Quotation	Exact estimate of price of product
Cash-flow statement	Schedule of cash received and paid
Costing	Actual expenses incurred
Balance sheet	Health of the organization
Profit and loss statement	financial statement for particular period

SUGGESTED ACTIVITIES

1) Estimate the Sales Value of an MS Grill having following details -

   Raw material - MS square bar 12 mm,

   Outer dimensions of the finished grill - 5' × 8'

   Grid inside - a square grid of 5 × 8 squares

2) Prepare a budget for the following

   A nursery of plants.

   a) Prepare a Moorghaas of 2000 kg - 3000 kg.

   b) Maintenance of a private or school garden.

   c) To run a Poultry farm for 25 birds.

   d) Pest control of five different crops.

   e) Run a Vermi Culture plant.

   f) Management of a Dairy farm for one month.

   Study project for effects of various fertilizers on a particular crop.

10

ENGINEERING DRAWING

10.1 INTRODUCTION

Drawing is universal language. It has several a**dvantages** over textual information. It is easily understood, - even by illiterates. Engineering drawing is the language of the technicians. Like any other language, Engineering drawing has it rules and grammar. We must learn to use principles of engineering drawing to convey our ideas. Engineering drawing makes it possible to convey ideas from one person to others. It makes it possible to replicate the jobs in large numbers without any deviations. In this lesson, we are going to study basic rules of drawing.

10.2 OBJECTIVES

After reading this lesson, you will be able to:

- know different forms of drawing and their use;
- learn to select scale and draw basic shapes;
- calculate the area of regular and irregular shape.

10.3 BASIC FORMS OF GRAPHICAL REPRESENTATION OF KNOWLEDGE

Any information can be represented by any one of the following four basic forms: -

(1) Engineering drawing, (2) Geographical Maps & Contours, (3) Electrical Diagrams, (4) Flow charts & Graphs.

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10.4 Basic symbols used in Engineering Drawing

Engineering drawings are usually created in accordance with standardized conventions for layout, nomenclature, interpretatition, appearance, line styles, size, etc. The purpose of drawing is to accurately and unambiguously capture all the geometric features of a product or a component. The end goal of an engineering drawing is to convey all the required information that will allow a manufacturer to produce that component. All engineering drawing uses standard symbols while drawing. The list of symbols is shown in the Table 1.

Different line styles are used to convey information such as hidden line, center line, dimension line etc. Standard symbols must be used, while drawing the maps and flow charts.

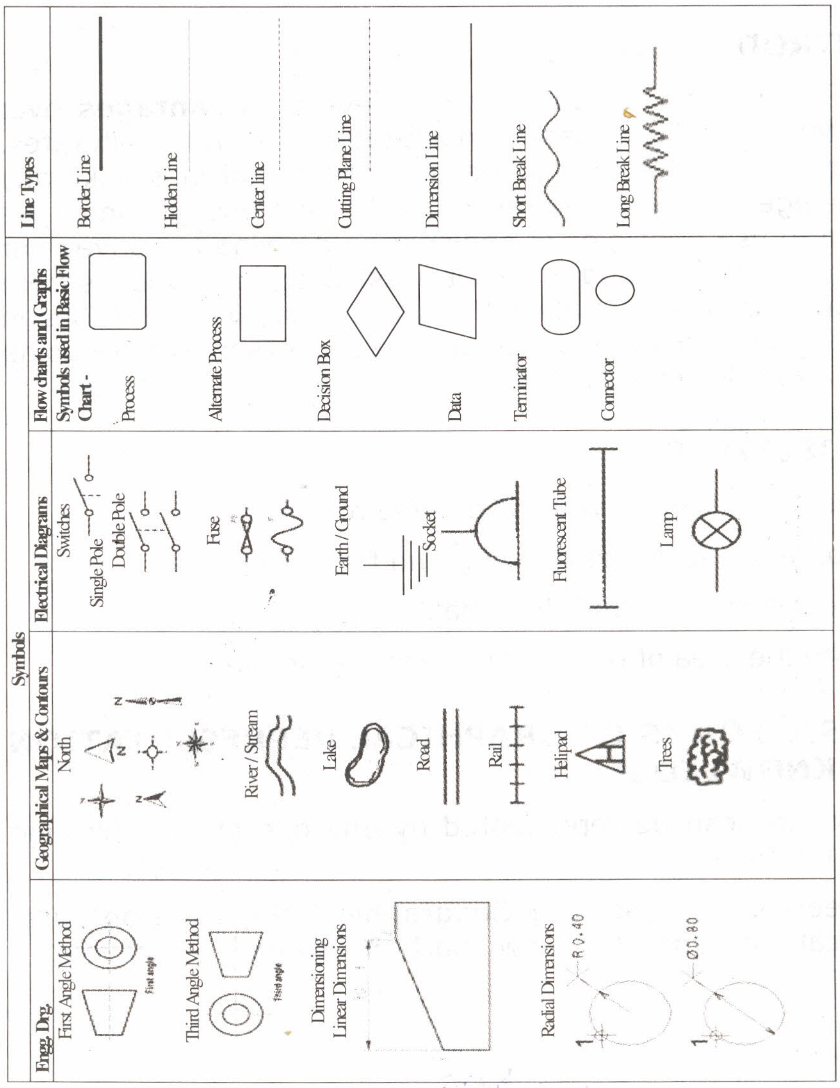

Table 1 – Symbols & Line Types

0.5 SELECTING SCALE FOR DRAWING

) Engineering drawing

draw engineering drawing or map on a small piece of paper, we eed scale. By selecting appropriate scale we can accommodate details of the object on a small piece of paper. It helps is study- g a large area.

Scale is selected by the maximum length available for drawing n the paper divided by maximum actual length to be plotted.

For example if 25cm size drawing paper is available for drawing nd we want to draw engineering drawing of sketch given in the g.10-1 Maximum dimension to be plot is 300 meter on the draw- g paper. Therefore, you can select scale as —

Scale = length available on the paper / Maximum length of the bject to be draw:

= 25 cm / 300 m = 1 cm / 12 m

Therefore, scale will be 1 cm = 12 m

Please remember all dimensions on the plot has to be reduced to is scale. For make it simple, try to select the scale in integers. i.e. 2, 3 ... As far as possible do not select a scale in fractions 1.2, 4, 4.5 etc.

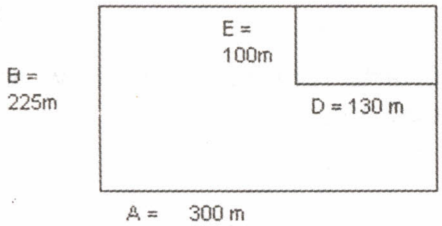

Fig: 10.1

ctual dimension in meter	Dimension reduced to scale for drawing on paper (12 m = 1 cm)
= 300 m	300/12 = 25 cm
= 225 m	225 / 12 = 18.75 cm
= 130 m	130 / 12 = 10.8 cm
= 100 m	100 / 12 = 8.3 cm

) For Geographical maps & contours – Distances plotted on e maps are very high. They can be hundreds of Kms. Consider aximum actual distance in the area to be mapped (A in KM) and aximum possible length available on the paper (B in cms), then,

Scale = B in cm / A in KM

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For example if maximum distance in the area to be mapped is 70 KM (A) and maximum possible length available on a wide A3 size (11.693" × 16.535") is say, 35 cm (B); then,

Scale = 35 cm / 70 KM = 1 : 2 KM

This means every 1 cm on the paper represents 2 KM. Suppose, distance between two places on the map is 6 cm then the actual distance between those two places would be 12 KM.

c) For Electrical Diagrams – To communicate electric connections, position of switches and load, polarities etc electric circuit diagram is very necessary. We have seen various symbols used in electric circuits.

Scale for electric diagram is selected as in engineering drawing. For e.g. Maximum actual distance in the wiring diagram is A = 100 m and the maximum possible length available on the paper to be B = 35 cm. Then the scale would be:

B / A = 35 / 100 = 1 / 2.85

For simplicity of calculation, we can make it 1cm : 2 m That means, every 1 cm of the figure on the paper represents 2 meter of actual wiring.

d) Graphs generally have grid of 1cm × 1cm. Therefore considering number to be plotted on graphs , we can calculate the scale as shown above.

e) Flow charts - Flow Charts represent only flow of any procedure, so they don't need any scale.

INTEXT QUESTIONS 10.1

01. Select appropriate scale for plotting on the maximum drawing sheet of size 40 cm.

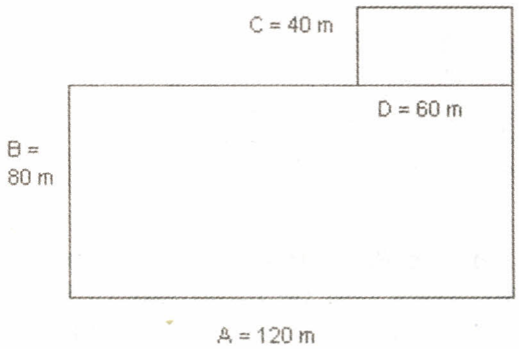


Fig. 10.2

02. Write down size of all dimensions for drawing on the paper.

Scale = ____________

Actual scale	Drawing dimension
A = 120 m	
B = 80 m	
C = 40 m	
C = 60 m	

10.6 DRAWING BASIC SHAPES

Compass, scale, sets square (30 – 60, 45-45), protractor are used to draw basic geometrical shapes.

1) Triangle

We can use compass and scale to draw triangle. Various steps to draw triangles are shown in the figure. Sum of all three angles of triangle is 180^0.

Area of Triangle = base × height / 2

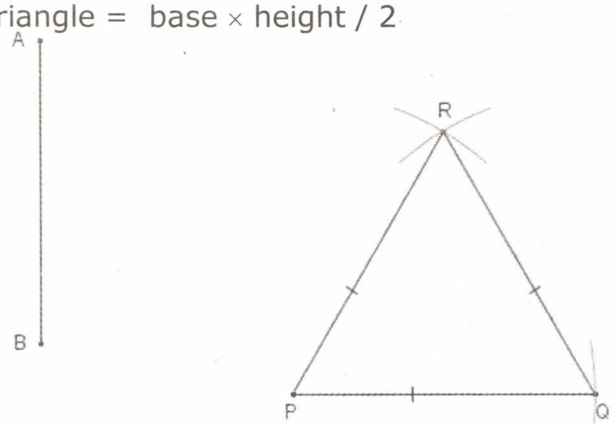


Fig. 10.3 Triangle

2) Quadrilateral

Quadrilateral has four sides. Sum of angles of quadrilateral is 360^0. Square has all four sides of same length. Rectangle has two opposite sides of same length. Square /rectangle is drawn as follows:

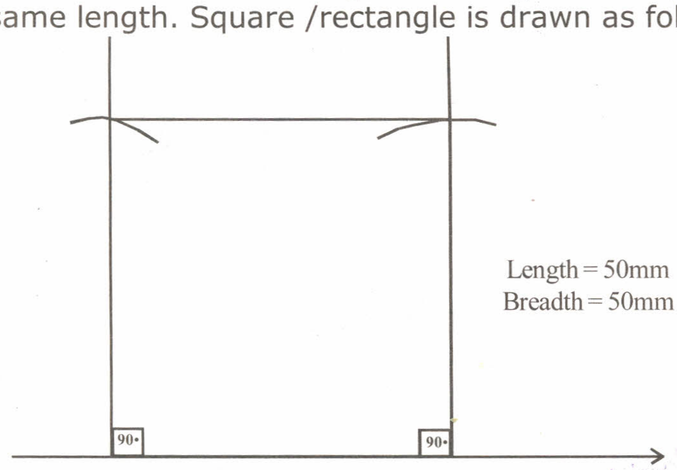


Fig 10.4 Quadrilateral

C) Regular Pentagon

Following are the steps in drawing pentagon of five sides of equal length. For e.g lets draw a pentagon of 5 cm in length:

1. Draw a line AB of 5 cm.
2. Draw a circle of 5cm radius by taking A as a center. Then draw another circle with B as a center. Both circle will cross each other at point X and Z. Join length XZ.
3. Now take distance ZA in compass and draw circle with Z as a center. The circle will cut other circles at point S and R.
4. Now draw line RC and line SE passing through point Y.
5. Using compass ,mark arc of length 5 cm from point E and C. The arc will cross each other at point D.
6. Now join all points A B C D E, to form a pentagon.

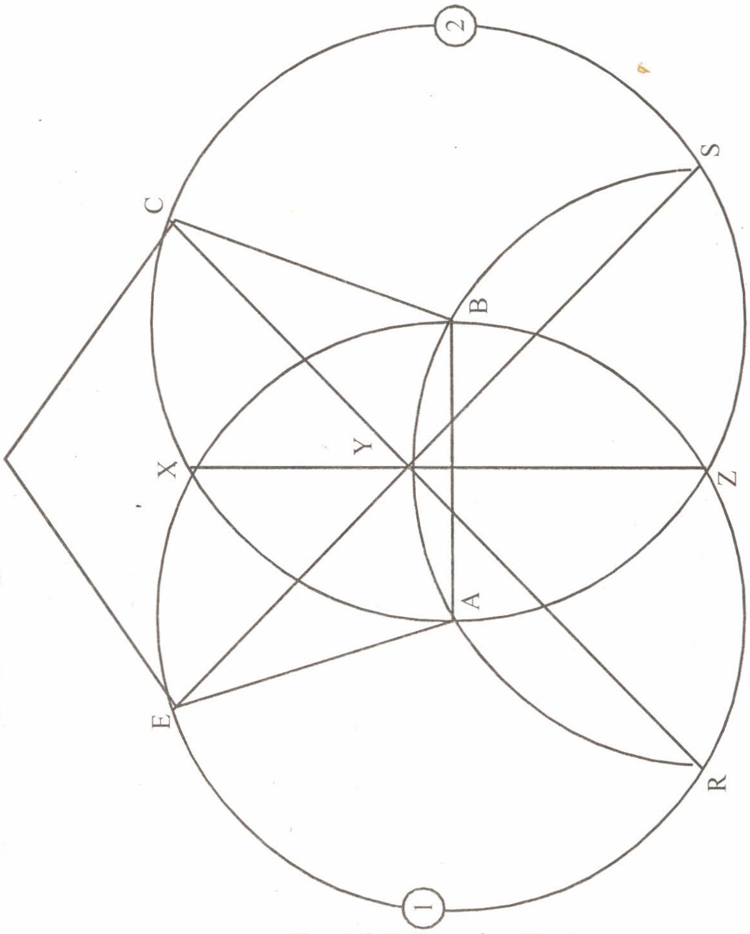


Fig. 10.5 Regular Pentagon

E) Hexagon.

Hexagon has six sides. Draw hexagon of equal side.

1. Draw a circle of radius equal to side of hexagon.
2. Put the compass anywhere at the edge of a circle, call that point as A.
3. Draw arc of circle cutting circle at point B and F. Now put compass at point B and mark point C using compass. Similarly point D and E are marked.
4. Join all points using scale to get a hexagon.

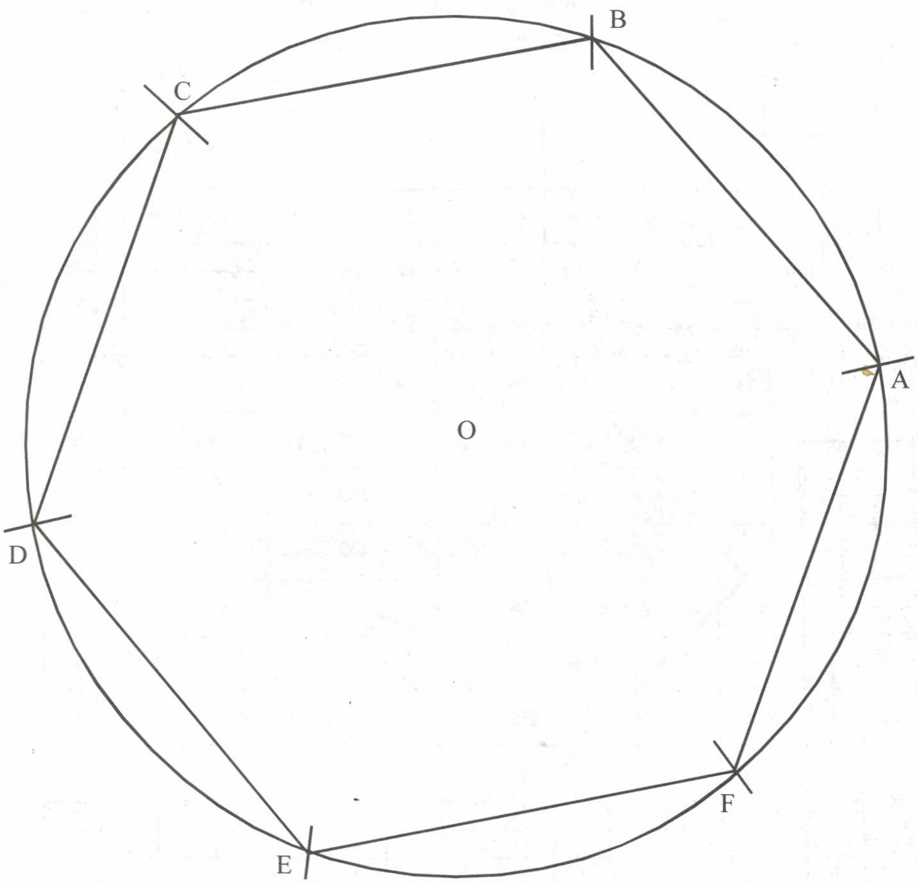


Fig 10.6 Hexagon

Area of geometric shapes

Area of regular shape is calculated using standard mathematical formula.

a) Triangle

Use following formula to calculate area of triangle.

Area = ½ × base × height

b) Quadrilateral

Area of quadrilateral = Length × breadth

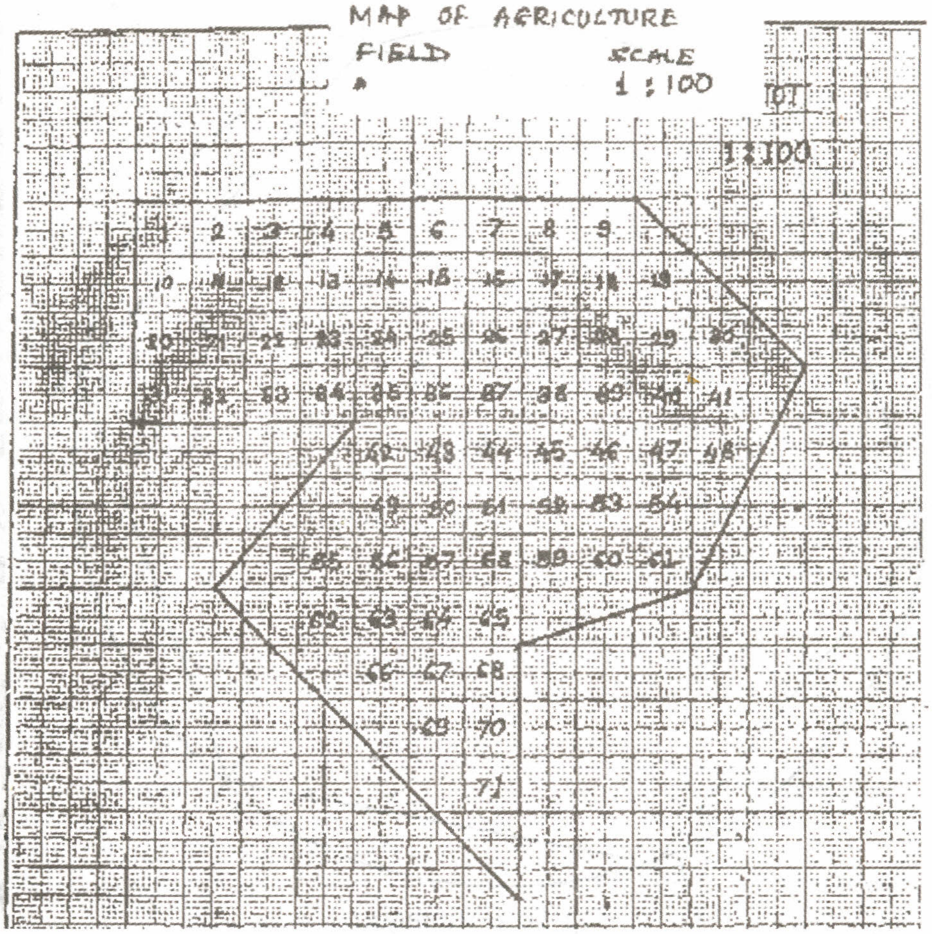
c) Circle

Area of circle = $\pi \times R^2$ (R = Radius)

Area of irregular shape

1) Graphical Method

In regular practice, we need to measure irregular shapes of land, construction area, material etc. Graphical method is used to calculate area of such irregular shapes.



Map of Agriculture Field

1) Select appropriate scale and draw the drawing on graph.
2) Then count number of complete square on the graph.
3) Count number 75% (three quarter) square on the graph.
4) Count the number of 50% square on the graph.
5) Count 25% square on the graph.

If you add all these squares then we get the area of the place. For example above Map is a graphical diagram of agricultural field. It has following squares:

Complete square	———	71×1	= 71
75% square	———	10×0.75	= 7.5
50% square	———	5×0.5	= 2.5
25% square	———	8×0.25	= 2.0
Total square is			= 83

This means total area of land on the graph is 83 Sq cm. If we multiply it with the scale we will get actual area of land.

2) We can also calculate the area of irregular shape by drawing many big size squares and triangles into the drawing. We can add area of all these squares and triangles to get area of the irregular shape.

INTEXT QUESTIONS 10.2

i) Match the following:

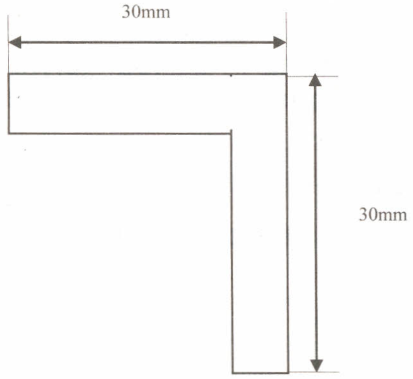
A	B
Area of triangle	Length × breadth
Area of rectangle	$\pi \times R^2$
Area of circle	½ × base × height

10.7 WHAT YOU HAVE LEARNT

In this lesson, We read about standard symbols and lines used in engineering drawing. Now we are able to select appropriate scale for drawing. We have also learned to draw different geometrical shapes and areas Calculation, of regular and irregular geometrical shape aslo.

10.8 TERMINAL QUESTIONS

1. If an MS bar of 2 mm thickness has 'L' shaped cross-section as shown in the figure. Calculate its cross-sectional area in cm^2.



2) Draw the following
   - i) Equilateral triangle of 10 cm length
   - ii) Square of 15 cm in length
   - iii) Rectangle of length = 12 cm , breadth = 10 cm
   - iv) Circle with radius = 7 cm
3) Draw symbols for the following
   - i) River
   - ii) Road
   - iii) Rail
   - iv) Hidden line

Actual scale	Drawing dimension
A = 120 m	40 cm
B = 80 m	26.67 cm
C = 40 m	13.33 cm
C = 60 m	20 cm

   - v) Center line
   - vi) Electric switch

10.9 ANSWER TO INTEXT QUESTIONS

1.1

Scale = 1 cm : 3 m

1.2

i) ½ × base × height

ii) Length × breadth

iii) $P \times R^2$

SUGGESTED ACTIVITIES

1) On A3 size (11.693 × 16.535 inches) drawing sheet - Draw the typical symbols used in all four forms of drawing – Engineering Drawing, Geographical Maps, Contours & Graphs and Line types.
2) Find area of a field/garden.
3) Find top surface area of a percolation tank.

11

ORTHOGRAPHIC AND ISOMETRIC PROJECTION

11.1 INTRODUCTION

Engineering drawing is a language of technicians. They can document and communicate all details of the job using engineering drawing. Drawing paper has two dimensions. To give information about 3-D object, only one view is not sufficient. Orthographic projection is a method to project 3-D drawing in two dimensions.

11.2 OBJECTIVES

After reading this lesson, you will be able to:

- Understand the orthographic and isometric methods of projection;
- draw simple orthographic and isometric drawing:
- select isometric scale.

11.3 ORTHOGRAPHIC PROJECTIONS

A three dimensional sketch of an object to be manufactured doesn't always gives a clear idea about the exact construction. The artisan or craftsman needs constructional details which can be better explained in the Orthographic Projections.

Orthogonal means 'Perpendicular', The object is observed with the viewer's eye sight at 90 degrees to a face of the object shown in fig. 11.1

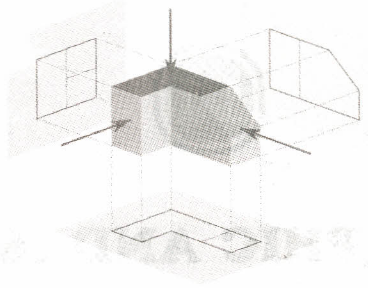


Fig: 11.1 Orthographie Projections

In First Angle Projection we place our object in the First Quadrant and in Third Angle Projection the Object is placed in the Third Quadrant. (See fig 11.2). It is consider as if the object is placed in a glass box with three planes of the object being parallel to the glass box. The image (or shadow or reflections) received on the three planes, collectively are called as 'orthographic projections'.

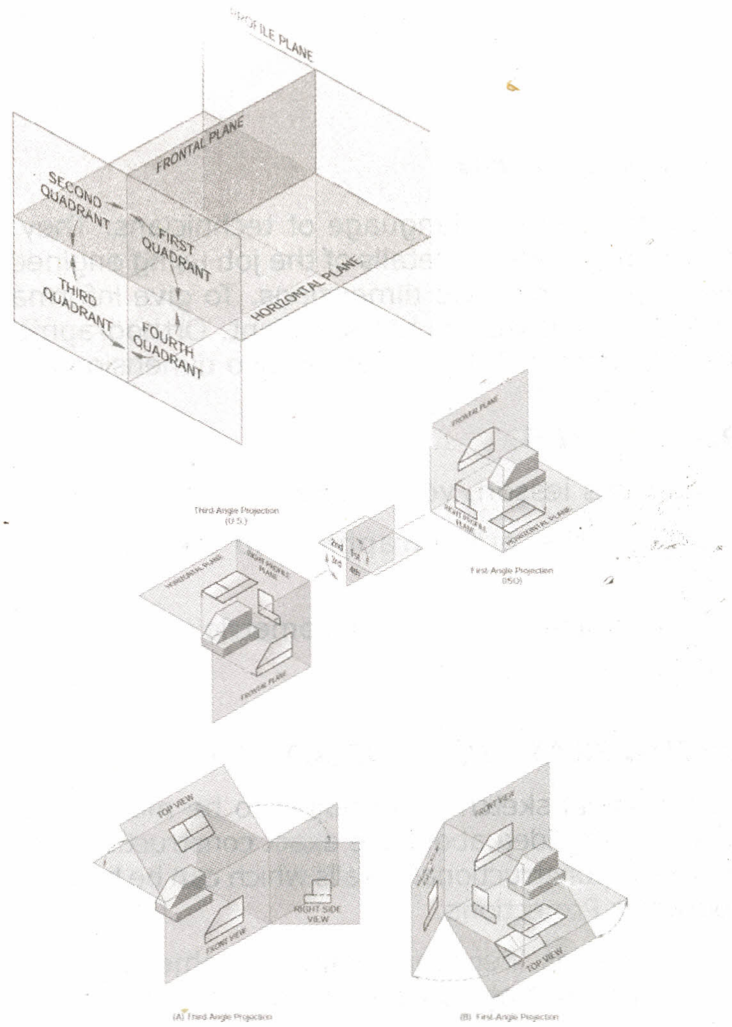


Fig: 11.2

When we draw an Orthographic view of the front of an object it is called an ELEVATION. When we draw an Orthographic view of the top of an object it is called a PLAN. When we draw an Orthographic view of one side of an object it is called an END ELEVATION.

If an object is very complicated then you can draw an End Elevation of the left and right hand side.

Observe following object and their orthographic projections:

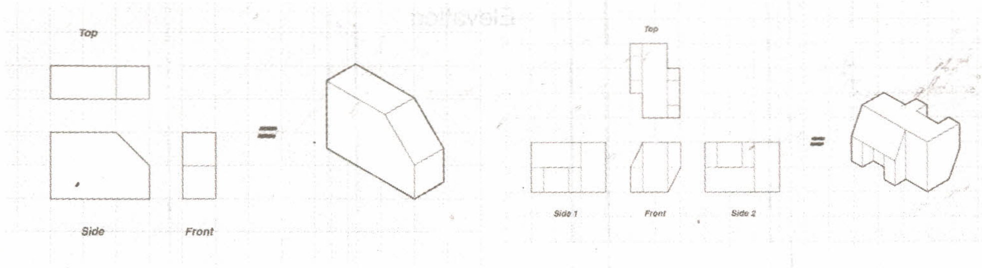
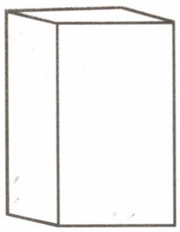


Fig: 11.3 Orthographic projections

11.4 STEPS TO DRAW THE ORTHOGRAPHIC VIEWS

Lets draw orthographic view of block shown in fig. 11.4 using third angle projection method.

Draw a horizontal line XY in the middle of the paper.



1. Draw a rectangle measuring 'height CO length and AC width' below the line XY. This is the 'Front View' or the 'Elevation.' Leave some space; say 20 mm, between the line XY and top of the rectangle.
2. Draw two more rectangles on either side of the first rectangle. These are two 'Side Views.' These two rectangles must be admeasuring width of the object. Leave 20 mm space between each pair of rectangles.
3. Draw two vertical lines, AB and CD, from top of the Elevation and extend them above the XY line. These are 'Projections' from Elevation. These lines must be fainter than the rectangle.
5. Draw vertical projections, EF & GH, from the top of either Side View, but these projections should just touch the XY line.
6. Draw two more projections at 45°, HB & FJ, so as to intersect the extended vertical projections AB and CD, from the Elevation. Intersections of all these projections will give the 'Top View' or 'Plan', exactly above the Elevation. This set of 4 views-viz. Elevation, Top View and Side Views - is called the 'Orthographic Views' or 'Orthographic Projections'

Please study the examples of orthographic projection given in the following figures:

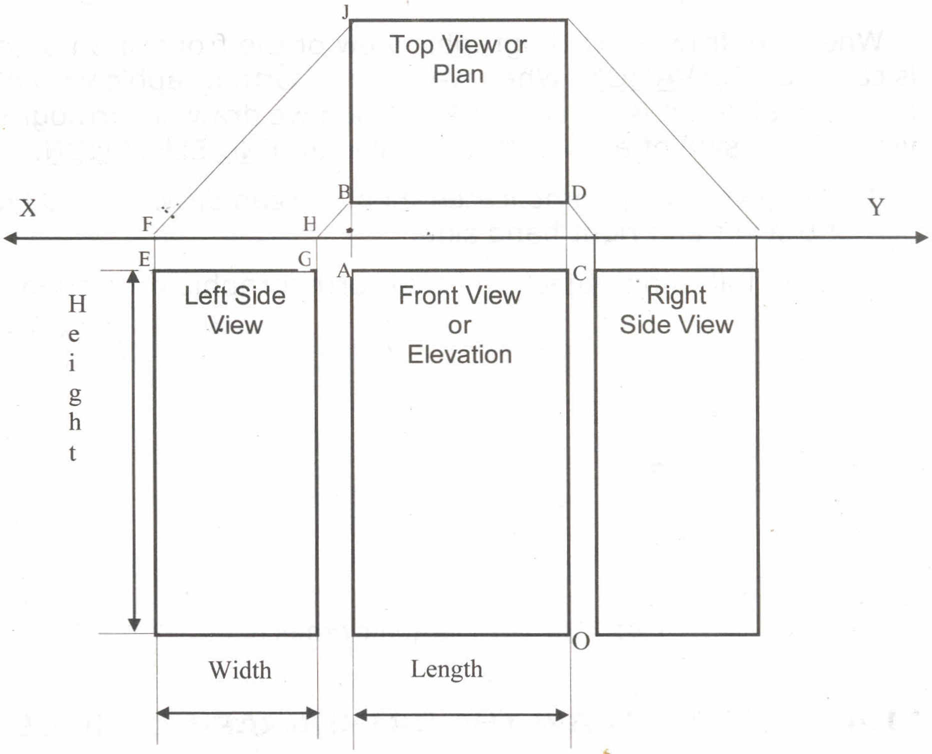


Fig: 11.4

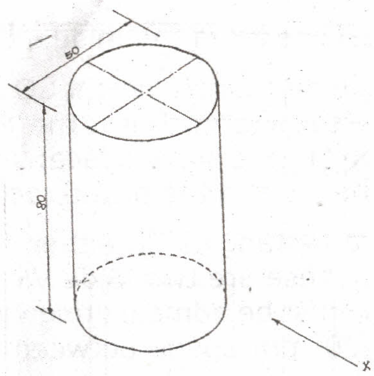


Fig: 11.5(a)

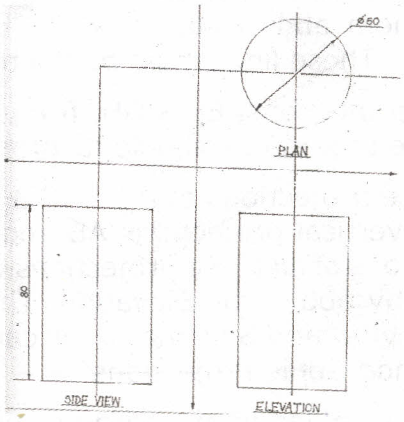


Fig: 11.5(b)

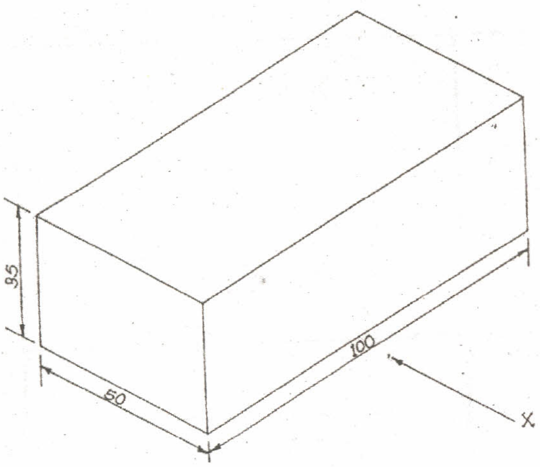


Fig: 11.6(a)

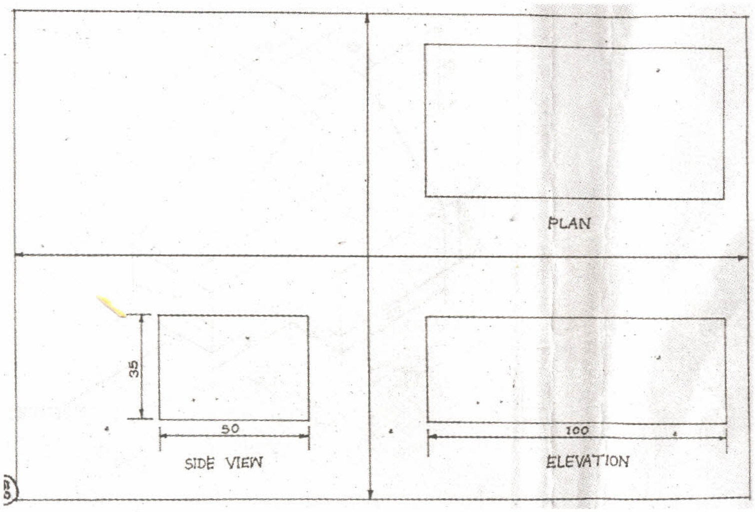


Fig: 11.6(b)

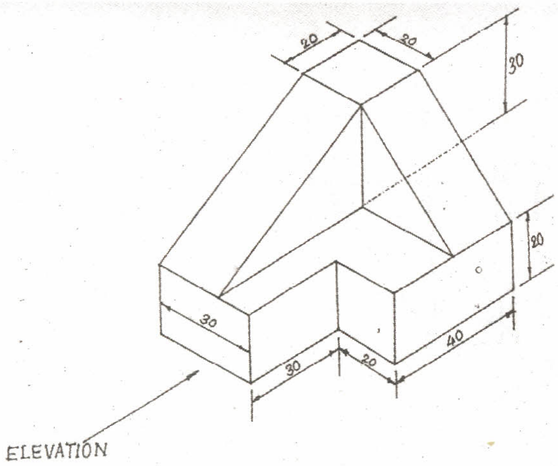


Fig: 11.7(a)

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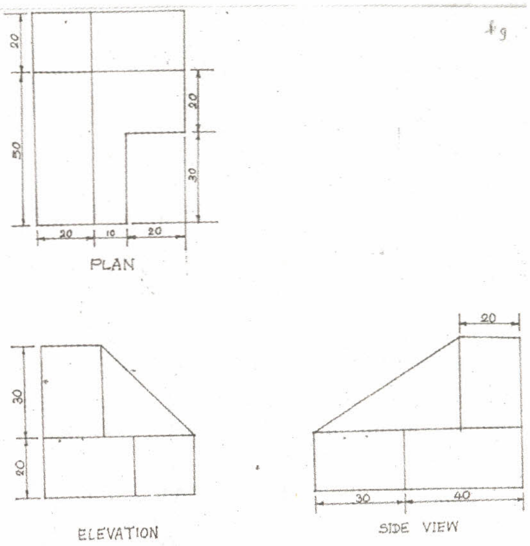


Fig: 11.7(b)

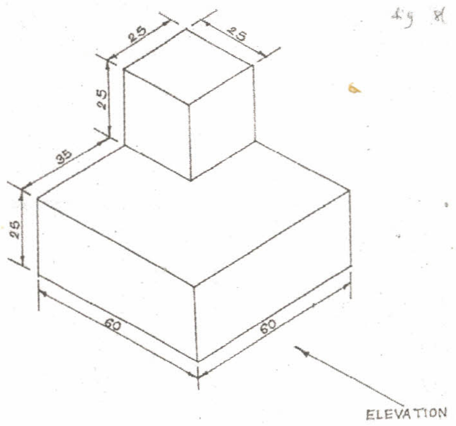


Fig: 11.8(a)

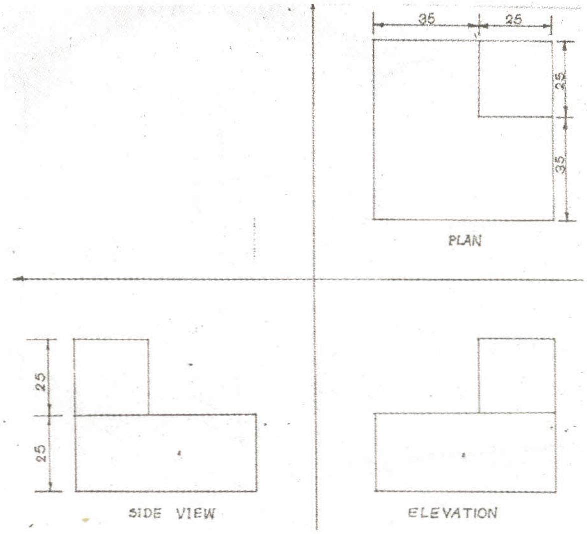
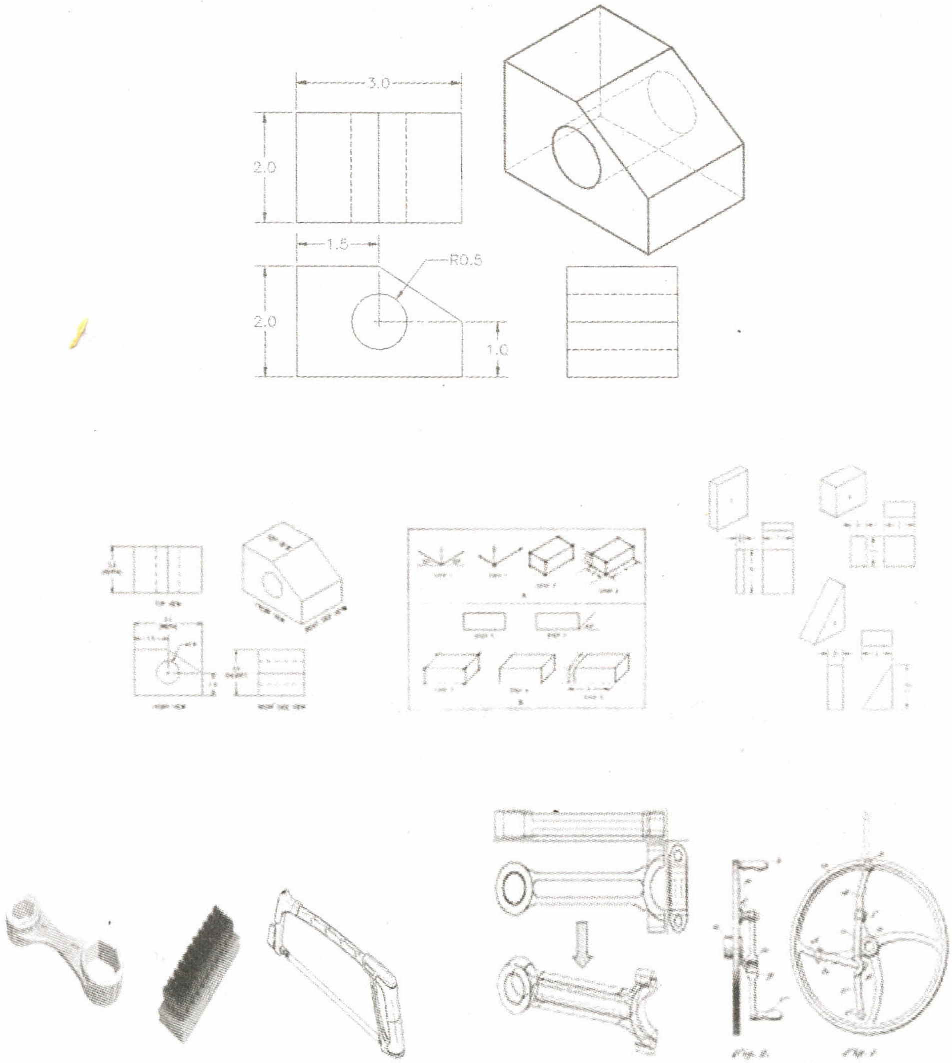


Fig: 11.8(b)

11.5 ISOMETRIC DRAWING

An Isometric Sketch is drawn with free hand; its dimensioning is just proportional, whereas the Isometric View is to be drawn with the Isometric Scale. **Isometric projection** is a method of visually representing three-dimensional objects in two dimensions, in which the three coordinate axes appear equally foreshortened and the angles between any two of them are 120 degrees. Isometric is a 3-D sketch whereas Orthographic is a set of 3 Plane Projections. Look at the fig.11.9 to see example of isometric drawing.



Spanner Brush Hack Saw Spanner Hand Wheel

Freehand Isometric sketches of common tools **Orthographic Views of hand Tools**

Fig: 11.9

11.6 NATURAL SCALE AND ISOMETRIC SCALE

True Scale or Natural Scale is used to draw Orthographic Views. In these views, the viewer's direction is exactly perpendicular to the plane of view,

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hence true Dimensions are seen. But in Isometric view, object is seen from an angle to get view of all three plane. A corner of the 3D object is the nearest point to the viewer and all other dimensions of the object are moving away from the viewer. So the dimensions APPEAR to be smaller than the true ones. This difference can be computed by the figure 10. Unit 1 on the natural scale appears to be Unit 1 on the Isometric scale.

Step in drawing isometric scale –

Ref.fig.11.10 draw a line at 45° and at 30°. Mark points on true scale and draw line perpendicular to X – axis as shown in the fig. Distance of point O from point on isometric scale is the length of object on isometric scale.

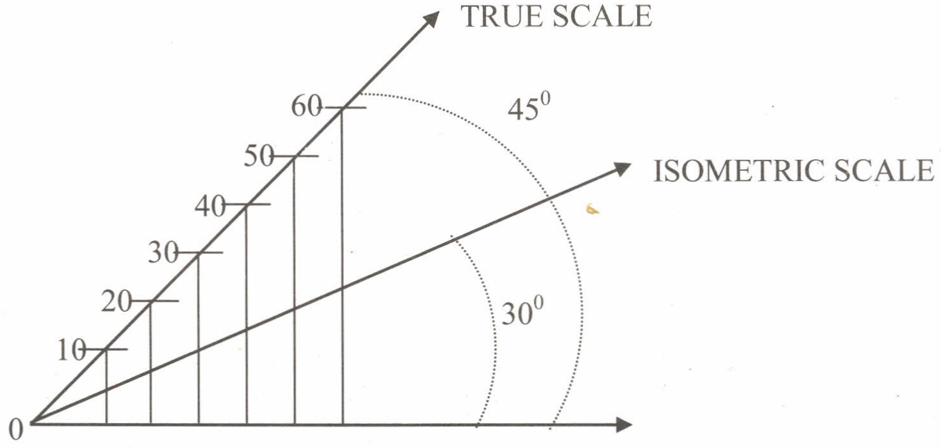

Fig. 11.10

11.7 STEPS TO DRAW AN ISOMETRIC VIEW

1. Orientation of the object and point of Origin, these two things are to be decided before drawing the Isometric View. For every Isometric View a separate Scale is required to be drawn.
2. Draw the Isometric and Natural scale, mark each dimension on the Natural scale, drop a perpendicular on the horizontal line, and transfer the corresponding Isometric dimension on the paper with the help of divider. (As Isometric dimension cannot be and need not be measured in cm or inches). Suppose we need a dimension of say, 35 mm to be converted into Isometric Scale. Take 35 mm dimension on the Natural scale, drop a perpendicular on the horizontal line. The perpendicular meets the 30° line at point A. The dimension OA is the Isometric dimension of Natural 35 mm. Transfer the dimension OA to the Isometric View to be drawn.
3. Take an Origin 'O' on the paper ref fig. 11.12, with sufficient space to draw the Isometric above the point 'O'. Draw a horizontal line XY through 'O' and another vertical line OZ.

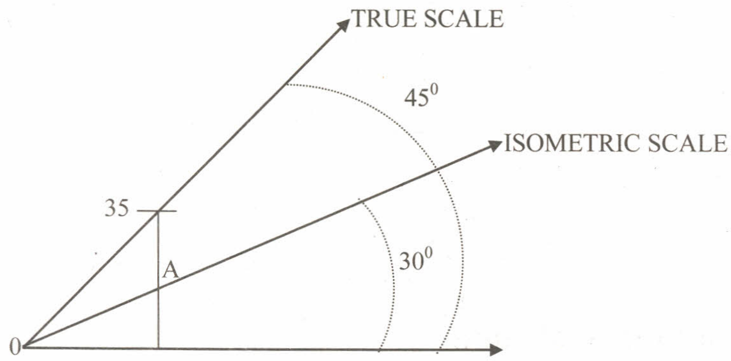

Fig. 11.11

4. Referring the orthographic Views, transfer the height, length and width of the object on the Natural Scale and convert them into Isometric Scale.
5. With the help of a Divider, transfer the height on the vertical line OZ, the length along OX and width along OY. Consider the Origin 'O'in the Elevation of the Orthographic Views (Lesson 2) to be the Origin in the Isometric View here.
6. Complete the entire Isometric block with the help of Tee Square and 30-60 Set Square.

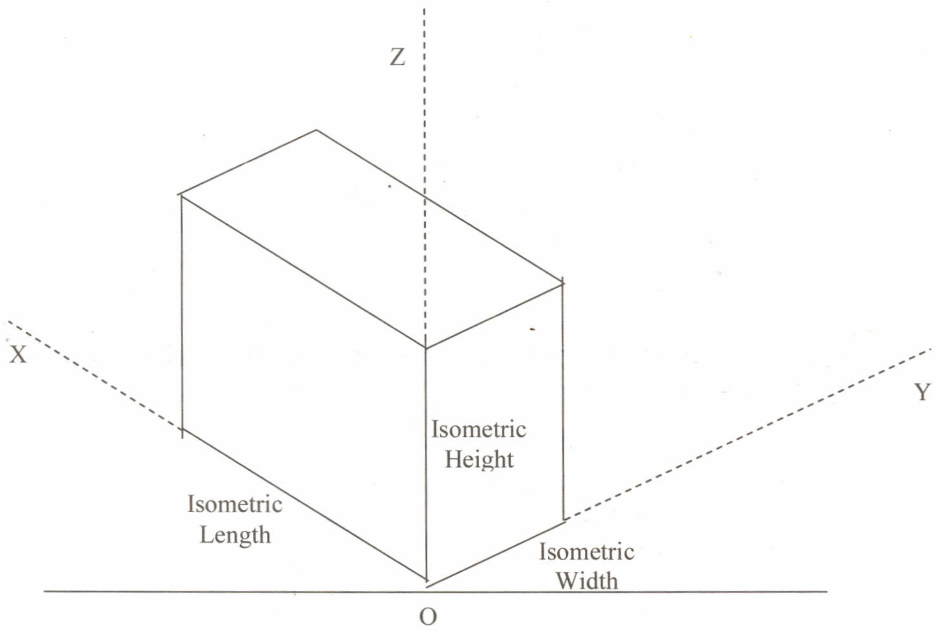

Fig. 11.12

Examples of drawing isometric drawing

1) Draw isometric drawing of a cube.

Orthographic projection of cube of 40cm length, 40cm height and 40cm width is shown below.

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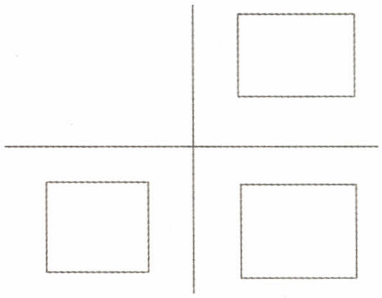


Fig. 11.13

To draw isometric of cube

1) Draw two basic 30 degree guidelines, one to the left and one to the right, plus a vertical guideline in the centre of the drawing. In this example three edges of the cube have been drawn over the guidelines (they are slightly darker)
2) Remember to draw the line of length equal to isometric scale. Therefore each side of 40cm cube should be converted to isometric scale.

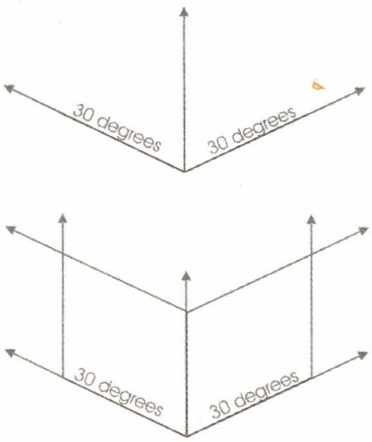


Fig. 11.14

Complete the top of the cube by projecting lines with the 30 degree set square as shown.

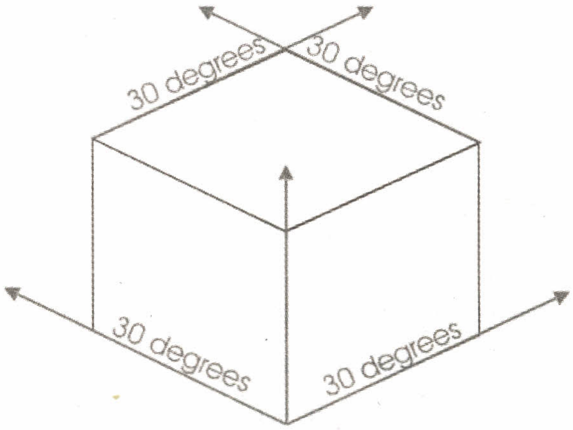


Fig. 11.15

2) Draw an square in isometric

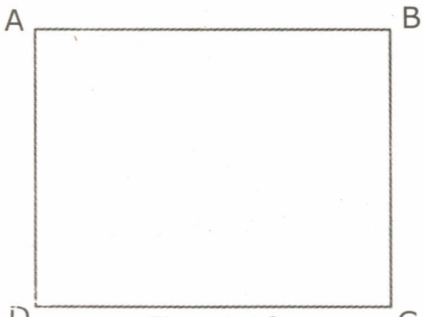


Fig. 11.16

Square ABCD is of 50mm size.

1) Draw a horizontal line.
2) Mark one corner of square at the center of line 'D' in fig.17
3) Draw two lines as shown in the fig at 30° to the horizontal line.
4) Select isometric scale as shown in the previous example. Measure distance on isometric scale.
5) Draw point A and B equal to isometric length.
6) Mark point 'C' using compass of length of isometric scale.

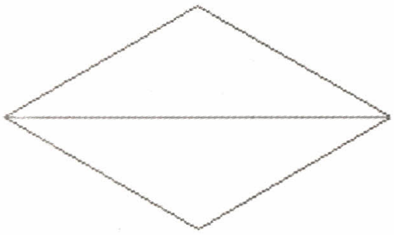


Fig. 11.17

3) Draw an isometric circle

Draw a square ABCD, centred on the position of the hole. The square should be the same size as the diameter of the hole.

Draw curves (GF and HE) using compass as shown in the fig.

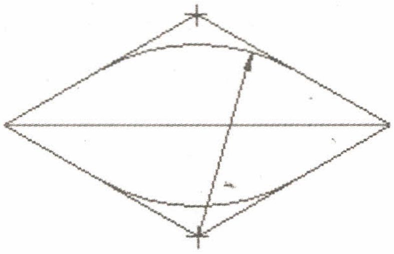


Fig. 11.18

Center of line CD and AB are marked as G and E. Join AG and CE as shown in the figure. Draw arc EF and GH using compass as shown in the figure. The isometric of circle is ellipse.

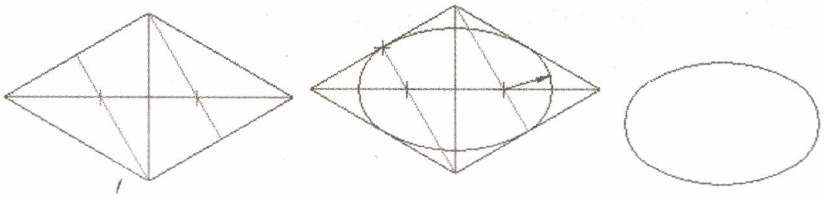


Fig: 11.19

Observe the following examples of drawing.

1. Stool

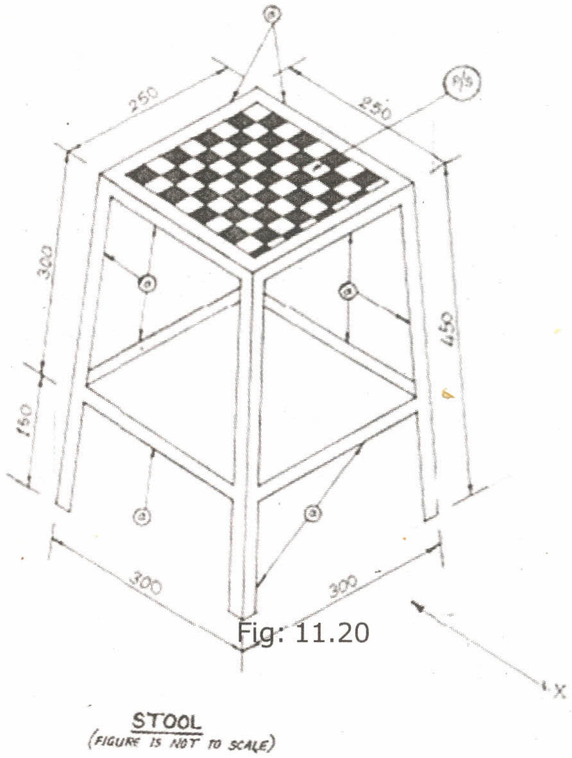


Fig: 11.20

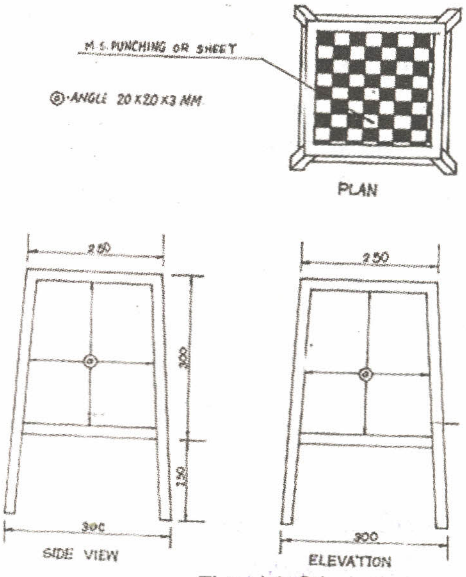
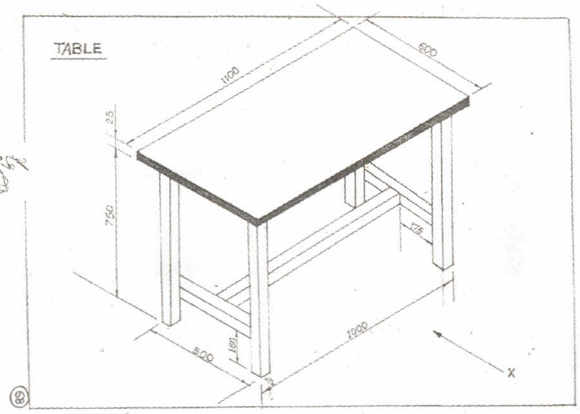
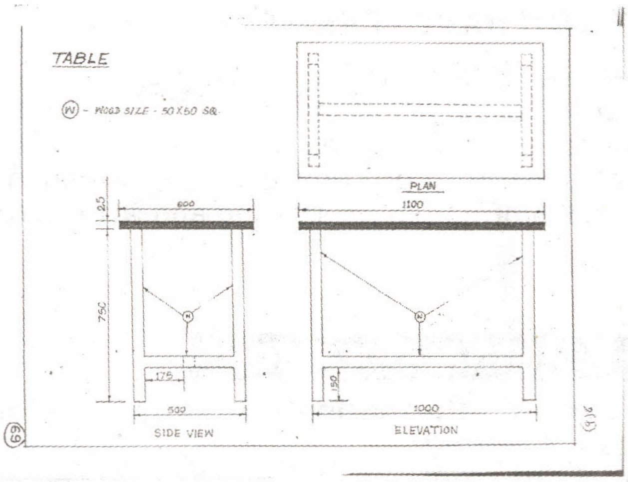


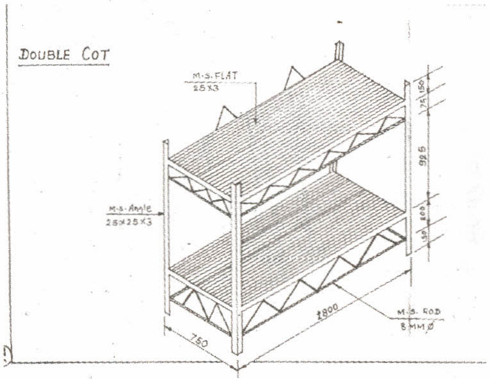
Fig: 11.21



Example:11.12



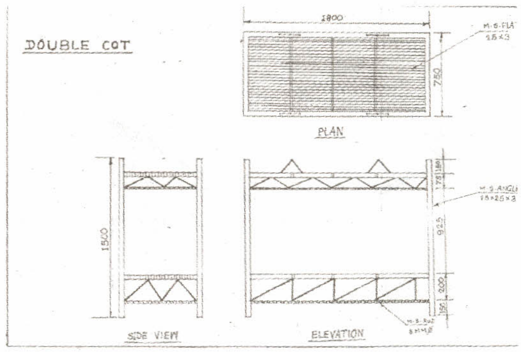
Example: 11.13



Example: 11.14

Module - 3

Notes



Example: 11.15

11.8 WHAT YOU HAVE LEARNT

In this chapter, you read the orthographic and isometric projection. You learnt to draw orthographic and isometric projection. You learnt the procedure to draw them. You learnt to draw basic isometric shapes. You also learnt to present textual information to drawing form and to read information on drawing and write in textual form.

11.9 TERMINAL QUESTIONS

1. **Convert textual information into graphical form** - A box measures 30 mm (length) × 20 mm (breadth) × 45 mm (height). Draw its isometric sketch with length on your right side.
2. **Convert textual information into graphical form -** A cylinder measures 25 mm (base diameter) × 75 mm (height). Draw its three orthographic views.
3. **Convert graphical information into textual form**
   a. What is the total length and breadth of the object?

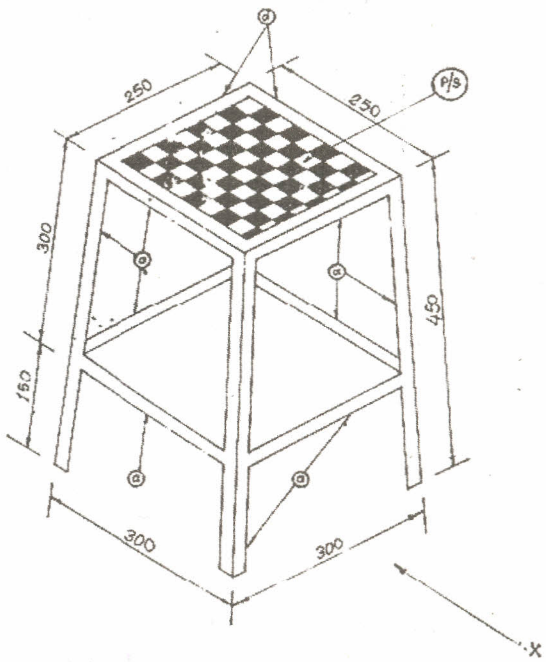


fig.11.16

b. State the dimensions of the top of the object.

c. What is the total length of each of the 4 legs?

d. What is the maximum distance between two legs?

e. What are the M.S. Angle dimensions?

f. Which two materials are suggested for the top?

SUGGESTED ACTIVITY

Make a orthographic projection of your house.

12

FLOW CHARTS & GRAPHS

12.1 INTRODUCTION

Information is required for decision making. It is very difficult to draw definite conclusions from the raw data. The raw data needs to be presented in appropriate form, which helps in decision making. Flow charts and graphs are important tools for taking management decision.

12.2 OBJECTIVES

After reading this lesson, you be will able to:

- know the flow charts and graphs;
- draw flow charts and straight line diagram;
- learn the rules for drawing flow chart.

12.3 FLOW CHART

What is Flow Chart?

Flow chart is graphical representation of a process, with the details of sequence, inputs, outputs, tools used, time taken etc. This helps us in better planning. Since you know the processes in step-by-step flow, you can concentrate more on smaller steps instead of feeling burdened by the whole process.

Types of Flow Charts

There are mainly two types:

i) Basic Flow Charts;

ii) Straight Line Diagrams (SLD).

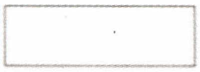
Basic Flow Charts need Symbols, SLD do not necessarily need symbols.

Benefits of flow Charts

1) A sequential, precise and short description of a process can be obtained.
2) Chances to overlook or miss any step, input-output elements are reduced.
3) Misuse of elements or tools can be located precisely.

12.4 RULES TO DRAW FLOW CHARTS

1) We have studied the symbols used in drawing flow chart in lesson 10. Let's learn to draw a flow chart by taking an example.
2) Flow charts are mainly made up of three types of symbol.
   - Elongated circles, which signify the start or end of a process 

   -  Rectangles, which show instructions or actions
   - Diamonds, which show decisions that must be made 

Within each symbol, write down what the symbol represents. This could be the start or finish of the process, the action to be taken, or the decision to be made.

3) Symbols are connected one to the other by arrows, showing the flow of the process.

Lets draw a flow chart to make a tomato sauce.

Following steps are involved in making tomato sauce:

Input material - tomato, clean them, cook them in pressure cooker, make a pulp in mixer, remove seeds and wastage, cook on stove to remove water, add spices, Cook it in pressure cooker, taste, packaging.

The flow chart is shown in the fig. 12.1.

Straight Line Diagram(SLD)

Lets make a SLD for preparing a tea in which tea powder and water is boiled together and then milk and tea is added separately as required.

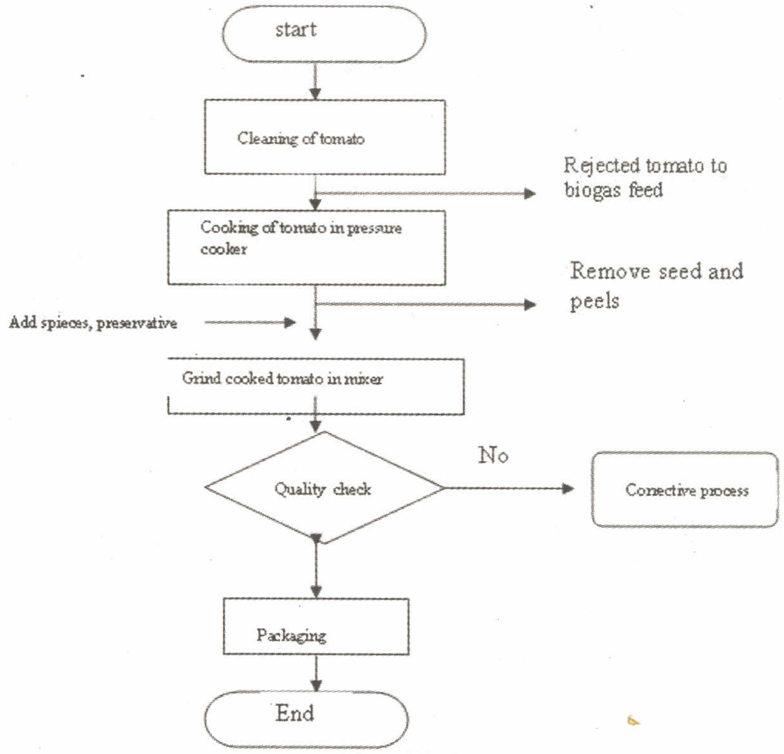


Fig: 12.1

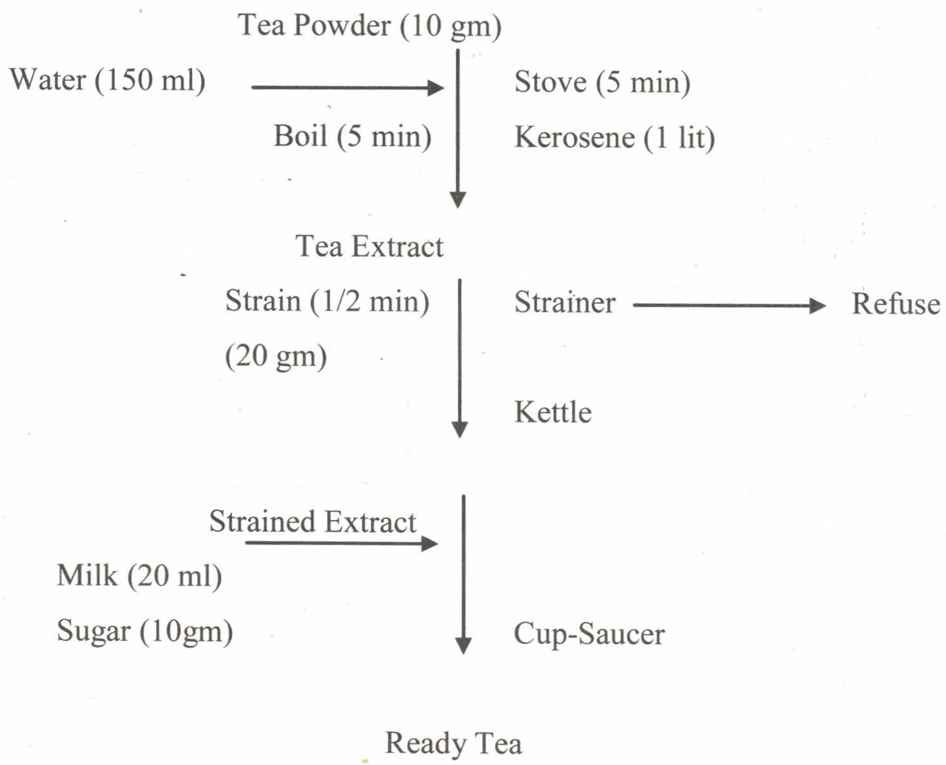


Fig. 12.2

Module-3

Notes

12.5 GRAPH

A graph is a chart or drawing displaying the relationship between numbers or amounts. It is also defined as Visual representation of statistical information, with the help of two or more reference axes.

TYPES OF GRAPH

1. Line Graph

A line graph shows points plotted on a graph. The points are then connected to see form a line. Refer fig.12.3 It shows the runs made by team A and B in various overs. A Line graph is usually used to display each single Data value. The graph shows us the progress made by both team.

Overs	First	Fifth	Tenth	Fifteenth	Twentieth
Runs by Team A	60	120	185	240	300
Runs by Team B	80	140	170	241	323

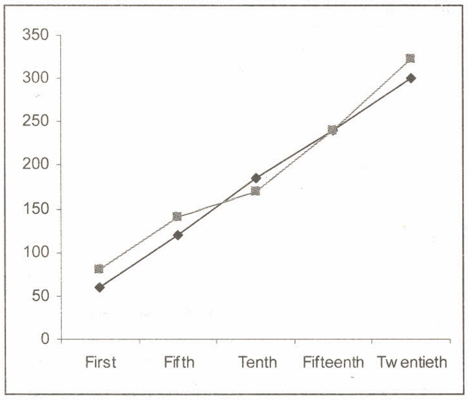


Fig: 12.3

2. Column Graph

It is also called as bar chart. A bar graph uses bars to show data. The bars can be vertical (up and down), or horizontal (across).

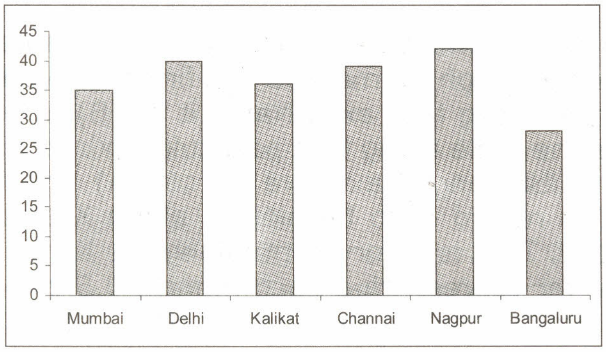


Fig:12.4

The data can be in words or numbers. A column or row bar graph compares values across a certain series. Fig. 12.4 shows comparative temperature of different cities.

3. Pie Graph

Refer fig. 12.5 it shows number of workers working in different departments. It shows comparative strength of each department. The graph is in circle form. A circle is divided into fractions that look like pieces of pie; Therefore, it is called a pie graph. A pie graph displays how mush each value contributes to the total.

Department	Welding	Fitting	Turning	Carpentry
No. of workers	40	37	46	20

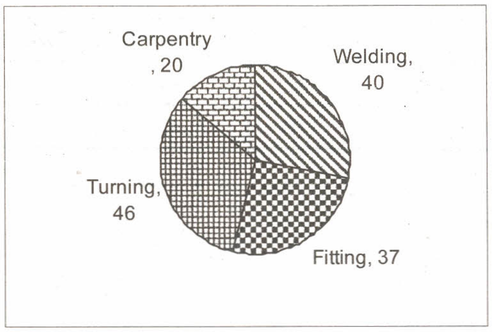


Fig: 12.5

Benefits of Graphs

Due to visual form of graph it easy to read and analyze the information. Graph is very useful management tool to analyze information. Using computers different style of graphs can be drawn, they can be enhanced by adding legends, labels etc.

Steps to plot a graph

1. **Draw two axes**, namely, X as horizontal axis and Y as vertical axis, both at right angled to each other. The point of intersection of axes is called the 'Origin' of the scale. It is treated as the 'Zero' of the scales.
2. **Decide a scale -** measure the maximum available units on any one axis of the graph. Name it as (A), find the maximum amount to be plotted along that axis. Name it as (B), the division of A by B gives the scale along that particular axis. e.g. if maximum available units along X axis are 12 cm (A) and maximum 24 months' (B) record is to be plotted along X axis then A/B = 12/24 = 1:2. That is, every 1 cm along the X axis represents 2 months or for representing each month, 0.5 cm of X axis can be used. Similar procedure is followed for other axes.
3. **To plot** each point of the graph, the X and Y values of that particular information are measured along the respective axes.

The point of intersection of perpendiculars drawn from these values, represents the point of information.

INTEXT QUESTIONS 12.2

i) Write down three main types of graphs?

12.6 WHAT YOU HAVE LEARNT

In this lesson, you read about flowchart and Straight line diagram. You also knew different types of graphs and their uses. You have also seen the examples of various types of graphs and flowchart. You have also studied how to draw them. Remember, graphs and flowcharts are very important tools in management. A flowchart is must before starting any practical in our course.

12.7 TERMINAL QUESTIONS

1. Draw a Straight Line Diagram (SLD) for the procedure of welding two MS circular rods of 20 mm diameter at right angles to each other.
2. Draw a Basic Flow Chart to express the procedure of making Tomato Sauce.
3. Prepare an SLD for packing a birthday gift.
4. Prepare an SLD for the steps to make 400 gm Guava Jelly from 2 Kg of Guava.
5. Plot a column graph of following information:

Students	Anuja	Rahul	Meghana	Hari
Marks	31	90	78	57

6. Plot a line graph of a 20-20 cricket match performance, given as follows -

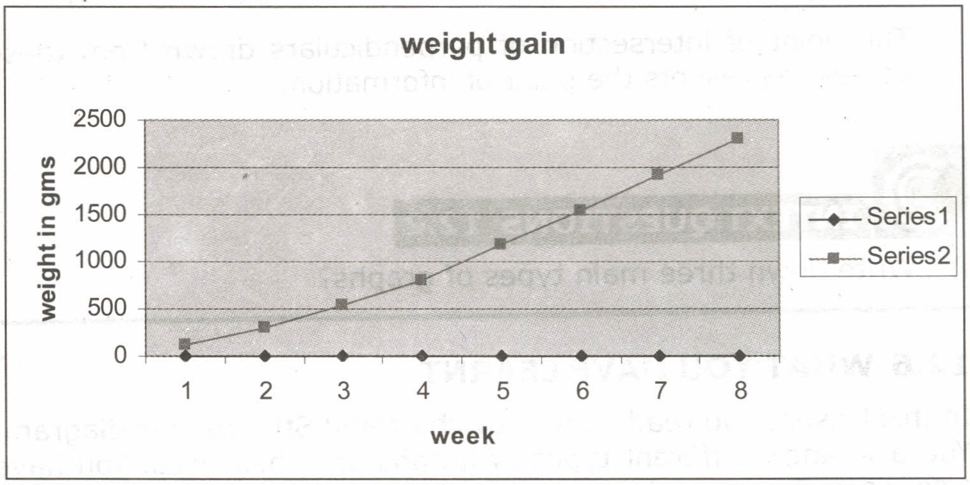
Over	First	Fifth	Tenth	Fifteenth	Twentieth
Runs by Team A	12	34	120	190	230
Runs by Team B	3	60	85	100	236

7. Read the following graph and answer the questions:

1) What is the weight of chicks after 6 weeks ?

2) What is the weight of chick after 3 weeks ?

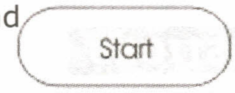
3) What conclusion you can draw from the graph ?



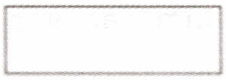
12.8 ANSWER TO INTEXT QUESTIONS

12.1

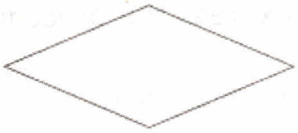
i) Start and End



ii) Process



iii) Decision



12.2

Bar chart, line chart, pie chart

SUGGESTED ACTIVITIES

1) Graphs of varied data viz. mark lists, contour readings, temperatures etc. are to be drawn, preferably using computer. Explore the Chart (means Graph) facility of computerized data sheets (e.g. Microsoft Excel), observe how the same information can be represented in different chart types.

2) Draw flow chart showing development of a broiler chicken from its first day to 8 weeks age.