has spare capacity and are paid for a 35-hour week, there is no relevant cost for the 210 hours. The only relevant cost is the additional cost incurred in overtime.

(d) £2,250

Working:

Variable overheads (£15 × 150) = £2,250

The variable overheads represent a future cost which will be incurred if the work is undertaken.

Solution 51

- The products must be ranked in order of their contribution per machine hour used.

Answer: (B)

	Product W	*Product X*	*Product Y*	*Product Z*
	£	£	£	£
Contribution per litre	10.40	9.00	5.40	9.00
Contribution per machine hour	10.40/12	9.00/9	5.40/6	9.00/11
=	0.8667	1.0000	0.9000	0.8182
Ranking	3rd	1st	2nd	4th

Solution 52

- The best production plan in part (b) is that which will maximise the contribution from the installation labour. The products must therefore be ranked in order of their contribution per hour.

(a) **2,900 hours**.

Workings:

Hours of installation labour required to satisfy maximum demand

	Hours
Day scan*: 2,000 units × 3 hours/unit	6,000
Night scan: 3,000 units × 4 hours/unit	12,000
Omni scan: 1,800 units × 5.5 hours/unit	9,900
	27,900
Available hours	25,000
Shortfall	2,900

* Hours of installation labour for Day scan $= \frac{£24}{£8} = 3$ hours.

(b) Day scan 2,000 units
Night scan 2,275 units
Omni scan 1,800 units

Workings:

	Day scan	*Night scan*	*Omni scan*
	£	£	£
Selling price	250	320	460
Variable costs			
Material	(70)	(110)	(155)
Manufacturing labour	(40)	(55)	(70)
Installation labour	(24)	(32)	(44)
Variable overheads	(16)	(20)	(28)
Contribution per unit	100	103	163
Installation hours required	3	4	5.5
Contribution per installation hour	£33.33	£25.75	£29.64
Production priority	1st	3rd	2nd

Best production plan

	Units		*Hours used*
Day scan to maximum demand	2,000	(× 3.0)	6,000
Omni scan to maximum demand	1,800	(× 5.5)	9,900

This leaves (25,000 − 6,000 − 9,900) = 9,100 installation labour hours for Night scan.
Therefore, production of Night scan $= \frac{9{,}100}{4} = 2{,}275$ units.

Solution 53

- Only three of the budget roles are correct here, but there are others that are not mentioned including communication, planning, resource allocation and motivation.

Answer: (B)

A budget does not provide a means for expansion. In fact, an organisation can budget to reduce its level of activity.

Solution 54

- If you remember that the principal budget factor is sometimes referred to as the limiting factor, then you should not have too many problems in selecting the correct answer!

Answer: (B)

The principal budget factor is important because it must be identified at the start of the budgeting process. Once the budget for the limiting factor has been prepared, all other budgets must be coordinated with it.

✓ Solution 55

- Although continuous budgeting is quicker and easier using a computerised system it can be accomplished with a manual system.

Options (a) and (c) are correct.

✓ Solution 56

- Remember the formula to calculate budgeted production:

Budgeted sales + Budgeted closing stock − Budgeted opening stock

Answer: (A)

	Units
Required by sales	120,000
Required closing stock	6,500
Less opening stock anticipated	(13,000)
Production level	113,500

✓ Solution 57

- Did you read the question carefully and note that the material *usage* budget was required, not the material purchases budget?

Answer: (C)

10,000 units × 4 kg = 40,000 kg

✓ Solution 58

- The first step is to calculate the required production volume, taking account of the budgeted change in finished goods stocks.
- Convert the production volume into material usage requirements, then adjust for the budgeted change in raw materials stocks to determine the budgeted purchases.

Answer: (B)

	Units
Budgeted sales of product P	4,000
Required decrease in finished goods stock	600
Required production	3,400
	Kg
Raw materials usage budget (× 2 kg)	6,800
Increase in raw materials stocks	1,500
Budgeted purchases of raw material	8,300

Solution 59

- Note that the 5 per cent bad debts will never be received in cash.
- Do not forget to allow for the 2 per cent settlement discount for those customers paying in September for August sales.

Answer: (C)

	£
Receipts in September from:	
June sales £100,000 × 15%	15,000
July sales £150,000 × 20%	30,000
August sales £130,000 × 60% less 2% settlement discount	76,440
Total receipts in September	121,440

Solution 60

- Make sure that you are completely familiar with the descriptions of all of the types of budgeting covered in this *Study System*.

A budget which is designed to show the allowed expenditure for the actual level of activity achieved is known as a *flexible budget*. A fixed budget is prepared for a single level of activity and a rolling budget is a continuously updated budget.

Solution 61

- This question is taken from the CIMA Specimen Questions which were posted on CIMA's website prior to the introduction of objective-test questions.

(a) **£1,740,000**

Quarter 1 *Sales Budget*

	January	*February*	*March*	*Total*
Sales (units)	5,000	5,500	6,000	
Selling price for each unit	£100	£100	£115	
Sales (£)	£500,000	£550,000	£690,000	£1,740,000

(b) **23,100 units**

Quarter 4 *Production Budget*

Required sales units	23,250	(7,750 + 8,000 + 7,500)
Add:		
Required closing stock	1,400	(20% × 7,000 – January 20X3 sales units)
Less:		
Opening stock	1,550	(20% × 7,750 – October sales units)
Production budget	23,100	

(c) **56,400 kg**

Quarter 2 *Material Usage Budget*

Quarter 2 production	18,800*
Material usage for each unit	3 kg
Total quarter 2 material usage	56,400 kg

*It is calculated below as a result of the production budget.

Quarter 2 *Production Budget*

Required sales units	18,750	(6,000 + 6,250 + 6,500)
Add:		
Required closing stock	1,250	(20% × 6,250 – July sales units)
Less:		
Opening stock	1,200	(20% × 6,000 – April sales units)
Production budget	18,800*	

(d) **£249,900**

Quarter 1 *Material Purchases Budget*

Quarter 1 material usage	50,100 kg	(16,700* × 3 kg)
Add:		
Required closing stock	3,630 kg	(6,050* × 3 kg × 20%)
Less:		
Opening stock	3,750 kg	
Purchases	49,980 kg	
Price of each kg	£5.00	
Total material purchases budget	£249,900	

Quarter 1 *Production Budget*

Required sales units	16,500	(5,000 + 5,500 + 6,000)
Add:		
Required closing stock	1,200	(20% × 6,000 – April sales units)
Less:		
Opening stock	1,000	
Production budget	16,700*	

April Production Budget

Required sales units	6,000	
Add:		
Required closing stock	1,250	(20% × 6,250 – May sales units)
Less:		
Opening stock	1,200	(20% × 6,000 – April sales units)
Production budget	6,050*	

(e) **126,300 hours**

Quarter 3 *Production Budget*

Required sales units	20,750	
Add:		
Required closing stock	1,550	(20% × 7,750 – October sales units)
Less:		
Opening stock	1,250	(20% × 6,250 – July sales units)
Production budget	21,050	

Total skilled labour hours required	84,200	hours	(21,050 × 4 hours)
Total unskilled labour hours required	42,100	hours	(21,050 × 2 hours)
Total hours required	126,300	hours.	

Solution 62

- Remember to exclude depreciation from your calculations of overhead cash payments. It is not a cash flow.

(a) June: **£6,500**
July: **£11,500**
August: **£8,000**

Workings:

	June	*July*	*August*
	£	£	£
Closing stock	3,500	6,000	4,000
Material usage	8,000	9,000	10,000
	11,500	15,000	14,000
Less: opening stock	5,000	3,500	6,000
Direct material purchases	6,500	11,500	8,000

(b) £51,000

(c) £20,000

Workings:

		£
(b)		
	Sales receipts in August:	
	Cash sales (10% × £60,000)	6,000
	Credit sales from July (90% × £50,000)	45,000
		51,000
(c)	*Cash payments in July:*	
	Wages	13,000
	Overheads (June £8,500 less depreciation)	7,000
		20,000

Solution 63

- The flexed budgets are reasonably straightforward to produce: all variable costs are multiplied by a factor of 13,600 and 14,500, respectively, and fixed overheads remain unaltered by the change in activity.

(a) **£2,560,000**

Workings:	£
Direct labour: £46 × 13,600 units	625,600
Direct material: £30 × 13,600 units	408,000
Variable overheads: £24 × 13,600 units	326,400
Fixed overheads: original budget	
(£80 × 15,000 units)	1,200,000
	2,560,000

(b) (i) **£50,000** favourable

(ii) **£164,000** adverse

Workings:	£	£	
Actual cost		2,814,000	
Budget cost allowance:			
Labour, materials and variable o/h			
£(46 + 30 + 24) × 14,500	1,450,000		
Fixed overhead – original budget	1,200,000		
		2,650,000	
Expenditure variance		164,000	(A)
Original budget cost = 15,000 × £180		2,700,000	
Flexed budget cost allowance		2,650,000	
Volume variance		50,000	(F)

Solution 64

Answer: (C)

Although standard costs are based on estimates of what might happen in the future, a standard costing system does not provide actual future costs.

Solution 65

- Read the question carefully. You are asked to calculate the standard total production cost, not the standard total cost.

The standard total production cost of one unit of product H is £182

		£ per unit
Direct material W	(4 kg × £1)	4
Direct material X	(2 kg × £5)	10
Direct labour	(14 × £8)	112
Production overhead	(14 × £4)	56
Total production cost		182

Solution 66

- Remember that all the 'quantity' variances (material usage, labour efficiency and variable overhead efficiency) are valued at the standard rate rather than at the actual rate. Therefore the material usage variance in kg should be multiplied by the standard price per kg to determine the monetary value of the material usage variance.

Answer: (A)

Material price variance	£
Standard cost of materials used 26,400 kg × £13	343,200
Actual cost	336,600
	6,600 F

Material usage variance	*Kg*
Standard usage 12,000 units × 2 kg	24,000
Actual usage	26,400
	2,400 × £13/kg = £31,200 A

Solution 67

- Once again, remember to use the standard rate per hour to evaluate the labour efficiency variance.

Answer: (A)

Labour rate variance	£
Standard cost of hours used 40,200 × £4	160,800
Actual labour cost	168,840
	8,040 A
Labour efficiency variance	*Hours*
Standard time 12,000 units × 3.3 hours	39,600
Actual time	40,200
	600 × £4/hour = £2,400 A

Solution 68

- The *total* fixed production overhead variance is the amount of overhead over- or under-absorbed for the period. If you simply deducted the actual overhead expenditure from the budgeted expenditure, you have calculated the fixed production overhead *expenditure* variance.

Answer: (C)

Total fixed production overhead variance	£
Absorbed: 12,000 × 4 std hours × £2.50	120,000
Incurred	160,000
	40,000 A

Solution 69

- The usage must have been higher than standard because the usage variance is adverse.
- Remember that the usage variance is equal to the excess usage multiplied by the standard price per kg of material.

Answer: (D)

Standard price per kilogram of material: $\dfrac{£46{,}248}{11{,}280} = £4.10$

Number of kilograms excess usage: $\dfrac{£492}{£4.10} = 120\,\text{kg}$.

Standard usage: 11,280 kg − 120 kg = 11,160 kg.

Solution 70

- The adverse efficiency variance means that the actual time taken was higher than the standard allowance.
- Notice that there was a nil rate variance. This means that the actual rate per hour was the same as the standard rate per hour.
- There are a number of ways of calculating the correct solution. You might have used a different method – it does not matter as long as you arrive at the correct answer!

Answer: (A)

$$\begin{aligned}
\text{Excess hours above standard time} &= \text{efficiency variance} \div \text{standard rate per hour} \\
&= \frac{£26{,}000}{8} = 3{,}250 \text{ hours} \\
\text{Actual hours worked} = \frac{£182{,}000}{£8} &= 22{,}750 \text{ hours} \\
\text{Standard hours for actual output} &= 22{,}750 - 3{,}250 \\
&= 19{,}500 \text{ hours} \\
\text{Standard hours for one unit} &= \frac{19{,}500}{6{,}500} = 3 \text{ hours.}
\end{aligned}$$

Solution 71

- The fixed overhead volume variance explains the under- or over-absorption which arose due to the actual production volume being different from the budgeted production volume.
- Remember that the calculation of the overhead absorption rate is always based on the budgeted data.

Answer: (B)

$$\text{Absorption rate per standard labour hour} = \frac{£100{,}000}{20{,}000} = £5 \text{ per standard labour hour}$$

$$\text{Shortfall in volume} = 500 \text{ standard labour hours}$$

$$\text{Volume variance} = 500 \times £5 = £2{,}500 \text{ adverse.}$$

Solution 72

- 'Backwards' variance questions are a good way of testing whether you really understand the logic of the variance calculations.
- If you got this question wrong, go back and study variance analysis again to ensure that you can calculate all the required variances quickly and accurately.

Actual labour hours worked		25,600
Adverse efficiency variance in hours	$\left(\frac{£8{,}250}{£7.50}\right)$	1,100
Standard hours expected for production achieved		**24,500**

Solution 73

- Adverse variances are deducted from the budgeted profit to derive the actual profit. Favourable variances are added because they would increase the profit above the budgeted level.

The actual profit reported for the period was **£488,030**.

$$£475{,}000 + £(11{,}245 + 6{,}025 - 3{,}100 + 5{,}075 - 3{,}800 - 2{,}415) = £488{,}030.$$

Solution 74

Only (b) and (c) could have contributed to an adverse direct labour efficiency variance.

(a) Higher output would not in itself cause an adverse efficiency variance. In calculating the efficiency variance the expected labour hours would be flexed according to the actual output achieved.
(b) If material was difficult to process the number of labour hours taken might have been higher than standard. This would result in an adverse labour efficiency variance.
(c) If the original standard time was set too low then actual times are likely to be higher than standard, thus resulting in an adverse labour efficiency variance.
(d) A higher hourly labour rate would cause an adverse labour rate variance, not an adverse efficiency variance.
(e) Using employees who are more skilled than specified in the standard is more likely to result in a favourable direct labour efficiency variance.

✓ Solution 75

Only (d) could have contributed to a favourable fixed production overhead volume variance.

(a) and (b) could both have contributed to an adverse fixed production overhead volume variance because output could have been lower than budgeted, leading to a potential under absorption of overheads.

(c) could have contributed to a favourable fixed production overhead expenditure variance but would have not affected the volume variance.

Higher output levels (d) could have contributed to a favourable fixed production overhead volume variance.

✓ Solution 76

- A favourable variance is always credited to the relevant variance account, so you can easily eliminate options (B) and (D) as incorrect.

Answer: (C)

As a general rule, all variances are entered in the accounts at the point at which they arise. The labour rate variance is therefore recorded in the wages control account.

✓ Solution 77

- Remember that adverse variances are always debited in the relevant variance account, and favourable variances are always credited in the variance account.

(a)

	Debit	*Credit*	*No entry in this account*
Materials control account		✓	
Material price variance account	✓		
Work in progress account			✓

(b)

	Debit	*Credit*	*No entry in this account*
Materials control account			✓
Material usage variance account		✓	
Work in progress account	✓		

(c) The labour force was paid at a *higher hourly rate than standard*. (Because the labour rate variance is adverse.)

(d) Production overhead for the period was *under-absorbed*. (Because the total production overhead variance is adverse.)

(e) Production output for the period was *lower than budgeted*. (Because the production overhead volume variance is adverse.)

Foundation Level Management Accounting Fundamentals

Mock assessment 1

You are allowed 90 minutes to complete this assessment.

The assessment contains 40 questions.

All questions are compulsory.

Do not turn the page until you are ready to attempt the assessment under timed conditions.

Question 1

Which ONE of the following would be classified as direct labour?

- ☐ Personnel manager in a company servicing cars.
- ☐ Bricklayer in a construction company.
- ☐ General manager in a DIY shop.
- ☐ Maintenance manager in a company producing cameras.

Question 2

The principal budget factor is the

- ☐ factor which limits the activities of the organisation and is often the starting point in budget preparation.
- ☐ budgeted revenue expected in a forthcoming period.
- ☐ main budget into which all subsidiary budgets are consolidated.
- ☐ overestimation of revenue budgets and underestimation of cost budgets, which operates as a safety factor against risk.

Question 3

R Ltd absorbs overheads based on units produced. In one period 110,000 units were produced and the actual overheads were £500,000. Overheads were £50,000 over-absorbed in the period.

The overhead absorption rate was £☐ per unit.

Question 4

X Ltd operates an integrated cost accounting system. The Work-in-Progress Account at the end of the period showed the following information:

Work-in-Progress Account

	£		£
Stores ledger a/c	100,000	?	200,000
Wage control a/c	75,000		
Factory overhead a/c	50,000	Balance c/d	25,000
	225,000		225,000

The £200,000 credit entry represents the value of the transfer to the

- ☐ Cost of sales account.
- ☐ Material control account.
- ☐ Sales account.
- ☐ Finished goods stock account.

Question 5

X Ltd operates a standard costing system and absorbs overheads on the basis of standard machine hours. Details of budgeted and actual figures are as follows:

	Budget		*Actual*	
Overheads	£1,250,000		£1,005,000	
Output	250,000	units	220,000	units
Machine hours	500,000	hours	450,000	hours

(a) Overheads for the period were:

under-absorbed ☐
over-absorbed ☐

(b) The value of the under/over absorption for the period was £☐.

Question 6

In an integrated bookkeeping system, when the actual production overheads exceed the absorbed production overheads, the accounting entries to close off the production overhead account at the end of the period would be:

	Debit	*Credit*	*No entry in this account*
Production overhead account	☐	☐	☐
Work in progress account	☐	☐	☐
Profit and loss account	☐	☐	☐

Question 7

X Ltd currently uses marginal costing to calculate profit. There were 10,000 units of opening stock and 12,000 units of closing stock for the period.

If absorption costing principles had been used and the fixed overhead absorption rate was £30 per unit, the absorption costing profit for the period compared to the marginal costing profit would have been

☐ £30,000 lower. ☐ £30,000 higher. ☐ £60,000 lower. ☐ £60,000 higher.

The following information is required for Questions 8–10

The following data relate to stock item PR7:

Average usage	1,000 units per day
Minimum usage	600 units per day
Maximum usage	1,300 units per day
Average lead time	7.5 days
Minimum lead time	5 days
Maximum lead time	10 days
EOQ	40,000 units
Reorder level	13,000 units

Question 8

The lead time is the period between raising a purchase requisition and receiving the requisitioned materials into stores.

True ☐ False ☐

Question 9

The maximum stock level is ☐ units.

Question 10

The minimum stock level is ☐ units.

Question 11

A company operates a differential piece-rate system and the following weekly rates have been set:

1–500 units	£0.20 per unit in this band
501–600 units	£0.25 per unit in this band
601 units and above	£0.55 per unit in this band

Details relating to employee A for the latest week are shown below:

Employee A	
Actual output achieved	800 units
Actual hours worked	45

There is a guaranteed minimum wage of £5 per hour for a 40-hour week paid to all employees.

The amount payable (to the nearest £) to employee A is £☐.

Question 12

Overtime premium is

- ☐ the additional amount paid for hours worked in excess of the basic working week.
- ☐ the additional amount paid over and above the normal hourly rate for hours worked in excess of the basic working week.
- ☐ the additional amount paid over and above the overtime rate for hours worked in excess of the basic working week.
- ☐ the overtime rate.

The following information is required for Questions 13 and 14

X Ltd has two production departments, Assembly and Finishing, and one service department, Stores.

Stores provide the following service to the production departments: 60% to Assembly and 40% to Finishing.

The budgeted information for the year is as follows:

Budgeted fixed production overheads:

Assembly	£100,000
Finishing	£150,000
Stores	£50,000
Budgeted output	100,000 units

Question 13

The budgeted fixed production overhead absorption rate for the Assembly Department will be £☐ per unit.

Question 14

At the end of the year, the total of all of the fixed production overheads debited to the Finishing Department Fixed Production Overhead Control Account was £130,000, and the actual output achieved was 100,000 units.

(a) The overheads for the Finishing Department were:

under-absorbed ☐
over-absorbed ☐

(b) The value of the under/over absorption was £☐.

Question 15

R Ltd has been asked to quote for a job. The company aims to make a profit margin of 20% on sales. The estimated total variable production cost for the job is £125.

Fixed production overheads for the company are budgeted to be £250,000 and are recovered on the basis of labour hours. There are 12,500 budgeted labour hours and this job is expected to take 3 labour hours.

Other costs in relation to selling and distribution, and administration are recovered at the rate of £15 per job.

The company quote for the job should be £☐.

Question 16

Which of the following would NOT be included in a cash budget? Tick all that would NOT be included.

- ☐ Depreciation
- ☐ Provisions for doubtful debts
- ☐ Wages and salaries

The following information is required for Questions 17 and 18

X Ltd is preparing its budgets for the forthcoming year.

The estimated sales for the first four months of the forthcoming year are as follows:

Month 1	6,000 units
Month 2	7,000 units
Month 3	5,500 units
Month 4	6,000 units

40% of each month's sales units are to be produced in the month of sale and the balance is to be produced in the previous month.

50% of the direct materials required for each month's production will be purchased in the previous month and the balance in the month of production.

The direct material cost is budgeted to be £5 per unit.

Question 17

The production budget in units for Month 1 will be ☐ units.

Question 18

The material cost budget for Month 2 will be £☐.

Question 19

When calculating the material purchases budget, the quantity to be purchased equals

☐ material usage + materials closing stock − materials opening stock
☐ material usage − materials closing stock + materials opening stock
☐ material usage − materials closing stock – materials opening stock
☐ material usage + materials closing stock + materials opening stock

Question 20

The following extract is taken from the overhead budget of X Ltd:

Budgeted activity	50%	75%
Budgeted overhead	£100,000	£112,500

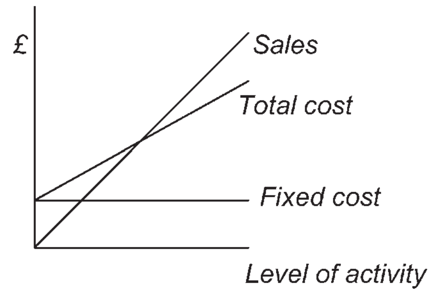
The overhead budget for an activity level of 80% would be £☐.

Question 21

Which of the following would be included in the cash budget, but would not be included in the budgeted profit and loss account? Tick all that are correct.

☐ Repayment of a bank loan.
☐ Proceeds from the sale of a fixed asset.
☐ Bad debts write off.

Question 22



This graph is known as a

- ☐ semi-variable cost chart.
- ☐ conventional breakeven chart.
- ☐ contribution breakeven chart.
- ☐ profit volume chart.

Question 23

The following details have been extracted from the creditors' records of X Limited:

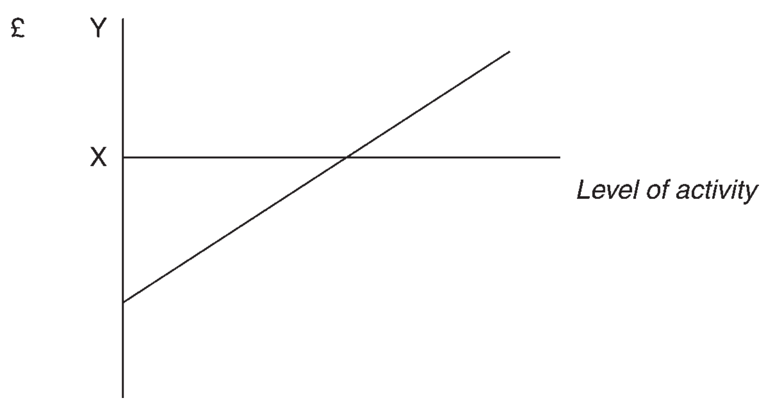
Invoices paid in the month of purchase	25%
Invoices paid in the first month after purchase	70%
Invoices paid in the second month after purchase	5%

Purchases for July to September are budgeted as follows:

July	£250,000
August	£300,000
September	£280,000

For suppliers paid in the month of purchase, a settlement discount of 5% is received. The amount budgeted to be paid to suppliers in September is £☐.

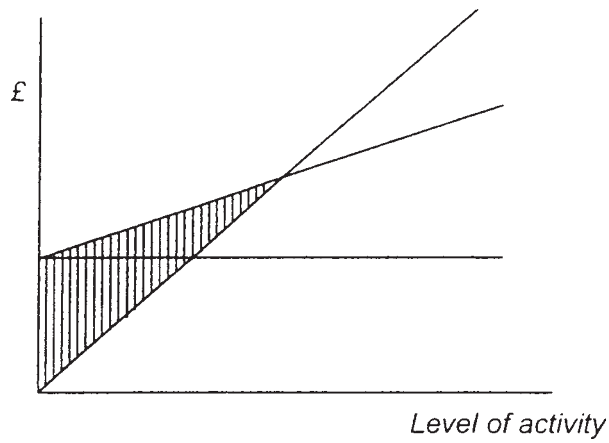
Question 24



The difference in the values (£) between point X and point Y on the profit volume chart shown above represents:

- ☐ contribution.
- ☐ profit.
- ☐ breakeven.
- ☐ loss.

Question 25



The shaded area on the breakeven chart shown above represents:

- ☐ loss.
- ☐ fixed cost.
- ☐ variable cost.
- ☐ profit.

Question 26

In a standard cost bookkeeping system, when the actual material usage has been greater than the standard material usage, the entries to record this is in the accounts are:

	Debit	*Credit*	*No entry in this account*
Material usage variance account	☐	☐	☐
Raw material control account	☐	☐	☐
Work in progress account	☐	☐	☐

Question 27

R Ltd makes one product, which passes through a single process.

Details of the process for period 1 were as follows:

	£
Material cost – 20,000 kg	26,000
Labour cost	12,000
Production overhead cost	5,700
Output	18,800 kg
Normal losses	5% of input

There was no work-in-progress at the beginning or end of the period. Process losses have no value.

The cost of the abnormal loss (to the nearest £) is £☐.

Question 28

JJ Ltd is preparing a quote for a job. The job requires 500 kg of material X. There are 400 kg of material X currently held in stock at a book value of £2 per kg. JJ Ltd uses material regularly and the current market price is £2.50 per kg. The materials have a scrap value of £1 per kg.

The relevant cost of the materials for this job is £☐.

The following information is required for Questions 29–35

X Ltd operates a standard marginal costing system. The following budgeted and standard cost information is available:

Budgeted production and sales	10,000 units
	£ per unit
Selling price	250
Direct material cost – 3 kg × £10	30
Direct labour cost – 5 hours × £8	40
Variable production overheads – 5 hours × £4	20

Actual results for the period were as follows:

Production and sales	11,500 units
	£
Sales value	2,817,500
Direct material – 36,000 kg	342,000
Direct labour – 52,000 hours	468,000
Variable production overheads	195,000

For all calculated variances, tick the correct box to indicate whether the variance is adverse or favourable.

Question 29

The direct material price variance is £☐

adverse ☐
favourable ☐

Question 30

The direct material usage variance is £☐

adverse ☐
favourable ☐

Question 31

The direct labour rate variance is £☐

adverse ☐
favourable ☐

Question 32

The direct labour efficiency variance is £☐

adverse ☐
favourable ☐

Question 33

The variable production overhead expenditure variance is £☐

adverse ☐
favourable ☐

Question 34

The variable production overhead efficiency variance is £☐

adverse ☐
favourable ☐

Question 35

The total sales contribution variance is £☐

adverse ☐
favourable ☐

Question 36

X Ltd uses the FIFO method to charge material issue costs to production. Opening stock of material M at the beginning of April was 270 units valued at £4 per unit.

Movements of material M during April were as follows.

4 April	Received 30 units at £4.10 per unit
9 April	Issued 210 units
14 April	Issued 80 units
22 April	Received 90 units at £4.20 per unit

(a) The total value of the issues to production during April was £☐.
(b) The value of the closing stock at the end of April was £☐.

Question 37

X Ltd manufactures a product called the 'ZT'. The budget for next year was:

Annual sales	10,000 units
	£ per unit
Selling price	20
Variable cost	14
Fixed costs	3
Profit	3

If the selling price of the ZT were reduced by 10 per cent, the sales revenue that would be needed to generate the original budgeted profit would be £☐.

Question 38

Z Ltd produces a single product. The management currently uses marginal costing, but is considering using absorption costing in the future. The budgeted fixed production overheads for the period are £250,000. The budgeted output for the period is 1,000 units. There were 400 units of opening stock for the period and 250 units of closing stock.

(a) If absorption costing principles were applied, the profit for the period compared to the marginal costing profit would be:

- ☐ higher
- ☐ lower

(b) The difference between the profit figures would be £☐.

Question 39

A purchase requisition is used to

- ☐ order goods or services specifying quantities, prices, delivery dates and order terms.
- ☐ instruct the buying office to purchase goods or services, stating their quantity and description.
- ☐ authorise the issue from stores of a specified quantity of material.
- ☐ record goods or services at the point of receipt.

Question 40

R Ltd has the following year-end information regarding one of its long-term contracts:

	£
Value certified–recognised as turnover	2,500,000
Profit recognised	750,000
Cash received	1,875,000
Costs to date	2,200,000
Future costs	220,000

(a) The cost of work certified was £☐.
(b) The value of the contract debtor is £☐.

First Mock Assessment – Solutions

Solution 1

Bricklayer in a construction company.

The bricklayer's wages can be identified with a specific cost unit therefore this is a direct cost. The wages paid to the other three people cannot be identified with specific cost units. Therefore they would be indirect costs.

Solution 2

The principal budget factor is the factor which limits the activities of the organisation and is often the starting point in budget preparation.

Solution 3

The overhead absorption rate was £5 per unit.

Workings:

	£
Actual overheads	500,000
Over absorption	50,000
Overhead absorbed	550,000

Overhead absorption rate = £550,000/110,000 units = £5.

Solution 4

Finished goods stock account.

Solution 5

Overheads for the period were *over-absorbed by £95,000*.

Workings:

Overhead absorption rate = £1,250,000/500,000 = £2.50 per standard machine hour

Standard hours per unit = 500,000 hours/250,000 units = 2 hours per unit

	£
Absorbed overhead = 220,000 units × 2 hours × £2.50	1,100,000
Actual overhead incurred	1,005,000
Over-absorbed overhead	95,000

Solution 6

	Debit	*Credit*	*No entry in this account*
Production overhead account		✔	
Work in progress account			✔
Profit and loss account	✔		

Solution 7

The absorption costing profit would have been *£60,000 higher*.

Workings:

Increase in stock (10,000 – 12,000) 2,000 units × £30 per unit = £60,000

The profit under absorption costing will be higher as the closing stock will carry fixed production overheads at the rate of £30 per unit into the next period.

Solution 8

False. The lead time is the period between sending a purchase order to the supplier and receiving the ordered materials into stores.

Solution 9

$$\begin{aligned}\text{Maximum stock level} &= (\text{reorder level} + \text{EOQ}) - (\text{minimum usage} \\ &\quad \times \text{minimum lead time}) \\ &= (13{,}000 + 40{,}000) - (600 \text{ units} \times 5 \text{ days}) \\ &= 50{,}000 \text{ units}\end{aligned}$$

Solution 10

$$\begin{aligned}\text{Minimum stock level} &= \text{reorder level} - (\text{average rate of usage} \times \text{average lead time}) \\ &= 13{,}000 - (1{,}000 \text{ units} \times 7.5 \text{ days}) \\ &= 5{,}500 \text{ units}\end{aligned}$$

Solution 11

The amount payable to employee A is £235.

Workings:

Units			*£*
500	×	20p	100
100	×	25p	25
200	×	55p	110
800			235

Solution 12

Overtime premium is the additional amount paid over and above the normal hourly rate for hours worked in excess of the basic working week.

Solution 13

The budgeted fixed production overhead absorption rate for the Assembly Department will be £1.30 per unit.

Workings:

	Assembly
	£
Budgeted overheads	100,000
Reapportioned stores overhead 60% × £50,000	30,000
Total budgeted overhead	130,000
Budgeted output	100,000

$$\text{OAR} = \frac{£130{,}000}{100{,}000} = £1.30 \text{ per unit}$$

Solution 14

The overheads for the Finishing Department were *over-absorbed by £40,000.*

Workings:

	Finishing
	£
Budgeted overheads	150,000
Reapportioned stores overhead 40% × £50,000	20,000
Total budgeted overhead	170,000
Budgeted output	100,000

$$\text{OAR} = \frac{£170{,}000}{100{,}000} = £1.70 \text{ per unit}$$

	£
Absorbed overhead £1.70 × 100,000	170,000
Actual overhead incurred	130,000
Over absorption	40,000

Solution 15

The company quote for the job should be *£250.*

Workings:

	Job quote
	£
Variable production costs	125
Fixed production overheads $\left(\frac{£250{,}000}{12{,}500} \times 3\right)$	60
Selling, distribution and administration	15
Total cost	200
Profit margin 20%	50
Quote	250

Solution 16

Depreciation and provisions for doubtful debts are not cash flows and would not be included in a cash budget.

Solution 17

The production budget for month 1 will be *6,600 units*.

Workings:

	Month 1	*Month 2*	*Month 3*	*Month 4*
	Units	*Units*	*Units*	*Units*
Sales	6,000	7,000	5,500	6,000
Production				
40% in the month	2,400	2,800	2,200	2,400
60% in the previous month	4,200	3,300	3,600	
Production	6,600	6,100	5,800	

Solution 18

The material cost budget for Month 2 will be *£30,500*.

Workings:

Month 2 6,100 units produced @ £5 per unit = £30,500.

Solution 19

The quantity to be purchased equals material usage + materials closing stock − materials opening stock.

Solution 20

The overhead budget for an activity level of 80% would be *£115,000*.

Workings:
Using the high/low method

		£	
High	75%	112,500	
Low	50%	100,000	
Change	25%	12,500	– variable cost of 25%
	1%	500	– variable cost of 1%

Substitute into 75% activity	£
Total overhead	112,500
Variable cost element 75 × £500	37,500
Fixed cost element	75,000
Total overhead for 80% activity	
Variable cost element 80 × £500	40,000
Fixed cost element	75,000
Total overhead	115,000

Solution 21

The correct answers are:
- repayment of a bank loan
- proceeds from the sale of a fixed asset.

Both these items result in a cash flow and would therefore be included in the cash budget. However, they would not be included in the profit and loss account. The bad debts write off would be included in the profit and loss account, but not in the cash budget.

Solution 22

The graph is known as a conventional breakeven chart.

Solution 23

The amount budgeted to be paid to suppliers in September is *£289,000*.

Workings:

	July	*August*	*September*
	£	*£*	*£*
Purchases	250,000	300,000	280,000
25% paid in the month of purchase	62,500	75,000	70,000
5% discount allowed	(3,125)	(3,750)	(3,500)
70% paid in the first month		175,000	210,000
5% paid in the second month			12,500
Budgeted payment			289,000

Solution 24

The difference in the values (£) between point X and point Y on the profit volume chart represents *profit*.

Solution 25

The shaded area on the breakeven chart represents *loss*.

Solution 26

	Debit	*Credit*	*No entry in this account*
Material usage variance account	✔		
Raw material control account			✔
Work in progress account		✔	

Solution 27

The cost of the abnormal loss is *£460*.

Workings:

	£
Direct material cost	26,000
Labour cost	12,000
Production overhead cost	5,700
	43,700

	Kg
Input	20,000
Normal loss	1,000
Expected output	19,000
Actual output	18,800
Abnormal loss	200

Cost per kg = £43,700/19,000 = £2.30
Cost of abnormal loss = £2.30 × 200 kg = £460.

Solution 28

The relevant cost of the materials for this job is *£1,250*.

The relevant cost of regularly used materials is the replacement price. Therefore relevant cost = £2.50 × 500kg = £1,250.

Solution 29

The direct material price variance is *£18,000 favourable*.

Workings:

	£	
36,000 kg should cost (× £10)	360,000	
but did cost	342,000	
Variance	18,000	F

Solution 30

The direct material usage variance is *£15,000 adverse*.

Workings:

11,500 units should use (× 3 kg)	34,500	kg
but did use	36,000	kg
Difference	1,500	kg
× std price per kg	× £10	
Variance	£15,000	A

Solution 31

The direct labour rate variance is *£52,000 adverse*.

Workings:

	£
52,000 hours should cost (× £8)	416,000
but did cost	468,000
Variance	52,000 A

Solution 32

The direct labour efficiency variance is *£44,000 favourable*.

Workings:

11,500 units should take (× 5 hours)	57,500 hours
but did take	52,000 hours
Difference	5,500 hours
× std rate per hour	× £8
Variance	£44,000 F

Solution 33

The variable production overhead expenditure variance is *£13,000 favourable*.

Workings:

	£
52,000 hours should have cost (× £4)	208,000
but did cost	195,000
Variance	13,000 F

Solution 34

The variable production overhead efficiency variance is *£22,000 favourable*.

Workings:

Variance in hours from labour efficiency variance	= 5,500 hours
× standard variable production overhead per hour	× £4
Variance	£22,000 F

Solution 35

The total sales contribution variance is *£182,500 favourable*.

Workings:

	£
Budgeted contribution £(250 − 30 − 40 − 20) × 10,000	1,600,000
Actual sales at standard cost: £2,817,500	
− [£(30 + 40 + 20) × 11,500]	1,782,500
Variance	182,500 F

✓ Solution 36

(a) The total value of the issues to production during April was *£1,329*.
(b) The value of the closing stock at the end of April was *£252*.

Workings:

			£
(a) Issues:	9 April	210 units × £4	840
	14 April	60 units × £4	240
		20 units × £4.10	82
	24 April	10 units × £4.10	41
		30 units × £4.20	126
			1,329

(b) Stock = 60 units × £4.20 = £252

✓ Solution 37

The sales revenue that would be needed to generate the original budgeted profit would be *£270,000*.

Workings:
Fixed costs are not relevant because they will remain unaltered.
Original budgeted contribution = 10,000 units × £(20 − 14) = £60,000
Revised contribution per unit = £(18 − 14) = £4
Required number of units to achieve same contribution = £60,000/£4 = 15,000 units
Required sales revenue = 15,000 units × £18 revised price = £270,000

✓ Solution 38

(a) The absorption costing profits would be *lower* than the marginal costing profits.
This is because stock is reducing, with the result that fixed production overheads are 'released' from stock with absorption costing.
(b) The difference between the profit figures would be *£37,500*.

Workings:

Reduction in stock (400 − 250)	150 units
× standard absorption rate per unit (£250,000/1,000)	× £250
Difference in reported profits	£37,500

✓ Solution 39

A purchase requisition is used to instruct the buying office to purchase goods or services, stating their quantity and description.

Solution 40

(a) The cost of work certified was *£1,750,000*.

Workings:

	£
Value certified	2,500,000
Profit recognised	750,000
Cost of work certified	1,750,000

(b) The value of the contract debtor is *£625,000*.

Workings:

	£
Value certified	2,500,000
Less cash received	1,875,000
Debtor balance	625,000

Foundation Level

Management Accounting Fundamentals

Mock assessment 2

You are allowed 90 minutes to complete this assessment.

The assessment contains 40 questions.

All questions are compulsory.

Do not turn the page until you are ready to attempt the assessment under timed conditions.

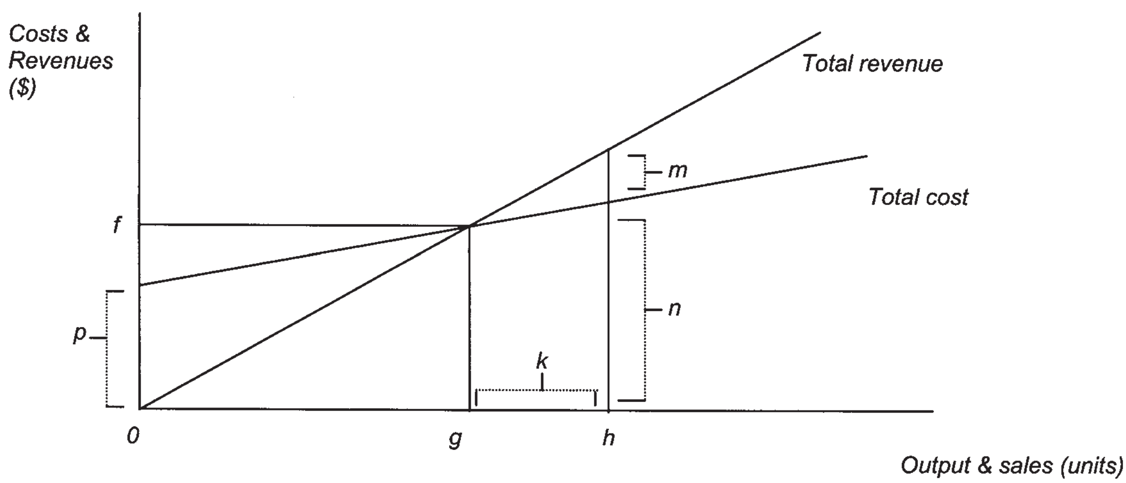
Question 1

W plc uses the economic order quantity (EOQ) as part of its materials control policy. The objective of the EOQ is to ensure that

- ☐ the company never runs out of stock, except in exceptional circumstances.
- ☐ the cost of being out of stock is minimised.
- ☐ the combined cost of ordering and holding stock is minimised.
- ☐ stock is purchased from suppliers at the cheapest price.

Question 2

A company expects to sell *h* units in the next accounting period, and has prepared the following breakeven chart.



(a) The margin of safety is shown on the diagram by ☐ (insert correct letter).

(b) The effect of an increase in fixed costs, with all other costs and revenues remaining the same, will be

	increase	*decrease*	*stay the same*
m will	☐	☐	☐
k will	☐	☐	☐
f will	☐	☐	☐
p will	☐	☐	☐

Question 3

A company uses the repeated distribution method to reapportion service department costs. The use of this method suggests

☐ the company's overhead rates are based on estimates of cost and activity levels, rather than actual amounts.
☐ there are more service departments than production cost centres.
☐ the company wishes to avoid under- or over-absorption of overheads in its production cost centres.
☐ the service departments carry out work for each other.

Question 4

The management accountant's report shows that fixed production overheads were over-absorbed in the last accounting period. The combination that is certain to lead to this situation is

Production activity	*and*	*Fixed overhead expenditure*
☐ lower than budget		☐ lower than budget
☐ higher than budget		☐ higher than budget
☐ as budgeted		☐ as budgeted

Question 5

Which of the following costs would be classified as production overhead cost in a food processing company (tick all that apply)?

☐ The cost of renting the factory building.
☐ The salary of the factory manager.
☐ The depreciation of equipment located in the materials store.
☐ The cost of ingredients.

Question 6

The output of a process consists of two joint products, Jointpro A and Jointpro B, and a by-product. Jointpro B could go through a further process in order to increase its sales value. To assist management in making the decision whether to carry out further processing, which ONE of the following is relevant?

☐ The share of the total processing cost which has been allocated to Jointpro B.
☐ The sales value of Jointpro A and the by-product.

- ☐ The physical quantities of all three products at separation point.
- ☐ The cost of further processing Jointpro B and the increase in sales value that will result.

The following information is required for questions 7 and 8

The incomplete process account relating to period 4 for a company which manufactures paper is shown below:

Process account

	Units	$		*Units*	$
Material	4,000	16,000	Finished goods	2,750	
Labour		8,125	Normal loss	400	700
Production overhead		3,498	Work in progress	700	

There was no opening work in process (WIP). Closing WIP, consisting of 700 units, was complete as shown:

Material	100%
Labour	50%
Production overhead	40%

Losses are recognised at the end of the production process and are sold for $1.75 per unit.

Question 7

Given the outcome of the process, which ONE of the following accounting entries is needed to complete the double entry in the process account for the abnormal loss or gain?

	Debit	*Credit*	*No entry in this account*
Process account	☐	☐	☐
Abnormal Gain account	☐	☐	☐
Abnormal Loss account	☐	☐	☐

Question 8

The value of the closing WIP was $☐.

Question 9

A machine operator is paid £10.20 per hour and has a normal working week of 35 hours. Overtime is paid at the basic rate plus 50%. If, in week 7, the machine operator worked 42 hours, the overtime premium paid to the operator would be £☐.

Question 10

An engineering firm operates a job costing system. Production overhead is absorbed at the rate of £8.50 per machine hour. In order to allow for non-production overhead costs and profit, a mark up of 60% of prime cost is added to the production cost when preparing price estimates.

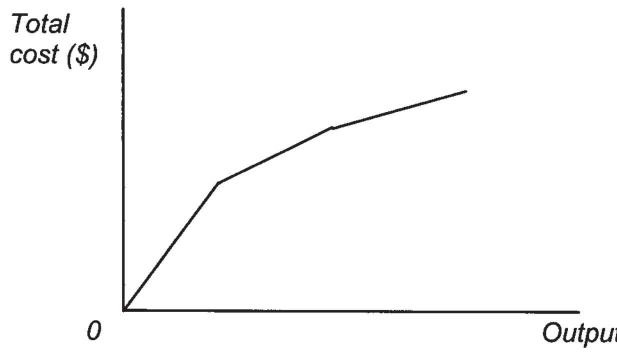
The estimated requirements of job number 808 are as follows:

Direct materials	£10,650
Direct labour	£3,260
Machine hours	140

The estimated price notified to the customer for job number 808 will be £[ ].

Question 11

The diagram represents the behaviour of a cost item as the level of output changes:



Which ONE of the following situations is depicted by the graph?

- ☐ Discounts are received on additional purchases of material when certain quantities are purchased.
- ☐ Employees are paid a guaranteed weekly wage, together with bonuses for higher levels of production.
- ☐ A licence is purchased from the government which allows unlimited production.
- ☐ Additional space is rented to cope with the need to increase production.

Question 12

A hospital's records show that the cost of carrying out health checks in the last five accounting periods have been as follows:

Period	*Number of patients seen*	*Total cost*
		£
1	650	17,125
2	940	17,800
3	1,260	18,650
4	990	17,980
5	1,150	18,360

Using the high–low method and ignoring inflation, the estimated cost of carrying out health checks on 850 patients in period 6 is £[ ].

Question 13

The principal budget factor for a footwear retailer is

- ☐ the cost item taking the largest share of total expenditure.
- ☐ the product line contributing the largest amount to sales revenue.
- ☐ the product line contributing the largest amount to business profits.
- ☐ the constraint that is expected to limit the retailer's activities during the budget period.

The following information is required for questions 14 and 15

Extracts from the budget of H Ltd, a retailer of office furniture, for the six months to 31 December show the following information:

	$
Sales	55,800
Purchases	38,000
Closing stock finished goods	7,500
Opening stock finished goods	5,500
Opening debtors	8,500
Opening creditors	6,500

Debtors and creditors are expected to rise by 10 and 5 per cent, respectively, by the end of the budget period.

Question 14

The estimated cash receipts from customers during the budget period are $☐.

Question 15

The profit mark-up, as a percentage of the cost of sales (to the nearest whole number) is ☐%.

Question 16

Which of the following actions are appropriate if a company anticipates a temporary cash shortage (tick all that apply)?

(i) ☐ issue additional shares;
(ii) ☐ request additional bank overdraft facilities;
(iii) ☐ sell machinery currently working at half capacity;
(iv) ☐ postpone the purchase of plant and machinery.

Question 17

A company manufactures three products, X, Y and Z. The sales demand and the standard unit selling prices and costs for the next accounting period, period 1, are estimated as follows:

	X	*Y*	*Z*
Maximum demand (000 units)	4.0	5.5	7.0
	£ per unit	*£ per unit*	*£ per unit*
Selling price	28	22	30
Variable costs:			
Raw material (£1 per kg)	5	4	6
Direct labour (£12 per hour)	12	9	18

(a) If supplies in period 1 are restricted to 90,000 kg of raw material and 18,000 hours of direct labour, the limiting factor would be

- ☐ direct labour.
- ☐ raw material.
- ☐ neither direct labour nor raw material.

(b) In period 2, the company will have a shortage of raw materials, but no other resources will be restricted. The standard selling prices and costs and the level of demand will remain unchanged.

In what order should the materials be allocated to the products if the company wants to maximise profit?

First: product ☐
Second: product ☐
Third: product ☐

Question 18

Performance standards which have remained unchanged over a long period of time are known as

- ☐ ideal standards.
- ☐ current standards.
- ☐ basic standards.
- ☐ long-term standards.

The following information is required for questions 19 and 20

W Ltd makes leather purses. It has drawn up the following budget for its next financial period:

Selling price per unit	\$11.60
Variable production cost per unit	\$3.40
Sales commission	5% of selling price
Fixed production costs	\$430,500
Fixed selling and administration costs	\$198,150
Sales	90,000 units

Question 19

The margin of safety represents ☐% of budgeted sales.

Question 20

The marketing manager has indicated that an increase in the selling price to $12.25 per unit would not affect the number of units sold, provided that the sales commission is increased to 8 per cent of the selling price.

These changes will cause the breakeven point (to the nearest whole number) to be ☐ units.

Question 21

An engineering firm has surplus capacity and wishes to secure a short-term contract to supply components. It has decided to bid for a contract at a price which will just cover all relevant costs.

Which of the following costs should NOT be included in the calculation of the minimum price it can bid (tick all that apply)?

(i) ☐ The cost of a research project undertaken last year which has resulted in an improved method of manufacturing the components.
(ii) ☐ The cost of hiring a supervisor to oversee the contract's progress.
(iii) ☐ The cost of labour which will be transferred to the contract from another production line where it is currently idle.
(iv) ☐ The depreciation charge on existing machinery owned by the firm which will be used to manufacture the components.

Question 22

A firm calculates the material price variance when material is purchased. The accounting entries necessary to record a favourable material price variance in the ledger are:

	Debit	*Credit*	*No entry in this account*
Material control account	☐	☐	☐
Work-in-progress control account	☐	☐	☐
Material price variance account	☐	☐	☐

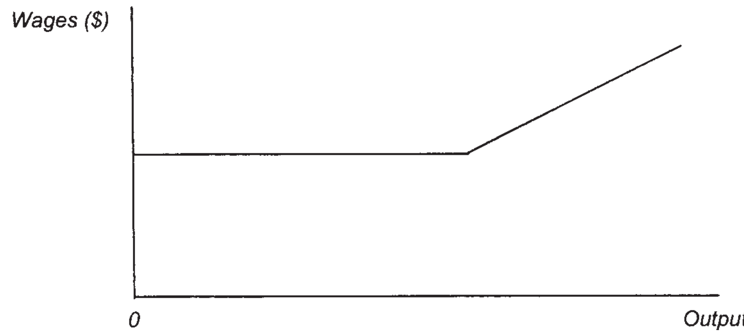
Question 23

The accounting entries necessary to record an adverse labour efficiency variance in the ledger accounts are:

	Debit	*Credit*	*No entry in this account*
Wages control account	☐	☐	☐
Labour variance account	☐	☐	☐
Work-in-progress control account	☐	☐	☐

Question 24

The following graph shows the wages earned by an employee during a single day:



Which ONE of the remuneration systems listed below does the graph represent?

- ☐ Differential piecework.
- ☐ A flat rate per hour with a premium for overtime working.
- ☐ Straight piecework.
- ☐ Piecework with a guaranteed minimum daily wage.

Question 25

J Ltd uses standard absorption costing and absorbs production overheads on the basis of standard machine hours. The following budgeted and actual information applied in its last accounting period:

	Budget	*Actual*
Production overhead	$180,000	$178,080
Machine hours	50,000	48,260
Units produced	40,000	38,760

(a) At the end of the period, production overhead will be reported as:

- ☐ under-absorbed
- ☐ over-absorbed

(b) The amount of the under/over-absorption will be $ ☐.

The following data are to be used to answer questions 26 and 27

E Ltd's stock purchases during a recent week were as follows:

Day	*Price per unit* ($)	*Units purchased*
1	1.45	55
2	1.60	80
3	1.75	120
4	1.80	75
5	1.90	130

There was no stock at the beginning of the week. 420 units were issued to production during the week. The company updates its stock records after every transaction.

Question 26

Using a first in, first out (FIFO) method of costing stock issues, the value of closing stock would be \$ ☐.

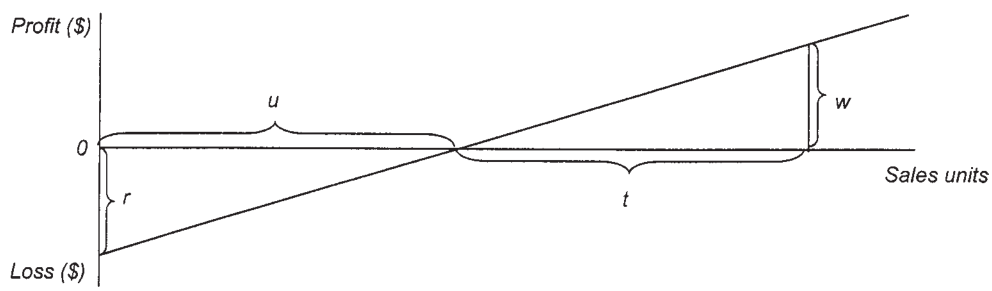
Question 27

If E Ltd changes to the weighted average method of stock valuation, the effect on closing stock value and on profit for the week compared with the FIFO method will be:

(a) Closing stock value will be: higher ☐
lower ☐
(b) Gross profit for the week will be: higher ☐
lower ☐

The following data are to be used to answer questions 28 and 29

The diagram shows the profit-volume chart of Z Ltd for its last accounting period. The company made a profit of \$*w* during the period.



Question 28

An increase in the fixed costs per period (assuming the selling price per unit and the variable cost per unit remain unchanged), will cause:

	increase	*decrease*	*remain the same*
r to	☐	☐	☐
w to	☐	☐	☐
t to	☐	☐	☐
u to	☐	☐	☐

Question 29

The following results were achieved in the last accounting period:

r = \$50,000 w = \$16,000 t = 800 units u = 2,500 units

The company expects to make and sell an additional 1,400 units in the next accounting period. If variable cost per unit, selling price per unit and total fixed costs remain unchanged, profit will increase by \$ ☐.

Question 30

A manufacturer of cell phones is considering the following actions. Which of these is likely to increase the manufacturer's C/S (contribution/sales) ratio (tick all that apply)?

(i) ☐ taking advantage of quantity discounts for bulk purchases of material;
(ii) ☐ introducing training programmes designed to improve labour efficiency;
(iii) ☐ following the actions of a competitor who has cut prices substantially;
(iv) ☐ reducing exports to countries where there is intense price competition;
(v) ☐ offering retailers a lower price if they display the product more prominently.

Question 31

An advertising agency uses a job costing system to calculate the cost of client contracts. Contract A42 is one of several contracts undertaken in the last accounting period. Costs associated with the contract consist of:

Direct materials	\$5,500
Direct expenses	\$14,500

Design staff worked 1,020 hours on contract A42, of which 120 hours were overtime. One third of these overtime hours were worked at the request of the client who wanted the contract to be completed quickly. Overtime is paid at a premium of 25 per cent of the basic rate of \$24.00 per hour.

The prime cost of contract A42 is \$ ☐.

The following data are to be used to answer questions 32 and 33

A newly-formed company has drawn up the following budgets for its first two accounting periods:

	Period 1	*Period 2*
Sales (units)	9,500	10,300
Production (units)	10,000	10,000

The following budgeted information applies to both periods:

	\$
Selling price per unit	6.40
Variable cost per unit	3.60
Fixed production overhead per period	15,000

Question 32

In period 1, the budgeted profit will be

☐ the same under both absorption costing and marginal costing.
☐ \$750 higher under marginal costing.
☐ \$750 higher under absorption costing.
☐ \$1,400 higher under absorption costing.

? Question 33

In period 2, everything was as budgeted, except for the fixed production overhead, which was $15,700.

The reported profit, using absorption costing in period 2, would be $ ☐.

? Question 34

If fixed production overhead is over-absorbed in an accounting period, which ONE of the following combinations could have caused this result?

		Fixed overhead expenditure variance	*and*	*Fixed overhead volume variance*
A	☐	$4,200 (A)		$3,750 (F)
B	☐	$3,250 (A)		$4,170 (F)
C	☐	$2,240 (A)		$1,870 (A)
D	☐	$2,980 (F)		$3,690 (A)

? Question 35

A company undertaking long-term building contracts has a financial year end of 30 April. The following details on the purchase and use of machinery refer to contract A44, which was started on 1 May year 3 and is due for completion after 27 months.

1 July year 3:	Machine 1 was purchased at a cost of $55,000. It is to be used throughout the contract, and will be sold for $6,400 when the contract finishes.
1 October year 3:	Machine 2 was purchased at a cost of $28,600. The machine will be scrapped at the end of contract A44, and is not expected to have any saleable value.

If the company's policy is to charge depreciation in equal monthly amounts, the balance sheet value of machinery on contract A44 at 30 April year 4 will be $☐.

? Question 36

The standard direct labour cost of one unit of product Q is $3.00 (0.25 hours × $12.00).

The eight employees who make product Q work a 7-hour day. In a recent 3-day period, results were as follows:

Actual units produced	650 units
Actual wages cost	$2,275

During this period, there was a power failure. This meant that all work had to stop for 2 hours.

(a) If the company reports idle time separately, the labour efficiency variance for the period is $ ☐. The variance is: adverse ☐ favourable ☐.

(b) The labour rate variance for the period is $ ☐. The variance is: adverse ☐ favourable ☐.

(c) The idle time variance for the period is $ ☐. The variance is: adverse ☐ favourable ☐.

? Question 37

G Ltd repairs electronic calculators. The wages budget for the last period was based on a standard repair time of 24 minutes per calculator and a standard wage rate of $10.60 per hour.

Following the end of the budget period, it was reported that:

Number of repairs	31,000
Labour rate variance	$3,100 (A)
Labour efficiency variance	Nil

Based on the above information, the actual wage rate per hour during the period was $ ☐.

? Question 38

Which ONE of the following factors could explain a favourable direct material usage variance?

A ☐ More staff were recruited to inspect for quality, resulting in a higher rejection rate.

B ☐ When estimating the standard product cost, usage of material had been set using ideal standards.

C ☐ The company had reduced training of production workers as part of a cost reduction exercise.

D ☐ The material price variance was adverse.

? Question 39

A company produces a single product B. The company budgets to sell 2,200 units of product B during period 4 and sales are budgeted to be 10 per cent higher in period 5. It is company policy to hold stocks of finished goods equal to 20 per cent of the following period's sales.

The budgeted production of product B for period 4 is ☐ units.

? Question 40

The following extract is taken from the delivery cost budget of D Limited:

Miles travelled	4,000	5,500
Delivery cost	£9,800	£10,475

The flexible budget cost allowance for 6,200 miles travelled is £ ☐.

Second Mock Assessment – Solutions

Solution 1

The EOQ ensures that the combined cost of ordering and holding stock is minimised.

Solution 2

(a) The margin of safety is shown on the diagram by *k*. This is the difference between the expected sales level and the breakeven point.

(b) *m* will decrease (extra fixed cost = lower profit)
k will decrease (extra fixed cost = higher breakeven point = smaller margin of safety)
f will increase (extra fixed cost = higher breakeven point)
p will increase (p = fixed costs, which have increased)

Solution 3

The use of this method suggests the service departments carry out work for each other.

Solution 4

The combination that is certain to lead to over-absorption is production activity higher than budget *and* fixed overhead expenditure lower than budget.

Solution 5

The costs are all production overheads with the exception of the cost of ingredients, which is a direct cost.

Solution 6

The only relevant items are the cost of further processing Jointpro B and the increase in sales value that will result. The other three factors would not be affected by the further processing decision.

Solution 7

Process account = credit; abnormal gain account = no entry in this account; abnormal loss account = debit.

Abnormal loss = (4,000 − 2,750 − 400 − 700) units = 150 units

Solution 8

The value of the closing WIP was $4,158.

Statement of equivalent units

	Total units	*Material equiv units*	*Labour equiv units*	*Production overhead equiv units*
Finished goods	2,750	2,750	2,750	2,750
Normal loss	400	–	–	–
Abnormal loss	150	150	150	150
WIP c/fwd	700	700	350	280
		3,600	3,250	3,180
		$	$	$
Costs		16,000	8,125	3,498
Scrap value normal loss		(700)		
		15,300		
Cost per equivalent unit		$4.25	$2.50	$1.10

Statement of evaluation of WIP

	$
WIP c/fwd – material (700 × $4.25)	2,975
labour (350 × $2.50)	875
production overhead (280 × $1.10)	308
	4,158

Solution 9

The overtime premium paid to the operator would be £35.70.

Overtime = 7 hours
Overtime premium per hour = £5.10
Overtime premium = £35.70

Solution 10

The estimated price notified to the customer for job number 808 will be £23,446.

	£
Direct material	10,650
Direct labour	3,260
Prime cost	**13,910**
Production overhead (140 × £8.50)	1,190
Mark up on prime cost (60%)	8,346
	23,446

Solution 11

Discounts are received on additional purchases of material when certain quantities are purchased. The graph depicts a variable cost where unit costs decease at certain levels of production.

Solution 12

The estimated cost of carrying out health checks on 850 patients is £17,625.

	Patients	*Total cost*
		£
High	1,260	18,650
Low	650	17,125
	610	1,525

Variable cost per patient $= \dfrac{£1,525}{610} = £2.50$

At 650 patients:	£
Total cost	17,125
Total variable cost (650 × £2.50)	1,625
Total fixed cost	15,500

Total cost of 850 patients:	£
Fixed cost	15,500
Variable cost (850 × £2.50)	2,125
	17,625

Solution 13

The principal budget factor for a footwear retailer is the constraint that is expected to limit the retailer's activities during the budget period.

Solution 14

The estimated cash receipts from customers during the budget period are $54,950.

Cash received = Sales + opening debtors − closing debtors
= $(55,800 + 8,500 − 9,350)
= $54,950.

Solution 15

The profit mark-up is 55%.

Cost of sales = Opening stock + purchases − closing stock
= $(5,500 + 38,000 − 7,500)
= $36,000

$36,000 + Mark up = $55,800

Mark Up = $19,800

$$\text{Mark Up\%} = \frac{19{,}800}{36{,}000} \times 100\% = 55\%.$$

Solution 16

The appropriate actions are (ii) and (iv). These are short term actions to cover a temporary cash shortage. Actions (i) and (iii) would be more appropriate for a longer term cash shortage.

Solution 17

(a) The limiting factor would be direct labour.

	X	*Y*	*Z*	*Total*
Material (kg)	20,000	22,000	42,000	84,000
Direct labour (hours)	4,000	4,125	10,500	18,625

(b) First: product *Y*; Second: product *X*; Third: product *Z*

	X	*Y*	*Z*
	£	£	£
Selling price	28	22	30
Variable cost	17	13	24
Contribution	11	9	6
Kg	5	4	6
Contribution per kg	£2.20	£2.25	£1.00
Ranking	2	1	3

Solution 18

Performance standards which have remained unchanged over a long period of time are known as basic standards.

Solution 19

The margin of safety represents 8.3% of budgeted sales.

$$\text{BEP} = \frac{\$(430{,}500 + 198{,}150)}{\$11.60 - \$(3.40 + 0.58)} = 82{,}500 \text{ units}$$

$$\text{Margin of safety} = \frac{90{,}000 - 82{,}500}{90{,}000} \times 100\% = 8.3\%$$

Solution 20

These changes will cause the breakeven point to be 79,879 units.

$$\text{New BEP} = \frac{\$628{,}650}{\$12.25 - \$(3.40 + 0.98)} = 79{,}879 \text{ units.}$$

Solution 21

Costs (i), (iii) and (iv) should not be included.
Cost (i) is a past cost which will not be affected by a decision about the future.
Cost (iii) will be incurred anyway, even if the contract bid is unsuccessful.
Cost (iv) will not be affected by the acceptance of the contract.

Solution 22

Material control account = debit; work in progress = no entry in this account; material price variance account = credit.

The price variance is calculated at the point of purchase therefore the work in progress account is not affected. The favourable variance is credited to the variance account and debited in the material control account.

Solution 23

Wages control account = no entry in this account; labour variance account = debit; work in progress control account = credit.

The efficiency variance is recorded at the point at which it arises, i.e. in the work in progress account rather than in the wages control account. The adverse variance is debited to the variance account.

Solution 24

The graph represents piecework with a guaranteed minimum daily wage.

Solution 25

Production overhead will be reported as $3,660 under absorbed.

Machine hour rate = $180,000/50,000 = $3.60 per machine hour
Standard machine hours per unit = 50,000/40,000 = 1.25 hours

	$
Overheads incurred	178,080
Overheads absorbed (38,760 × 1.25 × $3.60)	174,420
Under absorbed	3,660

Solution 26

Using FIFO, the value of the closing stock would be $76.

Units in stock = 460 purchased − 420 issued = 40 units.

Issues would have been made at the earliest prices therefore the latest prices paid would be used to value remaining stock = 40 units × $1.90 = $76.

✓ Solution 27

(a) Closing stock value will be lower (prices are rising and FIFO uses latest prices to value stock held in the stores)

(b) Gross profit for the week will be lower (higher average price charged to cost of sales)

✓ Solution 28

r will increase (*r* = loss at zero activity = fixed costs)
w will decrease (*w* = profit = lower if fixed costs increase)
t will decrease (*t* = margin of safety = lower if fixed costs increase)
u will increase (*u* = breakeven volume = higher if fixed costs increase)

✓ Solution 29

Profit will increase by $28,000.

Contribution per unit = (w + r)/(t + u) = $(16,000 + 50,000)/(800 + 2,500) = $20
Increase in profit = 1,400 additional units × $20 = $28,000

✓ Solution 30

(i), (ii) and (iv) will increase the contribution/sales ratio.

(i) Lower variable costs per unit, higher contribution per unit = higher C/S ratio
(ii) Lower variable costs per unit, higher contribution per unit = higher C/S ratio
(iii) Lower selling price per unit, lower contribution per unit = lower C/S ratio
(iv) Higher average contribution per unit = higher C/S ratio
(v) Lower selling price per unit, lower contribution per unit = lower C/S ratio

✓ Solution 31

The prime cost of contract A42 is $44,720.

	$
Direct materials	5,500
Direct expenses	14,500
Basic staff hours 1,020 hrs × $24	24,480
Overtime premium 40 hrs × $6	240
	44,720

✓ Solution 32

The budgeted profit in period 1 will be $750 higher under absorption costing.

Profit difference = stock increase × fixed production overhead per unit
= 500 units × $(15,000/10,000) = $750

Absorption costing profit is higher than marginal costing profit when stocks increase.

Solution 33

The absorption costing profit reported in period 2 would be $12,690.

	$	$
Sales (10,300 × $6.40)		65,920
Cost of sales: variable (10,300 × $3.60)	37,080	
fixed (10,300 × $(15,000/10,000))	15,450	
Under-absorbed fixed production overhead	700	53,230
Absorption costing profit		12,690

Solution 34

Over-absorbed fixed production overhead results in a favourable total fixed overhead variance.

Alternative B is the only combination that produces a favourable total variance = $3,250 (A) + $4,170 (F) = $920 (F)

Solution 35

The balance sheet value of machinery on contract A44 at 30 April year 4 is $55,060.

		Machine 1		*Machine 2*
		$		$
Cost		55,000		28,600
Depreciation	$\frac{(55{,}000 - 6{,}400)}{25\text{ months}} \times 10$	19,440	$\frac{28{,}600}{22\text{ months}} \times 7$	9,100
		35,560		19,500

Net book value = $35,560 + $19,500 = $55,060

Solution 36

(a) 650 units should take (× 0.25)	162.5	active hours
But did take (7 hours × 3 days × 8 employees) − (8 × 2 hours)	152.0	active hours
	10.5	(F) h × $12.00
Labour efficiency variance	$126	(F)

	$	
(b) 168 hours should cost (× $12.00)	2,016	
But did cost	2,275	
Labour rate variance	259	(A)

(c) Idle time variance = 2 hours × 8 employees = 16 hours idle × $12 per hour = $192 adverse.

Solution 37

Labour efficiency variance = zero, therefore hours worked = standard hours for 31,000 repairs.

Hours worked = 31,000 × 24/60 = 12,400 hours

Adverse rate variance per hour = \$3,100/12,400 = \$0.25
Therefore, actual wage rate per hour = \$10.60 + \$0.25 = \$10.85

Solution 38

Option D is the only factor that could explain a favourable direct material usage variance. Higher priced material may be of a higher quality than standard with the result that scrap and rejections were lower than standard.

Options A to C are all likely to result in an adverse direct material usage variance.

Solution 39

The budgeted production of product B for period 4 is 2,244 units.

	Units
Period 4 sales	2,200
Period 4 closing stock (2,200 × 1.10 × 0.20)	484
Period 4 opening stock (2,200 × 0.20)	(440)
Period 4 budgeted production	2,244

Solution 40

The flexible budget cost allowance for 6,200 miles travelled is £10,790.

	Miles	£
High	5,500	10,475
Low	4,000	9,800
	1,500	675

Variable cost per mile = £675/1,500 = £0.45
Fixed cost = £10,475 − £(0.45 × 5,500) = £8,000
Total cost for 6,200 miles = £8,000 + £(0.45 × 6,200) = £10,790

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