Ethiopian TVET-System

Furniture Making L-I

Based on Sept. 2012G.C. Occupational standard

Module Title: **Reading and Interpreting Working Drawings and Sketches**

TTLM Code: **IND-FMK1 TTLM 0919v1**

This module includes the following Learning Guides

LG11: Interpret technical drawing

LG Code: IND-FMK1 M04 LO1-LG-11

LG12: Read and interpret job specifications

LG Code: IND-FMK1 M04 LO1-LG-11

LG13: Interpret details from freehand sketch

LG Code: IND-FMK1 M04 LO1-LG-11

Instruction Sheet	LG11: Interpret technical drawing

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Drawing Tools & equipment
- Drawing materials as consumable
- Dimensioning techniques
- Calculate Tolerance, limits & fits

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Identify purpose and advantage of different types of drawing tools
- Identify, understand and apply common use symbols and abbreviations on drawings
- Identify the basic drawing tools

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 5.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3 and Sheet 4". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1, Self-check t 2, Self-check 3 and Self-check 4" **in page __, __, __ and ____** respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check
6. If you earned a satisfactory evaluation from the "Self-check" proceed to "Information Sheet 2" **in page _____.** However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

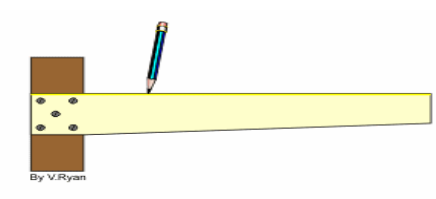
Information Sheet-1	Drawing Tools & equipment

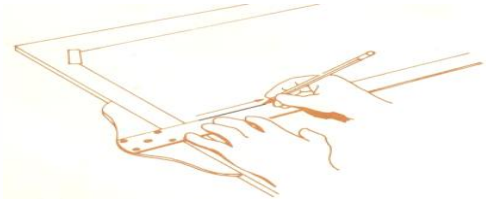
1. **Introduction**

Drawing is used by engineering technical and skill craft mane whether this drawing is made by:-

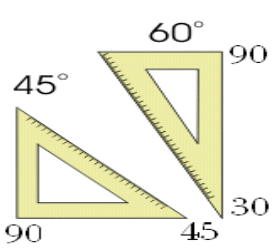
1.1 Types and Use of drawing materials

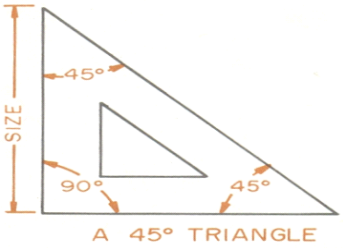
Tee -Squares are use to draw horizontal lines. They are especially useful when constructing accurate orthographic drawings or architectural drawings. A T-Square is normally used with a drawing board, set squares and clips.

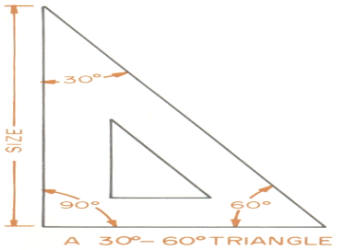




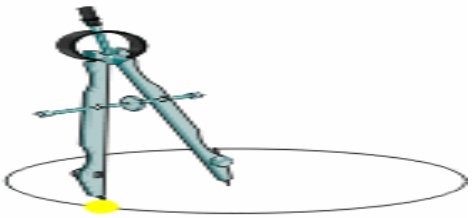
Set Squares are used to draw accurate angles. The most common are 45 and 60/30 degrees. When using set squares they should always used along with a T-Square.







A compass is an absolute essential piece of equipment. It includes at least two compasses allowing the drawing of small circles arcs and large circles arcs

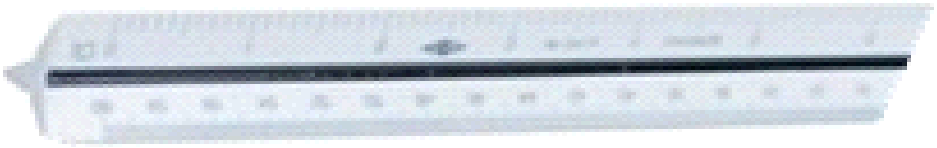


Dividers are similar to the compass. The dividers, as the name implies, are used for dividing distances into a number of equal parts. They are also used for transferring distance or for setting off a series of equal distance.

Divider Compass

Fig 2.1.9 Dividers and Compass

Engineering Scales are used only for measuring different scales.. It is important that drafters draw accurately to scale.



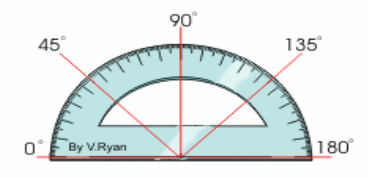
Scale also is calcified into three methods

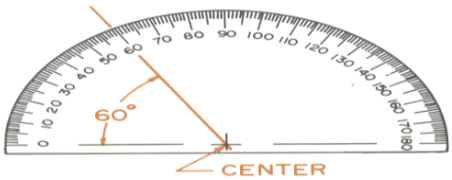
Full scale (1; 1) when the object is similar than the size of drawing an object.

Enlarged scale (5; 1, 100; 1) when the object is smallest than the size of drawing an object.

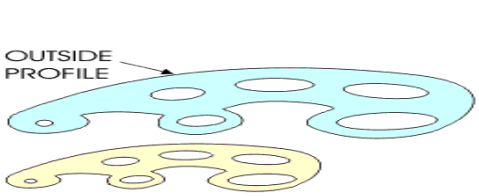
Reduced scale (1:20, 1:250 1; 500) when the object is larger than the size of drawing an object.

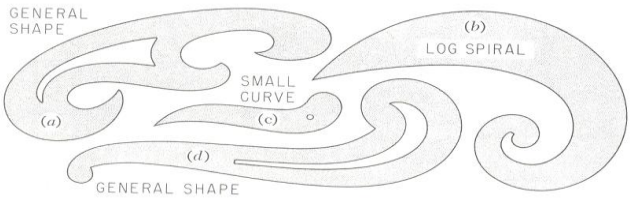
A protractor is used to measure angles. A typical protractor is a semi-circular piece of plastic With 180 degrees printed around its curve. This piece of equipment is not only used in graphics for constructing accurate drawings but is also used in subjects like Mathematics.





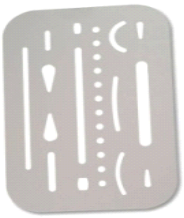
French curve Used to lay out any noncircular curve and ellipse





A ruler should only to use to measure distances with lines being drawn with T-Squares and Set Squares.

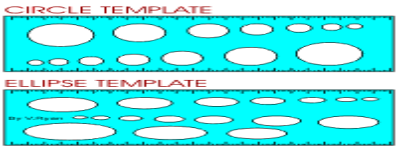
- **<u>Erasers</u>** used to remove unnecessary line (dirt) on surface drawing .



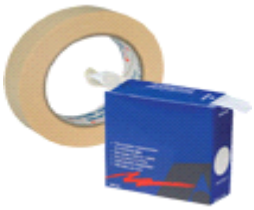
- **Eraser shield** - A metal plate with various slots and openings used to protect line work when a portion of a drawing is to be erased,

- **brush** - Used to brush loose graphite and eraser dust from a drawing,

A template is a thin & flat piece of plastic containing various cutout shapes. It is designed to increase the speed & accuracy of the drafter. Templates are available for drawing geometric shapes, electrical drafting, architectural drafting, screw head & so on. A template should be used whenever possible to increase the accuracy & the speed.



- **Drafting tape(scotch**) - A specially-prepared tape used to adhere drawing media to the working surface



- **Lettering guide** - Used to lay out guidelines for lettering

- **Triangle** - A thin, flat, right-angled piece of plastic or metal with acute angles of 45°, or 30° and 60° used for drawing vertical or inclined lines that are multiples of 15°

- **Papers**: Each smaller size has an area half of the preceding size, and the length to width ratio remains constant. (A0, A1, A2, A3, A4).

  Types of drawing papers: - There are two classes of papers.

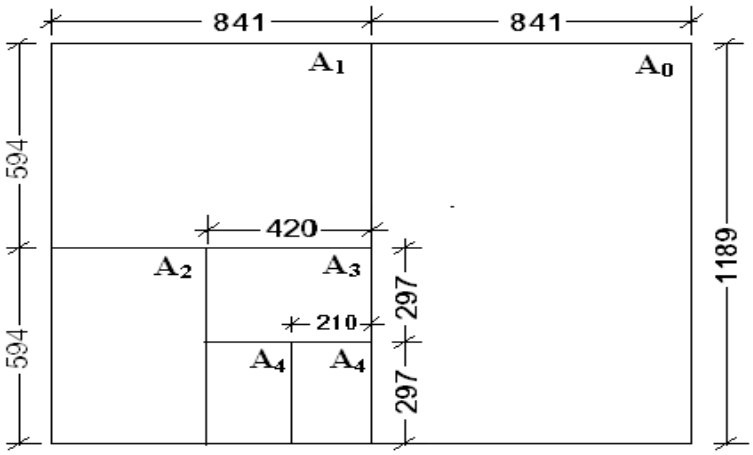
A. Detail paper: It is primarily for pencil work that is not used in reproduction processes that require a degree of transparency of the paper.

B. Translucent paper also known as tracing paper: which is designed so that it can be used in common reproduction process.

It can be used for both pencil and ink work. Only limited erasing may be done on it before damage occurs to the paper's surface. **Lead lines** erase well, but **inked lines** do not.

The most common A-series sheet sizes are:-

A-Size	Dimensions in "mm"
A_0	841x1189
A_1	594x841
A_2	420x594
A_3	297x420
A_4	210x297



PAPER LAY OUT

- *The layout of the paper for drawing purpose is very necessary*
- *The layout shows the areas to be covered through our paper*
- *It shows the drawing area, border line, page border and the title block*

TITLE BLOCK

- *Information center for our drawing*
- *It is composed of*
    - *Drawers name*
    - *Checkers name*
    - *Date that the drawing prepared*
    - *Scale of the drawing*
    - *Type of projection*
    - *Company*
    - *Title of the drawing*
    - *Drawing number*
    - *And other needed information required by the company*
    -

DRAWING PENCILS

- *selection of good and well sharpened pencil is important*
- *pencils of various degrees of pencils are available*

Grades of pencil

Pencil grades	***Strength***	***Application***
9H, 8H, 7H, 6H	*Hard*	*Light constructions*
5H, 4H	*Medium hard*	*Dimensioning, center lines, invisible object lines*
3H, 2H	*Medium*	*Visible object lines*
H, F	*Medium soft*	*Lettering and free hand sketching*
HB, B	*Soft*	
2B, 3B, 4B, 5B, 6B ,7B 8B, 9B	*Softness increases in the given order*	

Basic Drawing Equipment

Drafting Table

Drawing Board

Drafting Table

T-Square

L-Square

Parallel Bar Drafting Machine

Elbow Drafting Machine

V-Track Drafter

Alphabets of lines

- Each line on a drawing has a special meaning. In order to help make and read Drawings, standard line symbols were developed.

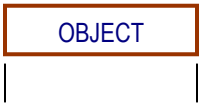
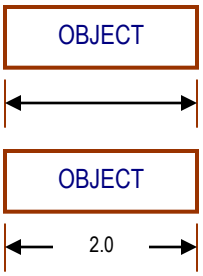
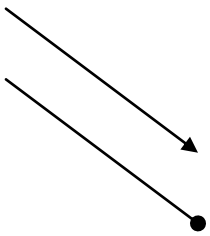
There are two thicknesses of lines: **thick and thin**.

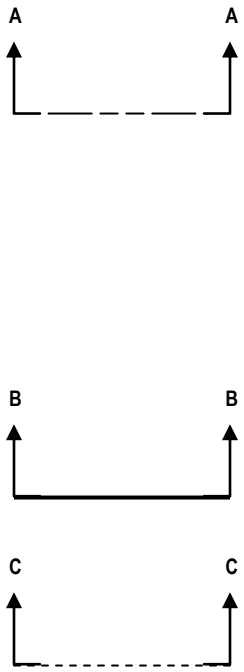
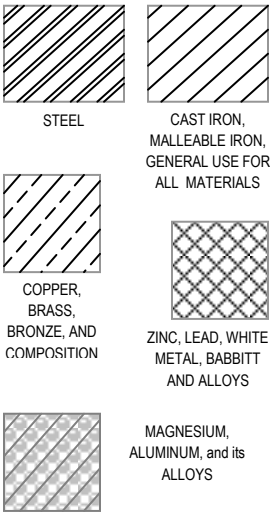
The thick lines: are used for visible, cutting-plane, and short break lines.

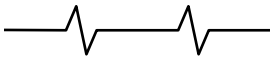
The thin lines: are used for long break, hidden, center, section, extension, and dimension.

- **Definition of line**
  - Line is the most basic design 'tool'.
  - A line has length, width, tone, and texture.

There are several types of lines used in drawing or graphical presentations, and each line has a meaning. To be able to interpret a print or drawing, the reader should have knowledge of these lines. The table below identifies the description of each line, also note that each line deals with either the shape of the object or its dimension.

TYPE OF LINE	DESCRIPTION	PURPOSE	REPRESENTATION
OBJECT LINE	Thick bold line	To show the visible sides/shape of the object	
HIDDEN LINE	Broken line of medium thickness	To show the edges/outline not visible to the eye	
CENTER LINE	A broken line made of a series of short and long dashes alternately spaced	To show center of circles, arcs, and symmetrical objects and to aid in dimensioning this part	
EXTENSION LINE	Lines that extend from the object with a slight break in between	To show dimensioning points	
DIMENSION LINE	Lines with arrow heads, unbroken except where dimension is placed	Touch the extension lines and shows the distance given by dimensions	
LEADER LINE	A fine straight line with an arrow head or round solid dot at one end. It is usually drawn at an angle.	Points directly to the object for the purpose	

CUTTING PLANE LINE	The preferred cutting plane line is heavy, broken line made up of series of one long and two short dashes alternately spaced. Arrow heads are placed at right angles to the cutting plane line. Alternate cutting plane lines are solid heavy line or a series of long dashes.	To indicate where an imaginary cut is made through the object. The arrow points in the direction in which the section should be viewed. Letters next to the arrow heads identify the section in cases where more than one section is shown on the drawing. These lines are oriented vertically, horizontally or at an actual angle at which the part is shown	
SECTION LINES	Series of fine lines, solid, solid and broken, arranged in specific patterns. They may be shown either straight or curved. When shown straight they are usually drawn at 45° angle, however this angle will vary when applied to adjacent part.	To indicate the imaginary cut surface referred to by the cutting plane line. To represent various kinds of materials.	
CHAIN LINE	Heavy broken line made up of series of long and short dashes alternately spaced	To indicate line location and extent of a surface area.	

SHORT BREAK LINE	Heavy irregular line drawn free hand	To show a short break (to conserve space on a drawing) to show a partial portion	
LONG BREAK LINE	Ruled light line with freehand zigzags	To show a long break (to conserve space on a drawing)	
PHANTOM LINE	Light broken line made up of a series of long and two short dashes	To show alternate position of a part, to show relationship of existing part to new part, and to show machine surfaces.	_____ _ _ _____

Self-Check -1	**Written Test**

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is drawing?
2. List out at list five Types and Use of drawing Instruments and materials?
3. list and explain types of lines?

.

Score = _____

Rating: _____

Note: **Satisfactory rating -** **Unsatisfactory - below**
You can ask you teacher for the copy of the correct answers

Name: _____ Date: _____

Short Answer Questions

Information Sheet- 2	Drawing materials as consumable

2. INTRODUCTION

Drawing materials these are consumable items used for technical drawing. They are consumable because they cannot be reused after use.

Drawing graphite pencils: a graphite pencil usually consists of a long, thin cylinder of graphite enclosed in a hexagonal wooden sleeve the standard pencil.

Art supplies or materials can be broken down into two categories: consumable and non-consumable art supplies are things like scissors, paper punches, stapler etc.

Consumable art supplies or materials are items such as crayons, marekers, and pencil.

Manual drafting and drawing consumables and stationary including:

- technical pens
- ink
- mechanical and clutch pencils
- leads
- Erasers, etc.

Drawing Pencils are a basic requirement of any graphics course. This refers to the hardness of the pencil lead & sharp edge for longer and produces very fine lines.

Erasers used to remove unnecessary line (dirt) on surface drawing.

Drafting tape (scotch) - A specially-prepared tape used to adhere drawing media to the working surface

Papers: Each smaller size has an area half of the preceding size, and the length to width ratio remains constant.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List and explain manual drafting and drawing consumables materials?
2. What are the different b/n drawing consumables and non- consumables materials?
3. Define drawing graphite pencils?

Score = _____

Rating: _____

Note: **Satisfactory rating - Unsatisfactory - below**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Dimensioning techniques

3. Introduction

Dimensioning

- Dimensions are used to describe the sizes and relationships between features in your drawing.

Dimensions are used to manufacture parts and to inspect the resulting parts to determine if they meet the drawing's specifications.

Dimensioning

The purpose of dimensioning is to provide a clear and complete description of an object. a complete set of dimension will permit only one interpretation needed to construct the part. Dimensioning should follow these guidelines.

1. Accuracy:-correct values must be given
2. Clearness:-dimension must be placed in appropriate positions.
3. Completeness:-nothing must be left out, and nothing duplicated.
4. Readability:-the appropriate line quality must be used for legibility.

Arrowheads (Dimension Line Terminator)

Dimensioning Methods

- Dimensions are represented on a drawing using one of two systems, unidirectional or aligned.
- The *unidirectional* method means all dimensions are read in the same direction.
- The *aligned* method means the dimensions are read in alignment with the dimension lines or side of the part, some read horizontally and others read vertically.

Types of Dimensions

- There are two classifications of dimensions: size and location.

Size Dimensions *are dimensions which indicate the overall size of the object and the various features which make up the object.*
Location **dimensions** are used to locate various features of an object from some specified datum or surface.

Dimensioning Rules

- Each dimension should be written clearly with only one way to be interpreted.
- A feature should be dimensioned only once.
- Dimension and extension lines should not cross.
- Each feature should be dimensioned.
- Dimension features or surfaces should be done to a logical reference point.

- Dimension circles should have diameters and arcs with a radius.
- A center line should be extended and used as an extension line.
- Dimension features on a view should clearly show its true shape.
- Enough space should be provided to avoid crowding and misinterpretation.
- Extension lines and object lines should not overlap.
- Dimensions should be placed outside the part.

Center lines or marks should be used on all circles and holes.

Obtaining dimension correctly

The dimension of the object is obtained correctly using appropriate measuring techniques or instrument some of the instrument that can be used are:-

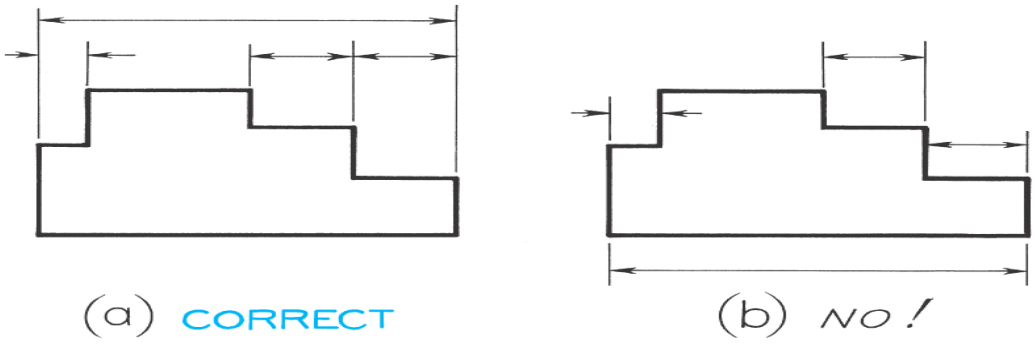
- architect's scale
- pencil
- drawing board
- T-square
- 45 degree set square
- 30 degree by 60 degree set square
- tracing vellum

Arrangement of dimensioning

- The accuracy of the final product is determined by the dimensions on the drawing. If all the dimensions originate from a common corner of the part, the object will be more accurate. This is referred to as

Datum Dimensioning (parallel dimensioning).

- Datum's insure the tolerance or errors in manufacturing do not accumulate.



Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Explain Dimensioning Methods?
2. List and explain types of Dimensions?

Score = _____

Rating: _____

Note: **Satisfactory rating – 3 and 4 points** **Unsatisfactory - below 3 and 4 points**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

4. Calculate tolerance, limits and fits

Tolerances all dimensions should have an associated tolerance. A general tolerance note should be included in the title block with exceptions included with the dimension.

Applying basic mathematical processes

Trades occupations require all or most of the math foundations listed below.

Math Foundation Skills		**Workplace Examples**
Whole numbers **e.g.: 3, 14**	Read, write, count, round off, add, subtract, multiply and divide whole numbers.	• Order supplies. • Take stock inventory. • Count parts. • Read serial numbers.
Integers **e.g.: -5, 0, 11**	Read, write, add, subtract, multiply and divide integers.	• Read temperatures. • Use survey tools. • Set up computer numerical control programs. • Measure air pressure.
Fractions **e.g.: $^1/_8$", $^1/_4$"**	Read, write, round off, add, subtract, multiply or divide fractions. Multiply or divide by a fraction.	• Take and record imperial measurements. • Determine tool or material sizes. • Calculate quantities.
Decimals **e.g.: 8.50, 0.00375**	Read, write, round off, add or subtract, multiply or divide decimals. Multiply or divide by a decimal.	• Handle money. • Take and record metric measurements. • Measure tolerances. • Select tool sizes.
Percentages **e.g.: 10%, 42%**	Read and write percentages. Calculate the percentage one number is of another. Calculate a percentage of a number.	• Calculate tax. • Read and write tolerances. • Adjust machine loads. • Describe in terms of a proportion of maximum capacity or an amount of

		progress towards completion.
Equivalent numbers e.g.: $^1/_2$ = 0.5 = 50%	Convert between fractions, decimals and percentages.	• Convert decimal readings on gauges to percent of output. • Convert decimals to fractions to select the correct part or size of tool. • Convert quantities of ingredients to decimals to calculate cost.
Other real numbers e.g.: v36, 9^2, 2.2 x 10^3, p	Use square roots, powers, scientific notation and significant digits.	• Calculate power and current in three-phase motors. • Use square roots to calculate dimensions for a staircase. • Use powers to express the volume of tanks.
Equations and formulas	Solve problems using equations with one unknown quantity. Use formulas by inserting quantities. Solve quadratic equations.	• Determine where to place holes. • Calculate the correct angles for rigging loads. • Set food prices. • Use Ohm's law to check motor voltage.
Rates, ratios and proportions	Use a rate comparing two quantities with different units. Use a ratio comparing two quantities with the same units. Use a proportion comparing two ratios or rates.	• Adjust tire pressure. • Mix gasoline additives. • Adjust ingredients in a recipe to make more servings. • Calculate speed and feed rates of a machine. • Read a scale drawing. • Calculate airflow rates.
Measurement conversions	Convert between imperial and metric (SI) measurements. Convert to another unit within a measurement system.	• Convert units to select wrench sizes. • Cut lengths of wire. • Mix colorings agents. • Meet product specifications. • Calculate airflow. • Use scale drawings.
Areas, perimeters and volumes	Calculate areas, perimeters and volumes.	• Calculate the area or perimeter of a work surface to be painted, sodded or

		caulked. • Calculate the volume of gasoline additives or concrete required. • Calculate the capacity of a storage tank.
Geometry	Apply geometric concepts such as parallelism, perpendicularity and tangents.	• Find the centre of a room to install fixtures. • Cut hair using angles. • Cut slopes to fabricate ramps. • Use angles to lay out patterns for materials.
Trigonometry	Use trigonometry to determine the size of an unknown side or angle of a triangle.	• Calculate angles for a circular staircase. • Place holes on a part. • Make bolt patterns for drilling or machine installation. • Find offsets.
Summary calculations	Calculate averages and rates other than percentages, proportions or ratios.	Calculate averages for: • fuel or power consumption; • tool lifespan; • speed and feed rates; • material production; and • time needed to perform tasks.
Statistics and probability	Use statistics and probability to draw conclusions.	• Estimate how much of something clients use. • Predict sales trends. • Determine the probability of equipment and parts failure. • Describe the progress of fabrication and installation tasks.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the purpose of Tolerance, limits & fits?

Score = _____

Rating: _____

Note: **Satisfactory rating –** **Unsatisfactory -**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

OPERATION SHEET #1	Adjusting drawing tools &equipment

Purpose: - **How To operate An Adjustable Triangle**

Equipment, Tools and Materials

Adjustable triangle, Parallel bar/Drawing Board, Activity Paper, Pencil, Eraser

Procedure

- Set required angle on triangle by loosening adjusting knob and setting the scale.
- Read numbers on lower half of scale if required angle is greater than 45°. The angle will be the actual angle made by the triangle.
- Read numbers on upper half of scale if required angle is less than 45°. The angle will be complementary to the angle.

OPERATION SHEET #1.1	Draw Horizontal and Vertical Lines with Triangle and Drafting Machine

Purpose: - **Drawing horizontal &vertical line**

Equipment, Tools and Materials

Drafting machine/Drawing Table, Standard triangles, two sheets of drafting media, Pencil, Eraser

Procedure

1. Set the drafting machine at the “0” mark with parallel scale approximately horizontal to the drawing surface.
2. Align the bottom edge of the drawing media with the parallel scale.
3. Tape the drawing in place.
4. Draw horizontal lines using the parallel scale as a guide.

Instruction Sheet	LG12. Reading and interpret job specifications

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- formal Job specifications of key features
- drawing Signs and symbols
- identify Material attributes

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Identify job specifications, notes and descriptions from drawings,
- Identify standards of work & tolerances from project specifications.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 5.
3. Read the information written in the information "Sheet 1, Sheet 2, and Sheet 3". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1, Self-check t 2, Self-check 3" **in page __, __, __ and ____** respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check
6. If you earned a satisfactory evaluation from the "Self-check" proceed to "Information Sheet 2" **in page _____.** However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	formal Job specifications of key features

1 setting up paper on a drawing

Drawing paper must be set up on a drawing board using a T-square. Once in position, the paper is clipped to the board with board clips or even *masking tape*.

1. The T-square must be placed up against the edge of the drawing board. There must be no gaps otherwise the paper will not be set up correctly and drawing accurate horizontal and vertical lines will be impossible.

2. The paper is then allowed to rest on the T-square. Check that the paper rests properly on the T-square and that there are no gaps between the T-square and the paper OR the T-square and the side of the drawing board.

The masking tape can then be positioned holding the paper securely to the board.

3. A 2H pencil can then be used to draw faint horizontal lines across the page. Try to keep the lines to the same size by measuring them with a ruler.
Each time you draw a line check that the T-square is pressed completely against the edge of the board. There should be no gaps.

4. To draw vertical lines a T-square and set square are used together.
Be careful to check that there no gaps between the T-square and the board AND the set square and the T-square. Do not draw vertical lines with a set square only as they will not be accurate.

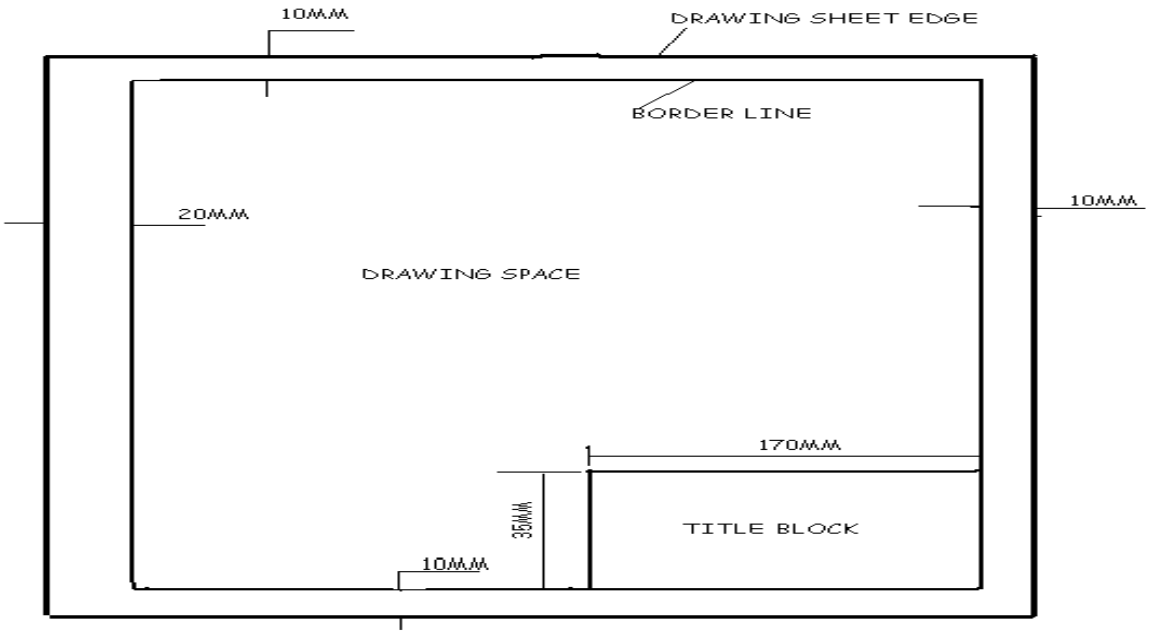
Great care should also be taken to ensure that the paper does not move. This can happen if a hand or arm rubs too strongly against the paper. Check that the paper has not moved by placing the T-square at the bottom edge of the paper. Then check that the paper rests level against the T-square and that the paper is not at an angle. Ensure that the T-square is also firmly against the edge of the board

2. Drawing bored and title

A border is a line drawn around the inside edge of the paper. Usually this is 10mm from the edge of the paper. It is basically a rectangle drawn precisely and inside this rectangle is the design area.
A title block is normally drawn at the bottom of the paper. Inside the title block is printed important information such as Name, Title and Date. The measurements for the title block can be seen below (these can vary depending on the type of title block being used). All the lines are dark with the exception of the guidelines between which the printing is positioned.

Below is a design sheet. The border line and title block ensures that the design sheet looks more professional and includes vital information such as the designers name, the title of the sheet and the date.
The next time you need to draw designs / ideas, draw a title and border line first. Also add notes by printing in block capital between faint guidelines.

Model design sheet drawing paper



The following ideas are the important objectives student should strive to attain.

1. **Accuracy-**no drawing is maximum usefulness .If it is not accurate.
2. **Speed** - Time is money in industry & there is no demand for a slow drafter, engineer.
3. **Legibility-**it must be clear &legible in order to serve its purpose well.
4. **Neatness: -** if drawing is to be accurate& legible. It must also be clean

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define drawing border?
2. What is the purpose of drawing board?
3. Explain Legibility?
4. What is Neatness?

Score = _____

Rating: _____

Note: **Satisfactory –** **Unsatisfactory -**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	drawing Signs and symbols

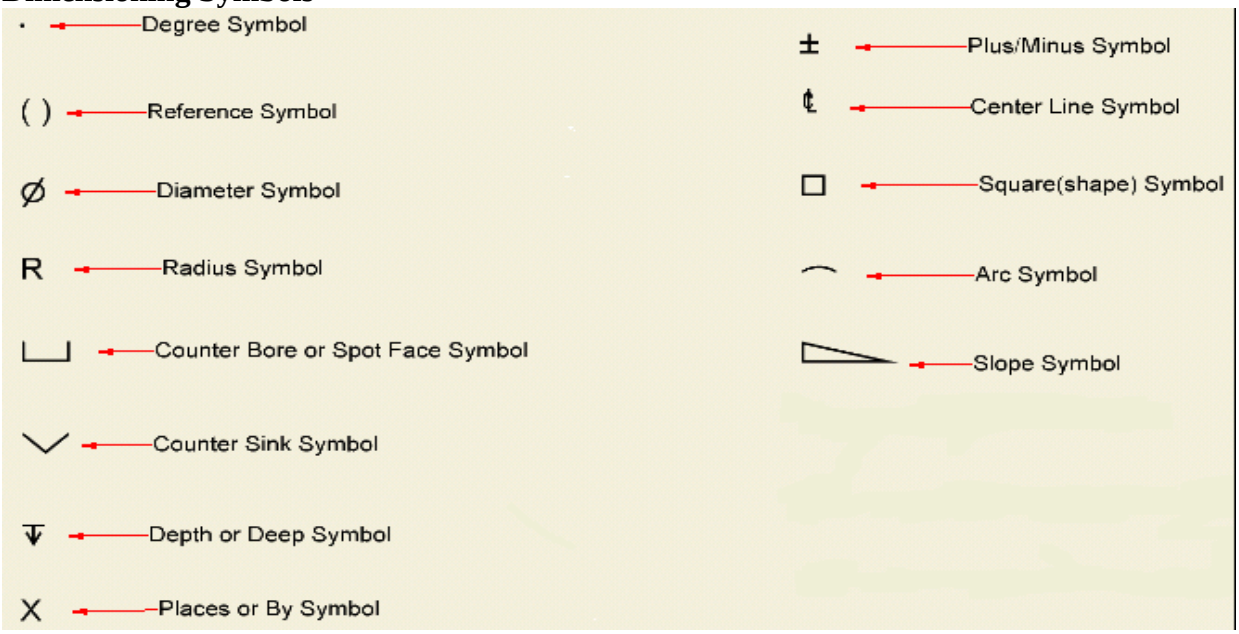
2.1 Interpreting signs and symbols

Standardized abbreviations and symbols for the various trades have been developed by numerous professional Organizations. These standard abbreviations and symbols are generally used by architects and engineers; however, Architects and engineers sometimes create their own symbols and abbreviations to represent materials and Equipment on drawings. If symbol and abbreviations are not standard, they are usually noted on the drawing.

2.1.1 Types of Symbols

The types of symbols used include those used in elevation views and those in sectional views. Elevation symbols are easily recognized, as they look very much like the actual material or object. An elevation view is a vertical picture of an object showing the front, side, or rear view of an object, room, or structure as one would view it while facing it. Without the use of symbols, architects cannot show. all necessary information regarding materials, methods, and location of components. The materials shown in an elevation view appear differently in a sectional view. A sectional view shows the object as if it were sliced vertically, showing of what the object would be composed. For example, a sectional view of a masonry wall would show the thickness of the joints and the units, how the wall ties are installed, and, many times, the exact height of the wall. The mason should be familiar with some of the more common symbols for the mechanical trades, as they may affect the work when building in or around certain equipment.

Dimensioning Symbols



Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is a symbol?
2. Describe Elevation symbols?

Score = _____

Rating: _____

Note: **Satisfactory –** **Unsatisfactory -**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-3	identify Material attributes

3. Introduction

Drawing is the art or techniques of producing images on a surface, usually paper, by means of investigations, drawings form the materials basis of mural, panel, and book painting.
There are different types of drawing materials and tools for beginners.

- Quality drawing pencils.
- A sketchbook.
- Quality drawing surface.
- Variety of erasers.
- A good pencil sharpener.
- A felt tip pen etc.

Quality drawing pencils

- *selection of good and well sharpened pencil is important*
- *pencils of various degrees of pencils are available*

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List out types of drawing materials?
2. Describe characteristics of quality drawing pencil?

Score = _____

Rating: _____

Note: **Satisfactory –** **Unsatisfactory -**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

OPERATION SHEET # 2	Read and interpret working drawing

Purpose: read and interpret job specifications is known to be one of the basic languages of technology, namely ***math***, ***science*** and ***drawing*.** Through this application a technology task can be performed correctly. Examples of it is the schematic diagram of a circuit for electronics technician & electrician, detailed plan of an object for carpenters and machinist, technical and furniture plans for carpenters and construction workers.e.tc.

Equipment, Tools and Materials:

Paper, pencils, erasers, drawing board-square irregular, curves scales
Protractor, *compass& triangle*

<u>Procedure</u>:

- **how to Read and interpret job specifications**

Instruction Sheet	LG13:-Interpreting details from freehand sketch

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Recognize Components, assemblies or objects
- Identify specifications, notes and descriptions
- Identify material requirements
- Identify instruction& working orders

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Assemble and recognize required components.
- identified Instructions followed as required
- Identify material requirements according to job specifications

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 5.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3 and Sheet 4". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1, Self-check t 2, Self-check 3 and Self-check 4" **in page __, __, __ and ____** respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check
6. If you earned a satisfactory evaluation from the "Self-check" proceed to "Information Sheet 2" **in page _____.** However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Recognize Components, assemblies or objects

1. Introduction

Free hand sketching: is done by sketching the line without instrument, only paper and pencil it is very important to sketching fast & primary design

Freehand sketching is a documenting process of the optical image, and it helps the architects to gain understanding, insight and inspiration to express their observation, thoughts and feelings.

1.1. Recognize Components, assemblies or objects

Where appropriate the relationship between the views contained in the sketches should be identified this will allow

- the number of objects represented in the sketch to be identified
- the object represented in the sketch is correctly identified

Pictorial drawing

- Pictorial sketches are a type of technical illustration that shows several faces of an object at once. Such sketches are used by any industry that designs, sells, manufactures repairs, installs or maintains a product.

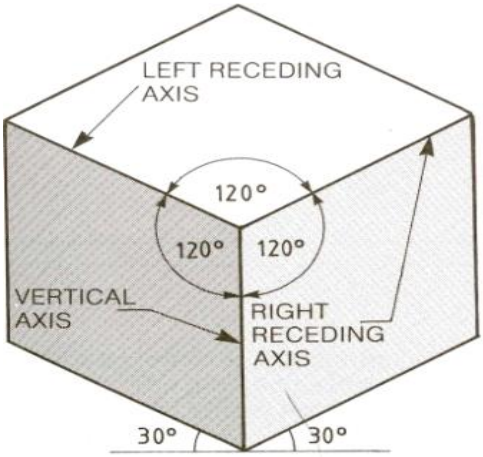
the different types of pictorial drawing usually illustrate the relationship between the views of the object.

- Isometric
- Oblique
- Perspective

1. Isometric Projections

An isometric view of an object is created by rotating it 30 degrees about a vertical axis, and then tilted forward until the body diagonal of the cube (A-B) appears as a point in the front view. The angle the cube is titled forward is 35 degrees 16 minutes.

The three corners meet to form equal angles of 120 degrees and is called the isometric axis. All the edges of the cube are parallel to the edges that make up the isometric axis since projections of parallel lines are parallel



2. Oblique projections

- The easiest pictorial sketches to produce.
- Show the front view as if you were looking straight at it.
- Sides extend back from the front view.
- Sides shown with parallel lines that are generally drawn at 45 degrees to the front view.

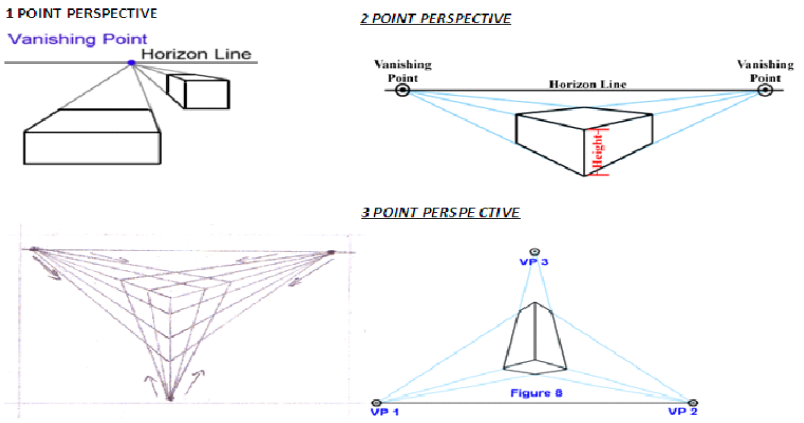
3. Perspective projections

- Show how the human eye and camera would see it.
- Realism is obtained by having parallel lines meet at a distance vantage point.
- Most realistic, yet, most difficult of the three sketches.

Types Of Perspective

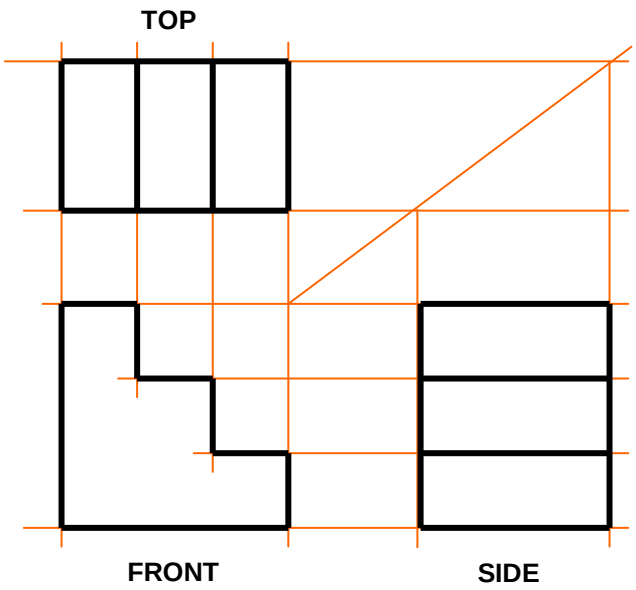
Three major types: one-point, two-point, and three-point.

- **One-point** perspective shows an object as if you were directly in front of it.
- **Two-point** perspective shows how an object would appear if you stood at one corner.
- **Three-point** perspective shows how the eye sees the length, width and height of an object.



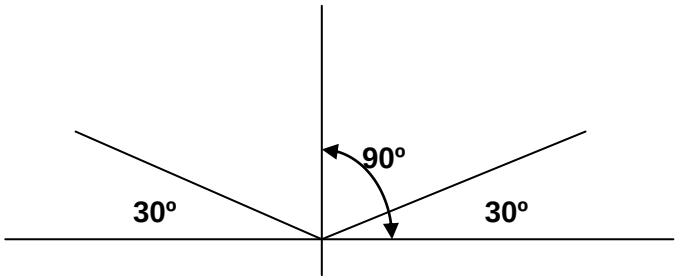
Isometric Sketching (ASSEMBLING THE PARTS)

Sometimes there are given parts of an object using the orthographic illustration, your concern will be identifying the perspective figure to complete a task. An example figure below is given to find the perspective.

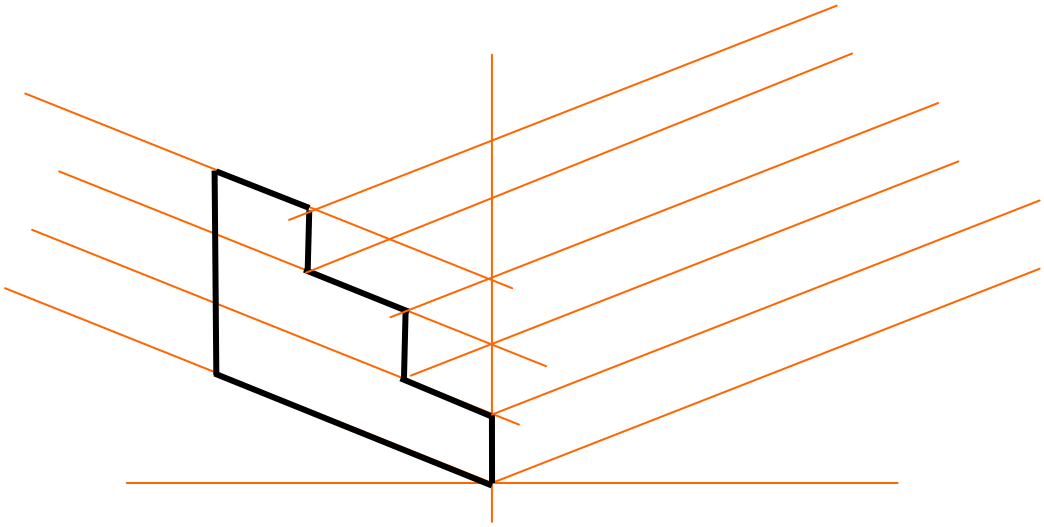


Steps in assembling the parts:

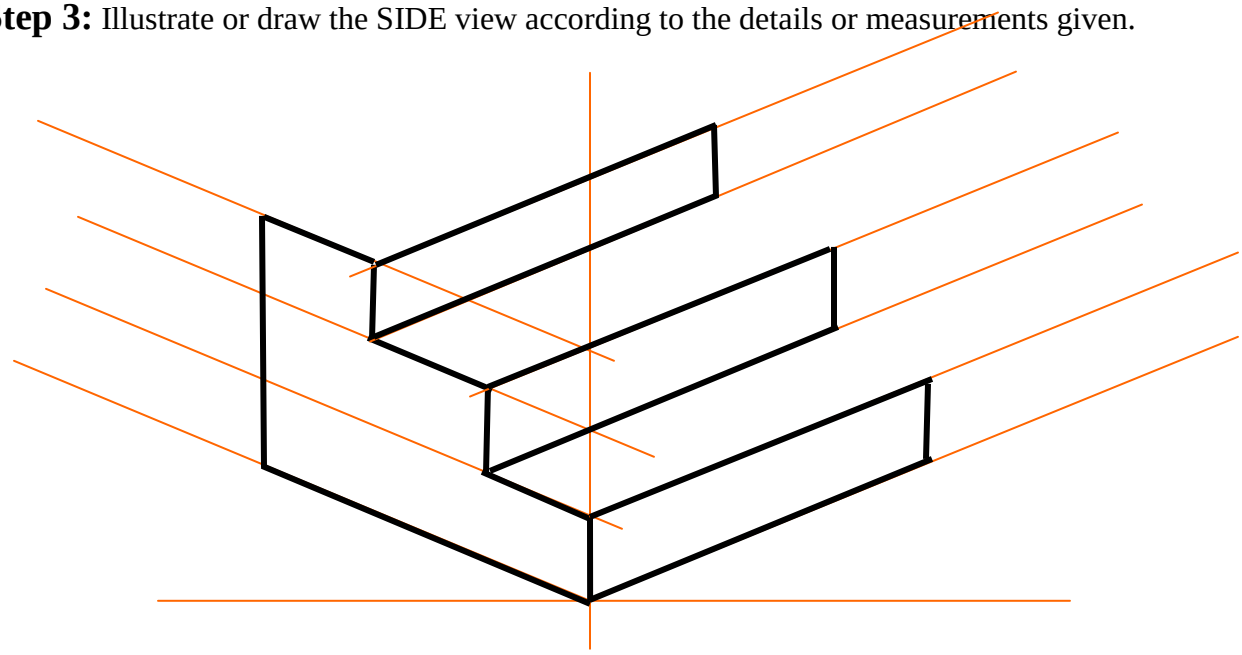
Step 1: Follow the procedures of Isometric drawing. Create first the 30º angles used in creating isometric figures.



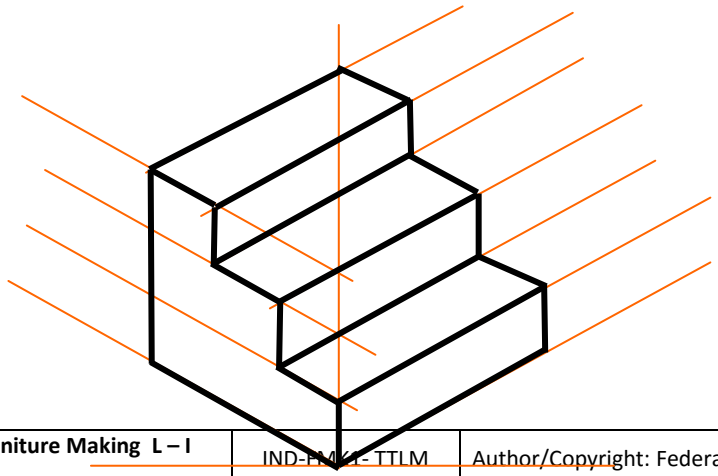
Step 2: Illustrate or draw the FRONT view first, following the given measurements. Project the side view after completing the front view.

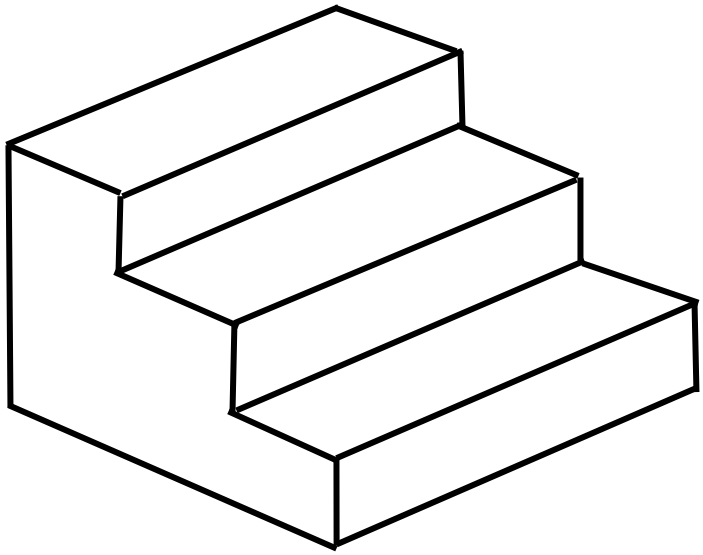


Step 3: Illustrate or draw the SIDE view according to the details or measurements given.

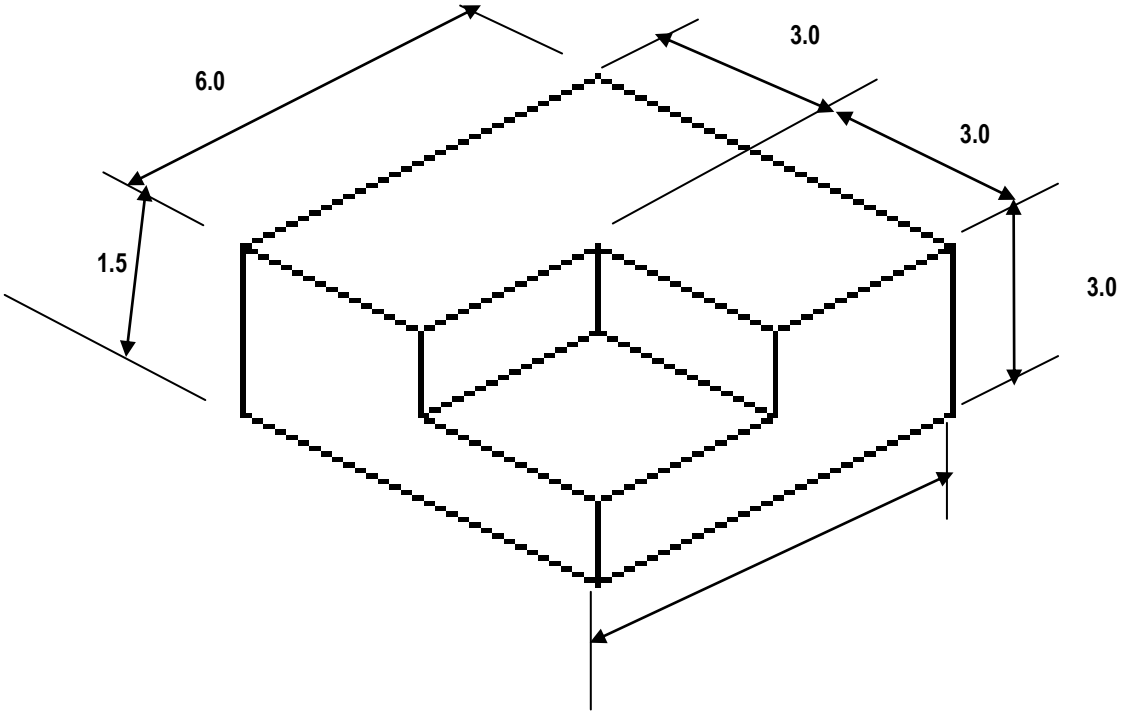


Step 4: Project the remaining lines that will complete the top view. After completing the figure, erase all unnecessary lines or the projection lines.

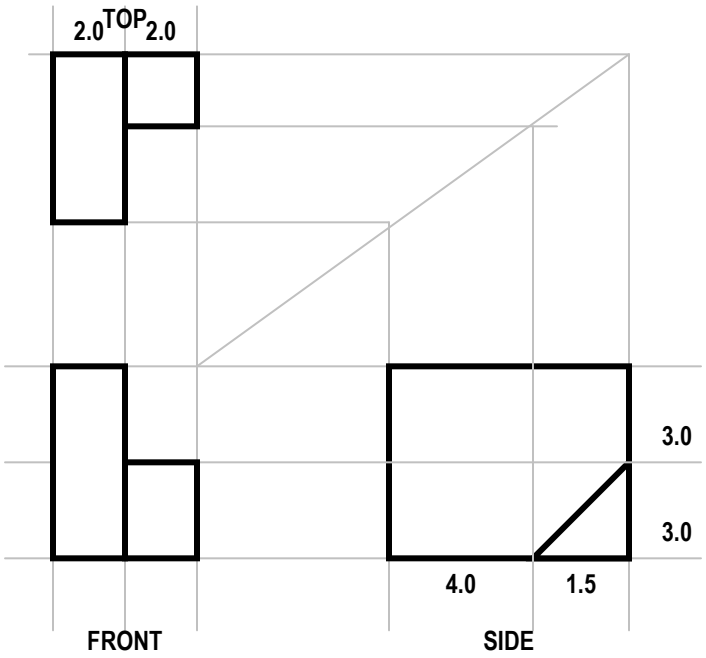




A. Identify the 3 principal views of the object below. (TOP, FRONT and right SIDE view). All measurements are in centimeters.



A. Identify the 3 principal views of the object below. (TOP, FRONT and right SIDE view). All measurements are in centimeters.



Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define Free hand sketching?
2. Write at least two types of Pictorial drawing?
3. List and describe the Types of Perspective?

Score = _____

Rating: _____

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 and 4 points**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Question

Information Sheet-2	Identify specifications, notes and descriptions

2. Introduction

specifications is a written document describing in detail the scope of work, materials to be used, method of installation and quality of workmanship for a parcel of work to be placed under contract.

Specifications describe the materials and workmanship required for a development. They do not include cost, quantity or draw information, and so need to be read alongside other information such as quantities, schedules and drawings.

These technical drawing and specifications vary depending upon for whom they are intended. The manufacturing engineer will want orthographic detail and assembly drawing.

Designer use technical drawing and specifications prepared by draughts persons to convey their ideas and intentions to such people as manufacturing engineer, maintenance or service engineer, sales engineer, and customers.

Specifications are identified from drawings, notes and descriptions (hand side) of the drawing sheet.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are specifications?

Score = _____

Rating: _____

Note: **Satisfactory –** **Unsatisfactory -**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-3	Identify material requirements

3. Introduction

Material requirement planning (MRP):- is a computer-based production planning and inventory control system.

First off to produce production drawings manually you will need access to specific work area where drawing can be done. Sometimes this can be a work area which has been set up especially foe drawing.

Where appropriate, the materials, the materials from which the object should be made and can be identified from sketch.

This will allow the engineer to:-

- make accurate decisions
- follow instruction carefully
- complete the task in reasonable time

Material quantity requirements are calculated in accordance with plans, specifications and quality requirements. Materials appropriate to the work application are identified, obtained, prepared, safely handled and located ready for use**.**

Identifying and applying necessary quality requirements include:

 Attention to specifications of work

 Control of handling procedures

Relevant regulations, including:

- Australian standards
- internal company quality policy and standards
- manufacturer specifications where specified
- workplace operations and procedures

 Use and maintenance of equipment.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define material requirement planning?
2. Write at least four include in identifying quality requirements?

Score = _____

Rating: _____

Note: **Satisfactory –** **Unsatisfactory -**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information Sheet-4	Identify instruction& working orders

4. Introduction

All instructions contained in sketches should be identified the actions to be undertaken in response to those instruction should also be given. This will guide the engineer in this task of accurately completing the sketches.

Title Blocks

Location and Contents

A title block should be included on all sheets in the lower right corner. At a minimum a title block should include sub-blocks for:

1. Drawing title (should be descriptive and unique)
2. Drawing number
3. Revision letter
4. Department and University names
5. Names of following people (first and last name)
   - Drawer
   - Drawing checker
   - Engineering approver
   - Manufacturing approver
   - Quality assurance checker
6. Dates associated with all names (in format Year Month Day)
7. Predominant scale of drawing.
8. Drawing size letter designation.
9. Units used for dimensions and general tolerance note
10. Material (insert N/A on assembly and subassembly drawings)
11. Finish (insert N/A on assembly and subassembly drawings)
12. Third angle projection symbol
13. Sheet number and total number of sheets. All sub-blocks should include the indicated information except perhaps the drawing checker, engineering approver, manufacturing approver, and quality assurance checker boxes and associated date boxes.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define title block?
2. Write at least four include in title block?

Score = _____

Rating: _____

Note: **Satisfactory –** **Unsatisfactory -**
You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Short Answer Questions

OPERATION SHEET #3	Interpret details from freehand sketch

Purpose: Interpret details from freehand sketches known to be one of the basic languages of technology, namely ***math***, ***science*** and ***drawing*****.** Through this application a technology task can be performed correctly. Examples of it is the schematic diagram of a circuit for electronics technician & electrician, detailed plan of an object for carpenters and machinist, technical and furniture plans for carpenters and construction workers.e.tc.

Equipment, Tools and Materials:

Paper pencils, erasers, drawing board, T-square, Irregular curves **scales, protractor, compass *triangle***

Procedure:

- Interpret details from freehand sketch
- How to sketch drawing

LAP Test	Practical Demonstration

Name:_____ Date: _____

Time Started: _____ Time Finished: _____

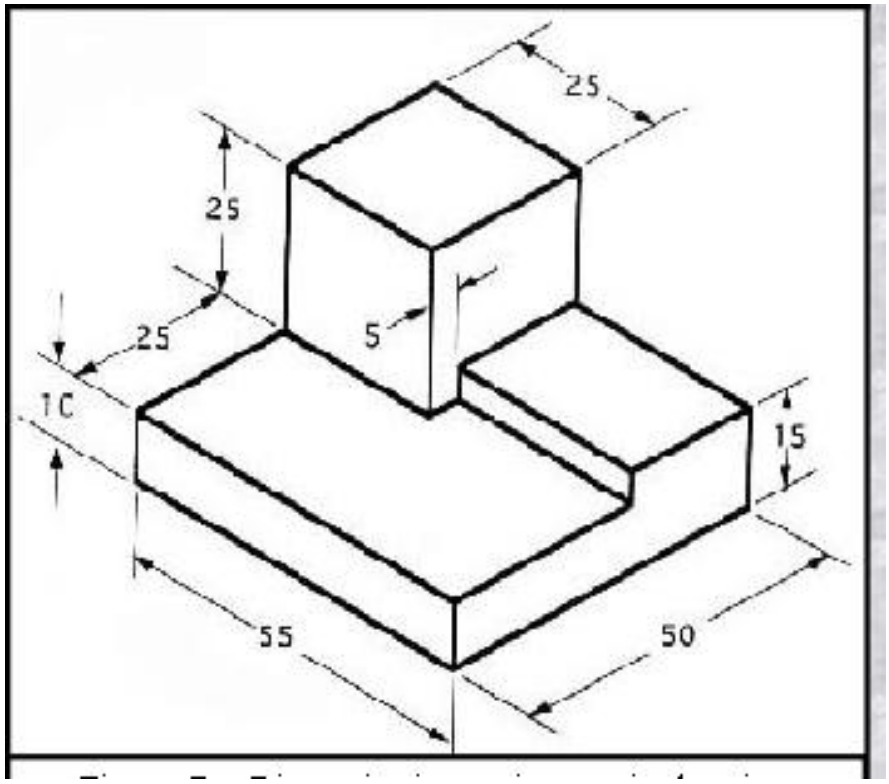
Instruction

<u>You are required to perform the following-</u>

- Request a Meter, Pencil with pencil sharpener, Try square, Colored chalk, Marker , Engineering scale, Ruler, Paper and lead

  - Attempt all questions very carefully
  - Neatness has its own value
  - Follow the necessary Steps in each question
- Draw the Top, Front, and Side view of the given iso-metric drawing below.

  NB. Using 3rd Angle projection, Scale 1:1 and all measurement in cm



Request your trainer for an evaluation and feedback.

Other Reference books

- https://www.dlsweb.rmit.edu.au
- Basic Engineering Drawings, RS Rhodes LB cook, long man Scientific& Technical,
- https://www.scincedirect.com
- Technicaldrawing1,plain& solid geometry,A.Bankole,S.Bland,Longman,©1992
- Technical drawing2,Mechanical Drawing,A.Bankole,S.Bland,Longman,©1990
- https://www.dtwd.wa.gov.au