INTRODUCTION OF ENGINEERING DRAWING

DRAWING

- The art of representation of an object by systematic lines on a paper is called drawing.

Classification of Drawing :- The drawing can be classified in to two groups :-

1. Artistic Drawing (Free Hand Drawing or Sketching)
2. Engineering Drawing (Instrument Drawing).

Drawings
(Some Types)

Nature Drawings
(landscape, scenery etc.)

Geographical Drawings
(maps etc.)

Botanical Drawings
(plants, flowers etc.)

Zoological Drawings
(creatures, animals etc.)

Portraits
(human faces, expressions etc.)

Engineering Drawings, ***(projections.)***

Building Related Drawings.

Machine component Drawings

Orthographic Projections
(Fv,Tv & Sv.-Mech.Engg terms)
(Plan, Elevation- Civil Engg.terms)
(Working Drawings 2-D type)

Isometric (Mech.Engg.Term.)
or Perspective(Civil Engg.Term)
(Actual Object Drawing 3-D)

ARTISTIC DRAWING

Artistic Drawing :- The art of representation of an object on a paper by the artist by his imagination or by keeping the object before him is called artistic drawing.

NO DIMENSIONS ARE GIVEN IN THE ARTISTIC DRAWING.

It is commonly used by the artists.

For e.g.:- Portrait of any person, painting, advertisements boards etc.

Artistic Drawing (Sketch of an old man)

ENGINEERING DRAWING

- The art of representation of any engineering object on a piece of paper is called Engineering drawing.

It is meant for communicating his ideas, thoughts and designs to others.

Types of Engineering Drawing

- Mechanical Engineering Drawing (machines , machine parts etc)
- Civil Engineering Drawing (roads, buildings, bridges, dams etc)
- Electrical Engineering Drawing (motors, generators, poles , towers etc)
- Computer Engineering Drawing
- Architectural Engineering Drawing
- Production Engineering Drawing
- Electronics Engineering Drawing

DRAWING INSTRUMENTS

- Drawing board
- Drawing sheet
- T-square,
- Set Square,
- Scales,
- Pencil
- Sand paper block,
- Drawing pins or cello-tape,
- Duster or handkerchief,
- Eraser etc.

Drawing Board

Drawing board

- Drawing board is made of soft wooden platens. Almost perfect planning of the working surface of the drawing board is to be ensured. A strip of hard ebony edge is fitted up in a groove on the shorter edge of the board and perfectly lined to provide the guide for the T-square. The standard sizes of the drawing board is shown in Table 1.1 below. D2 size of drawing board is normally recommended for the First year Engineering students.

Drawing Sheet

- Drawing sheet is the medium on which drawings are prepared by means of pencils or pen. Drawing sheets are available in standard sizes as shown in Table 1.2. A standard A0 size sheet is the one with an area of 1 m-2 and having dimensions of 1189 x 841. Each higher number sheet (A1, A2, A3, etc. in order) is half the size of the immediately lower numbered sheet. For drawing practice for first year engineering students A2 size is the preferred drawing sheet. The recommended sizes obtained for various drawing sheets are shown in figure:

Drawing Sheets

Table 1.2 Standard Sizes of Drawing sheets as per BIS

Designation	Size (mm)
A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297

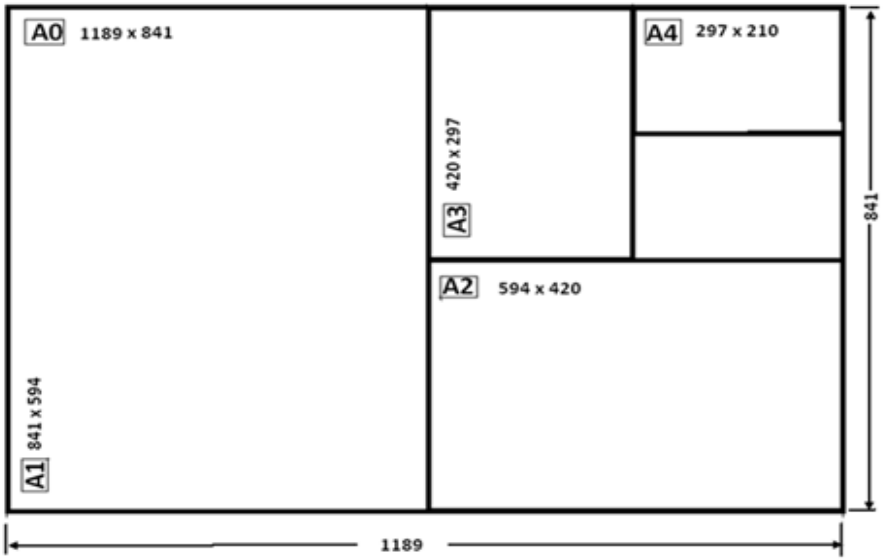


Figure 1. recommended sizes obtained for various drawing sheets

Dimensions of Drawing boards

Table 1.1. Standard dimension of Engineer's Drawing Board

Designation	Length x Width (mm)	Recommended for use with sheet sizes
D0	1500 x 1000	A0
D1	1000 x 700	A1
D2	700 x 500	A2
D3	500 x 500	A3

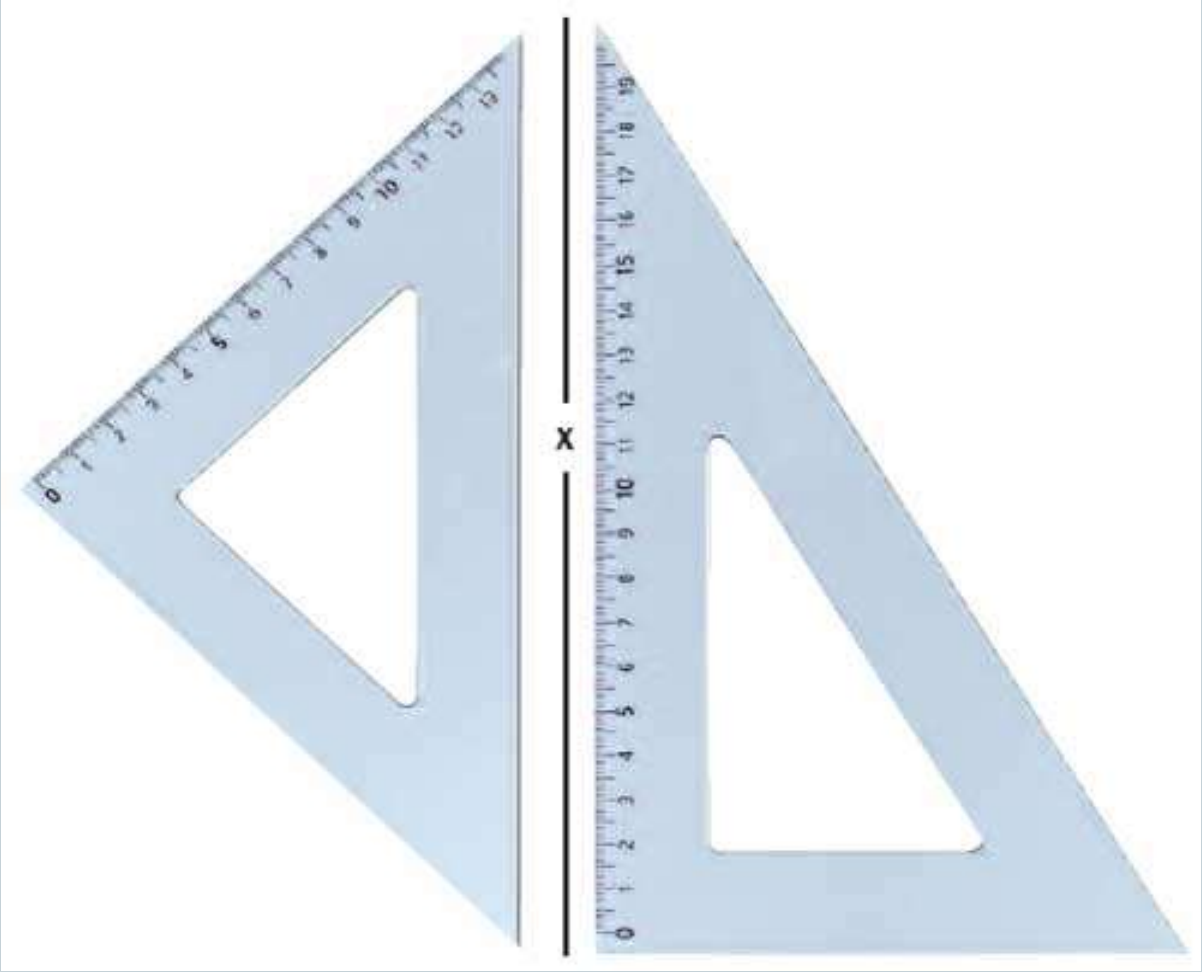
D0 and D1 for drawing offices, for students use – D2

Mini drafter

Mini drafter

- **Mini drafter** is an instrument which can be used for multiple functions in drawing. ... **Mini drafter** is used for drawing horizontal lines, vertical lines, inclined lines, angles, parallel lines, perpendicular lines etc.
- https://www.youtube.com/watch?v=nZvp6Jgw87I

Set-squares (45° – 45° & 60° – 90°)



Set Square

- A **set square** or triangle (American English) is an object used in engineering and technical drawing, with the aim of providing a straightedge at a right angle or other particular planar angle to a baseline.
- A right-angled triangular plate for drawing lines, especially at 90°, 45°, 60°, or 30°.her particular planar angle to a baseline.

T-square

T-Square

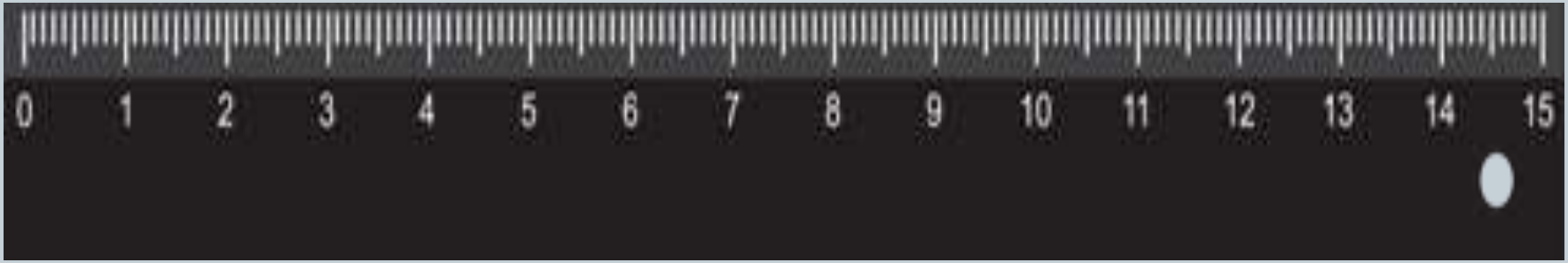
- A **T-square** is a technical drawing instrument used by draftsmen primarily as a guide for drawing horizontal lines on a drafting table. It may also guide a set square to draw vertical or diagonal lines. Its name comes from its resemblance to the letter T. T-squares come in varying sizes, common lengths being 18 inches (460 mm), 24 inches (610 mm), 30 inches (760 mm), 36 inches (910 mm) and 42 inches (1,100 mm).

Protractor (180°, 360°)

Protractor

- Protractor helps you measure angles in degrees.
- Protractors usually have two sets of numbers going in opposite directions.
- Be careful which one you use!
- When in doubt think *"should this angle be bigger or smaller than 90° ?"*

Scale Ruler



Scale Ruler

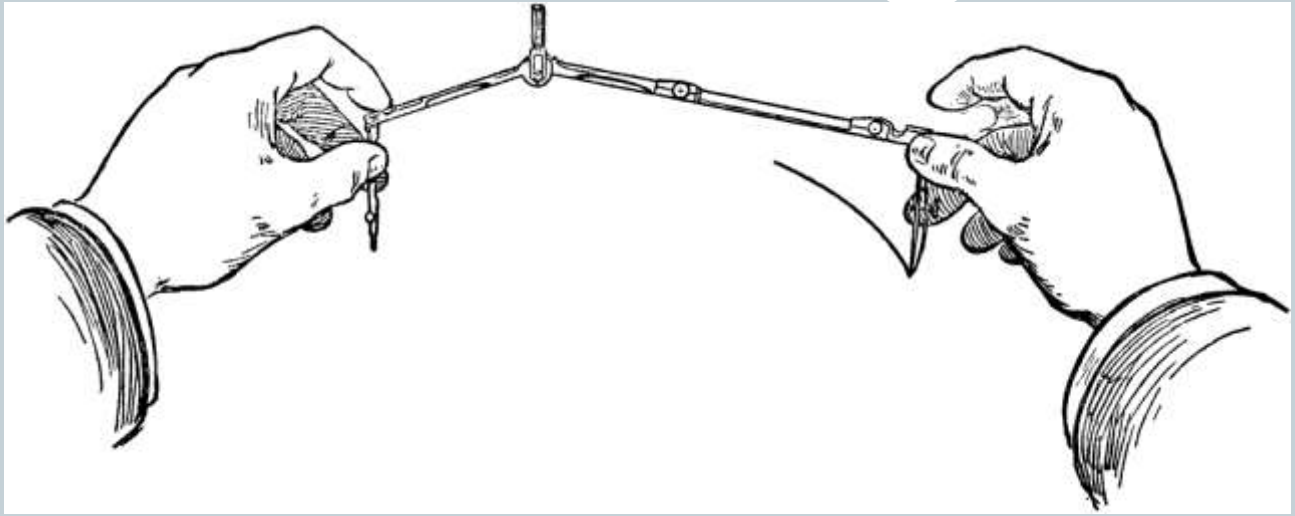
- A **scale ruler** is a tool for **measuring** lengths and transferring **measurements** at a fixed ratio of length; two common examples are an architect's **scale** and engineer's **scale**. ... A device for drawing straight lines is a straight edge or **ruler**. In common usage both are referred to as a **ruler**.

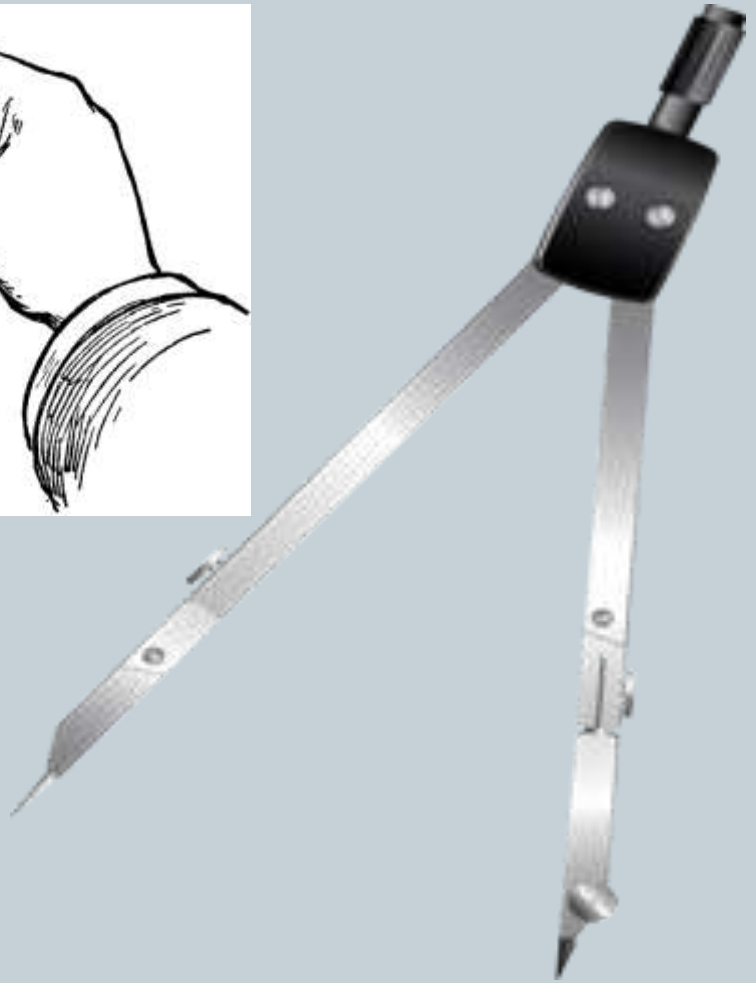
Roll & Draw

Drawing Instruments Box

- Small bow compass.
- Small bow divider
- Lengthening bars.
- Large Size Divider.
- Large size compass with interchangeable legs.

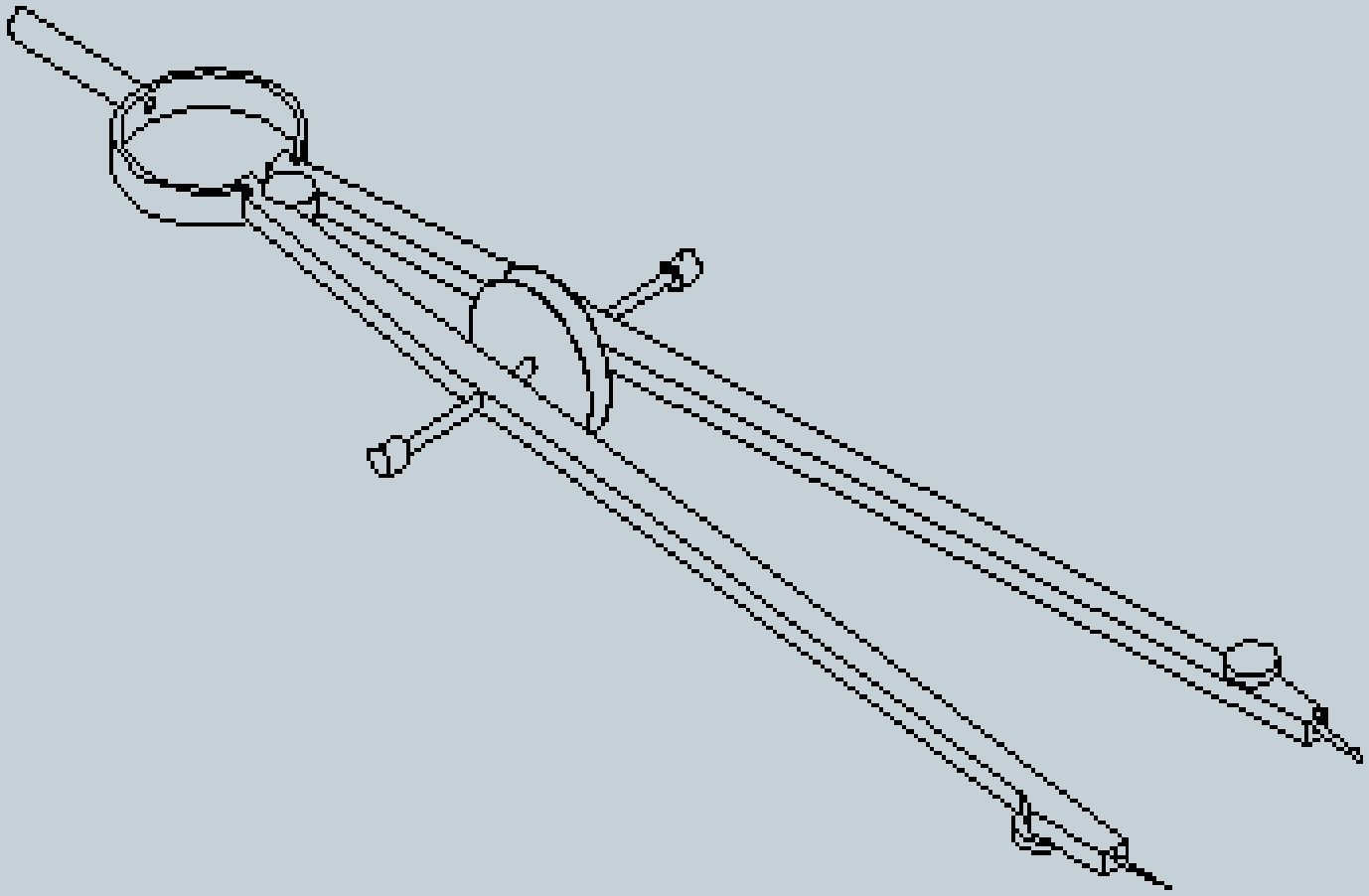
Lengthening bars.





Lengthening bar is used to draw circles bigger than 10 inches.

Small Bow Compass.



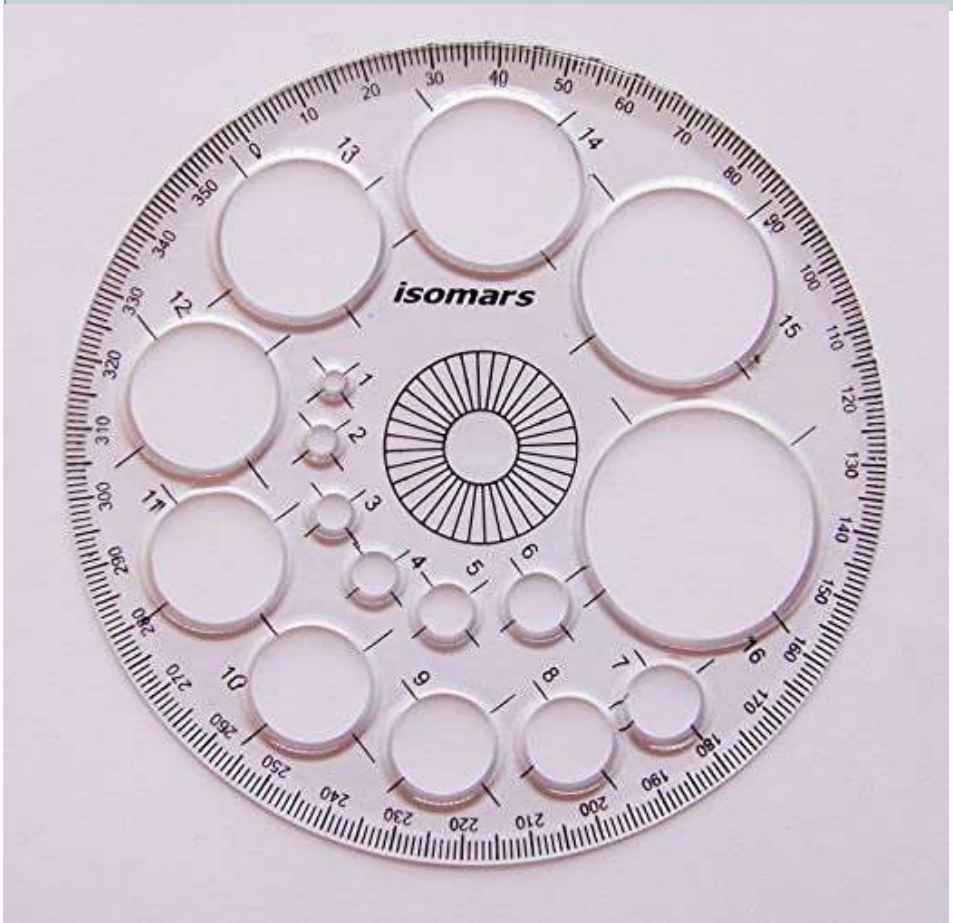
Small Bow Compass.

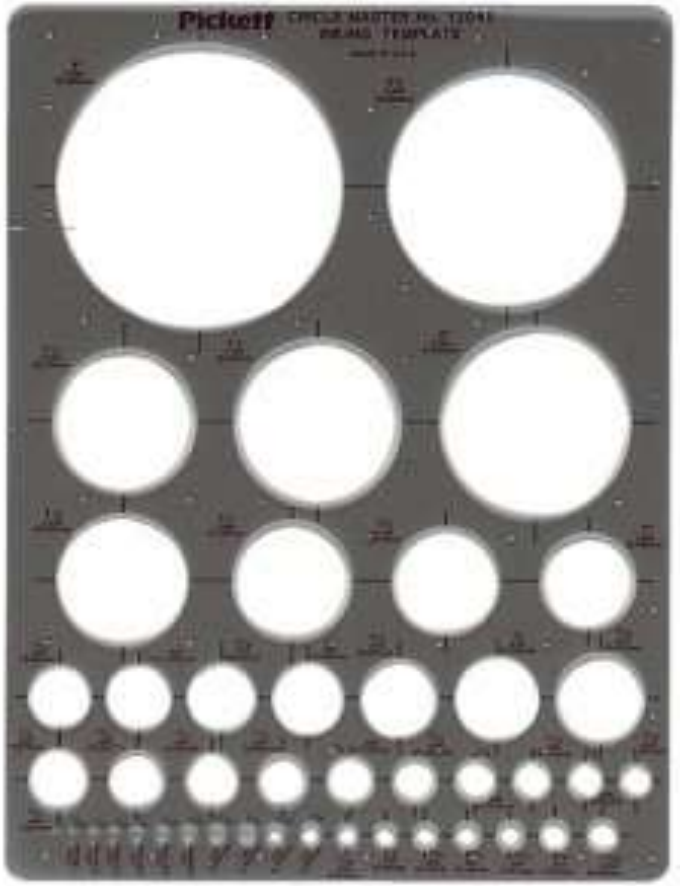
A compass, is a technical drawing instrument that can be used for inscribing circles or arcs. A bow compass capable of drawing the smallest possible circles.

Small Bow Divider

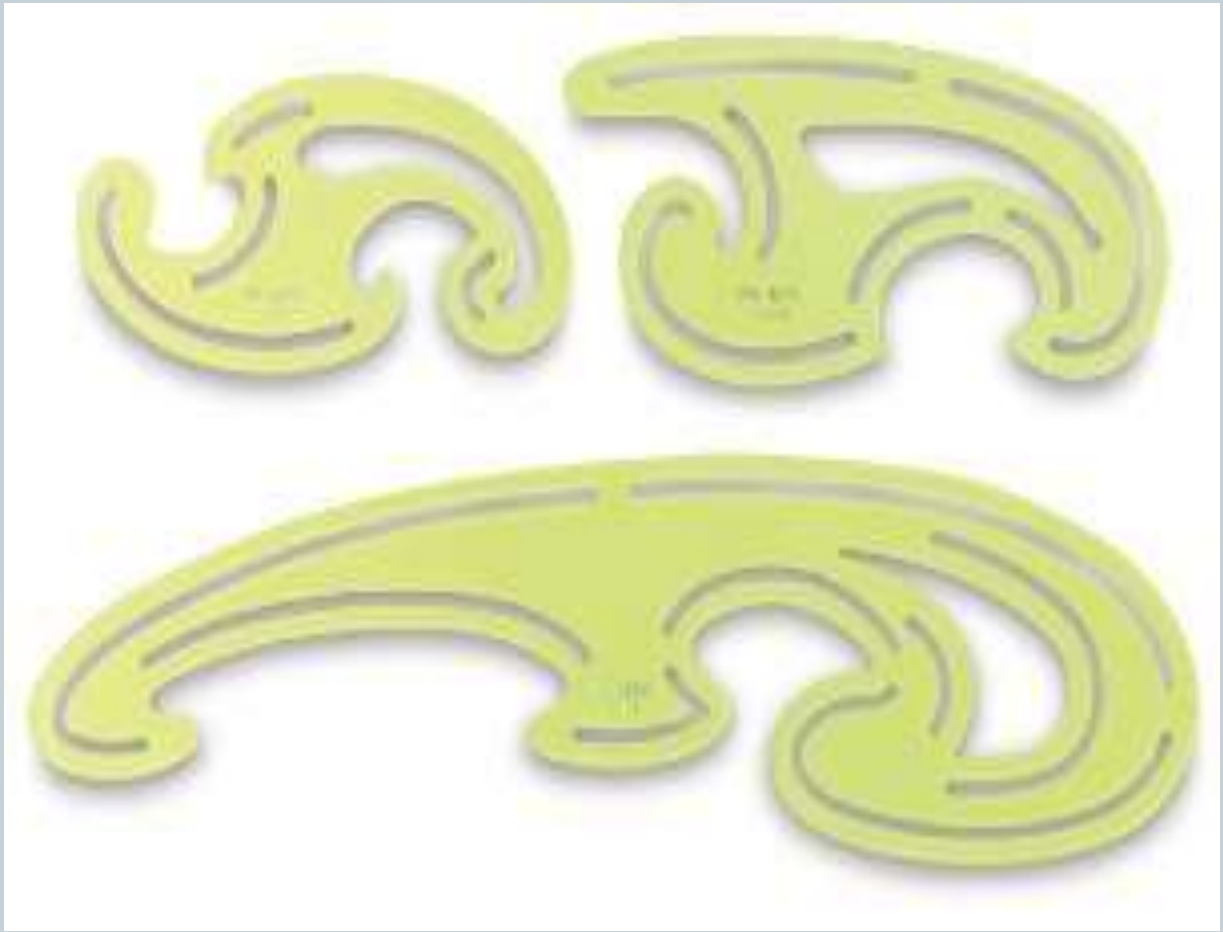
A small divider whose legs ar e connected by a bow-shaped spring, rather than by a joint. A bow divider is used to transfer measurements from one part of a drawing to another.

Circle Master



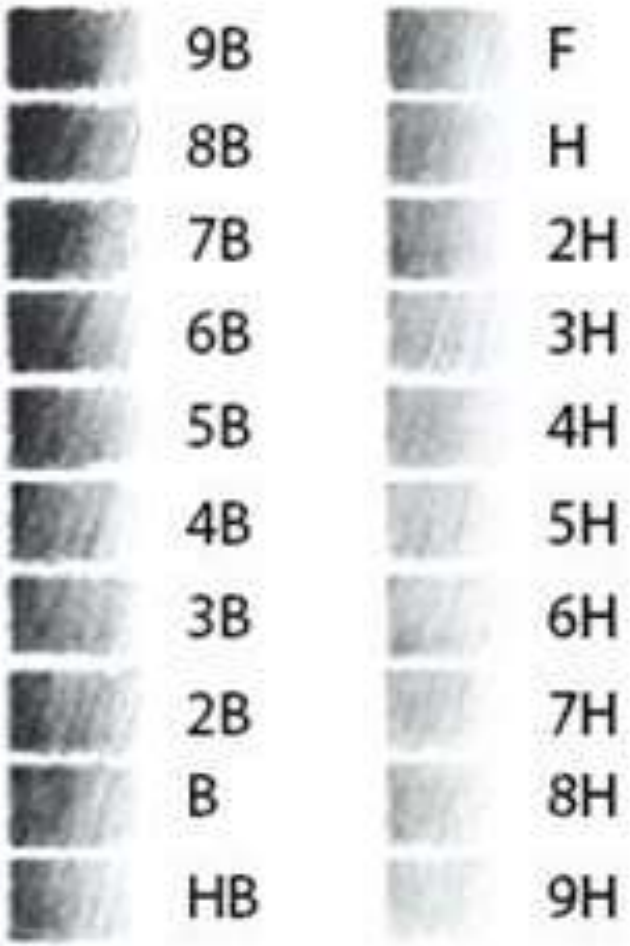


French Curves



Drawing pencil (Lead pencil [Mechanical Pencil], Wooden pencil)

"H" and "B" to note how hard or soft a **pencil** is. Most pencil manufacturers utilize the **HB** grading system. The letter "**H**" is used to indicate the hardness of a pencil's mark. The letter "B" is used to indicate the blackness of a pencil's mark. (a **darker** mark means a softer lead).



Sharpener

Eraser

Drawing pins, clips & cello tape

Drawing pins

Drawing clips

Tape

Duster or handkerchief

Types of Lines

TYPE	ILLUSTRATION	APPLICATION
A – CONTINUOUS THICK		VISIBLE OUTLINES.
B – CONTINUOUS THIN		DIMENSION LINES, LEADER LINES, EXTENSION LINES, CONSTRUCTION LINES OF ADJACENT PARTS, HATCHING AND REVOLVED SECTION.
C – CONTINUOUS THIN-WAVY		IRREGULAR BOUNDARY LINES, SHORT BREAK LINES.
D – SHORT DASHES MEDIUM		HIDDEN OUTLINES & EDGES.

Types of Lines

E – LONG CHAIN THIN		CENTRE LINES, LOCUS LINES, EXTREME POSITIONS OF THE MOVABLE PARTS SITUATED IN FRONT OF THE CUTTING PLANTS AND PITCH CIRCLES.
F – LONG CHAI N LINE THICH AT ENDS AND THIN ELSEWHERE		CUTTING PLANE LINES.
G – LONG CHAIN THICK		TO INDICATE SURFACES WHICH ARE TO RECEIVE ADDITIONAL TREATMENT.
H – RULED LINE & SHORT ZIGZAG THIN.		LONG BREAK LINES.

LINES, LETTERS & DIMENSIONING

Engineering Graphics and Design (BTME-101-21)

Course for Unit-I

Drawing Techniques: Various types of lines, principles of dimensioning, size and location of dimensions, symbols, conventions scales (plane and diagonal) and lettering as per IS Code SP–46 of practice for general engineering drawings. Practice of drawing various types of lines and dimensioning exercises. rawing exercises pertaining to symbols, conventions. Exercise on lettering techniques: Free hand printing and numerals in 3, 5, 8 and 12 mm sizes vertical and inclined at 75 ; instrumental lettering in single stroke.

Projection of Points, Lines and Planes: First angle and third angle projections, concept of horizontal and vertical planes, Projection of points and lines, True length, Horizontal and vertical traces, Projection of Planes, Traces of Planes, Auxiliary planes. Practice exercises on projection of points, lines and planes.

Projection and Selection of Solids: Projection of solids such as Prisms, Pyramids, Cylinders, Cones, Spheres, Auxiliary View. Principles of sectioning, types of sectioning, section lines, cutting plane lines. Practice on projection of solids.

Basic Line Types

Types of Lines	Appearance	Name according to application
Continuous thick line		Visible line
Continuous thin line		Dimension line Extension line Leader line
Dash thick line		Hidden line
Chain thin line		Center line

Meaning of Lines

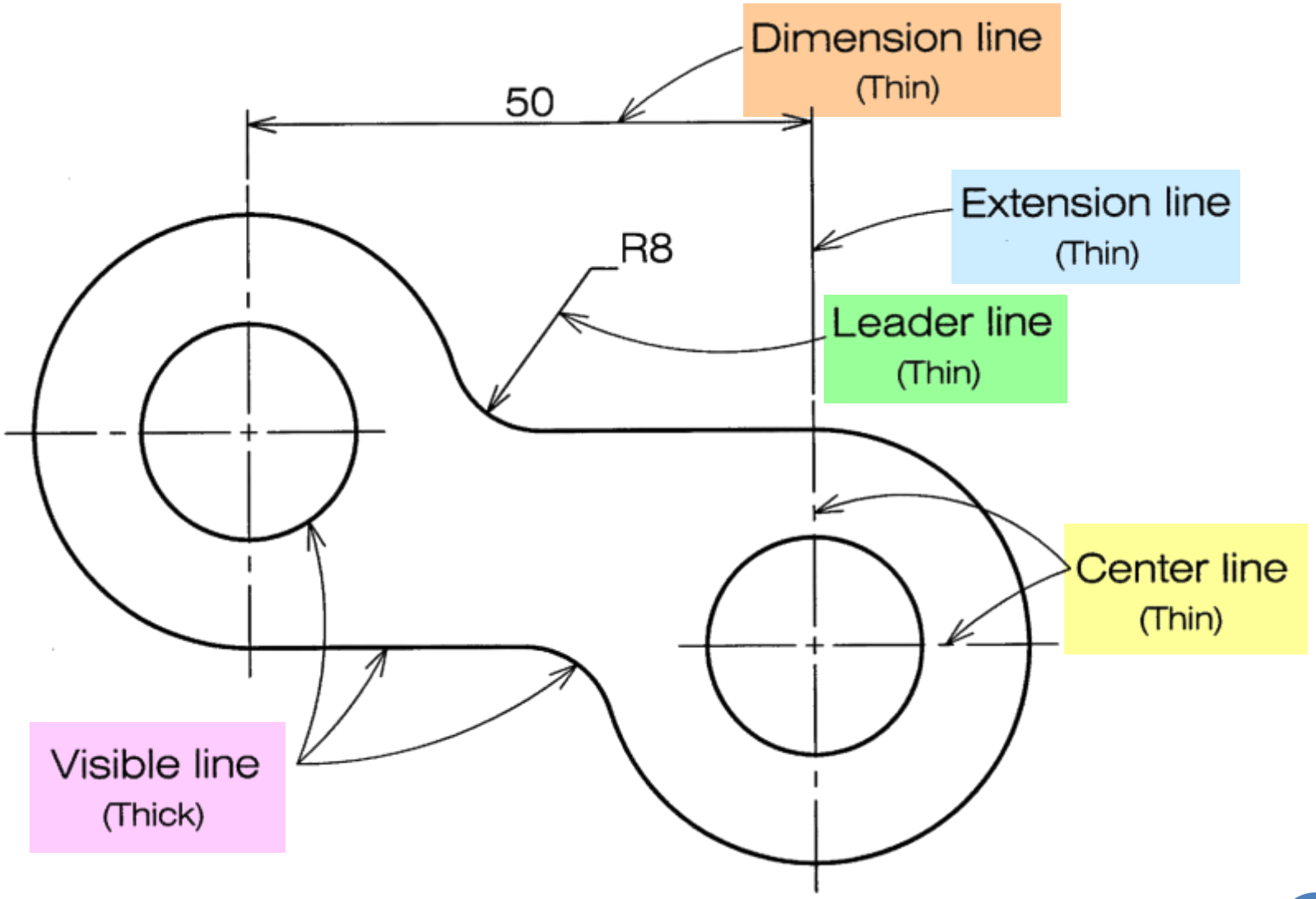
Visible lines represent features that can be seen in the current view

Hidden lines represent features that can not be seen in the current view

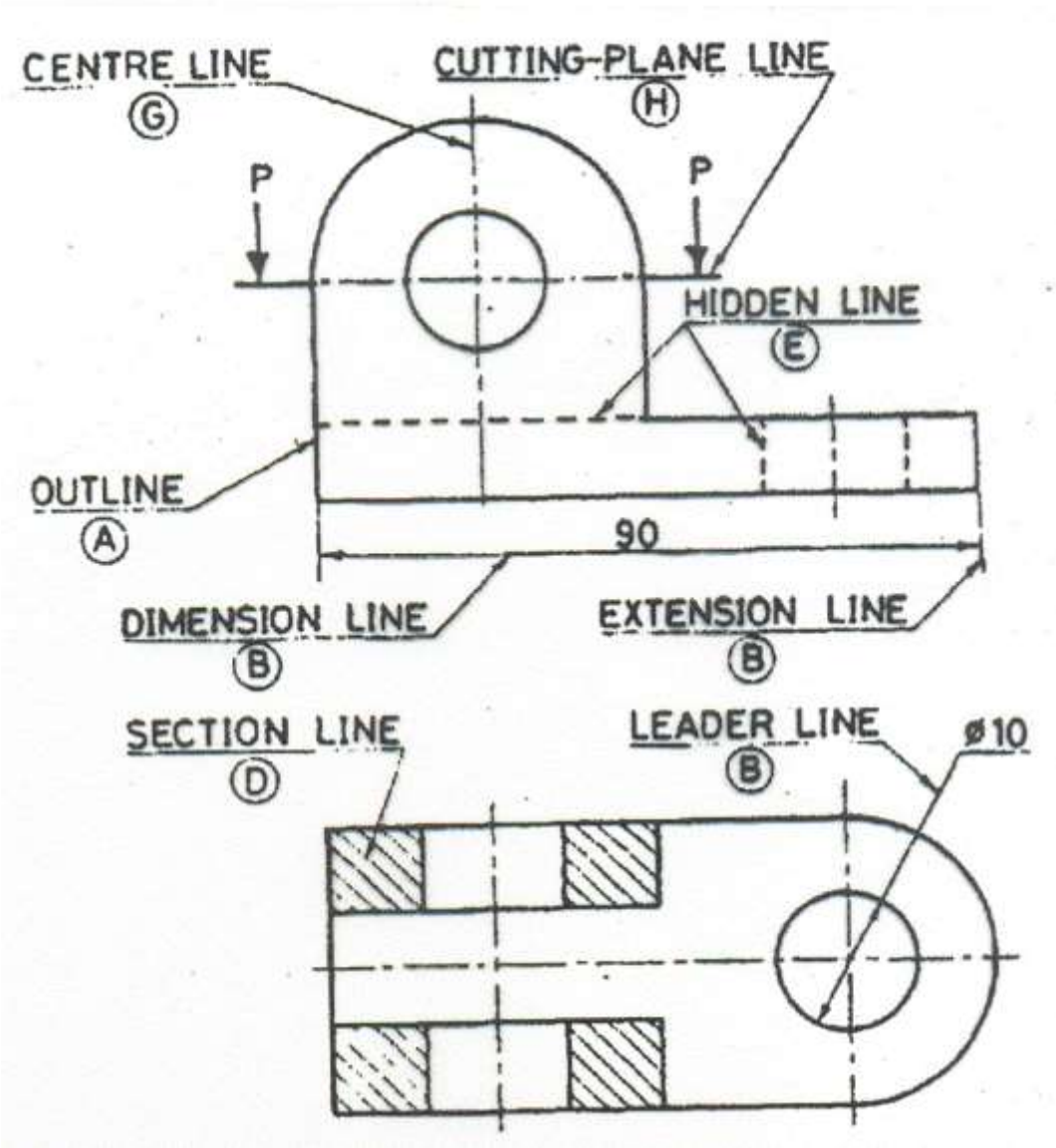
Center line represents symmetry, path of motion, centers of circles, axis of axisymmetrical parts

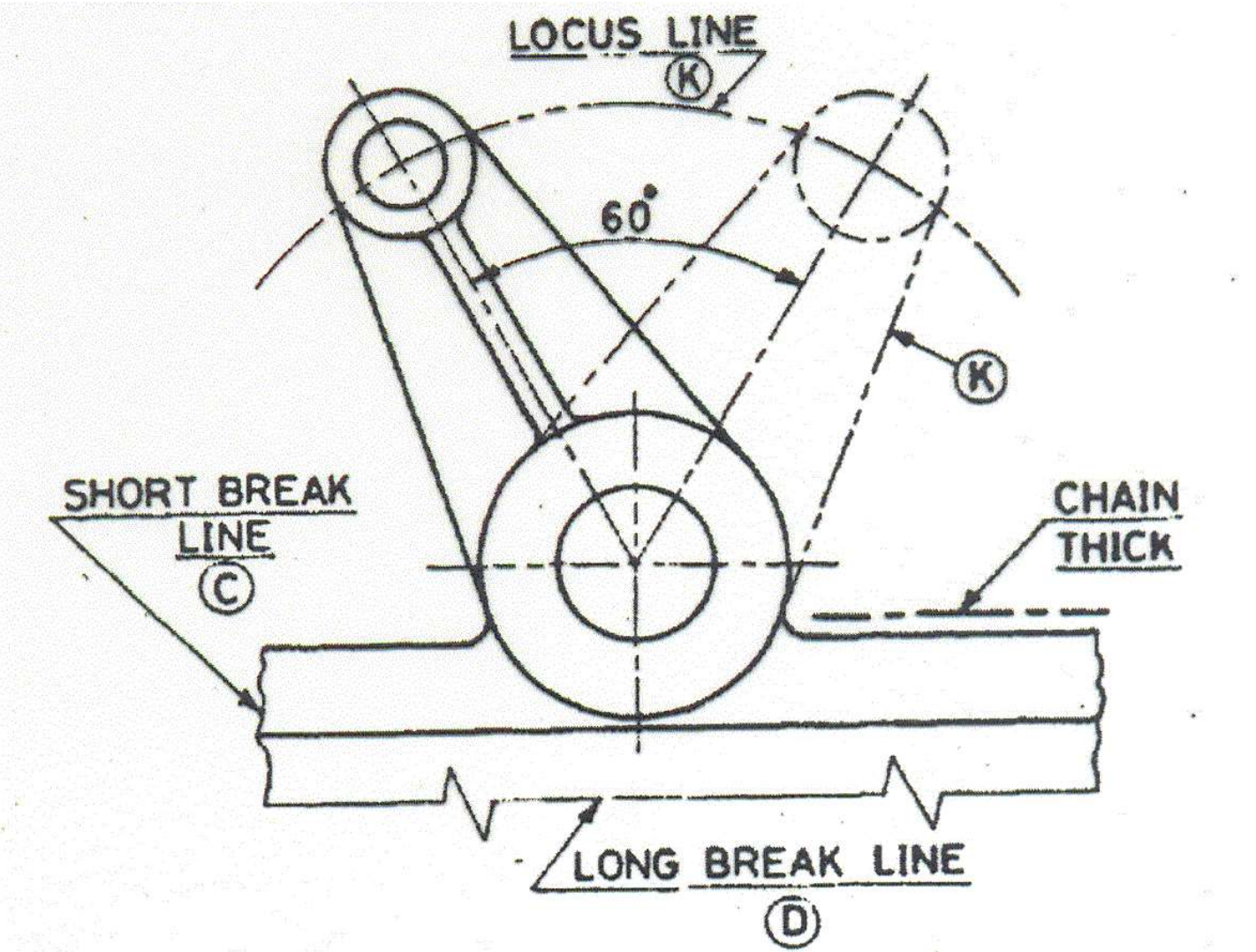
Dimension and Extension lines indicate the sizes and location of features on a drawing

Example : *Line conventions in engineering drawing*



TYPES OF LINES




LOCUS LINE
K
60°
K
SHORT BREAK
LINE
C
CHAIN
THICK
LONG BREAK LINE
D

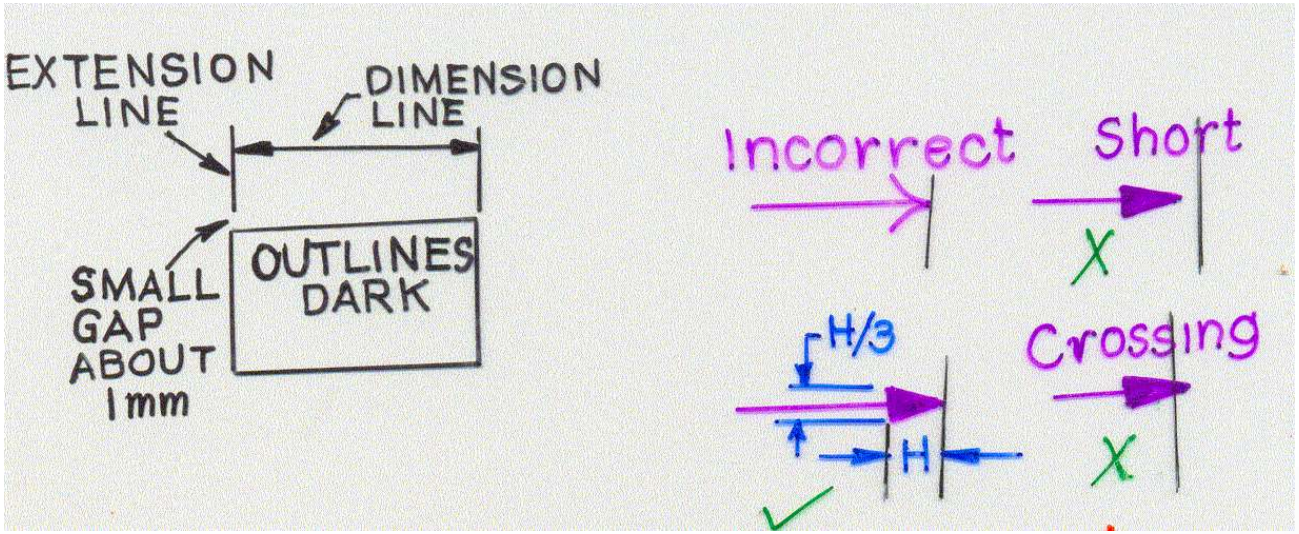
Lines	Pencil
Initial work and construction lines	H
Outlines, dotted lines, section-plane lines, dimension lines, arrowheads	2H
Centre lines, section lines	3H or 4H

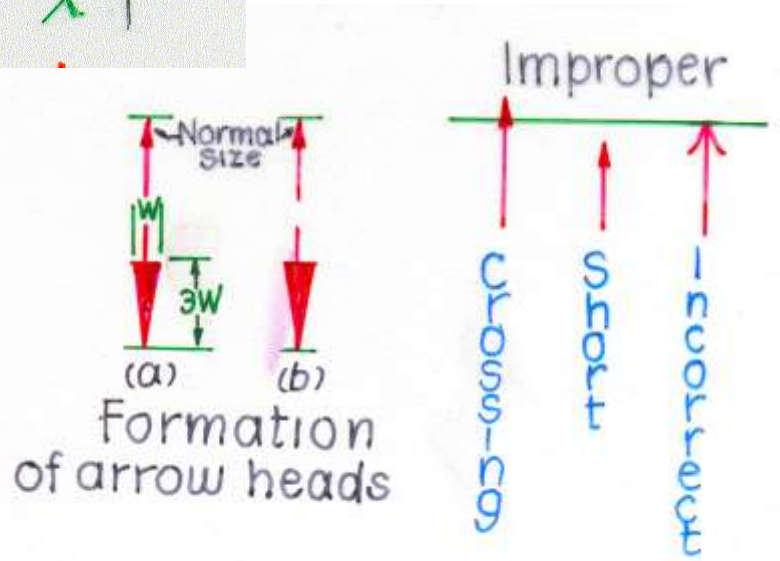
Line	Description	General applications
A 	Continuous thick	Visible outlines Visible outlines
B 	Continuous thin (straight or curved)	Imaginary lines of intersection Dimension lines Projection lines Leader lines Hatching Outlines of revolved sections in place Short centre lines
C 	Continuous thin freehand	Limits of partial or interrupted views and sections, if the limit is not a chain thin line
D 	Continuous thin (straight) with zigzags	Long-break line
E	Dashed thick	Hidden outlines Hidden edges
F 	Dashed thin	Hidden outlines Hidden edges
G 	Chain thin	Centre line Lines of symmetry Trajectories
H 	Chain thin, thick at ends and changes of direction	Cutting planes
J	Chain thick	Indication of lines or surfaces to which a special requirement applies
K 	Chain thin double-dashed	Outlines of adjacent parts Alternative and extreme positions of movable parts Centroidal lines Initial outlines prior to forming Parts situated in front of the cutting plane

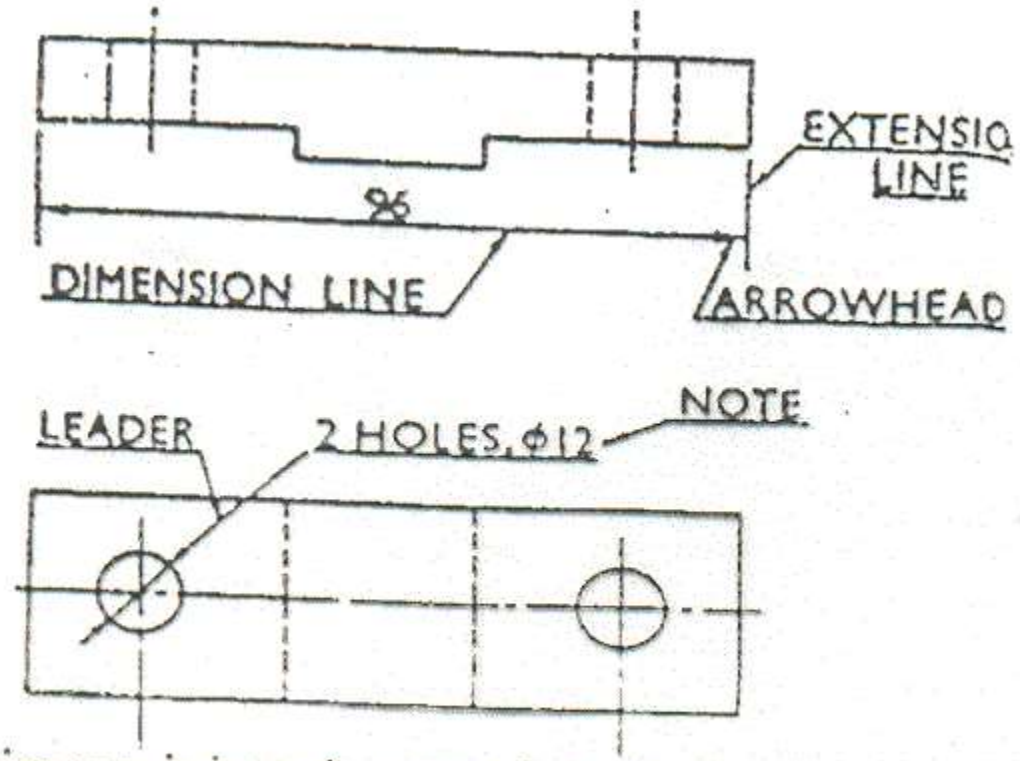
DIMENSIONING

Orthographic Views convey the *shape* information

Dimensioning is required to convey the exact *size* of the object

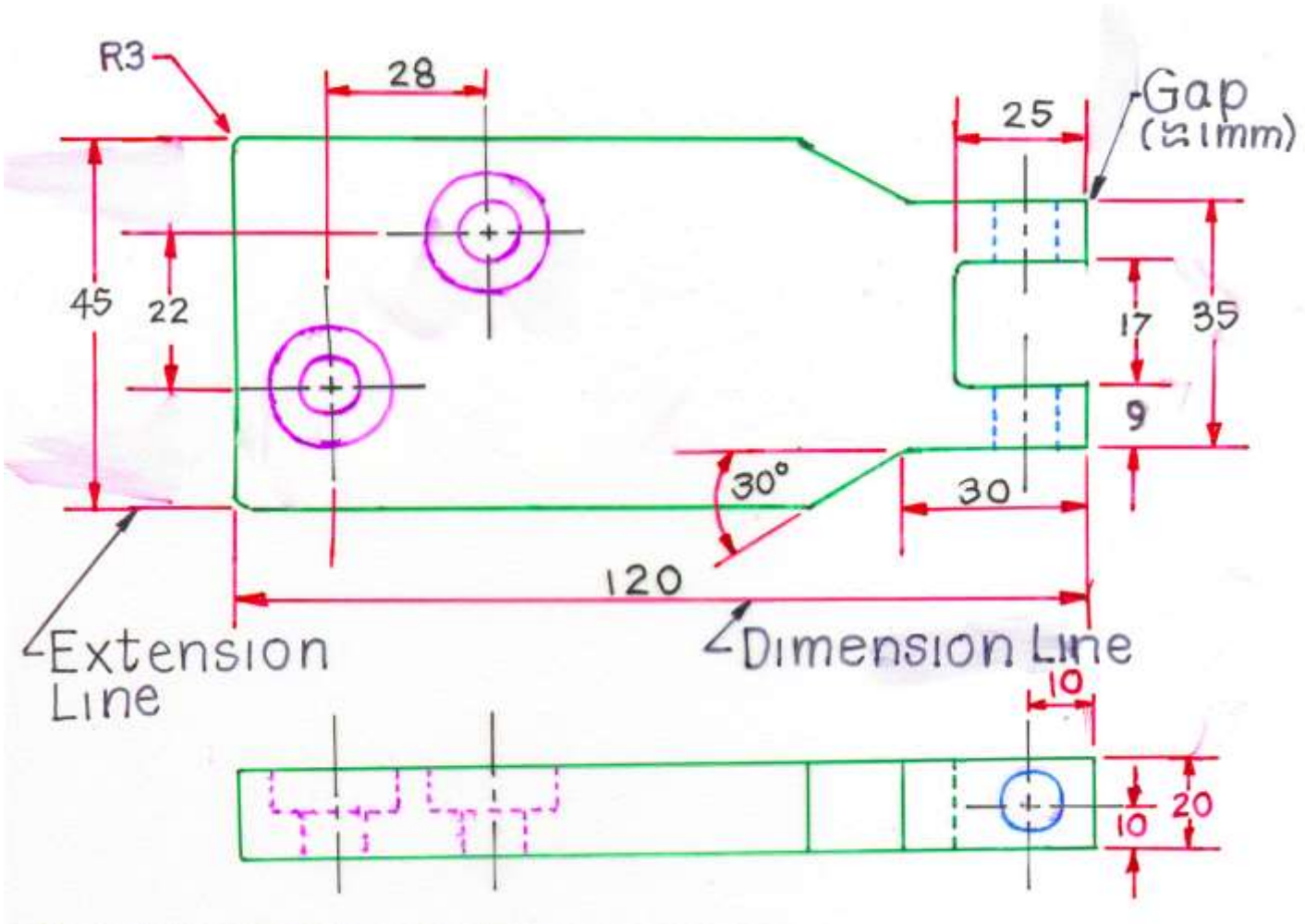






Dimensioing terms & notations

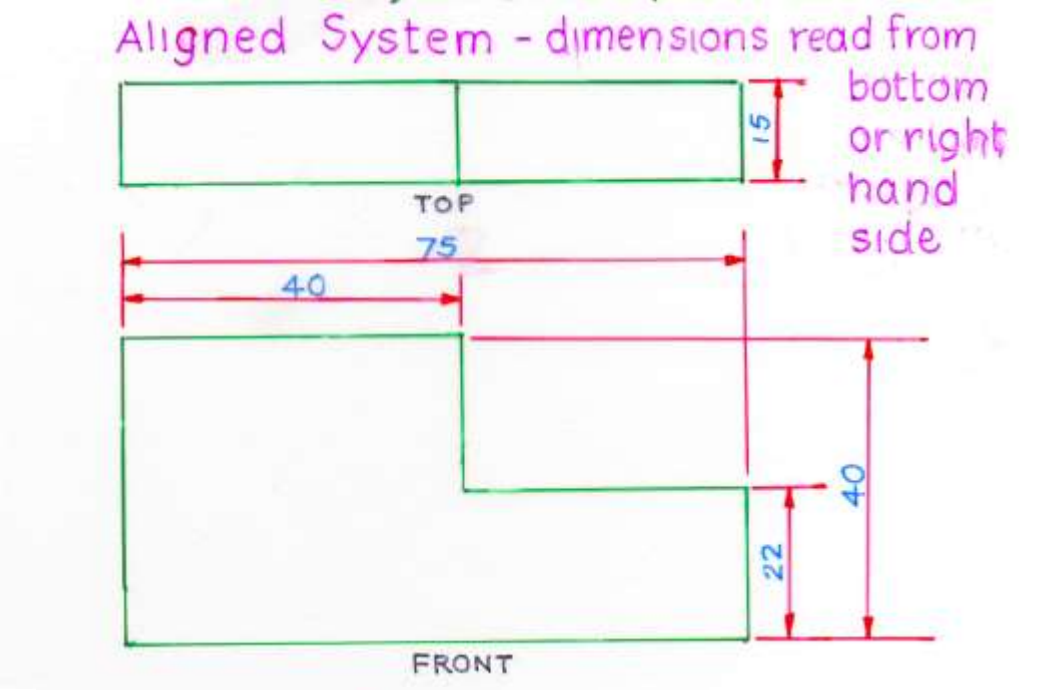
DIMENSIONING

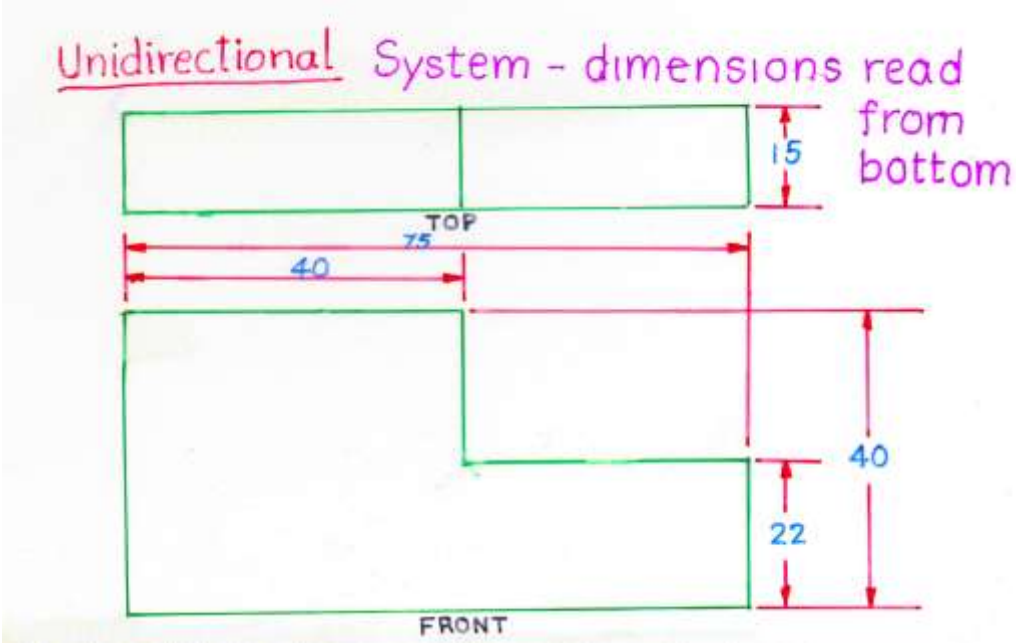


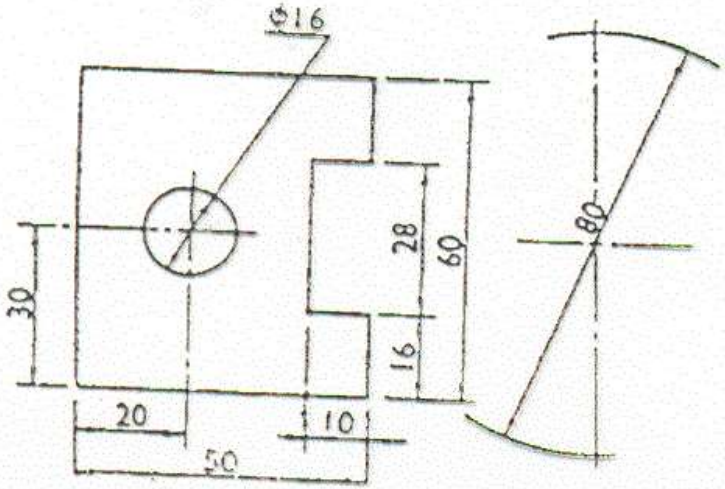
TWO MAJOR

METHODS OF

DIMENSIONING

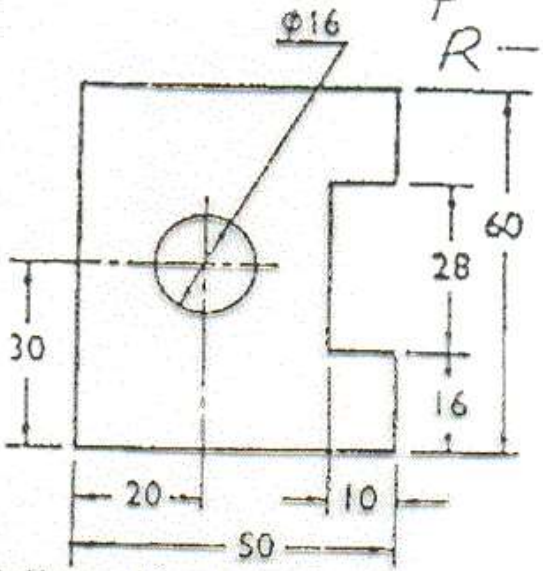






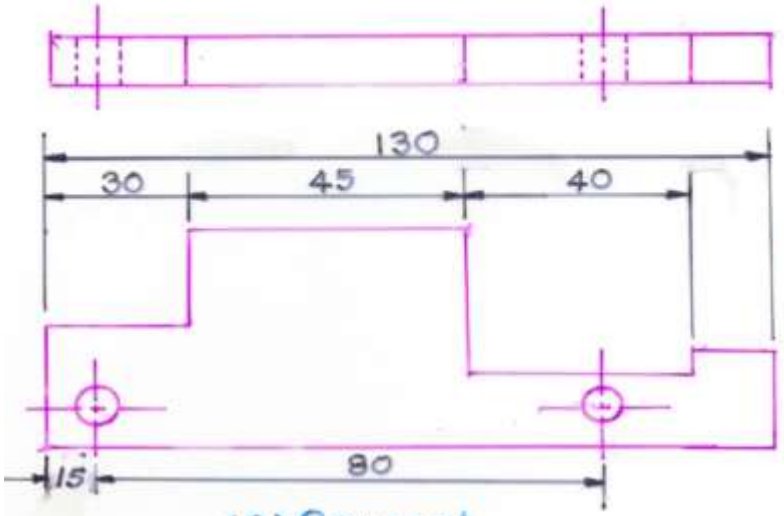
Aligned system of dimensioning

Φ - Diameter
R - Radius



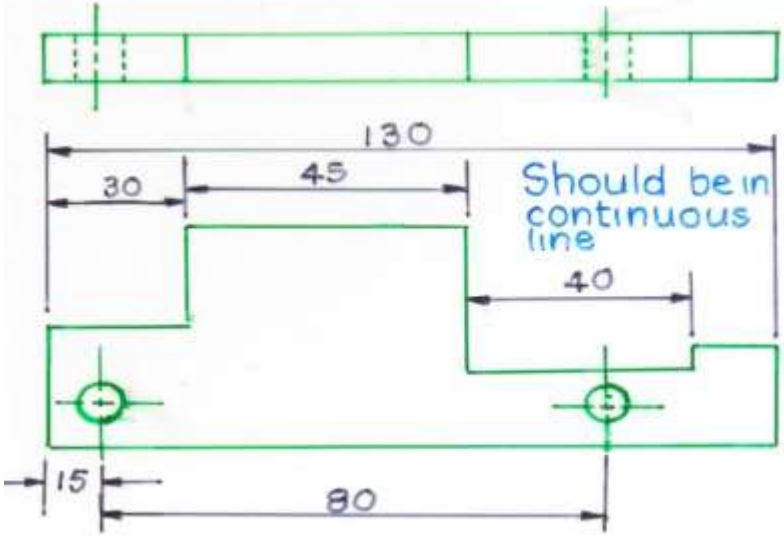
Unidirectional system of dim.

Consecutive Dimensions p. 335

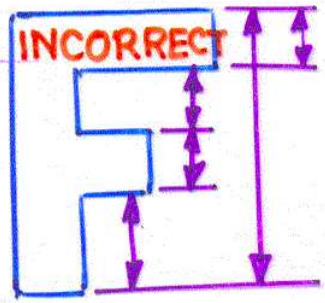


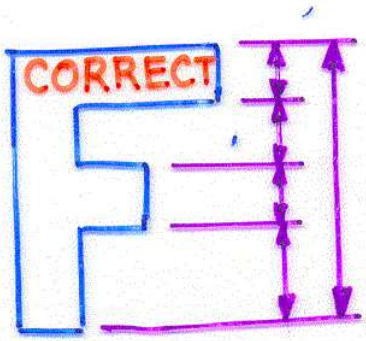
In line
Good
practic

(a) Correct

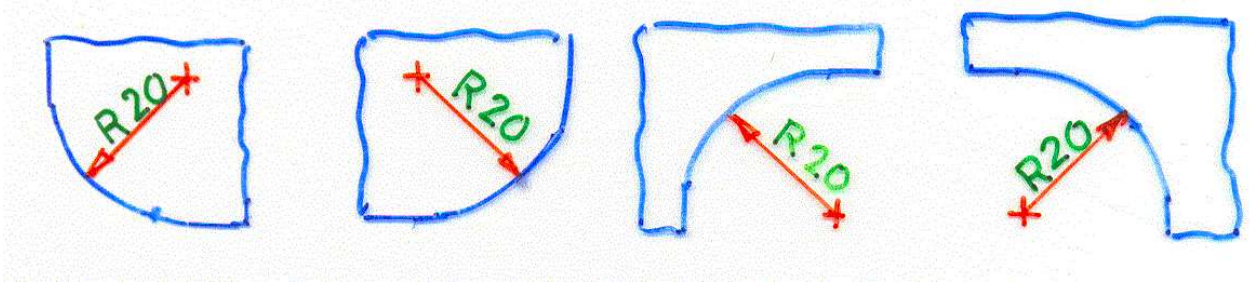


(b) Incorrect

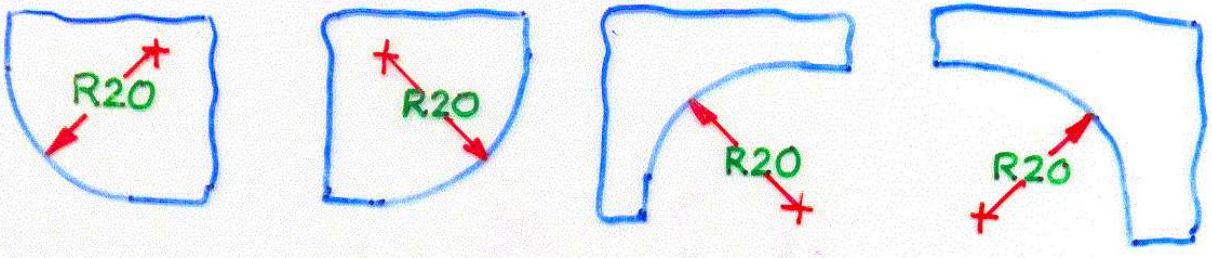


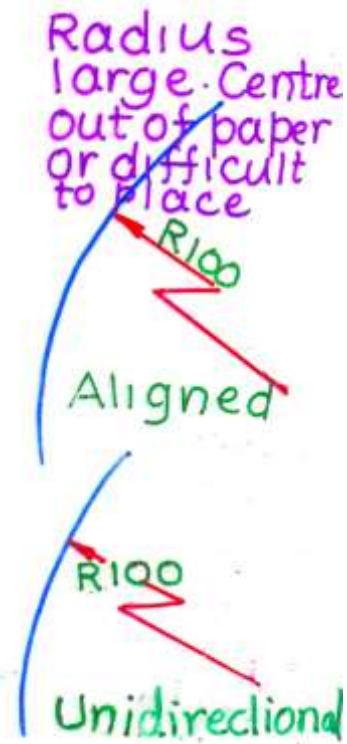


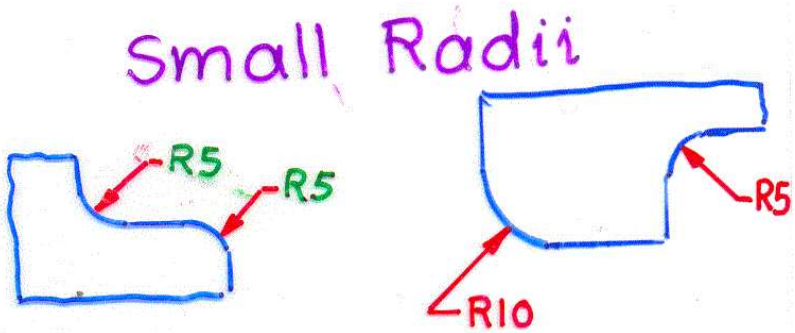
ALIGNED



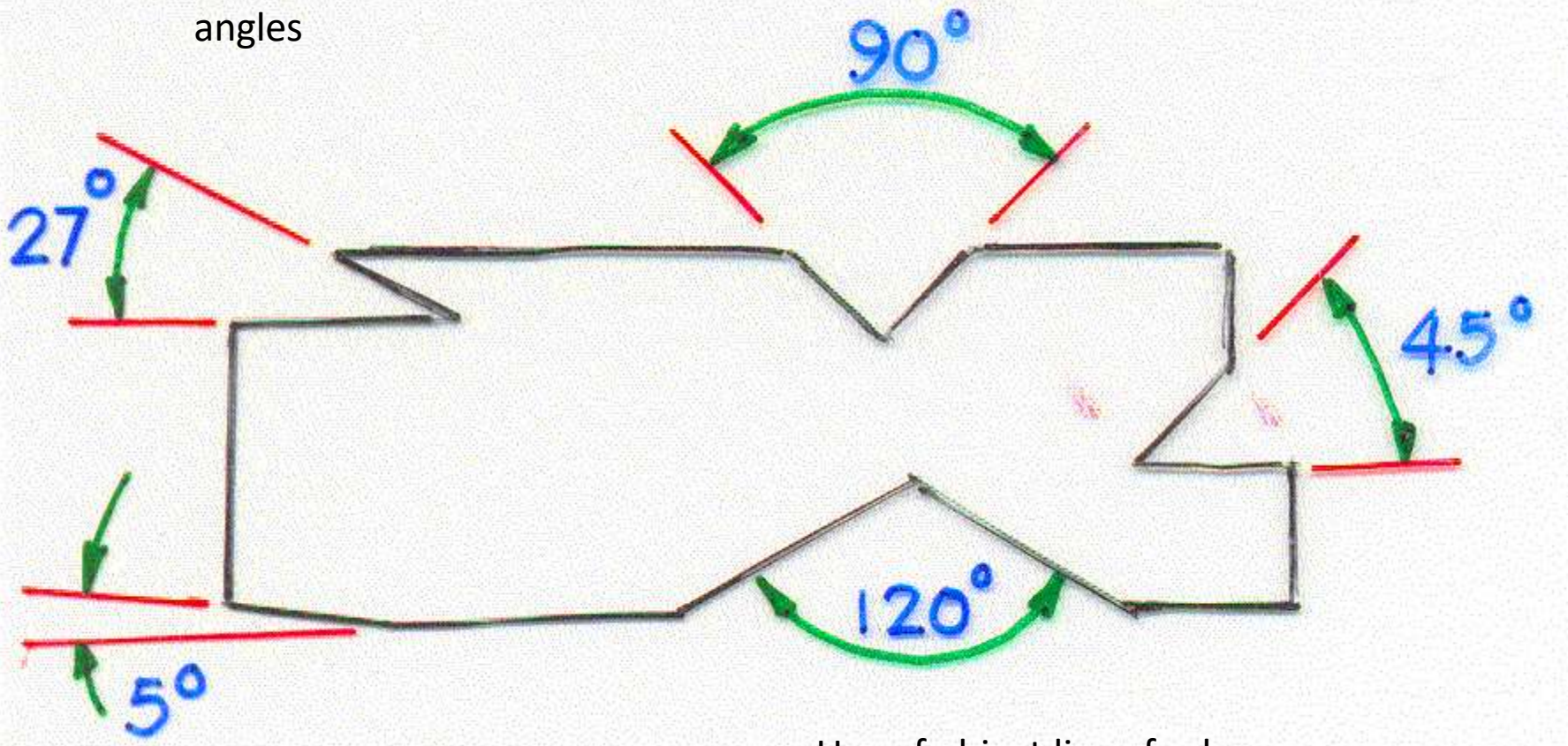
UNIDIRECTIONAL



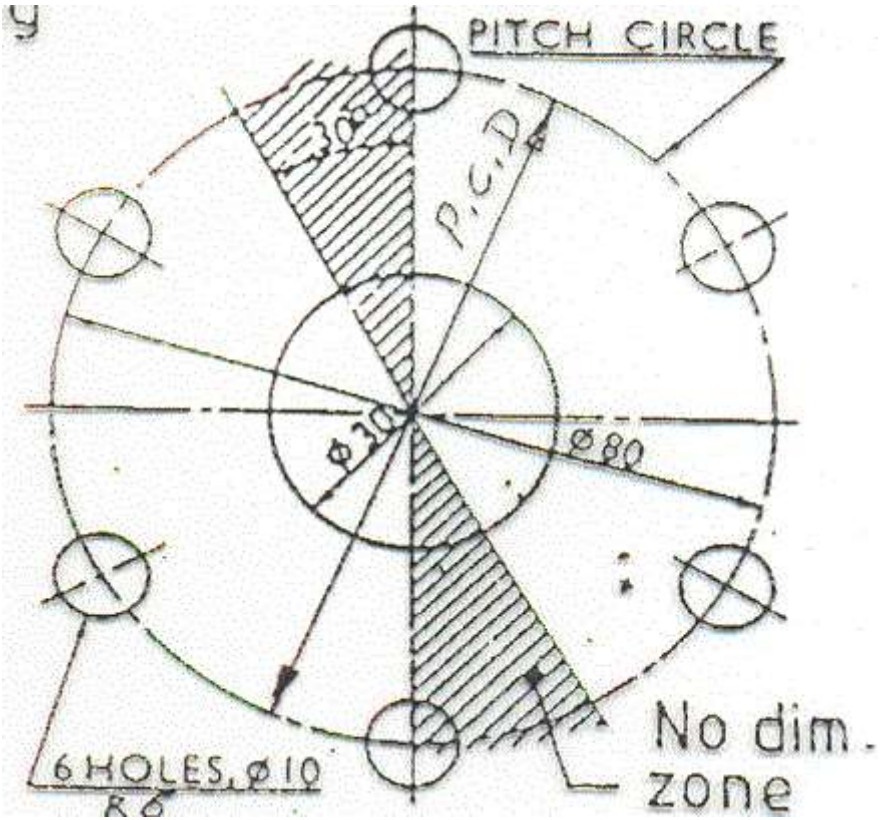


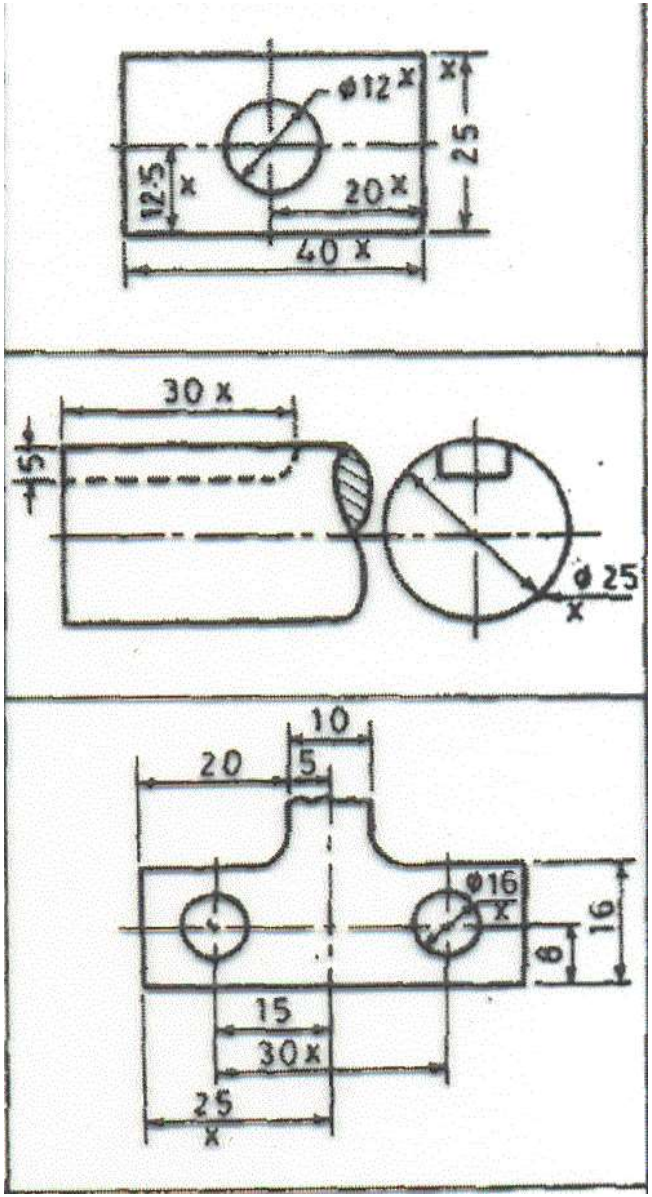


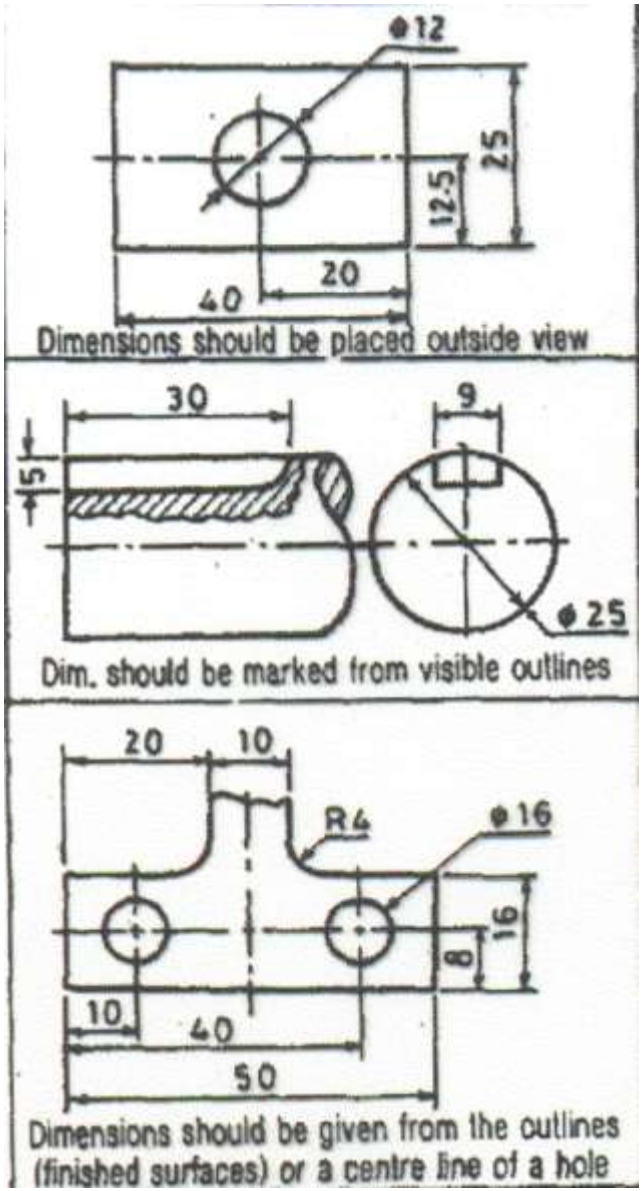
Use of leader lines for smaller angles

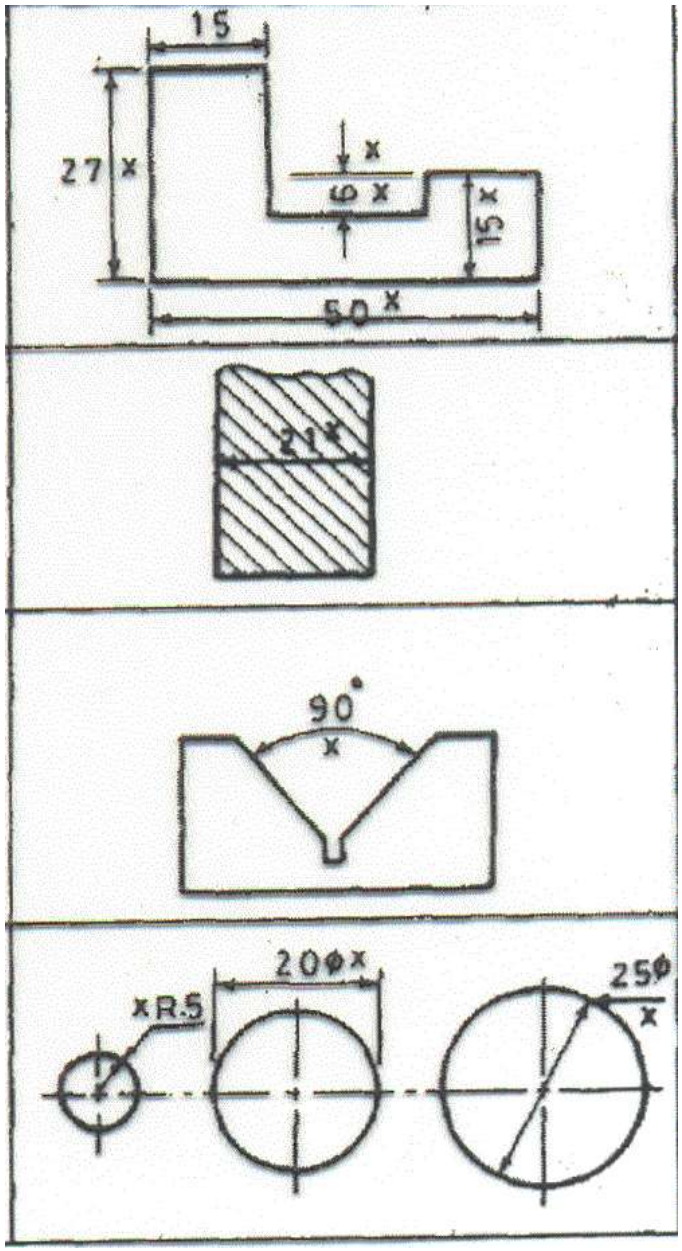


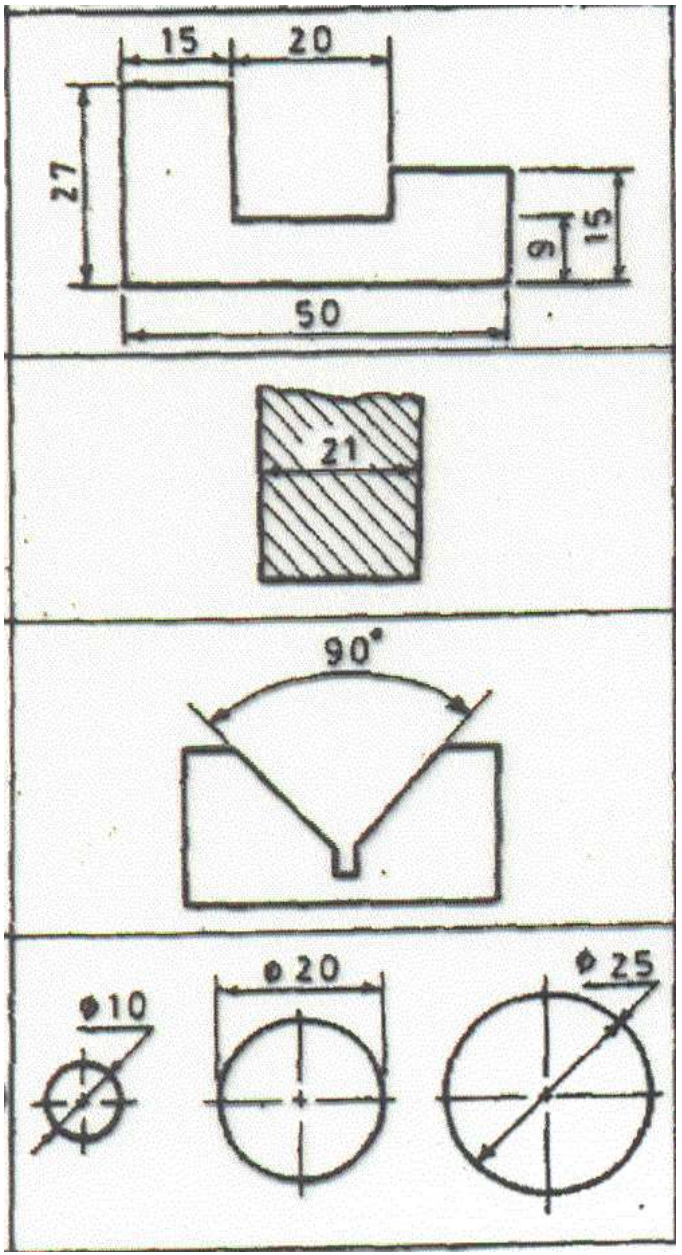
Use of object lines for large angles


PITCH CIRCLE
P.C.D
ø30
ø80
6 HOLES, ø10
No dim.
zone


ø12 x
x
25
12·5 x
20 x
40 x
30 x
5
ø25 x
10
20
5
ø16 x
16
6
15
30 x
25 x


ø12
25
12·5
20
40
Dimensions should be placed outside view
30
9
5
ø25
Dim. should be marked from visible outlines
20
10
R4
ø16
16
8
10
40
50
Dimensions should be given from the outlines
(finished surfaces) or a centre line of a hole


15
27 x
x
6 x
15 x
50 x
21 x
90°
x
20ϕx
xR.5
25ϕ
x


15
20
27
9
15
50
21
90°
ϕ10
ϕ 20
ϕ 25

CHANDIGARH
ENGINEERING COLLEGE
CGC LANDRAN
Building Careers. Transforming lives

Orthographic Projections and Projection of Points

What is Projections?

- When you through the light on an object at any angle, then the image is formed of the object on reference planes, that image is called **Projection.**
- If you through the light at 90^0 on an object, then the image formed of the object is perpendicular or straight, then that perpendicular image is called **Orthographic Projections.**

(Continues in next slide)

ORTHOGRAPHIC PROJECTIONS:

IT IS A TECHNICAL DRAWING IN WHICH DIFFERENT VIEWS OF AN OBJECT ARE PROJECTED ON DIFFERENT REFERENCE PLANES OBSERVING PERPENDICULAR TO RESPECTIVE REFERENCE PLANE

Different Reference planes are

Horizontal Plane (HP),
Vertical Plane (VP)
Side Or Profile Plane (PP)

And

Different Views are Front View (FV), Top View (TV) and Side View (SV)

FV is a view projected on VP.
TV is a view projected on HP.
SV is a view projected on PP.

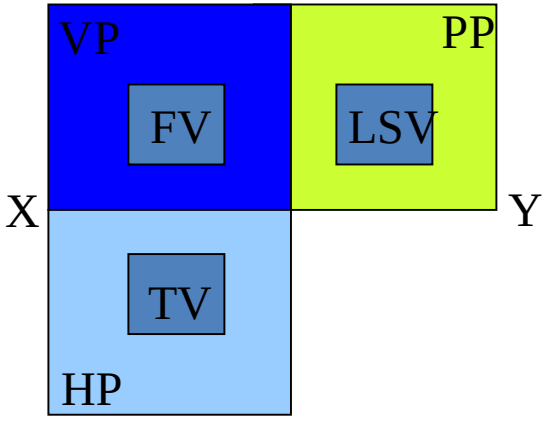
IMPORTANT TERMS FOR UNDERSTANDING OF ORTHOGRAPHIC PROJECTIONS:

1. **Quadrant System**
2. **Planes.**
3. **Pattern of planes & Pattern of views**
4. **Methods of drawing Orthographic Projections**

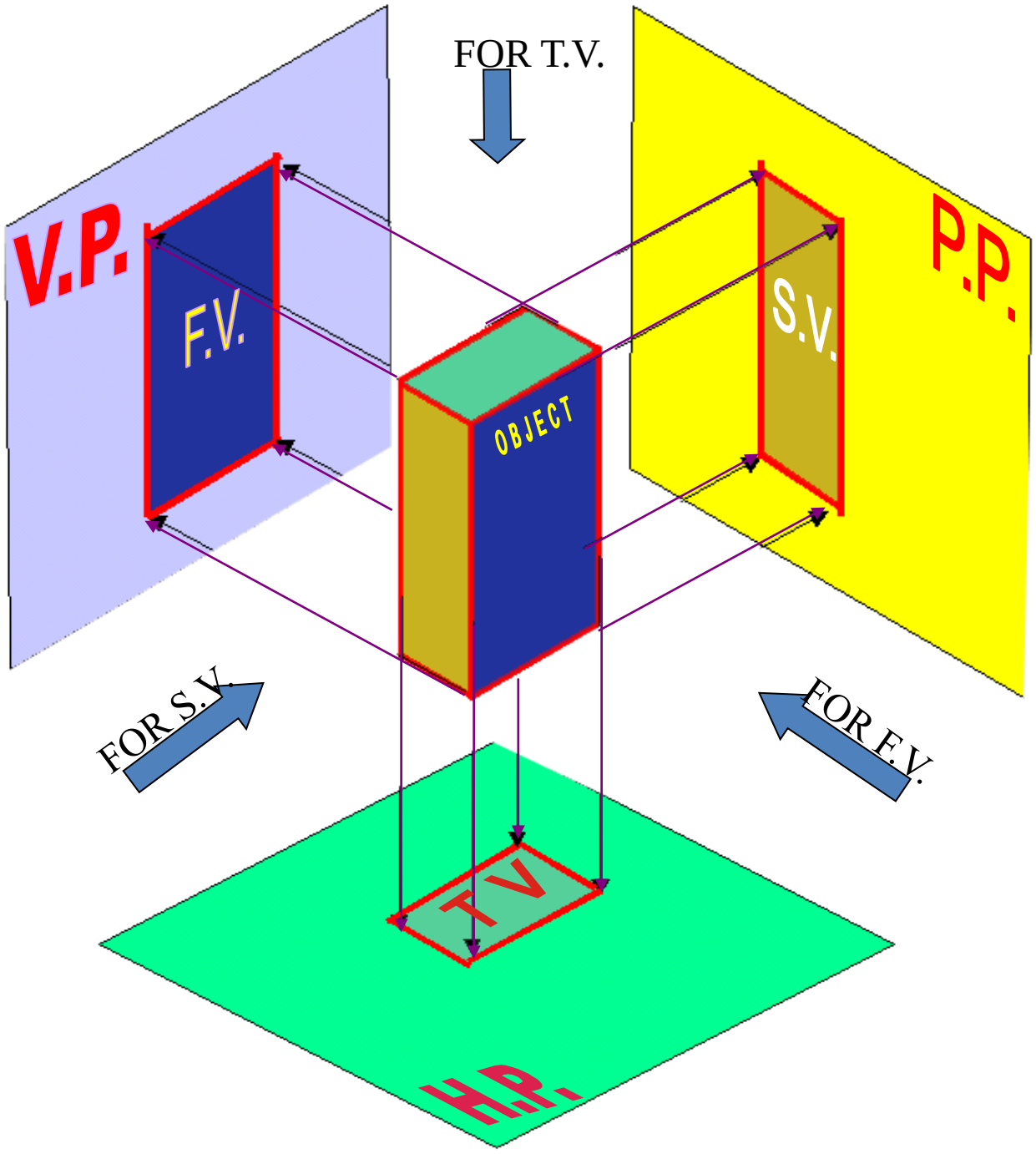
FIRST ANGLE PROJECTION

IN THIS METHOD,
THE OBJECT IS ASSUMED TO BE SITUATED IN FIRST QUADRANT
MEANS
ABOVE HP & INFRONT OF VP.

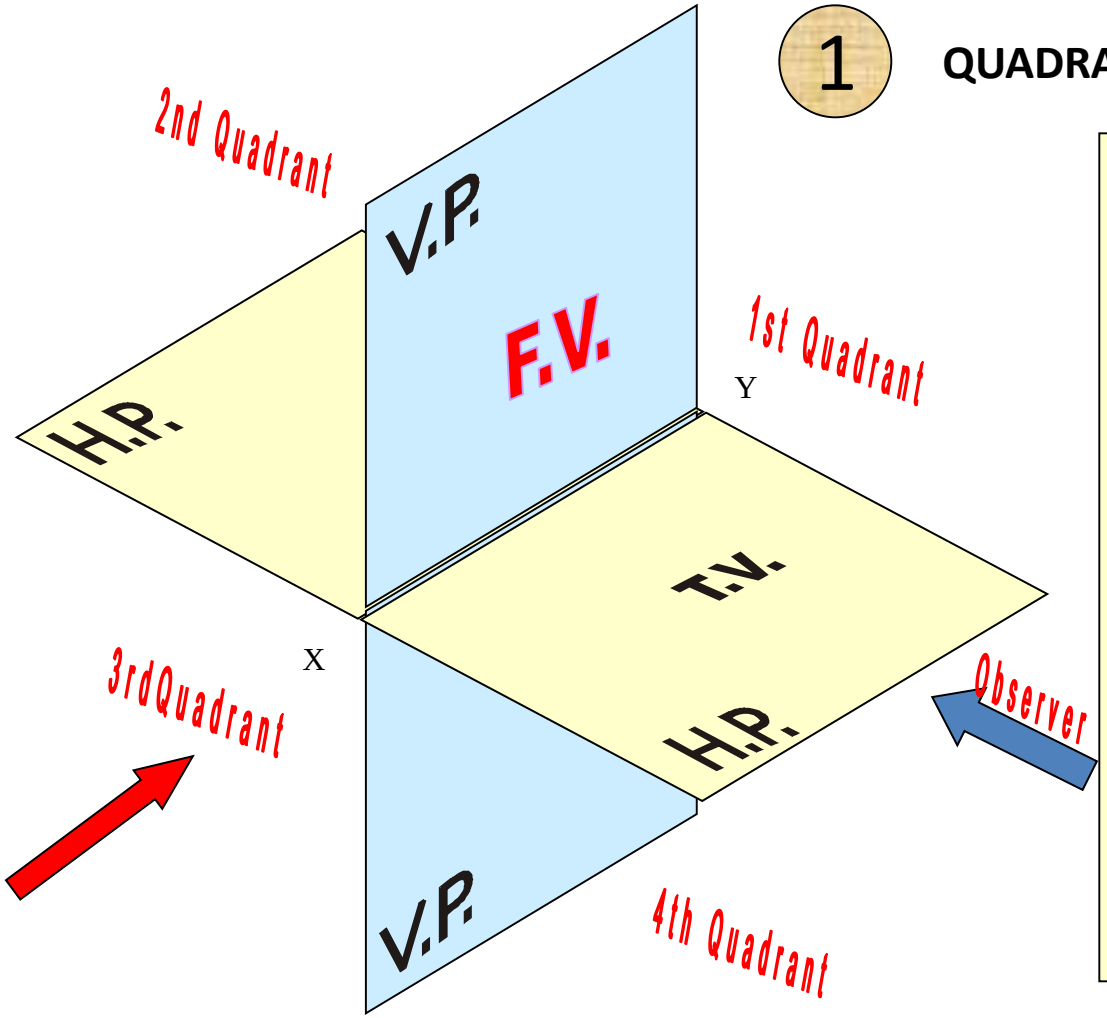
OBJECT IS INBETWEEN OBSERVER & PLANE.

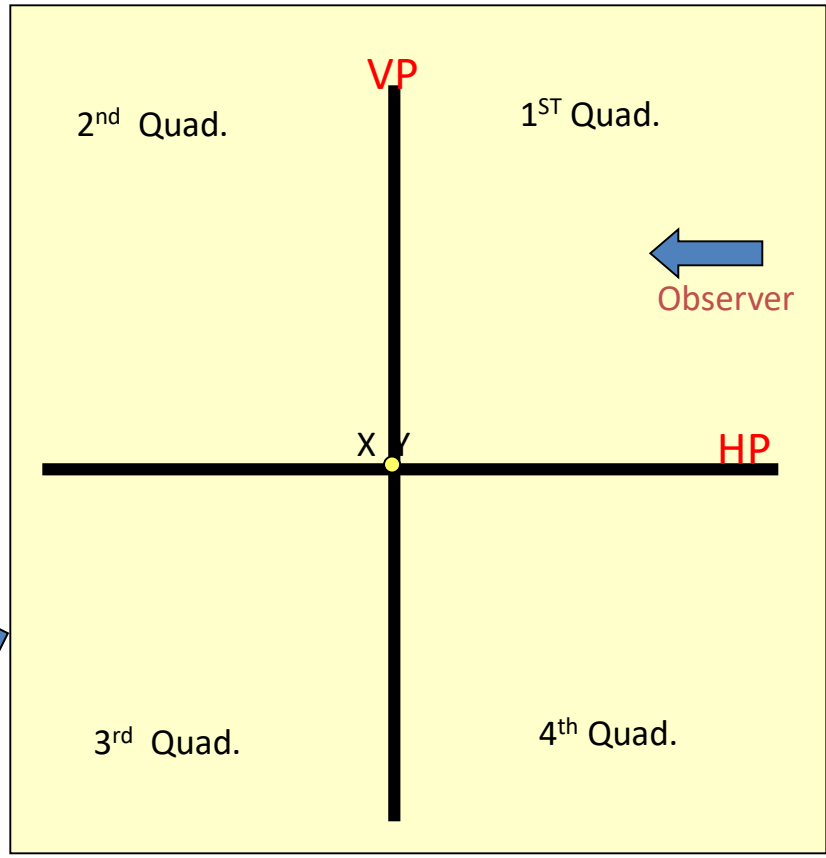


ACTUAL PATTERN OF PLANES & VIEWS
IN
FIRST ANGLE METHOD
OF PROJECTIONS

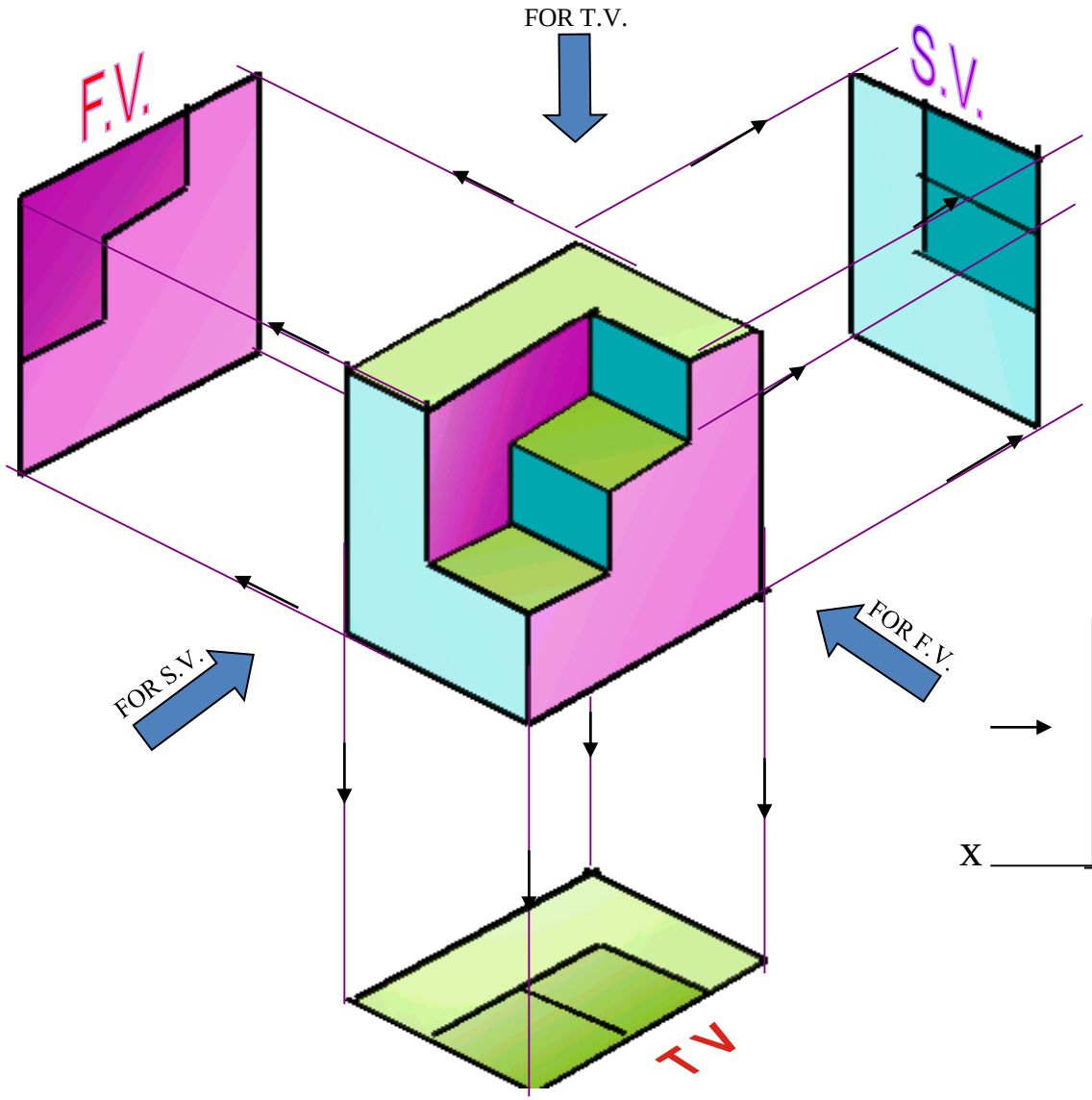


1 QUADRANT SYSTEM

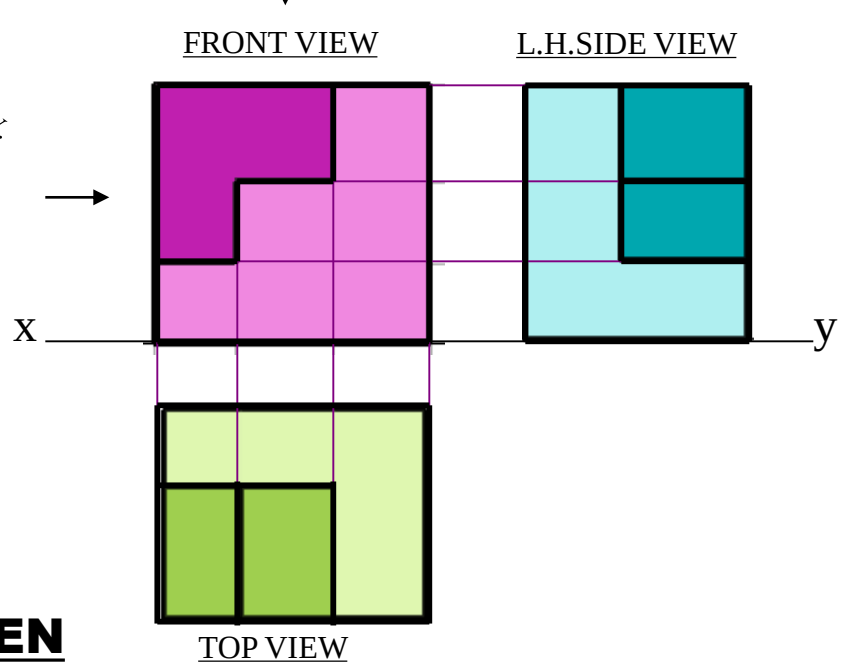




THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECTION)
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND HENCE,
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION PROPERLLY.



ORTHOGRAPHIC PROJECTIONS OF OBJECT



PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

ORTHOGRAPHIC PROJECTIONS

OF POINTS, LINES, PLANES, AND SOLIDS.

TO DRAW PROJECTIONS OF ANY OBJECT,
ONE MUST HAVE FOLLOWING INFORMATION

A) OBJECT

{ WITH IT'S DESCRIPTION, WELL DEFINED.}

B) OBSERVER

{ ALWAYS OBSERVING PERPENDICULAR TO RESP. REF.PLANE}.

C) LOCATION OF OBJECT,

{ MEANS IT'S POSITION WITH REFFERENCE TO H.P. & V.P.}

TERMS 'ABOVE' & 'BELOW' WITH RESPECTIVE TO H.P.
AND TERMS 'INFRONT' & 'BEHIND' WITH RESPECTIVE TO V.P
FORM 4 QUADRANTS.
OBJECTS CAN BE PLACED IN ANY ONE OF THESE 4 QUADRANTS.
IT IS INTERESTING TO LEARN THE EFFECT ON THE POSITIONS OF VIEWS (FV, TV)
OF THE OBJECT WITH RESP. TO X-Y LINE, WHEN PLACED IN DIFFERENT QUADRANTS.

STUDY ILLUSTRATIONS GIVEN ON HEXT PAGES AND NOTE THE RESULTS.TO MAKE IT EASY
HERE A POINT A IS TAKEN AS AN OBJECT. BECAUSE IT'S ALL VIEWS ARE JUST POINTS.

NOTATIONS

FOLLOWING NOTATIONS SHOULD BE FOLLOWED WHILE NAMING DIFFERENT VIEWS IN ORTHOGRAPHIC PROJECTIONS.

OBJECT	POINT A	LINE AB
IT'S TOP VIEW	a	a b
IT'S FRONT VIEW	a'	a' b'
IT'S SIDE VIEW	a"	a" b"

SAME SYSTEM OF NOTATIONS SHOULD BE FOLLOWED INCASE NUMBERS, LIKE 1, 2, 3 – ARE USED.

PROJECTION OF POINTS

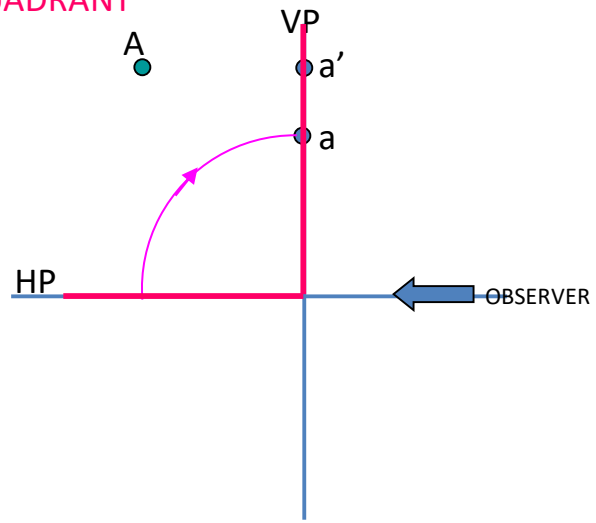
- Point is a dimensionless. It has no Length, Breadth and Height.

PROJECTION OF POINTS IN DIFFERENT QUADRANTS

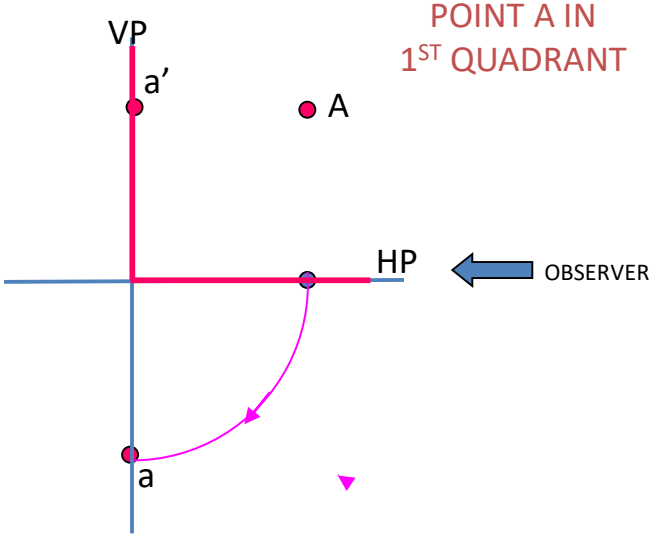
Point A is Placed In different quadrants and it's FV & TV are brought in same plane for Observer to see clearly. FV is visible as it is a view on VP. But as TV is a view on Hp, it is rotated downward 90^0, In clockwise direction. The In front part of Hp comes below XY line and the part behind VP comes above.

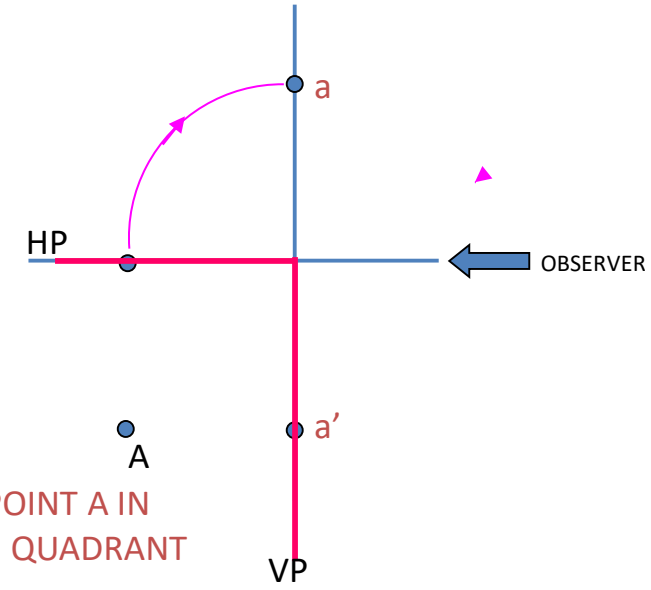
Observe and note the process.

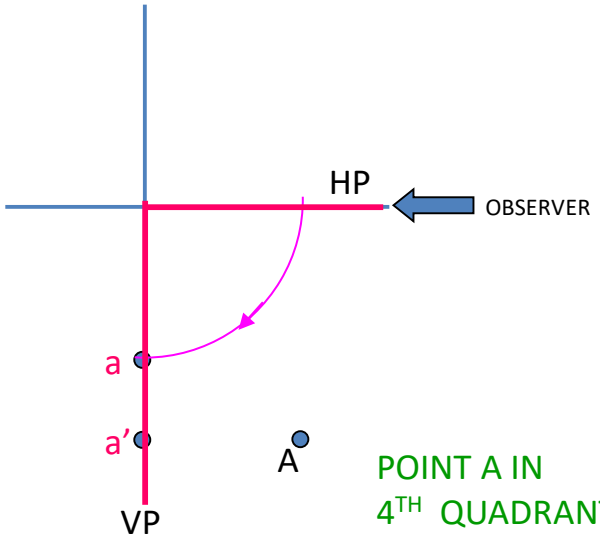
POINT A IN 2ND QUADRANT



POINT A IN 1ST QUADRANT

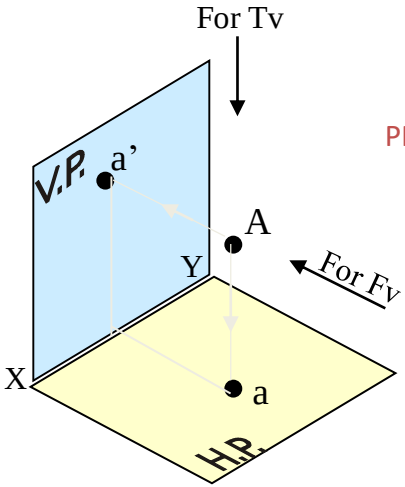






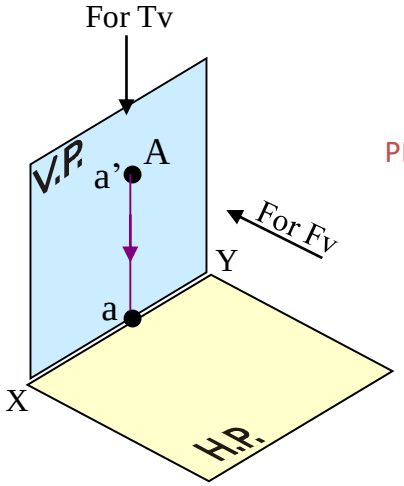
PROJECTIONS OF A POINT IN FIRST QUADRANT.

POINT A ABOVE HP & INFRONT OF VP



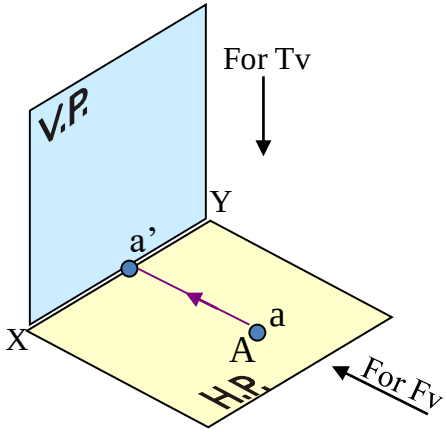
PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP



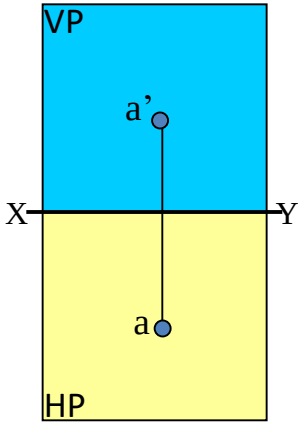
PICTORIAL PRESENTATION

POINT A IN HP & INFRONT OF VP

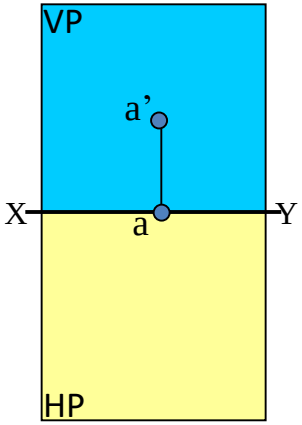


ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

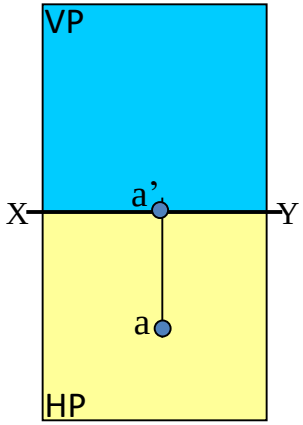
Fv above xy, Tv below xy.



Fv above xy, Tv on xy.



Fv on xy, Tv below xy.



Different Problems of Projection of Points

Thank You

Chapter 12

PROJECTIONS OF PLANES

12-0. INTRODUCTION

Plane figures or surfaces have only two dimensions, viz. length and breadth. They do not have thickness. A plane figure may be assumed to be contained by a plane, and its projections can be drawn, if the position of that plane with respect to the principal planes of projection is known.

In this chapter, we shall discuss the following topics:

1. Types of planes and their projections.
2. Traces of planes.

12-1. TYPES OF PLANES

Planes may be divided into two main types:

(1) Perpendicular planes.

(2) Oblique planes.

(1) Perpendicular planes: These planes can be divided into the following sub-types:

(i) Perpendicular to both the reference planes.

(ii) Perpendicular to one plane and parallel to the other.

(iii) Perpendicular to one plane and inclined to the other.

(i) *Perpendicular to both the reference planes* (fig. 12-1)**:** A square *ABCD* is perpendicular to both the planes. Its H.T. and V.T. are in a straight line perpendicular to *xy*.

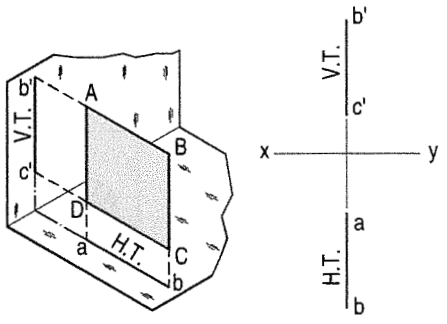


FIG. 12-1

The front view *b'c'* and the top view *ab* of the square are both lines coinciding with the V.T. and the H.T. respectively.

(ii) *Perpendicular to one plane and parallel to the other plane:*

(a) Plane, perpendicular to the H.P. and parallel to the V.P. [fig. 12-2(i)].

A triangle *PQR* is perpendicular to the H.P. and is parallel to the V.P. Its H.T. is parallel to *xy*. It has no V.T.

The front view *p'q'r'* shows the exact shape and size of the triangle. The top view *pqr* is a line parallel to *xy*. It coincides with the H.T.

(b) Plane, perpendicular to the V.P. and parallel to the H.P. [fig. 12-2(ii)].

A square *ABCD* is perpendicular to the V.P. and parallel to the H.P. Its V.T. is parallel to *xy*. It has no H.T.

The top view *abcd* shows the true shape and true size of the square. The front view *a'b'* is a line, parallel to *xy*. It coincides with the V.T.

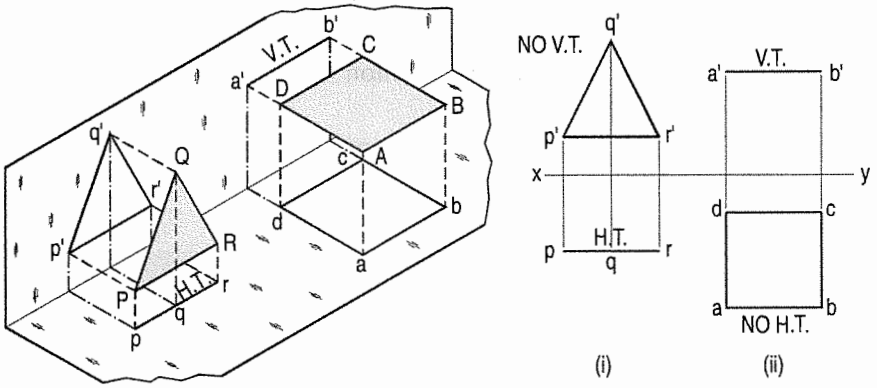


FIG. 12-2

(iii) *Perpendicular to one plane and inclined to the other plane:*

(a) Plane, perpendicular to the H.P. and inclined to the V.P. (fig. 12-3).

A square *ABCD* is perpendicular to the H.P. and inclined at an angle ø to the V.P. Its V.T. is perpendicular to *xy*. Its H.T. is inclined at ø to xy.

Its top view *ab* is a line linclined at ø to *xy*. The front view *a'b'c'd'* is smaller than *ABCD*.

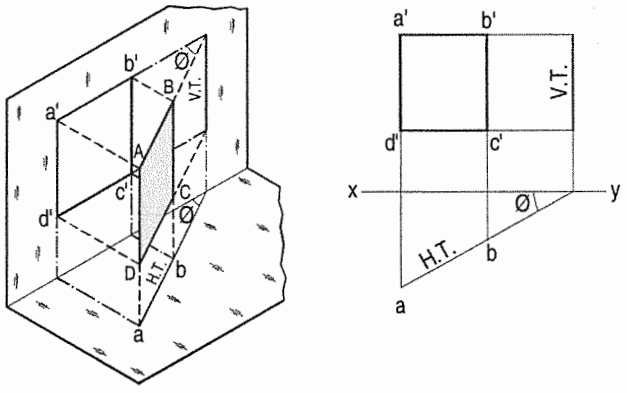


FIG. 12-3

(b) Plane, perpendicular to the V.P. and inclined to the H.P. (fig. 12-4).

A square *ABCD* is perpendicular to the V.P. and inclined at an angle θ to the H.P. Its H.T. is perpendicular to *xy*. Its V.T. makes the angle θ with *xy*. Its front view *a'b'* is a line inclined at θ to *xy*. The top view *abcd* is a rectangle which is smaller than the square *ABCD*.

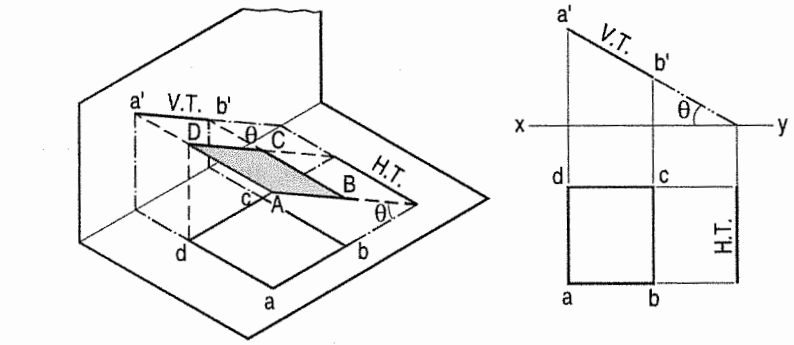


FIG. 12-4

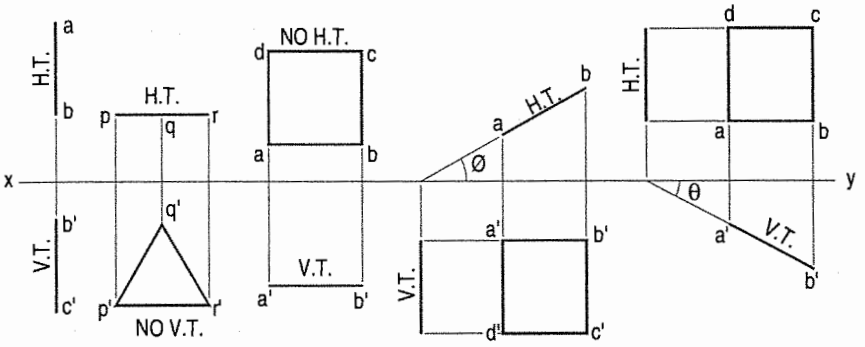


FIG. 12-5

Fig. 12-5 shows the projections and the traces of all these perpendicular planes by third-angle projection method.

(2) Oblique planes: Planes which are inclined to both the reference planes are called *oblique planes*. Representation of oblique planes by their traces is too advanced to be included in this book.

A few problems on the projections of plane figures inclined to both the reference planes are however, illustrated at the end of the chapter. They will prove to be of great use in dealing with the projections of solids.

12-2. TRACES OF PLANES

A plane, extended if necessary, will meet the reference planes in lines, unless it is parallel to any one of them.

These lines are called the *traces* of the plane. The line in which the plane meets the H.P. is called the *horizontal trace* or the H.T. of the plane. The line in which it meets the V.P. is called its *vertical trace* or the V.T. A plane is usually represented by its traces.

12-3. GENERAL CONCLUSIONS

(1) Traces:

(a) When a plane is perpendicular to both the reference planes, its traces lie on a straight line perpendicular to *xy*.

(b) When a plane is perpendicular to one of the reference planes, its trace upon the other plane is perpendicular to *xy* (except when it is parallel to the other plane).

(c) When a plane is parallel to a reference plane, it has no trace on that plane. Its trace on the other reference plane, to which it is perpendicular, is parallel to *xy*.

(d) When a plane is inclined to the H.P. and perpendicular to the V.P., its inclination is shown by the angle which its V.T. makes with *xy*. When it is inclined to the V.P. and perpendicular to the H.P., its inclination is shown by the angle which its H.T. makes with *xy*.

(e) When a plane has two traces, they, produced if necessary, intersect in *xy* (except when both are parallel to *xy* as in case of some oblique planes).

(2) Projections:

(a) When a plane is perpendicular to a reference plane, its projection on that plane is a straight line.

(b) When a plane is parallel to a reference plane, its projection on that plane shows its true shape and size.

(c) When a plane is perpendicular to one of the reference planes and inclined to the other, its inclination is shown by the angle which its projection on the plane to which it is perpendicular, makes with *xy*. Its projection on the plane to which it is inclined, is smaller than the plane itself.

Problem 12-1. *Show by means of traces, each of the following planes:*

(a) *Perpendicular to the H.P. and the V.P.*

(b) *Perpendicular to the H.P. and inclined at 30° to the V.P.*

(c) *Parallel to and 40 mm away from the V.P.*

(d) *Inclined at 45° to the H.P. and perpendicular to the V.P.*

(e) *Parallel to the H.P. and 25 mm away from it.*

Fig. 12-6 and fig. 12-7 show the various traces.

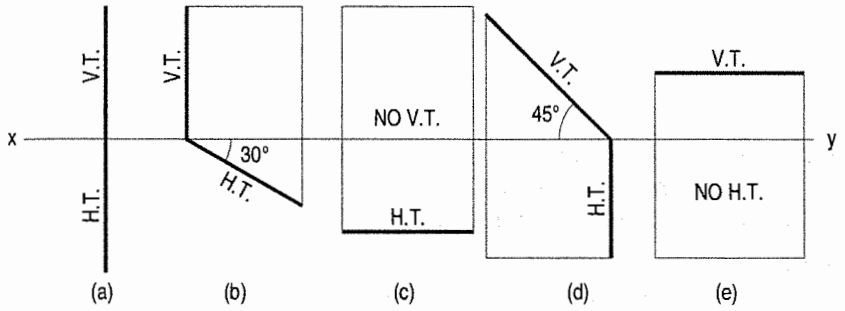
(a) The H.T. and the V.T. are in a line perpendicular to xy.

(b) The H.T. is inclined at 30° to *xy*; the V.T. is normal to *xy*; both the traces intersect in *xy*.

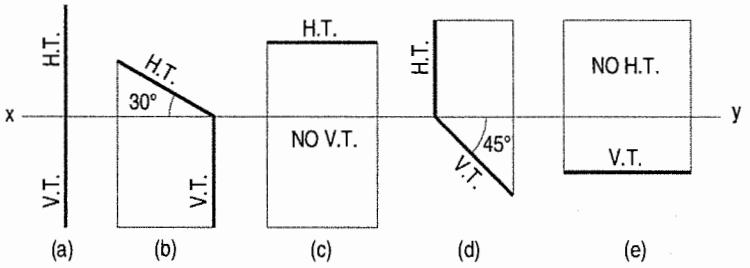
(c) The H.T. is parallel to and 40 mm away from *xy*. It has no V.T.

(d) The H.T. is perpendicular to *xy*; the V.T. makes 45° angle with *xy*; both intersect in *xy*.

(e) The V.T. is parallel to and 25 mm away from *xy*. It has no H.T.



(First-angle projection)
FIG. 12-6



(Third-angle projection)
FIG. 12-7

12-4. PROJECTIONS OF PLANES PARALLEL TO ONE OF THE REFERENCE PLANES

The projection of a plane on the reference plane parallel to it will show its true shape. Hence, beginning should be made by drawing that view. The other view which will be a line, should then be projected from it.

(1) When the plane is parallel to the H.P.: The top view should be drawn first and the front view projected from it.

Problem 12-2. (fig. 12-8): *An equilateral triangle of 50 mm side has its V.T. parallel to and 25 mm above xy. It has no H.T. Draw its projections when one of its sides is inclined at 45° to the V.P.*

As the V.T. is parallel to *xy* and as there is no H.T. the triangle is parallel to the H.P. Therefore, begin with the top view.

(i) Draw an equilateral triangle *abc* of 50 mm side, keeping one side, say *ac*, inclined at 45° to *xy*.

(ii) Project the front view, parallel to and 25 mm *above* *xy*, as shown.

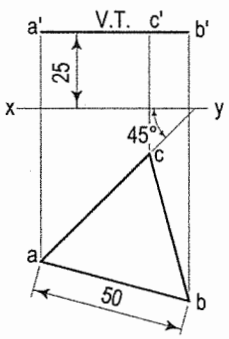


FIG. 12-8

(2) When the plane is parallel to the V.P.: Beginning should be made with the front view and the top view projected from it.

Problem 12-3. (fig. 12-9): *A square ABCD of 40 mm side has a corner on the H.P. and 20 mm in front of the V.P. All the sides of the square are equally inclined to the H.P. and parallel to the V.P. Draw its projections and show its traces.*

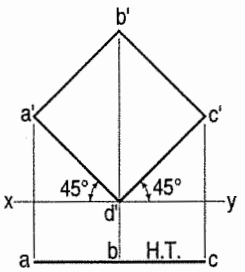


FIG. 12-9

As all the sides are parallel to the V.P., the surface of the square also is parallel to it. The front view will show the true shape and position of the square.

(i) Draw a square *a'b'c'd'* in the front view with one corner in *xy* and all its sides inclined at 45° to *xy*.

(ii) Project the top view keeping the line *ac* parallel to *xy* and 30 mm below it. The top view is its H.T. It has no V.T.

12-5. PROJECTIONS OF PLANES INCLINED TO ONE REFERENCE PLANE AND PERPENDICULAR TO THE OTHER

When a plane is inclined to a reference plane, its projections may be obtained in two stages. In the initial stage, the plane is assumed to be parallel to that reference plane to which it has to be made inclined. It is then tilted to the required inclination in the second stage.

(1) Plane, inclined to the H.P. and perpendicular to the V.P.: When the plane is inclined to the H.P. and perpendicular to the V.P., in the initial stage, it is assumed to be parallel to the H.P. Its top view will show the true shape. The front view will be a line parallel to *xy*. The plane is then tilted so that it is inclined to the H.P. The new front view will be inclined to *xy* at the true inclination. In the top view the corners will move along their respective paths (parallel to *xy*).

Problem 12-4. (fig. 12-10): *A regular pentagon of 25 mm side has one side on the ground. Its plane is inclined at 45° to the H.P. and perpendicular to the V.P. Draw its projections and show its traces.*

Assuming it to be parallel to the H.P.

(i) Draw the pentagon in the top view with one side perpendicular to *xy* [fig. 12-10(i)]. Project the front view. It will be the line *a'c'* contained by *xy*.

(ii) Tilt the front view about the point *a'*, so that it makes 45° angle with *xy*.

(iii) Project the new top view $ab_1c_1d_1e$ upwards from this front view and horizontally from the first top view. It will be more convenient if the front view is reproduced in the new position separately and the top view projected from it, as shown in fig. 12-10(ii). The V.T. coincides with the front view and the H.T. is perpendicular to *xy*, through the point of intersection between *xy* and the front view-produced.

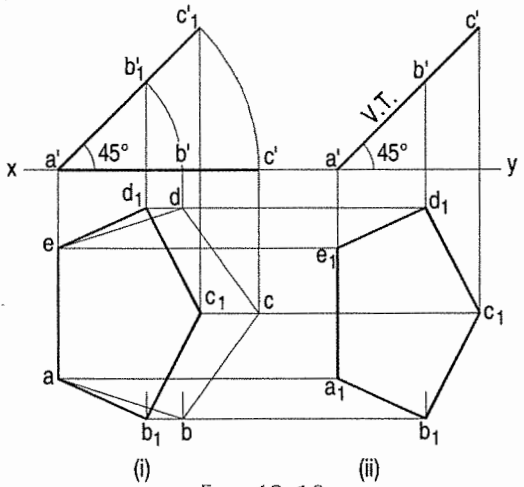


FIG. 12-10

(2) Plane, inclined to the V.P. and perpendicular to the H.P.: In the initial stage, the plane may be assumed to be parallel to the V.P. and then tilted to the required position in the next stage. The projections are drawn as illustrated in the next problem.

Problem 12-5. (fig. 12-11): *Draw the projections of a circle of 50 mm diameter, having its plane vertical and inclined at 30° to the V.P. Its centre is 30 mm above the H.P. and 20 mm in front of the V.P. Show also its traces.*

A circle has no corners to project one view from another. However, a number of points, say twelve, equal distances apart, may be marked on its circumference.

(i) Assuming the circle to be parallel to the V.P., draw its projections. The front view will be a circle [fig. 12-11(i)], having its centre 30 mm above *xy*. The top view will be a line, parallel to and 20 mm below *xy*.

(ii) Divide the circumference into twelve equal parts (with a 30°-60° set-square) and mark the points as shown. Project these points in the top view. The centre *O* will coincide with the point 4.

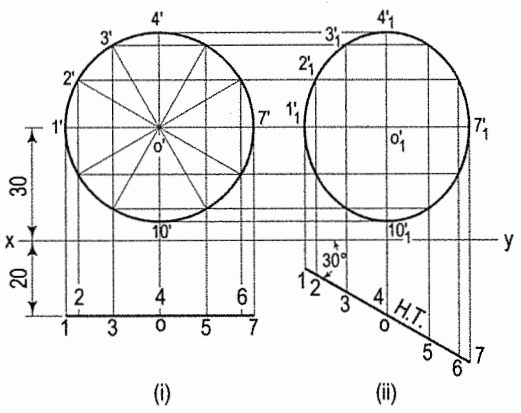


FIG. 12-11

(iii) When the circle is tilted, so as to make 30° angle with the V.P., its top view will become inclined at 30° to *xy*. In the front view all the points will move along their respective paths (parallel to *xy*). Reproduce the top view keeping the centre *o* at the same distance, viz. 20 mm from *xy* and inclined at 30° to *xy* [fig. 12-11(ii)].

(iv) For the final front view, project all the points upwards from this top view and horizontally from the first front view. Draw a freehand curve through the twelve points $1'_1$, $2'_1$ etc. This curve will be an ellipse.

12-6. PROJECTIONS OF OBLIQUE PLANES

When a plane has its surface inclined to one plane and an edge or a diameter or a diagonal parallel to that plane and inclined to the other plane, its projections are drawn in three stages.

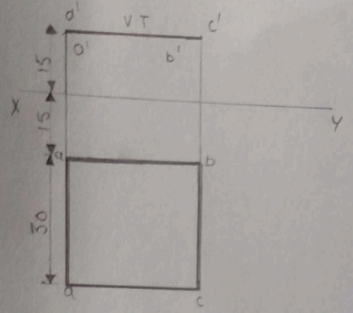
(1) If the surface of the plane is inclined to the H.P. and an edge (or a diameter or a diagonal) is parallel to the H.P. and inclined to the V.P.,

(i) in the initial position the plane is assumed to be parallel to the H.P. and an edge perpendicular to the V.P.

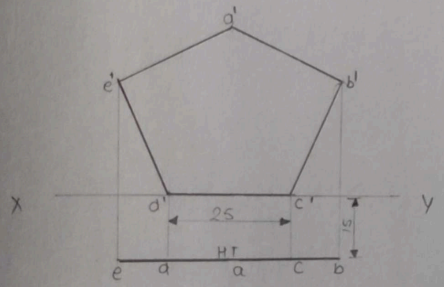
(ii) It is then tilted so as to make the required angle with the H.P. As already explained, its front view in this position will be a line, while its top view will be smaller in size.

(iii) In the final position, when the plane is turned to the required inclination with the V.P., only the position of the top view will change. Its shape and size will not be affected. In the final front view, the corresponding distances of all the corners from *xy* will remain the same as in the second front view.

1. A square lamina ABCD of 30mm side is parallel to HP and is 15mm from it. Draw its projections in first quadrant only and locate its traces.

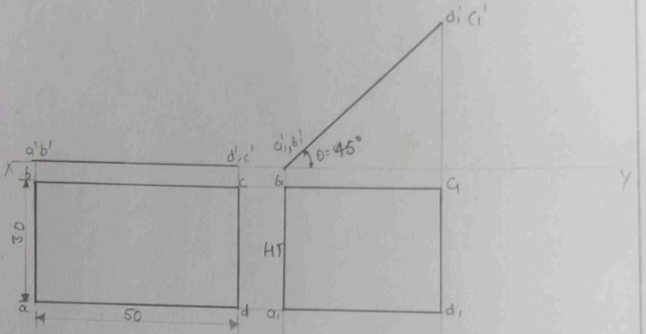


2. A regular pentagonal lamina ABCDE 25 mm side, has its side CD lies on HP. Draw its projections when its plane is parallel to and 15mm infront of VP. Also locate its traces



3. A rectangular lamina ABCD of 50mm X 30 mm is inclined to HP at 45° and perpendicular to VP. If rests one one of its side say AB in HP. Draw its projections in first quadrant only and locate its traces too

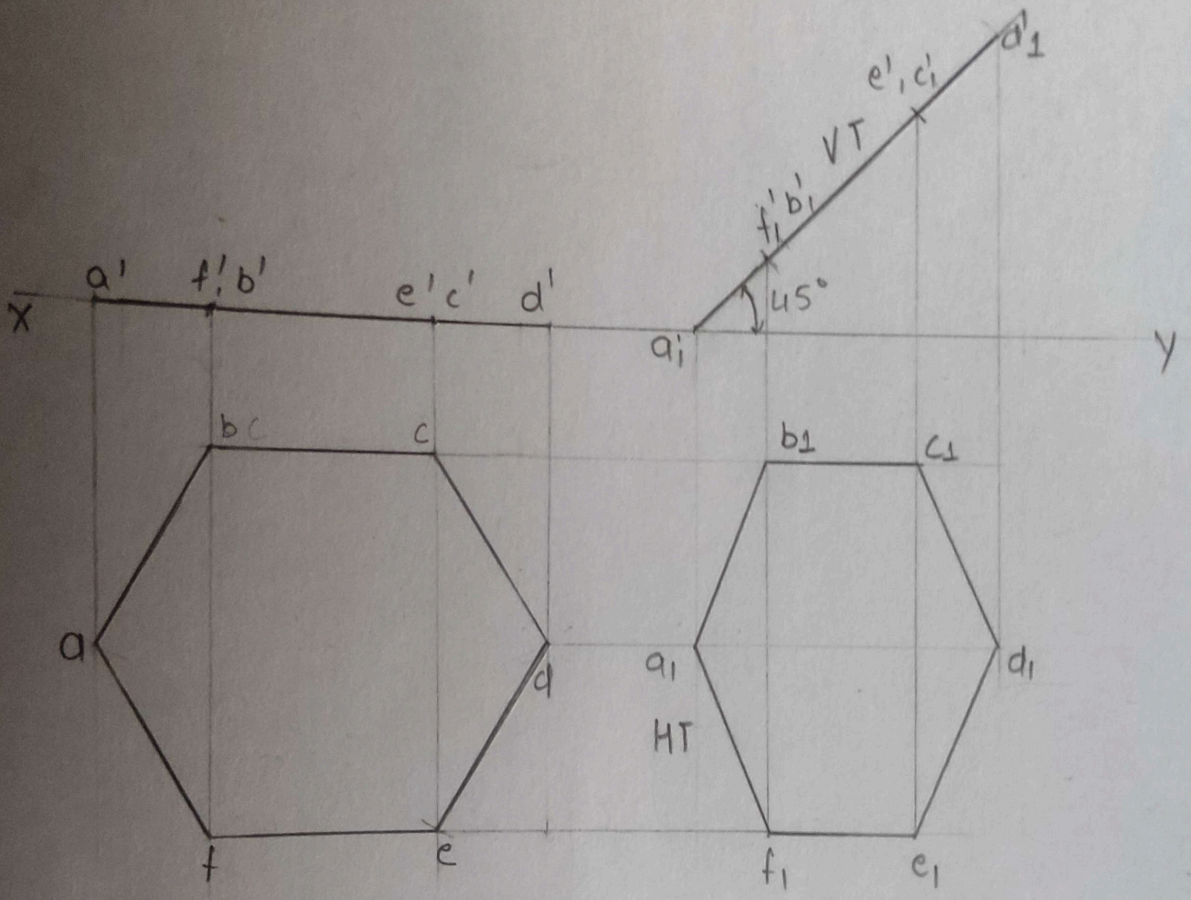
Sol.



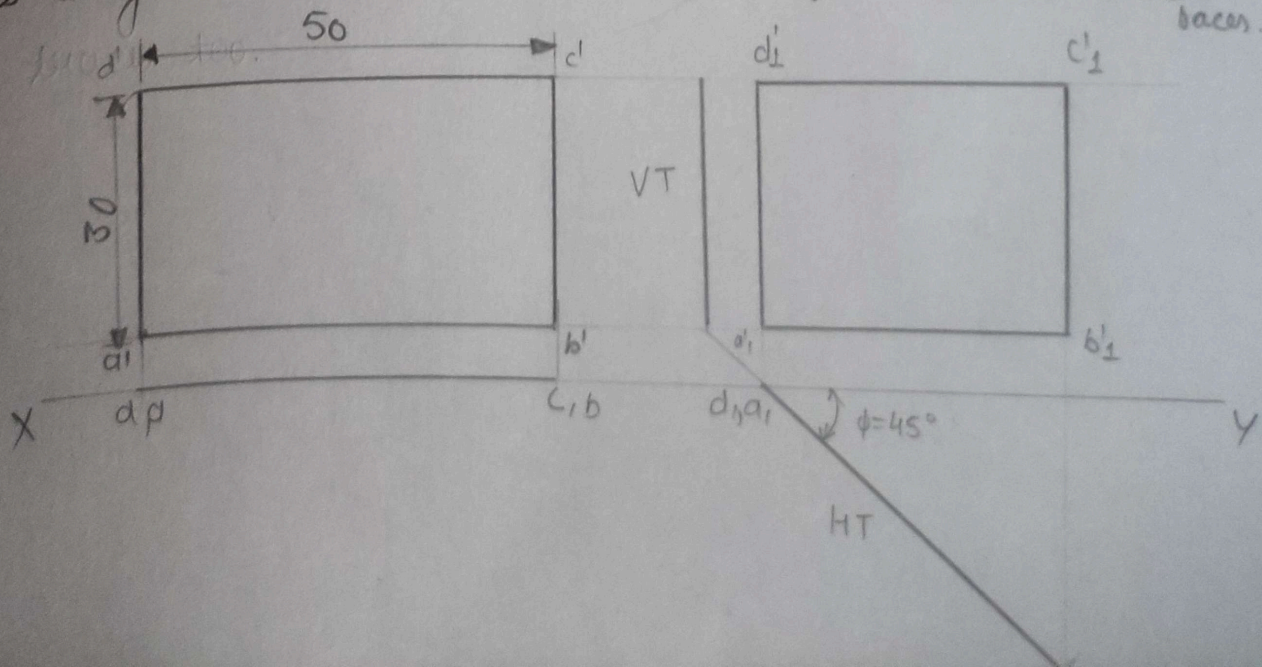
ISHIKA SHARMA	CHANDIGARH ENGINEERING COLLEGE LANDRAN, MOHALI	
2002712		
Branch - ECE (B2)	Projection of Planes	Sheet No - 5
16/07/2021		
Scale		Checked By - Rahul Mehra Sir

4. A regular pentagonal lamina ABCDEF of 25mm side, lies on one of its corner in HP such that the surface is inclined at 45° to the HP and perpendicular to the VP. Draw its Projections and locate its traces

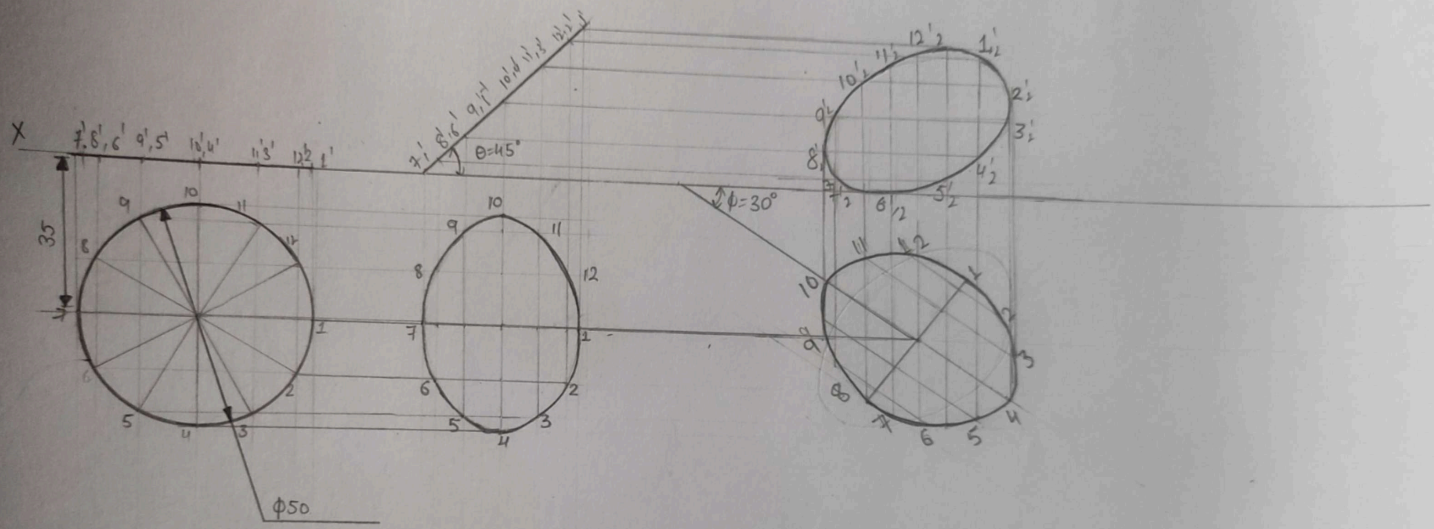
Solution.



5. A rectangular lamina ABCD of 50mm x 30mm is inclined to the VP at 45°. and perpendicular to HP. If one of the sides say AD lies in VP. Draw its projections and locate its traces.

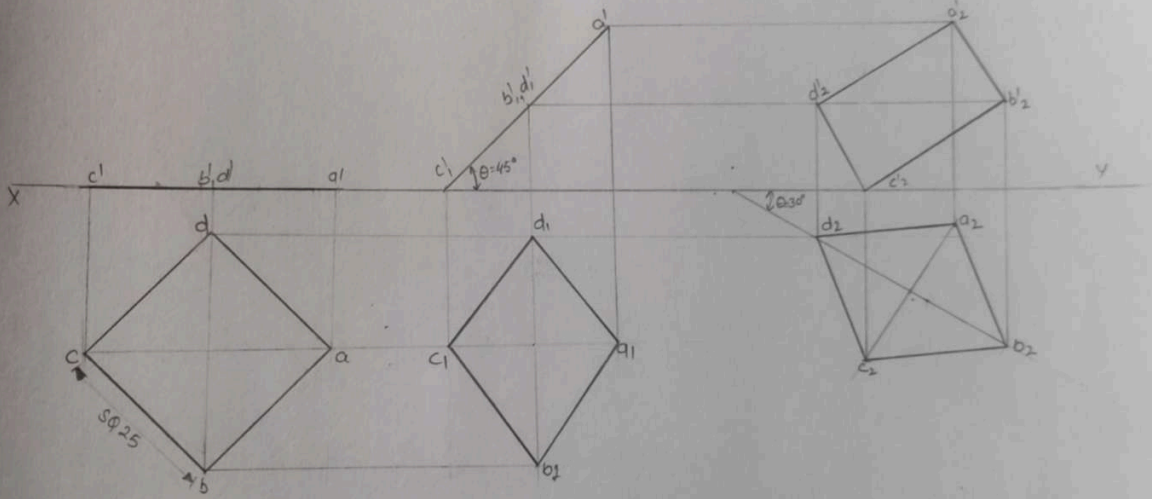


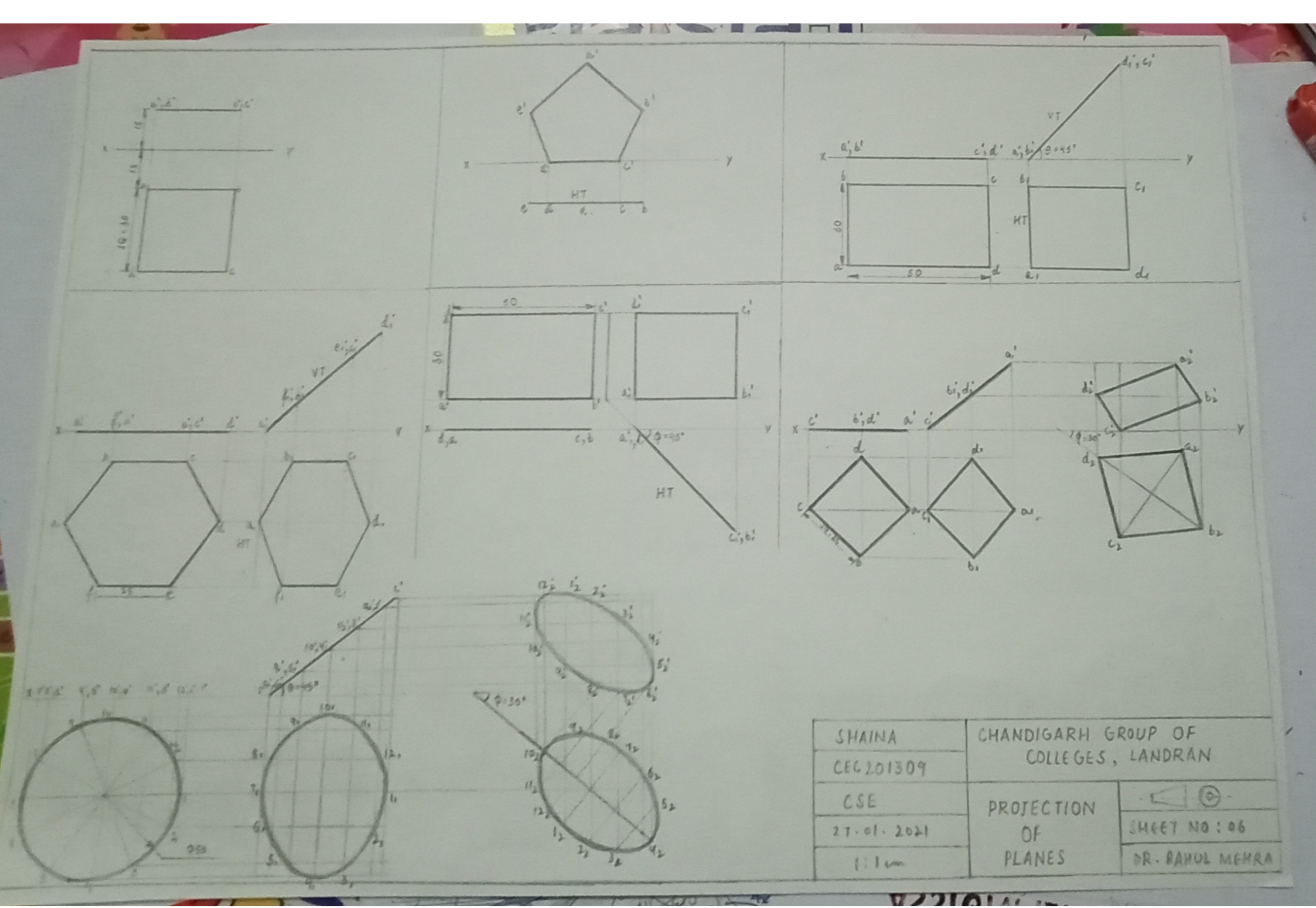
5-3 A thin circular plate of ϕ 50mm and negligible thickness rests on HP on its rim and makes angle 45° to it. one of its diameter inclined to VP at 30°. Draw its projections keeping distance of the centre of the circular plate 35mm infront of VP



A Square lamina ABCD of 25mm side, rests on its corner C in HP. Its plane is inclined at 45° to the HP and diagonal to the HP and diagonal DB inclined at 30° to the VP. Draw its projections.

Sol:-





SHAINA	CHANDIGARH GROUP OF COLLEGES, LANDRAN	
CEC201309		
CSE	PROJECTION OF PLANES	SHEET NO : 06
27.01.2021		DR. RAHUL MEHRA
1:1 cm		

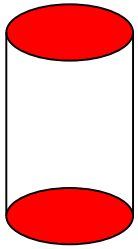
PROJECTION OF SOLIDS

SOLIDS

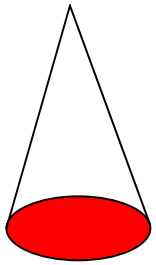
To understand and remember various solids in this subject properly, those are classified & arranged in to two major groups.

Solids having top and base of same shape	Solids having base of some shape and just a point as a top, called apex.

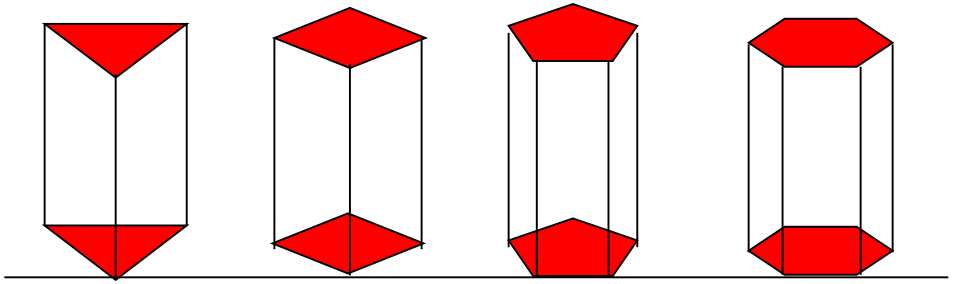
Cylinder



Cone

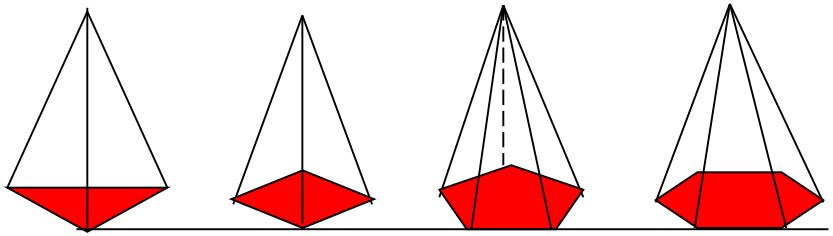


Prisms



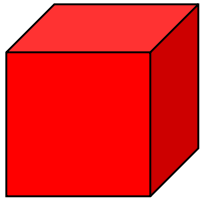
Triangular Square Pentagonal Hexagonal

Pyramids

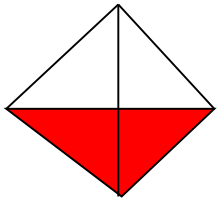


Triangular Square Pentagonal Hexagonal

Cube

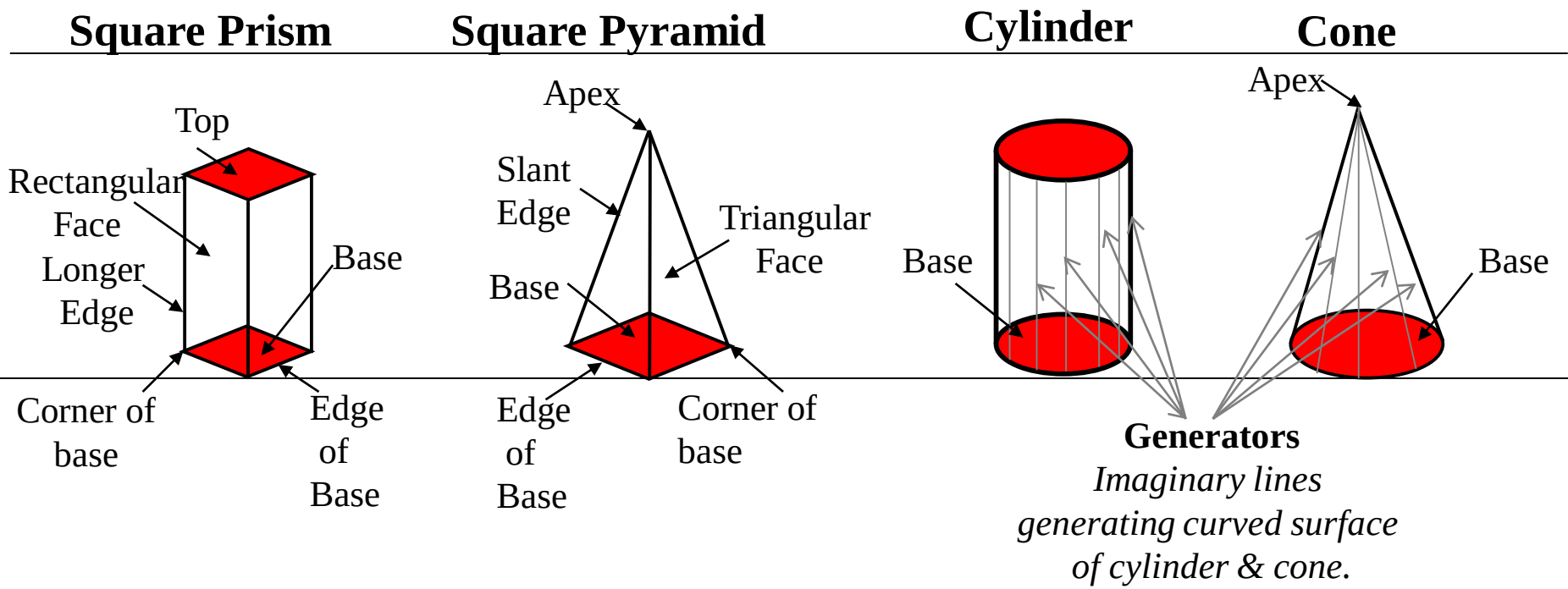


Tetrahedron



SOLIDS

Dimensional parameters of different solids.



Rules for solving problem of projection of solid

1. Axis of the solid inclined to……at……
2. Edge or side of the base inclined to …….at……

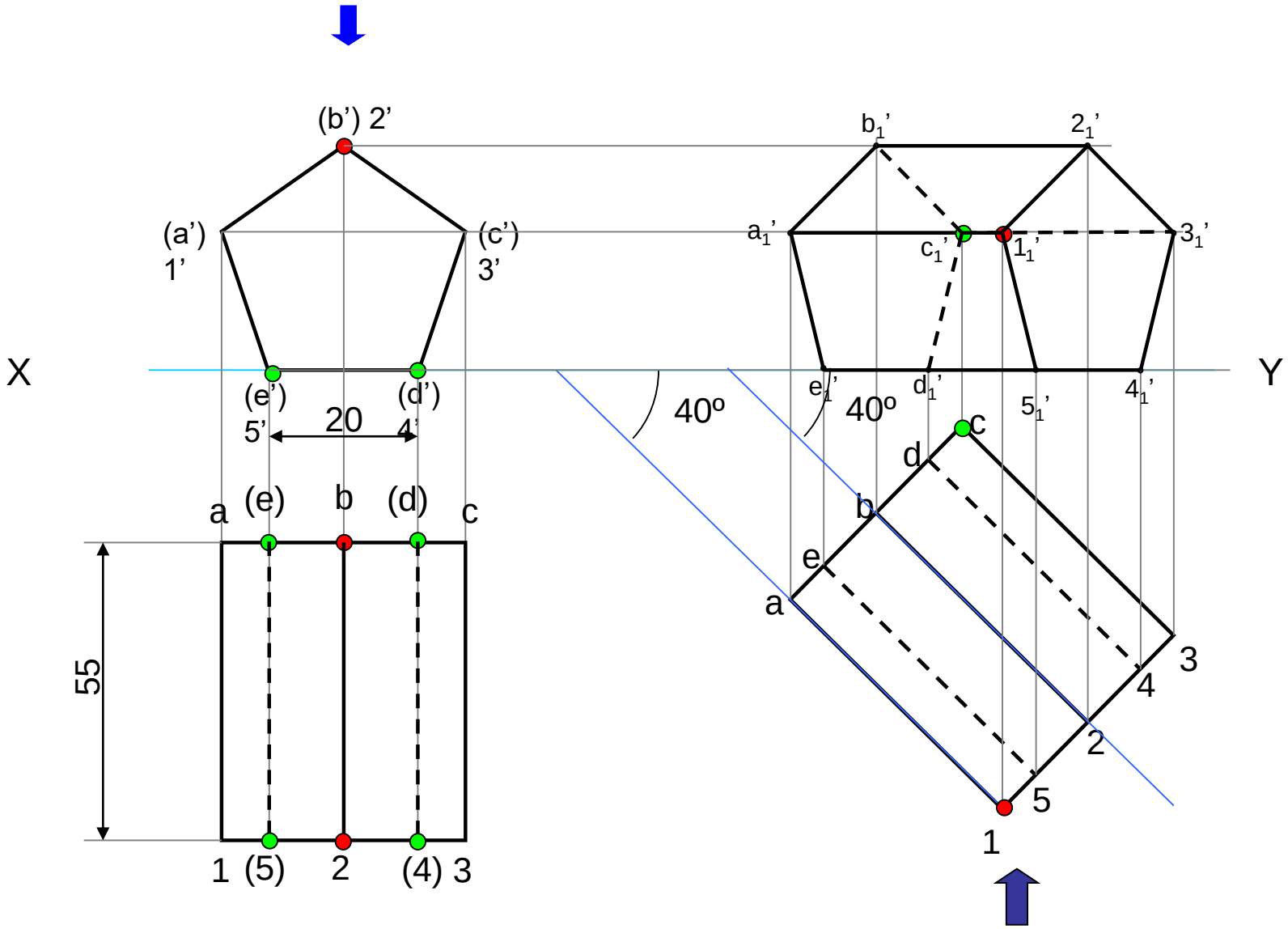
Assumptions for initial position

1. Keep the axis perpendicular to the principal plane from which it is to be inclined.
2. Keep the edge perpendicular to the principal plane from which it is to be inclined.

Steps for solution

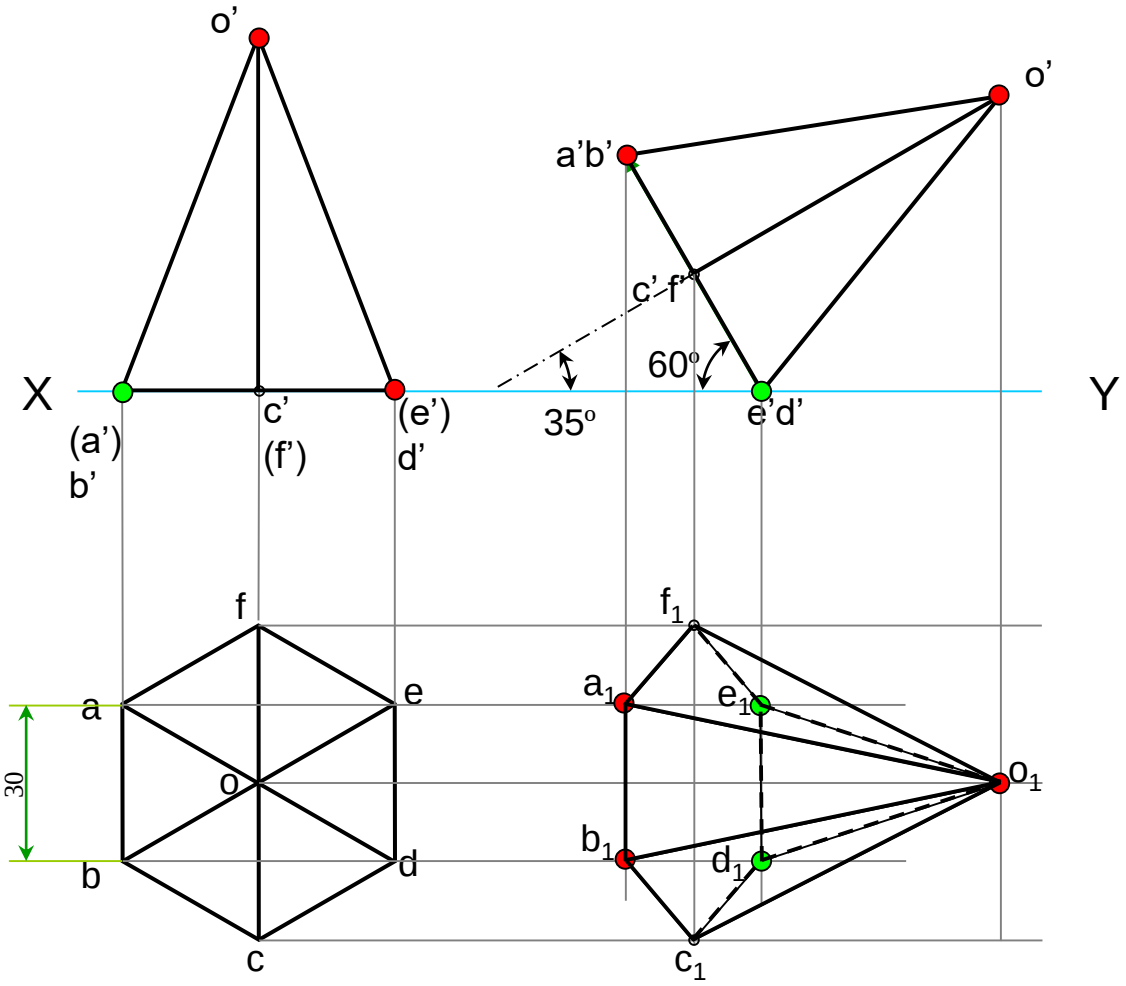
1. Incline the axis.
2. Incline the edge.

Problem 1: Draw the projections of a pentagonal prism , base 20 mm side and axis 55 mm long, resting on one of its rectangular faces on the H.P. with the axis inclined at 40º to the V.P.

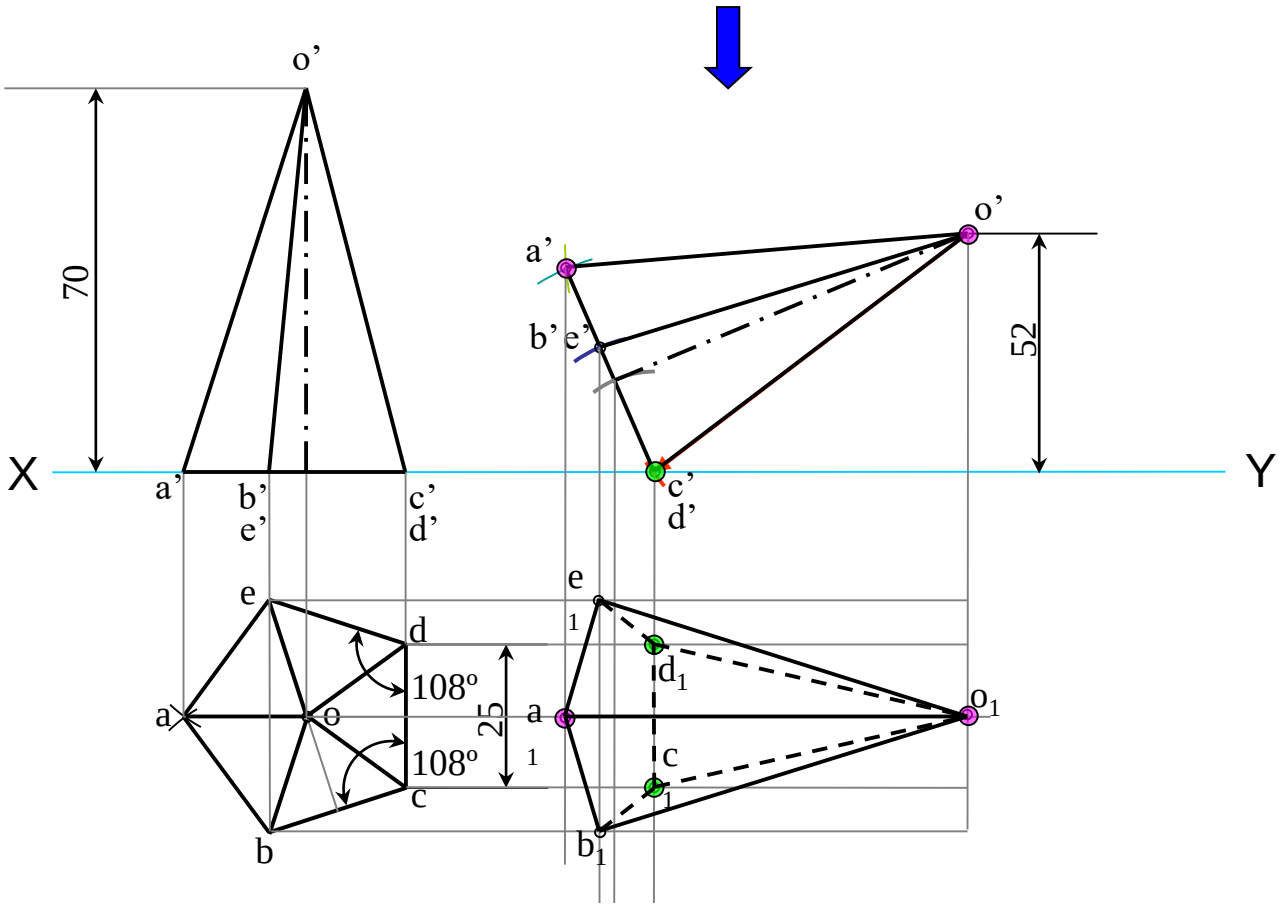


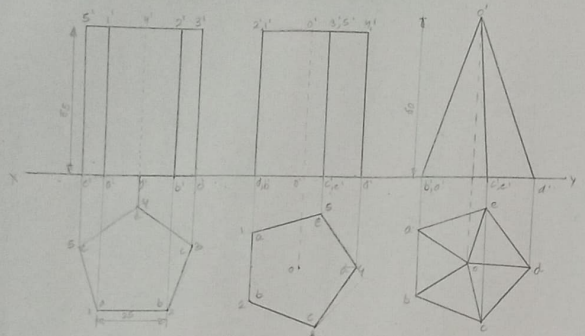
Problem 2: A hexagonal pyramid base 30 mm side and axis 60 mm long has an edge of its base on HP. Its axis is inclined at 35º to HP and parallel to V.P. Draw its projections

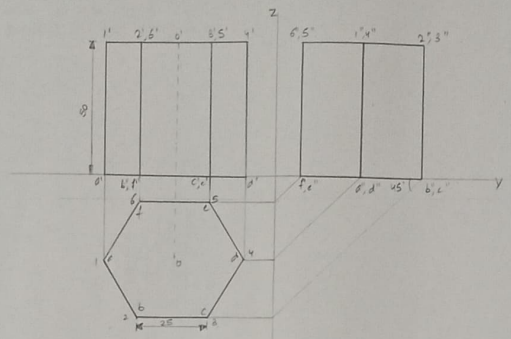
As the axis is to be inclined with the HP, in the first position we have to keep it perpendicular to HP, and as one side of base is resting on the HP, we have to keep one edge of the hexagon perpendicular to VP

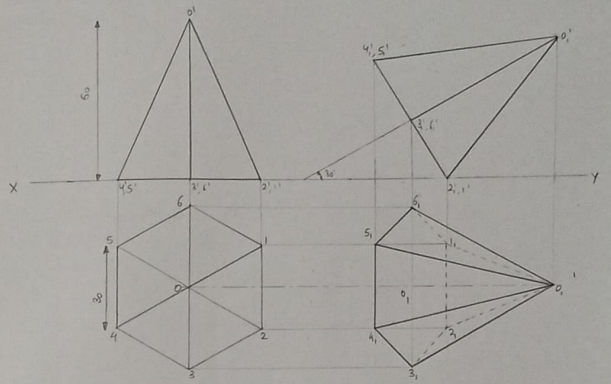


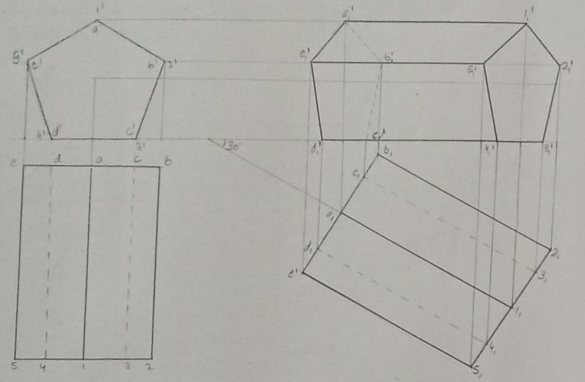
Problem 3: A regular pentagonal pyramid with the sides of its base 25 mm and height 70 mm rests on an edge of the base with one of its edge perpendicular to VP. The base is tilted until its apex is 52 mm above the level of the edge of the base on which it rests. Draw the projections of the pyramid in front and top view.

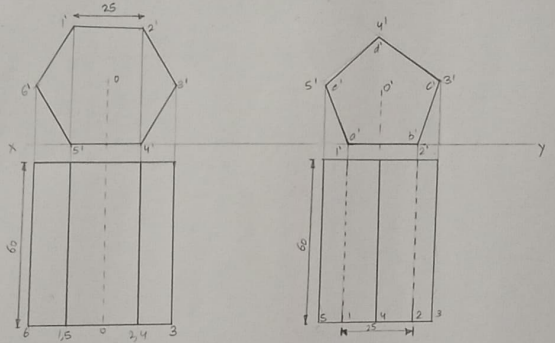


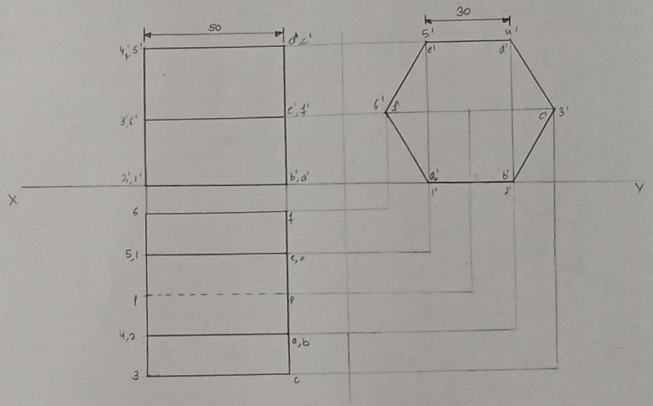


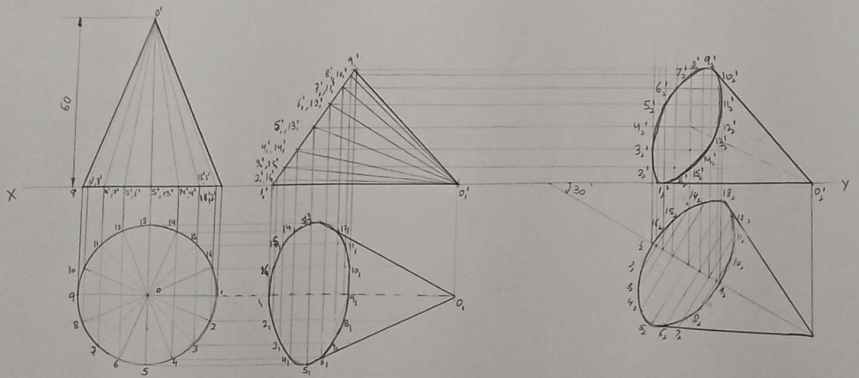












SHREYANSH KUMAR MAURYA	CHANDIGARH GROUP OF COLLEGES, LANDRAN	
CEC 20316		
CSE	PROJECTION OF SOLIDS - 2	Sheet no 08

CHANDIGARH
ENGINEERING COLLEGE
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Building Careers. Transforming lives

Orthographic Projections and Projection of Points

What is Projections?

- When you through the light on an object at any angle, then the image is formed of the object on reference planes, that image is called **Projection.**
- If you through the light at 90^0 on an object, then the image formed of the object is perpendicular or straight, then that perpendicular image is called **Orthographic Projections.**

(Continues in next slide)

ORTHOGRAPHIC PROJECTIONS:

IT IS A TECHNICAL DRAWING IN WHICH DIFFERENT VIEWS OF AN OBJECT ARE PROJECTED ON DIFFERENT REFERENCE PLANES OBSERVING PERPENDICULAR TO RESPECTIVE REFERENCE PLANE

Different Reference planes are

Horizontal Plane (HP),
Vertical Plane (VP)
Side Or Profile Plane (PP)

And

Different Views are Front View (FV), Top View (TV) and Side View (SV)

FV is a view projected on VP.
TV is a view projected on HP.
SV is a view projected on PP.

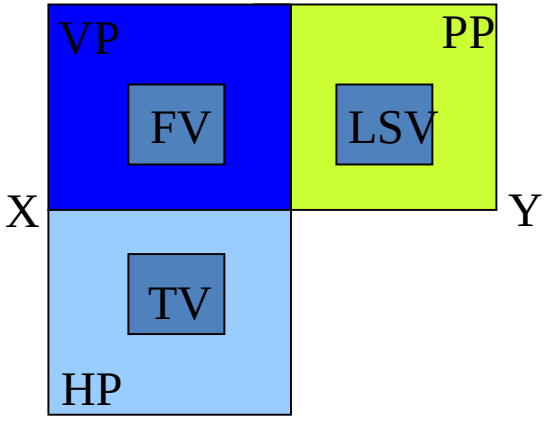
IMPORTANT TERMS FOR UNDERSTANDING OF ORTHOGRAPHIC PROJECTIONS:

1. **Quadrant System**
2. **Planes.**
3. **Pattern of planes & Pattern of views**
4. **Methods of drawing Orthographic Projections**

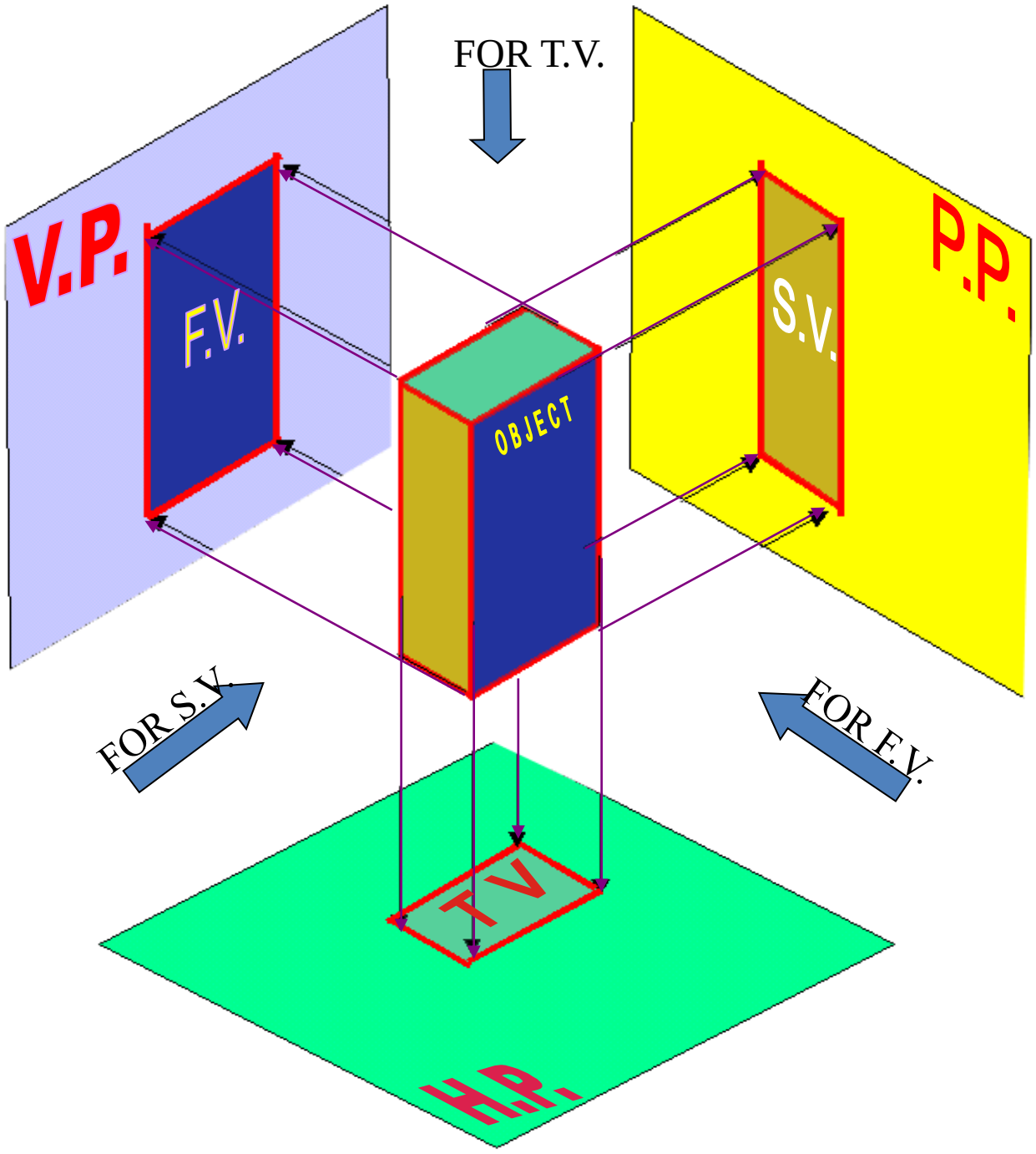
FIRST ANGLE PROJECTION

IN THIS METHOD,
THE OBJECT IS ASSUMED TO BE SITUATED IN FIRST QUADRANT
MEANS
ABOVE HP & INFRONT OF VP.

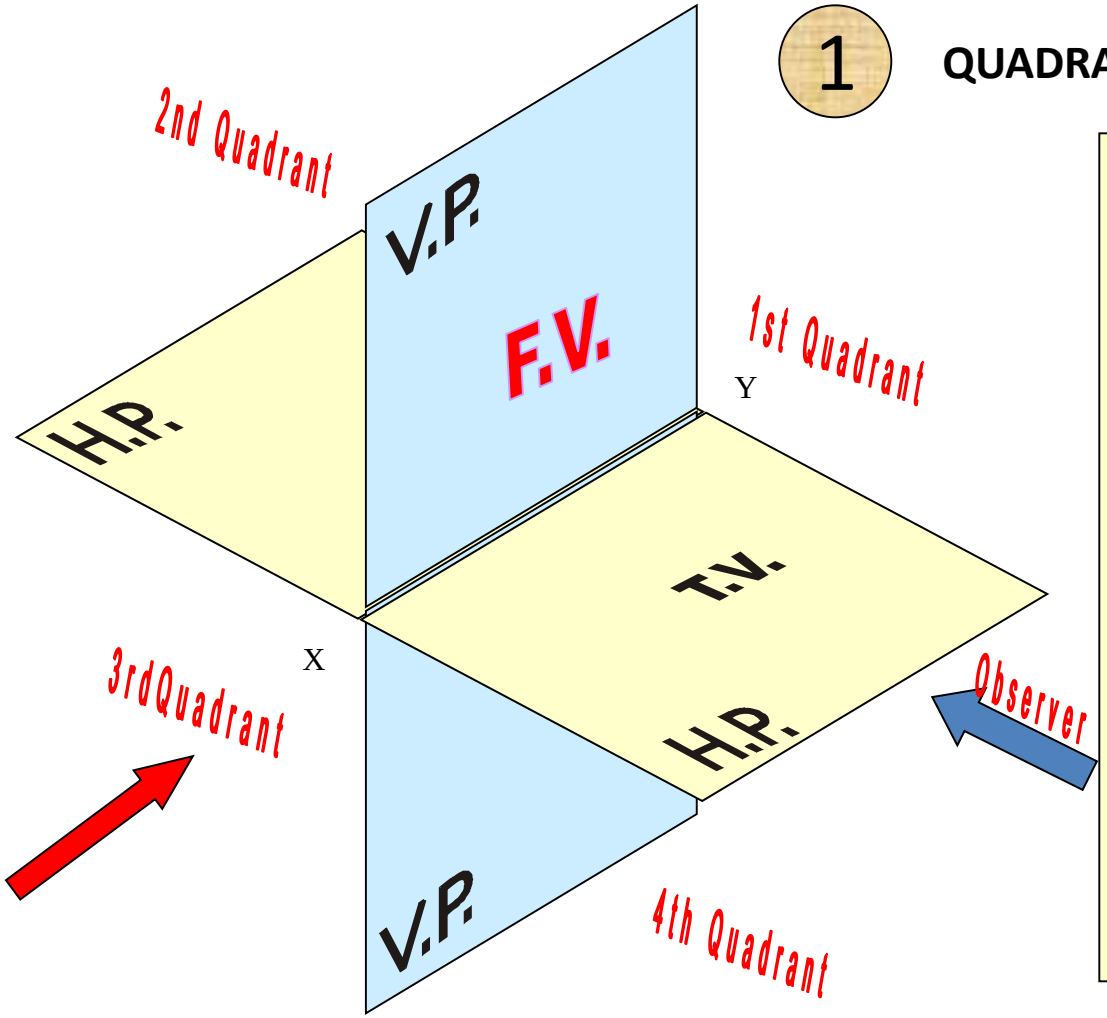
OBJECT IS INBETWEEN OBSERVER & PLANE.

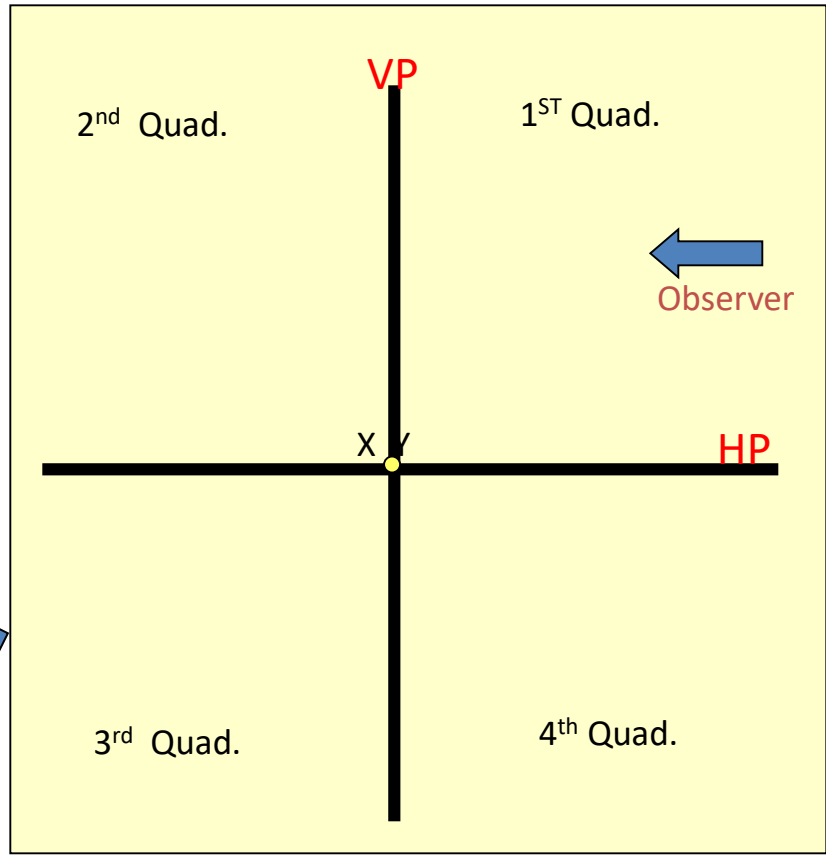


ACTUAL PATTERN OF PLANES & VIEWS
IN
FIRST ANGLE METHOD
OF PROJECTIONS

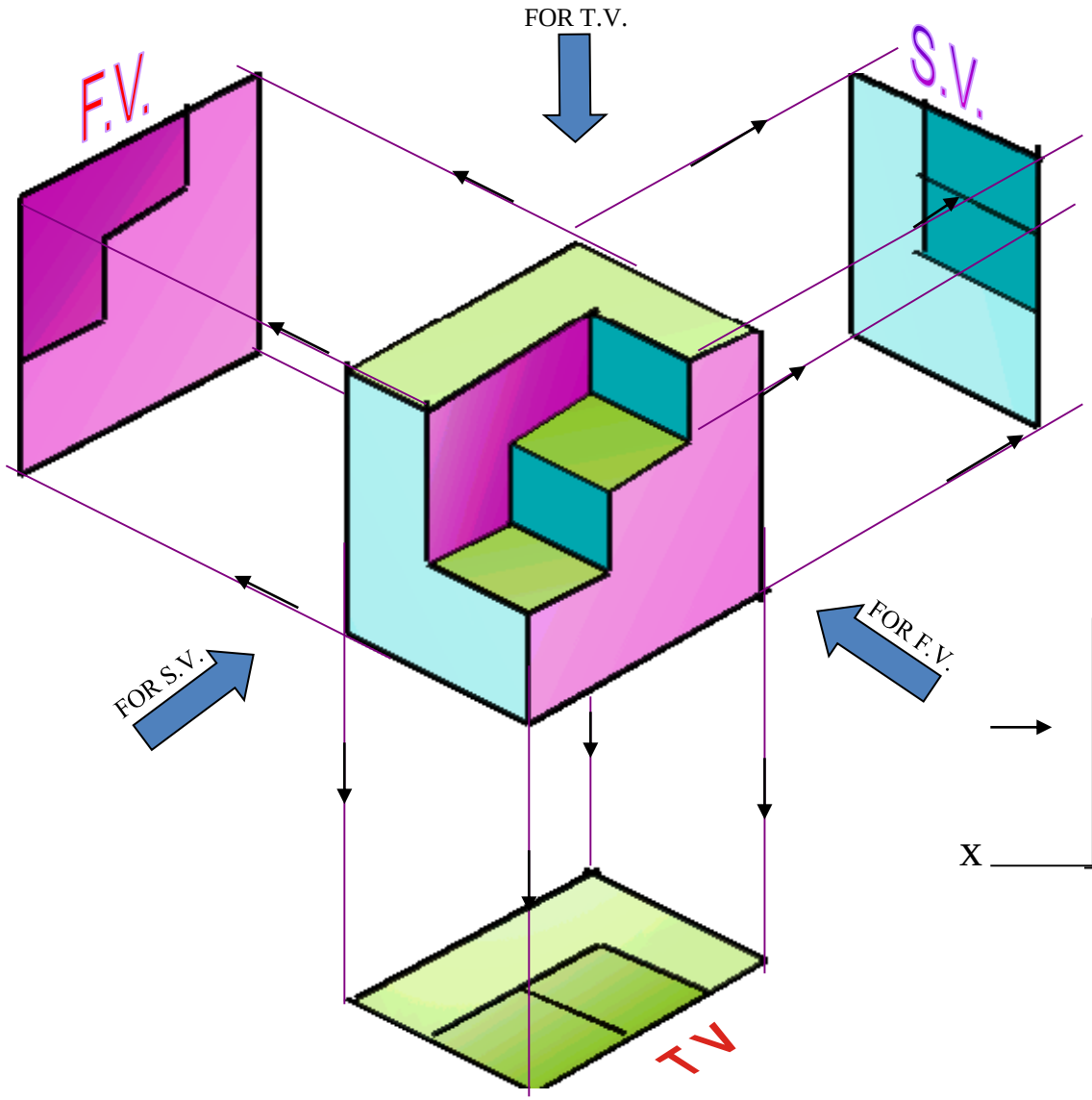


1 QUADRANT SYSTEM

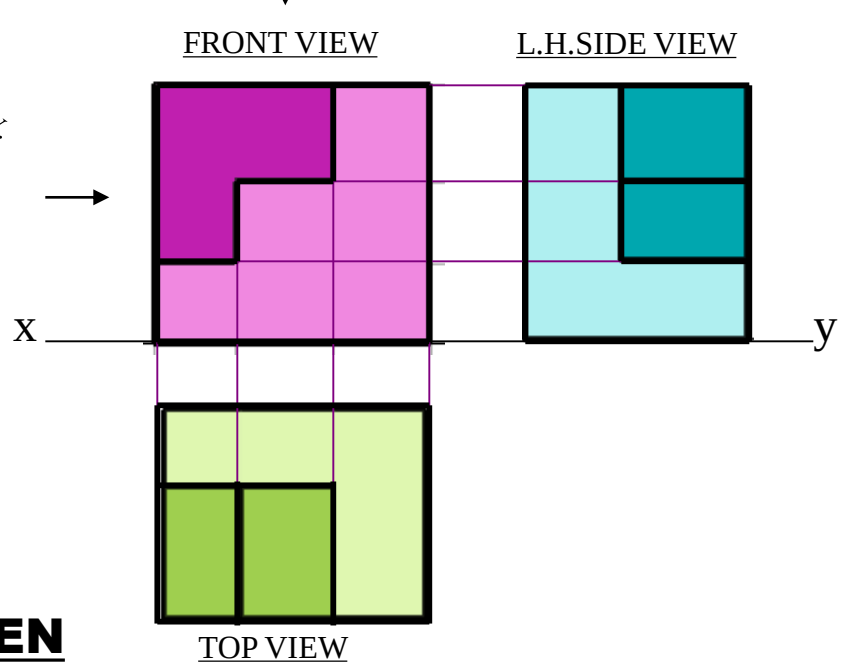




THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECTION)
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND HENCE,
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION PROPERLLY.



ORTHOGRAPHIC PROJECTIONS OF OBJECT



PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

ORTHOGRAPHIC PROJECTIONS

OF POINTS, LINES, PLANES, AND SOLIDS.

TO DRAW PROJECTIONS OF ANY OBJECT,
ONE MUST HAVE FOLLOWING INFORMATION

A) OBJECT

{ WITH IT'S DESCRIPTION, WELL DEFINED.}

B) OBSERVER

{ ALWAYS OBSERVING PERPENDICULAR TO RESP. REF.PLANE}.

C) LOCATION OF OBJECT,

{ MEANS IT'S POSITION WITH REFFERENCE TO H.P. & V.P.}

TERMS 'ABOVE' & 'BELOW' WITH RESPECTIVE TO H.P.
AND TERMS 'INFRONT' & 'BEHIND' WITH RESPECTIVE TO V.P
FORM 4 QUADRANTS.
OBJECTS CAN BE PLACED IN ANY ONE OF THESE 4 QUADRANTS.
IT IS INTERESTING TO LEARN THE EFFECT ON THE POSITIONS OF VIEWS (FV, TV)
OF THE OBJECT WITH RESP. TO X-Y LINE, WHEN PLACED IN DIFFERENT QUADRANTS.

STUDY ILLUSTRATIONS GIVEN ON HEXT PAGES AND NOTE THE RESULTS.TO MAKE IT EASY
HERE A POINT A IS TAKEN AS AN OBJECT. BECAUSE IT'S ALL VIEWS ARE JUST POINTS.

NOTATIONS

FOLLOWING NOTATIONS SHOULD BE FOLLOWED WHILE NAMING DIFFERENT VIEWS IN ORTHOGRAPHIC PROJECTIONS.

OBJECT	POINT A	LINE AB
IT'S TOP VIEW	a	a b
IT'S FRONT VIEW	a'	a' b'
IT'S SIDE VIEW	a"	a" b"

SAME SYSTEM OF NOTATIONS SHOULD BE FOLLOWED INCASE NUMBERS, LIKE 1, 2, 3 – ARE USED.

PROJECTION OF POINTS

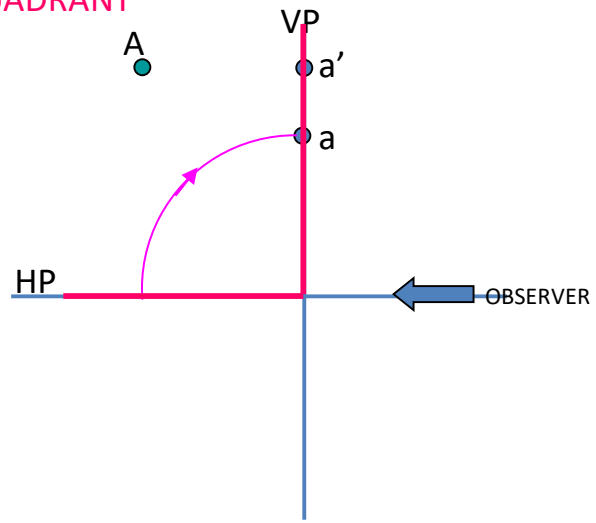
- Point is a dimensionless. It has no Length, Breadth and Height.

PROJECTION OF POINTS IN DIFFERENT QUADRANTS

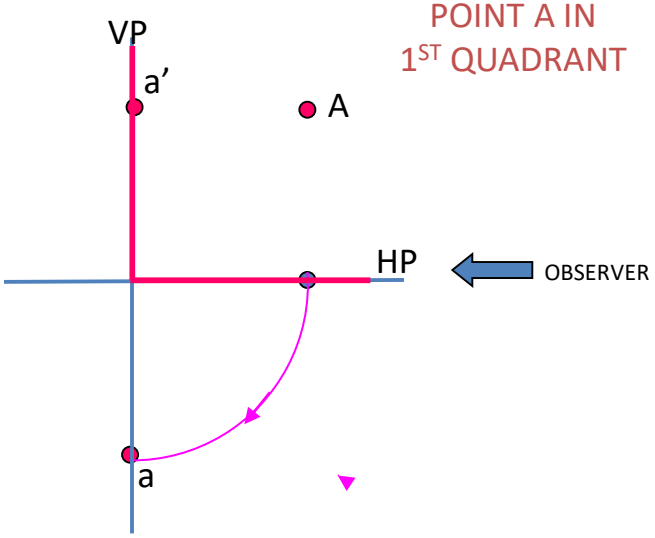
Point A is Placed In different quadrants and it's FV & TV are brought in same plane for Observer to see clearly. FV is visible as it is a view on VP. But as TV is a view on Hp, it is rotated downward 90^0, In clockwise direction. The In front part of Hp comes below XY line and the part behind VP comes above.

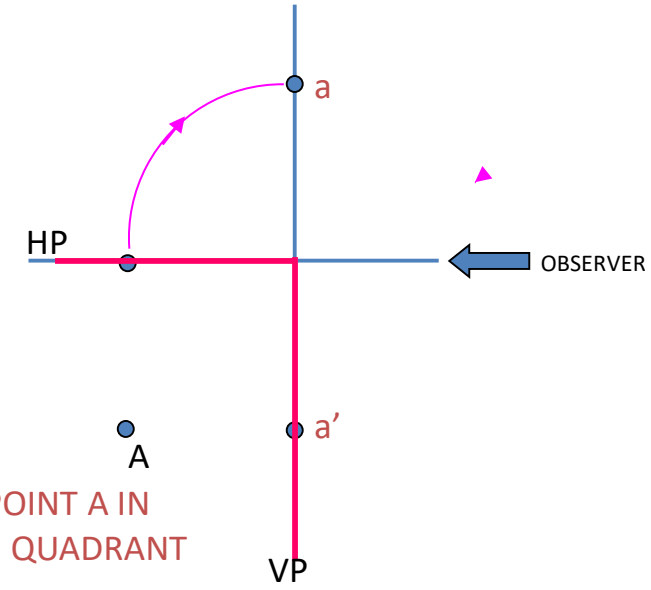
Observe and note the process.

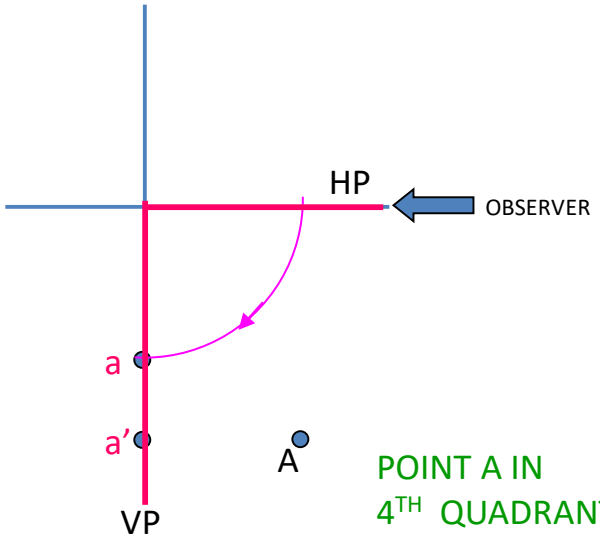
POINT A IN 2ND QUADRANT



POINT A IN 1ST QUADRANT

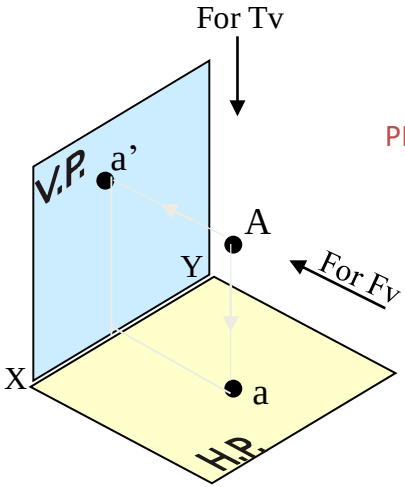






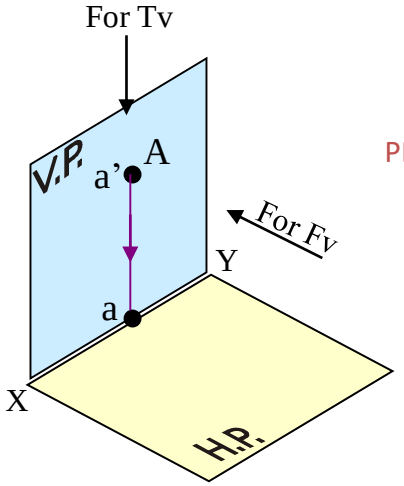
PROJECTIONS OF A POINT IN FIRST QUADRANT.

POINT A ABOVE HP & INFRONT OF VP



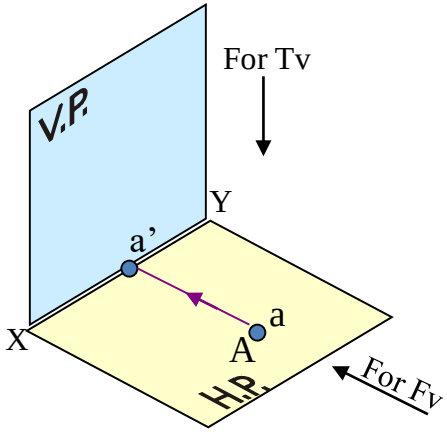
PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP



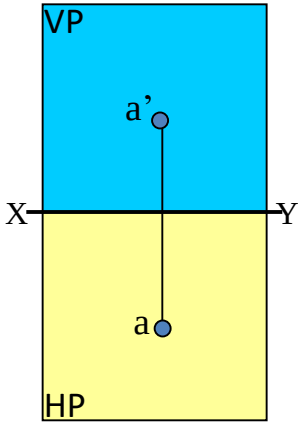
PICTORIAL PRESENTATION

POINT A IN HP & INFRONT OF VP

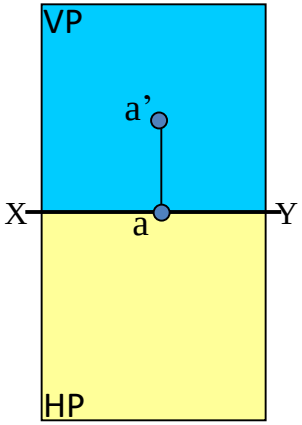


ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

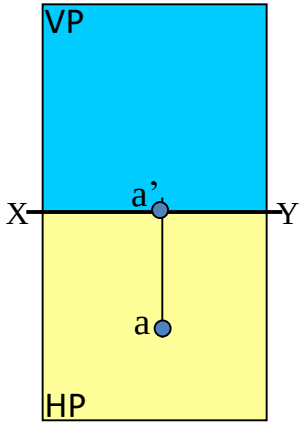
Fv above xy, Tv below xy.



Fv above xy, Tv on xy.



Fv on xy, Tv below xy.



Different Problems of Projection of Points

Thank You

ISOMETRIC PROJECTIONS

ISOMETRIC DRAWING

IT IS A TYPE OF PICTORIAL PROJECTION IN WHICH ALL THREE DIMENSIONS OF AN OBJECT ARE SHOWN IN ONE VIEW AND IF REQUIRED, THEIR ACTUAL SIZES CAN BE MEASURED DIRECTLY FROM IT.

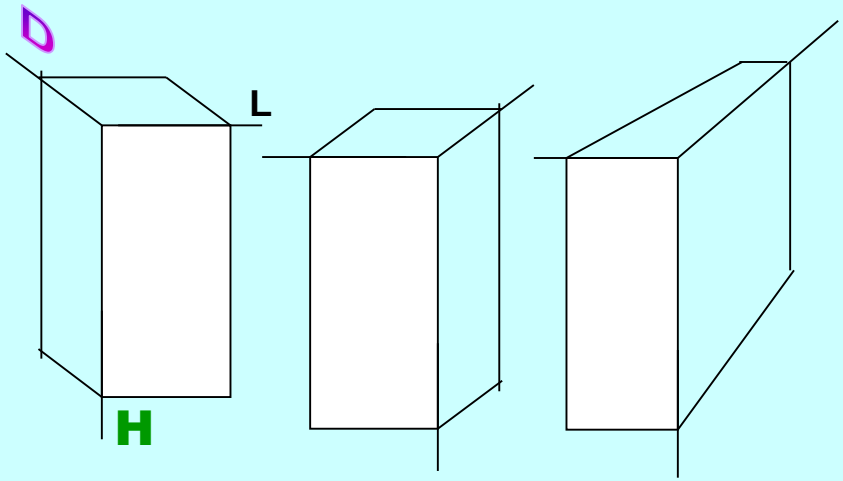
ISOMETRIC PROJECTIONS

IN THIS 3-D DRAWING OF AN OBJECT, ALL THREE DIMENSIONAL AXES ARE MENTAINED AT EQUAL INCLINATIONS WITH EACH OTHER.(120^0)

3-D DRAWINGS CAN BE DRAWN IN NUMEROUS WAYS AS SHOWN BELOW. ALL THESE DRAWINGS MAY BE CALLED

3-DIMENSIONAL DRAWINGS, OR PHOTOGRAPHIC OR PICTORIAL DRAWINGS.

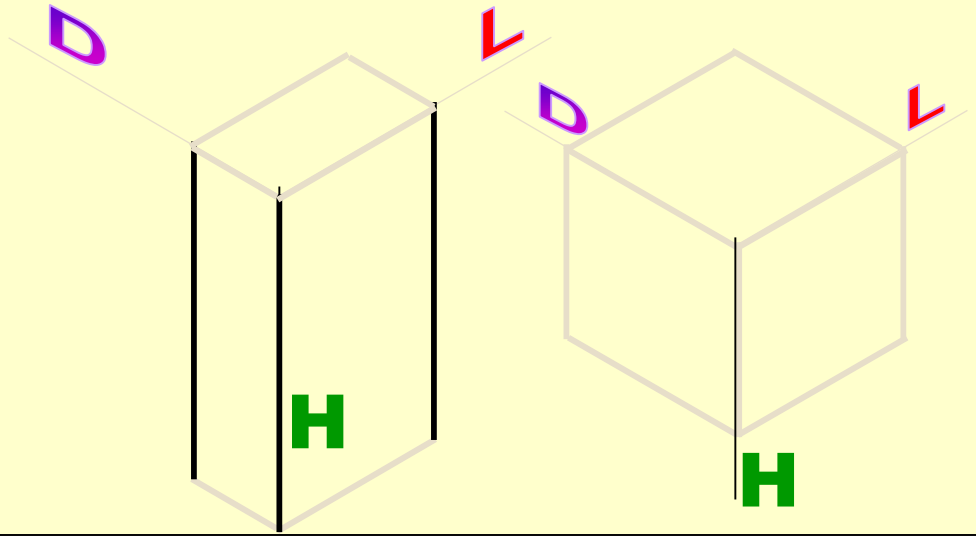
HERE NO SPECIFIC RELATION AMONG H, L & D AXES IS MENTAINED.



NOW OBSERVE BELOW GIVEN DRAWINGS. ONE CAN NOTE SPECIFIC INCLINATION AMONG H, L & D AXES.

ISO MEANS SAME, SIMILAR OR EQUAL.

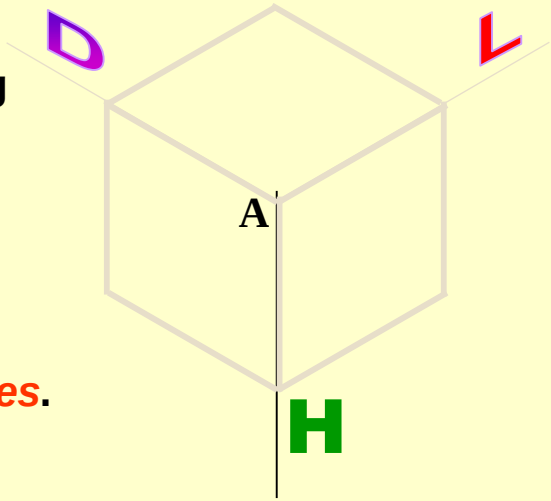
HERE ONE CAN FIND EDUAL INCLINATION AMONG H, L & D AXES. EACH IS 120^0 INCLINED WITH OTHER TWO. HENCE IT IS CALLED ISOMETRIC DRAWING



PURPOSE OF ISOMETRIC DRAWING IS TO UNDERSTAND OVERALL SHAPE, SIZE & APPEARANCE OF AN OBJECT PRIOR TO IT'S PRODUCTION.

SOME IMPORTANT TERMS:

ISOMETRIC AXES, LINES AND PLANES:



The three lines AL, AD and AH, meeting at point A and making 120^0 angles with each other are termed *Isometric Axes.*

The lines parallel to these axes are called *Isometric Lines*.

The planes representing the faces of of the cube as well as other planes parallel to these planes are called *Isometric Planes*.

ISOMETRIC SCALE:

When one holds the object in such a way that all three dimensions are visible then in the process all dimensions become proportionally inclined to observer's eye sight and hence appear apparent in lengths.

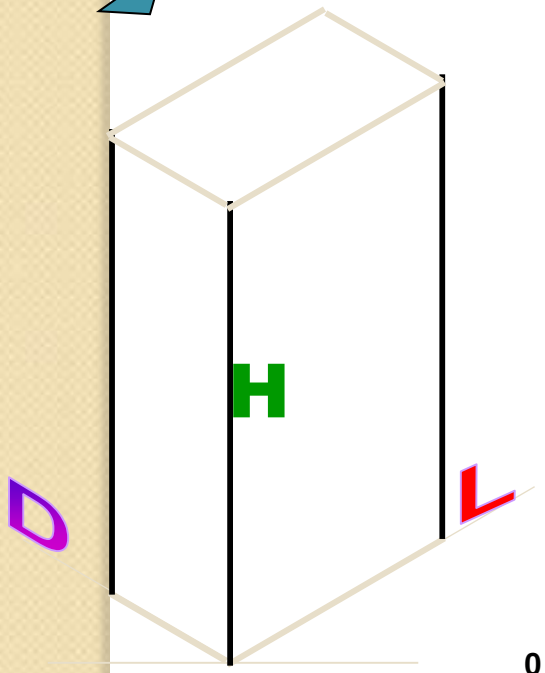
This reduction is 0.815 or 9 / 11 (approx.) It forms a reducing scale which Is used to draw isometric drawings and is called *Isometric scale.*

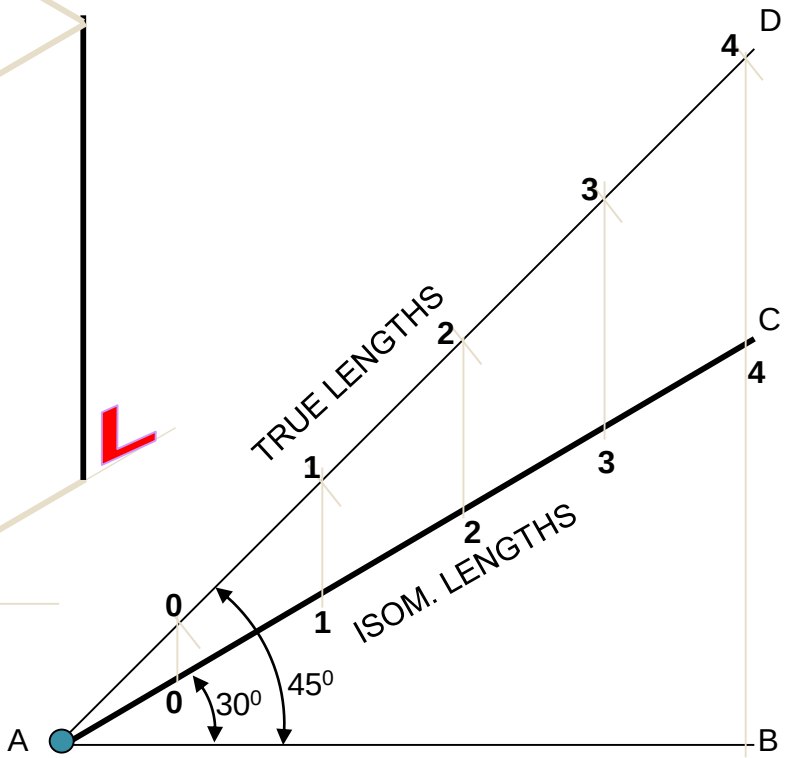
In practice, while drawing isometric projection, it is necessary to convert true lengths into isometric lengths for measuring and marking the sizes. This is conveniently done by constructing an isometric scale as described on next page.

TYPES OF ISOMETRIC DRAWINGS

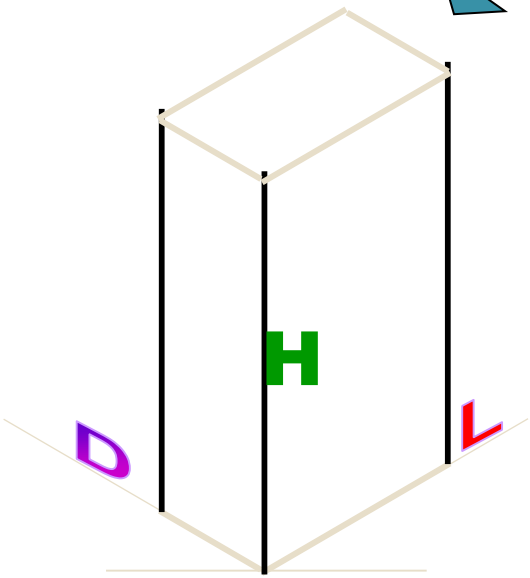
ISOMETRIC VIEW/DRAWING
Drawn by using True scale
(True dimensions)

ISOMETRIC PROJECTION
Drawn by using Isometric scale
(Reduced dimensions)





Isometric scale [Line AC]
required for Isometric Projection



CONSTRUCTION OF ISOM.SCALE.
From point A, with line AB draw 30^0 and 45^0 inclined lines AC & AD resp on AD. Mark divisions of true length and from each division-point draw vertical lines upto AC line.
The divisions thus obtained on AC give lengths on isometric scale.

1

ISOMETRIC OF PLANE FIGURES

AS THESE ALL ARE 2-D FIGURES WE REQUIRE ONLY TWO ISOMETRIC AXES.

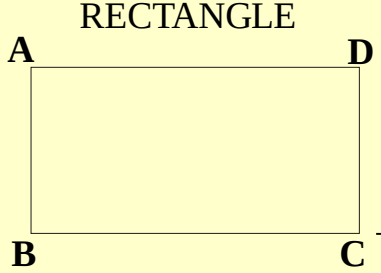
IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

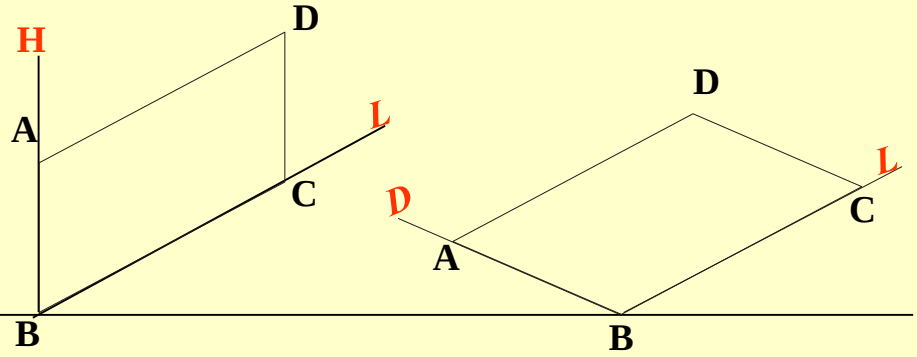
IF THE FIGURE IS TOP VIEW, D & L AXES ARE REQUIRED.

Shapes containing Inclined lines should be enclosed in a rectangle as shown. Then first draw isom. of that rectangle and then inscribe that shape as it is.

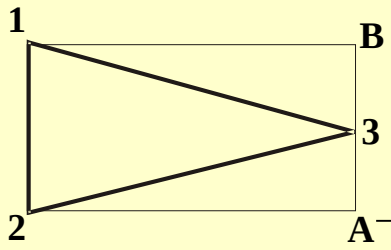
SHAPE	Isometric view if the Shape is F.V. or T.V.

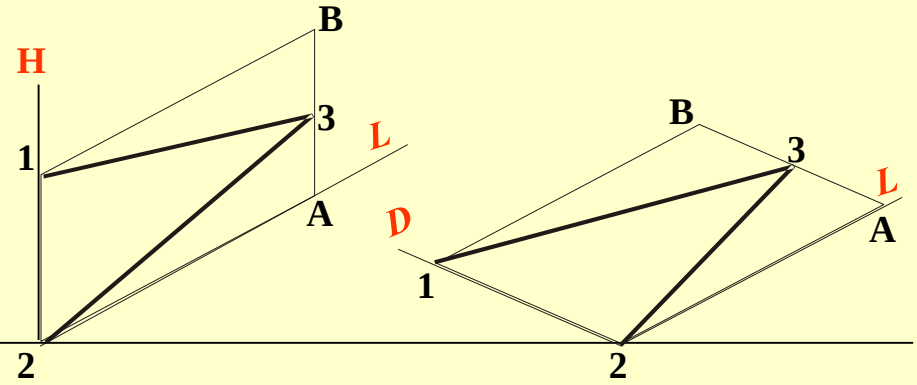
RECTANGLE



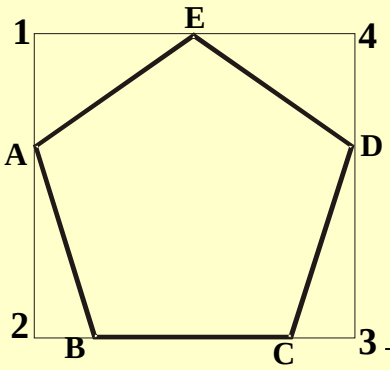


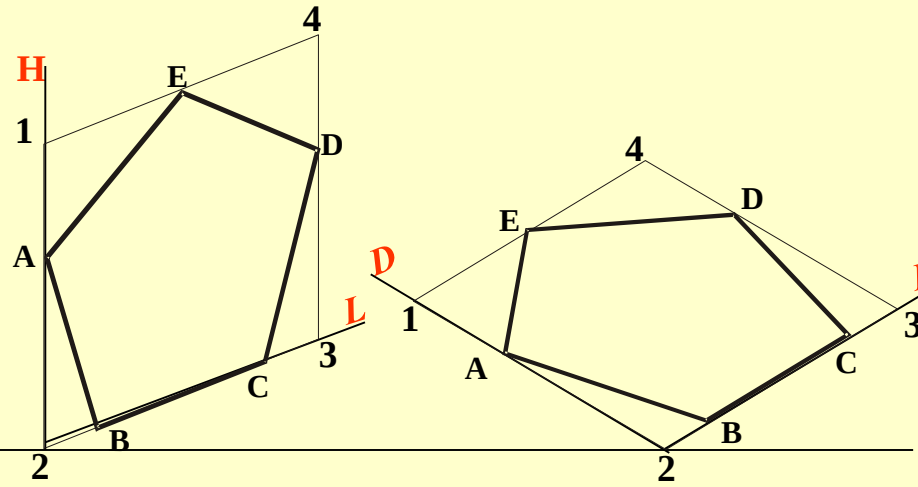
TRIANGLE



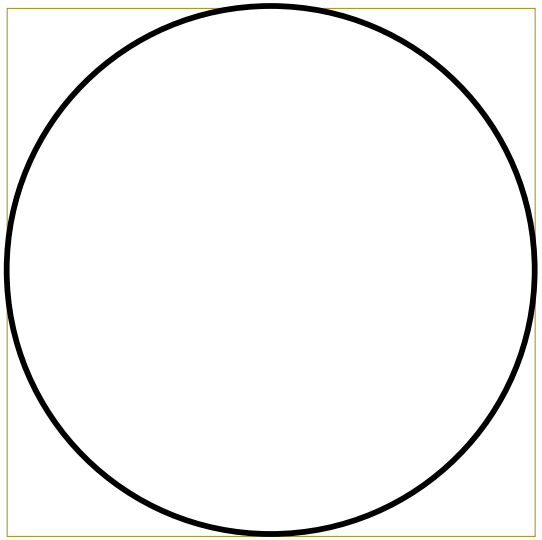


PENTAGON

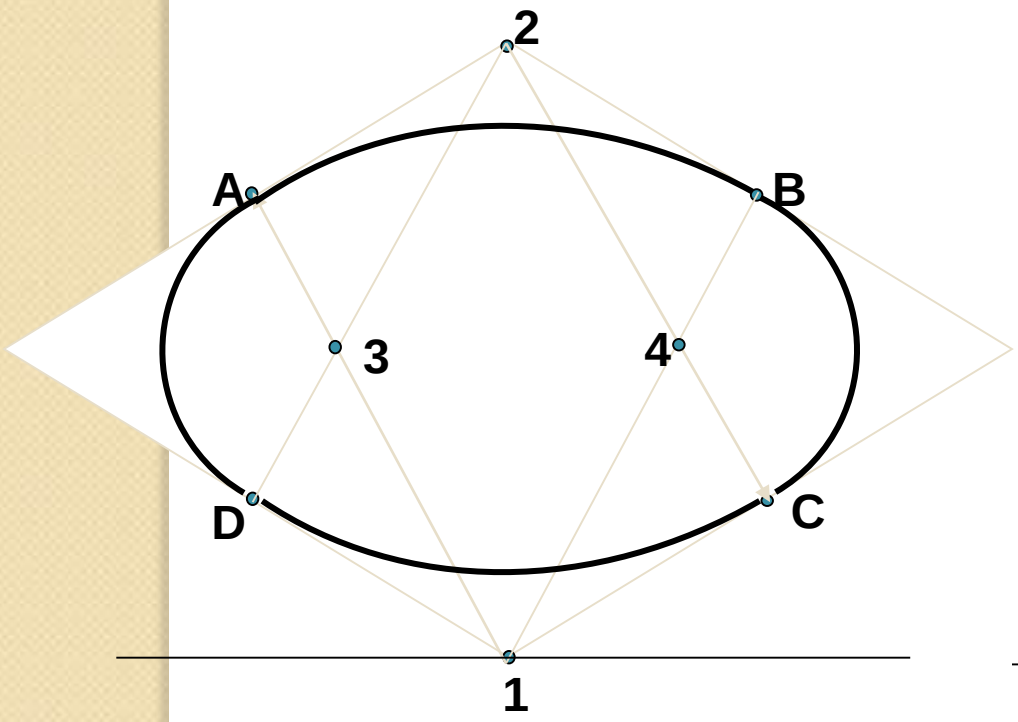


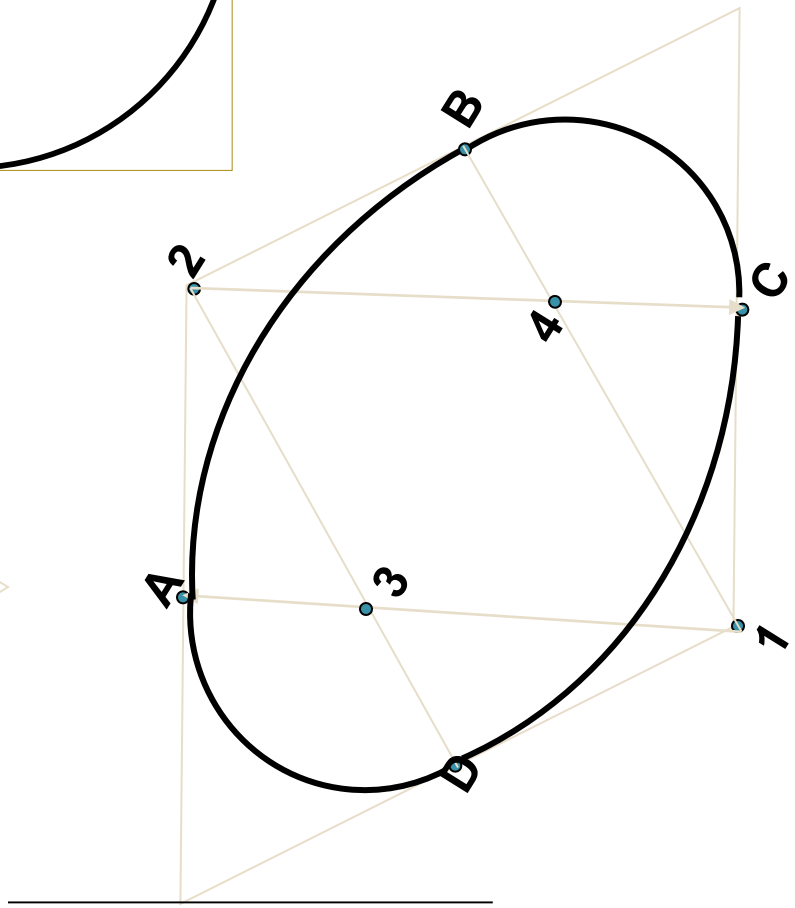


DRAW ISOMETRIC VIEW OF A CIRCLE IF IT IS A TV OR FV.



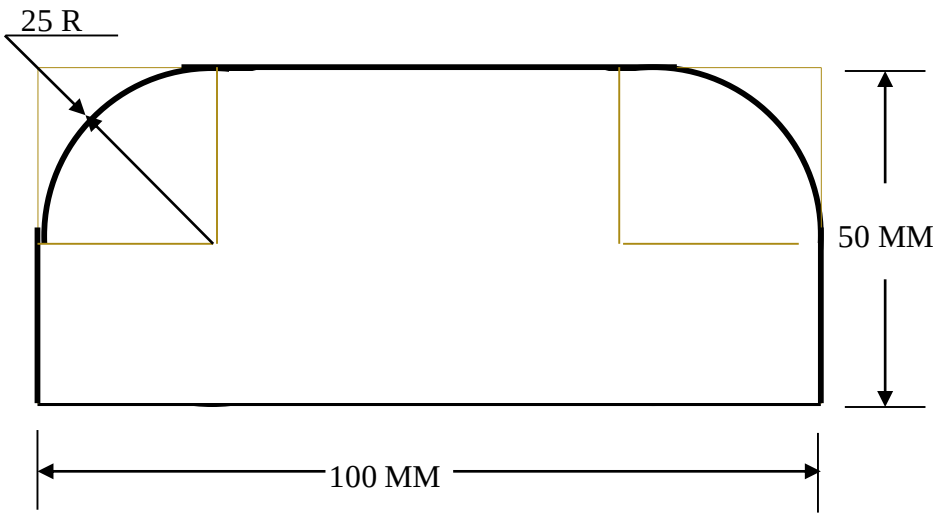
FIRST ENCLOSE IT IN A SQUARE.
IT'S ISOMETRIC IS A RHOMBUS WITH D & L AXES FOR TOP VIEW.
THEN USE H & L AXES FOR ISOMETRIC WHEN IT IS FRONT VIEW.
FOR CONSTRUCTION USE RHOMBUS METHOD SHOWN HERE. STUDY IT.



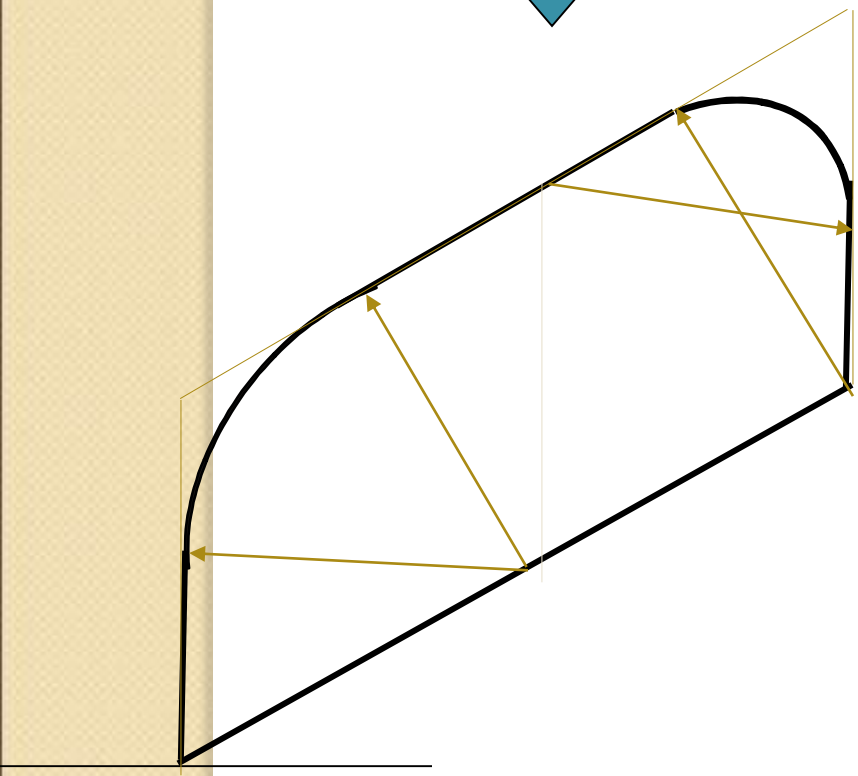


STUDY ILLUSTRATIONS

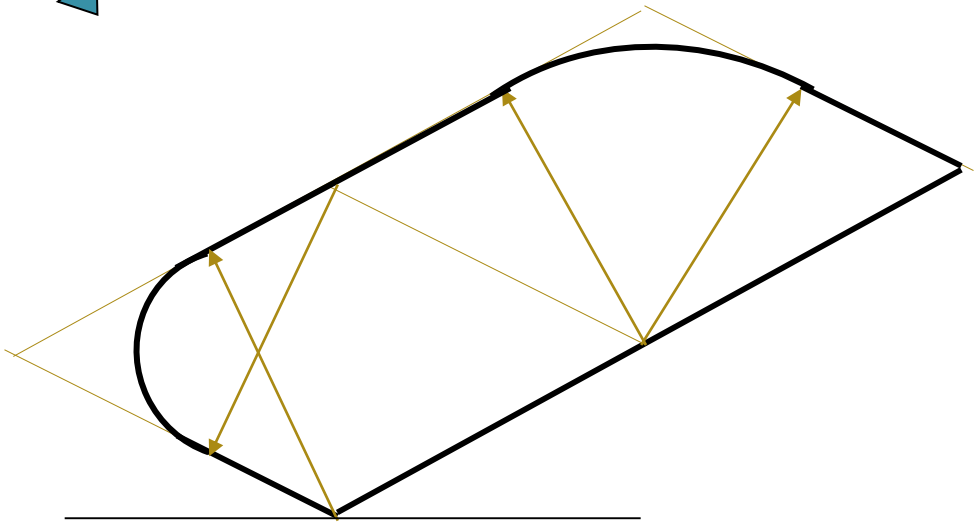
DRAW ISOMETRIC VIEW OF THE FIGURE SHOWN WITH DIMENTIONS (ON RIGHT SIDE) CONSIDERING IT FIRST AS F.V. AND THEN T.V.



IF FRONT VIEW



IF TOP VIEW



ISOMETRIC OF PLANE FIGURES

AS THESE ALL ARE 2-D FIGURES WE REQUIRE ONLY TWO ISOMETRIC AXES.

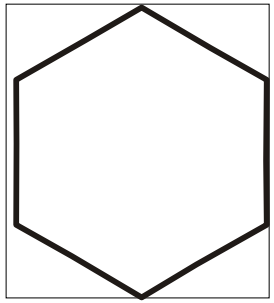
IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

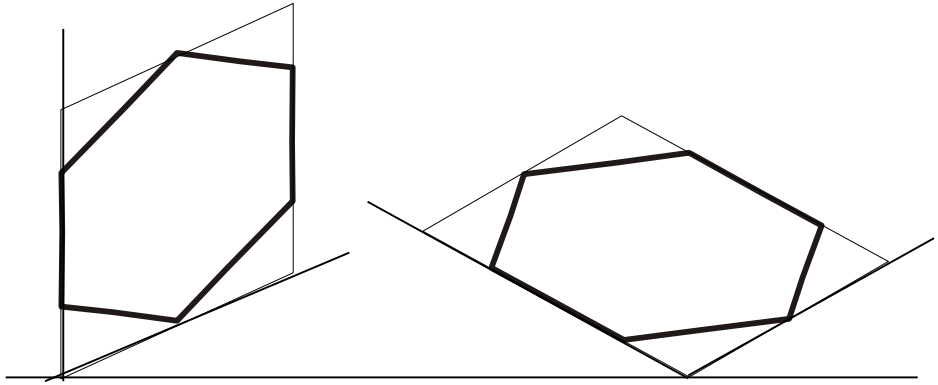
IF THE FIGURE IS TOP VIEW, D & L AXES ARE REQUIRED.

For Isometric of Circle/Semicircle use Rhombus method. Construct it of sides equal to diameter of circle always. (Ref. Previous two pages.)

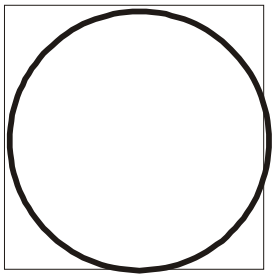
SHAPE	IF F.V.	IF T.V.

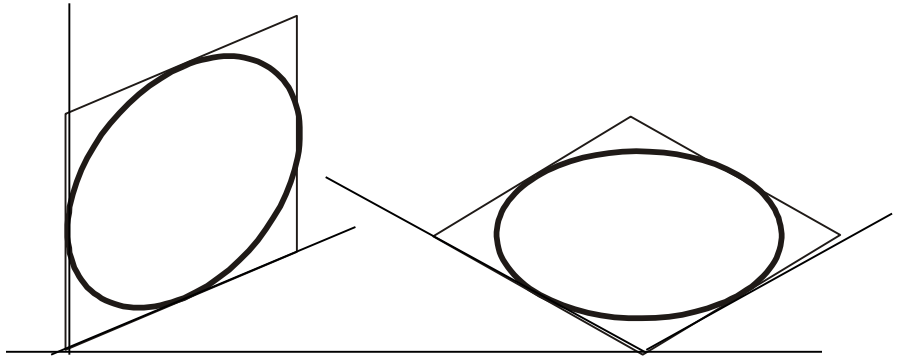
HEXAGON





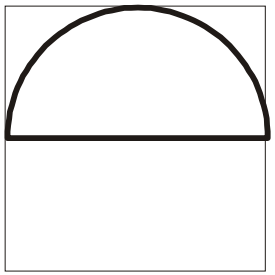
CIRCLE

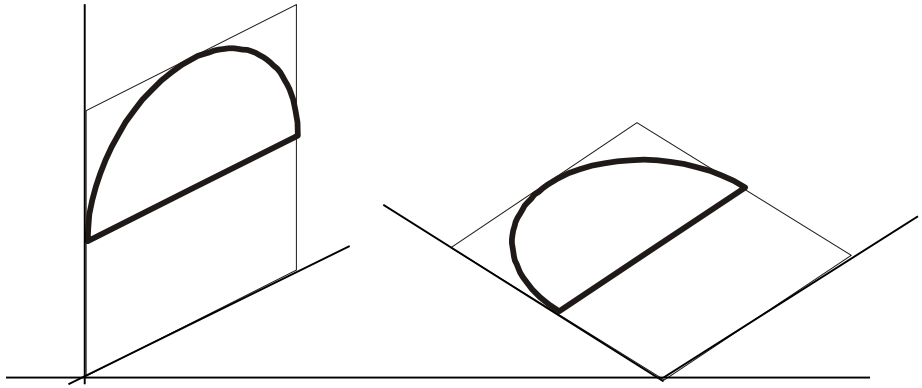




For Isometric of Circle/Semicircle use* Rhombus method.** ***Construct Rhombus of sides equal to Diameter of circle always. **(Ref. topic ENGG. CURVES.)**

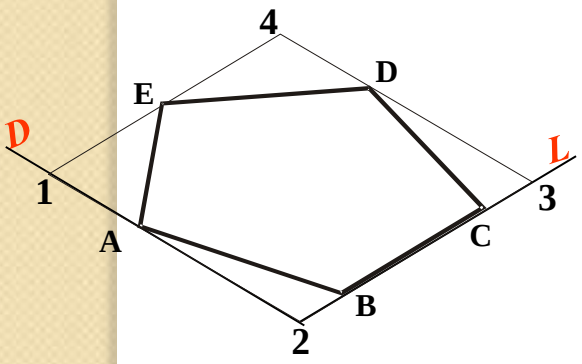
SEMI CIRCLE





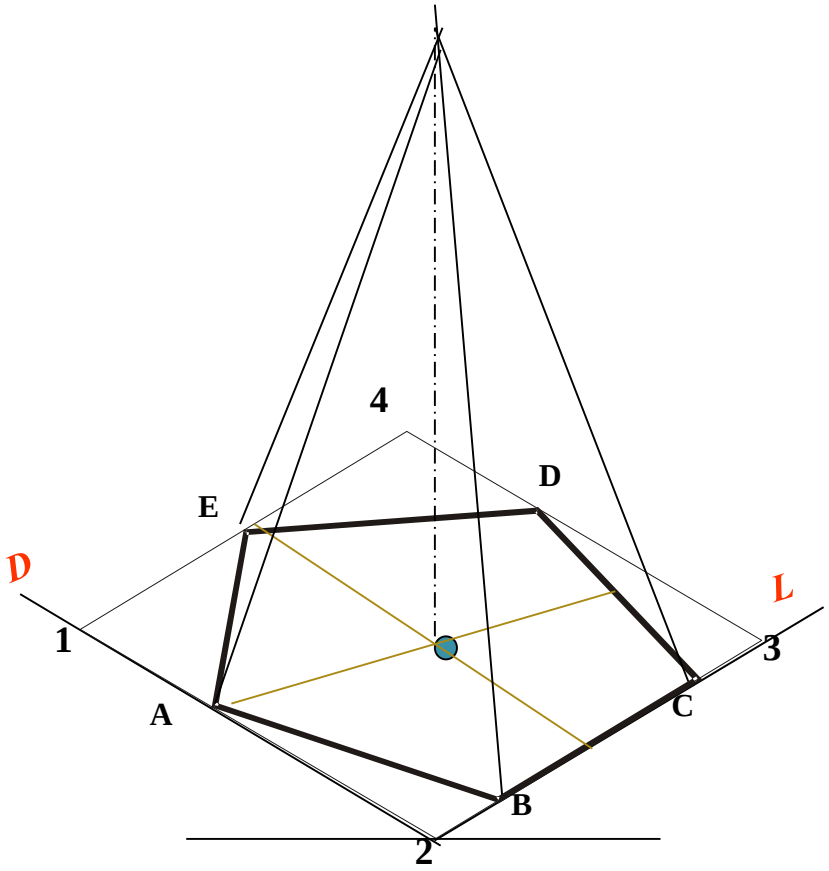
STUDY ILLUSTRATIONS

ISOMETRIC VIEW OF BASE OF PENTAGONAL PYRAMID STANDING ON H.P.

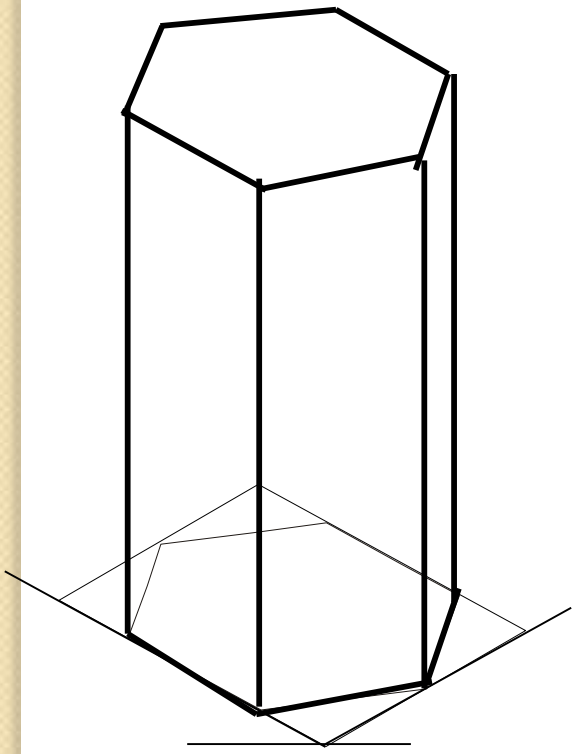


ISOMETRIC VIEW OF PENTAGONAL PYRAMID STANDING ON H.P.

(Height is added from center of pentagon)

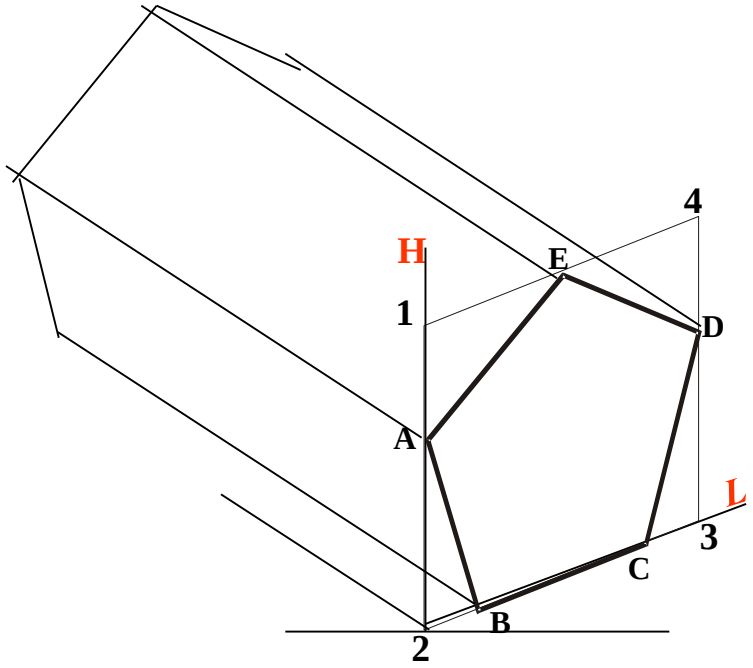


STUDY ILLUSTRATIONS



ISOMETRIC VIEW OF
HEXAGONAL PRISM
STANDING ON H.P.

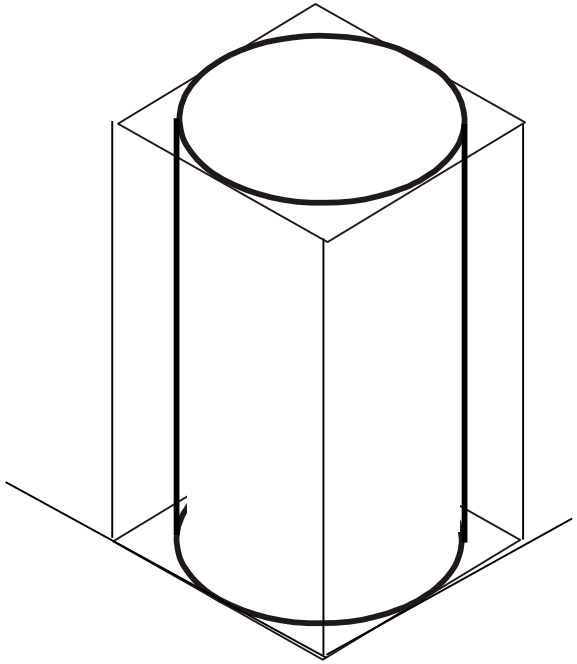
ISOMETRIC VIEW OF
PENTAGONALL PRISM
LYING ON H.P.

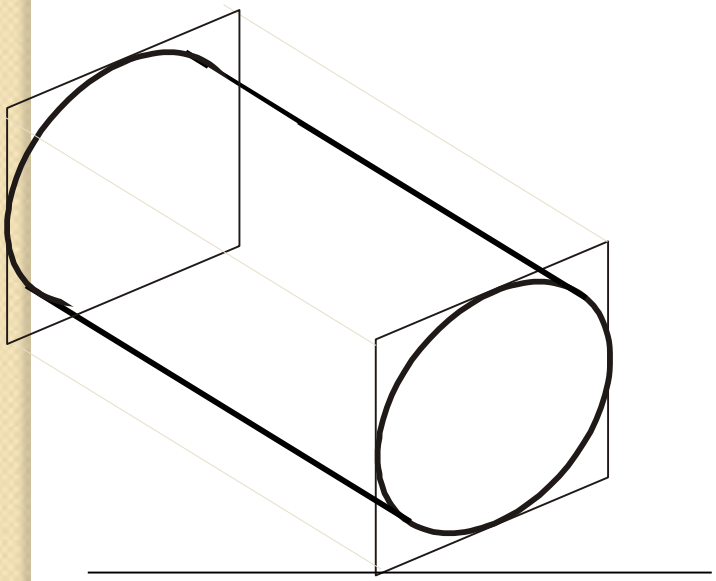


STUDY ILLUSTRATIONS

Z

CYLINDER STANDING ON H.P.



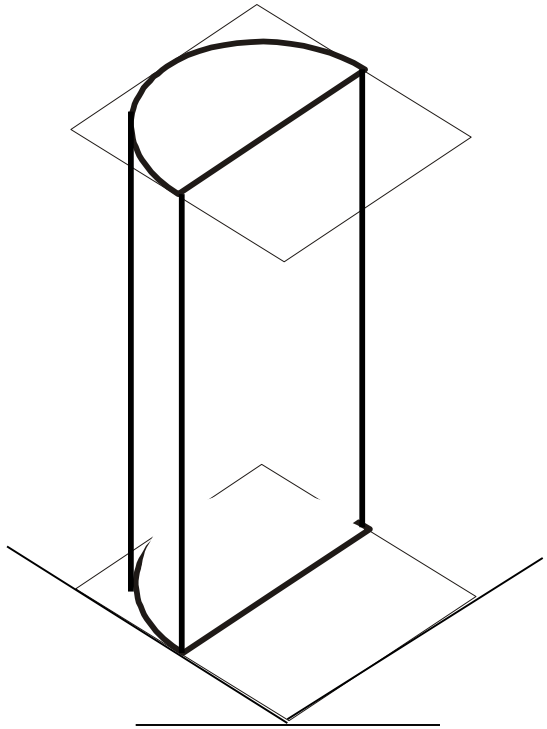


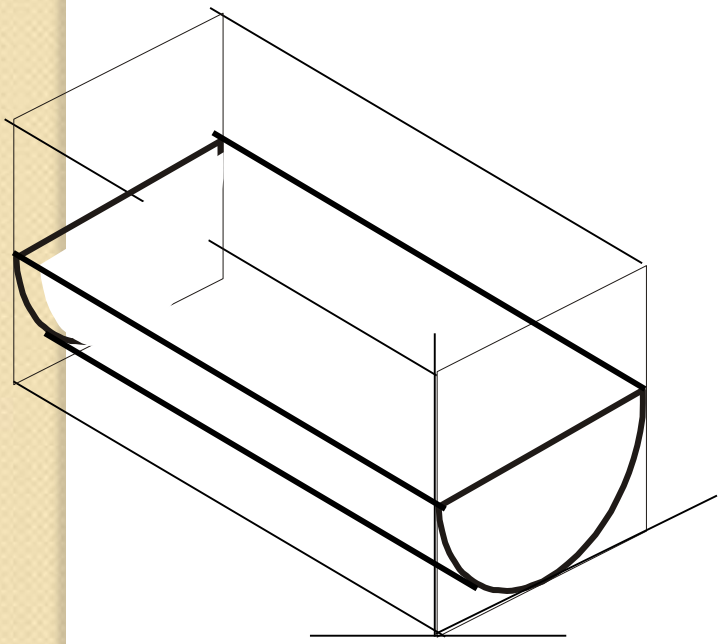
CYLINDER LYING ON H.P.

STUDY ILLUSTRATIONS

Z

HALF CYLINDER STANDING ON H.P.
(ON IT'S SEMICIRCULAR BASE)

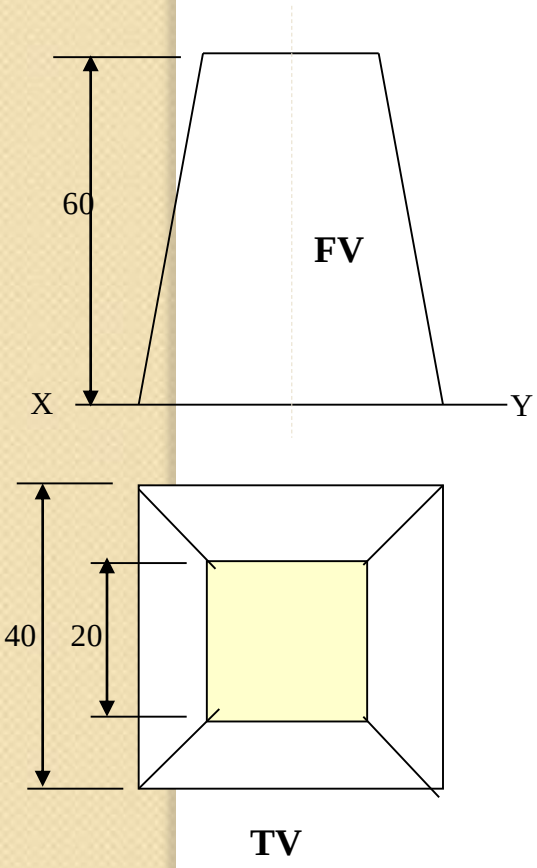


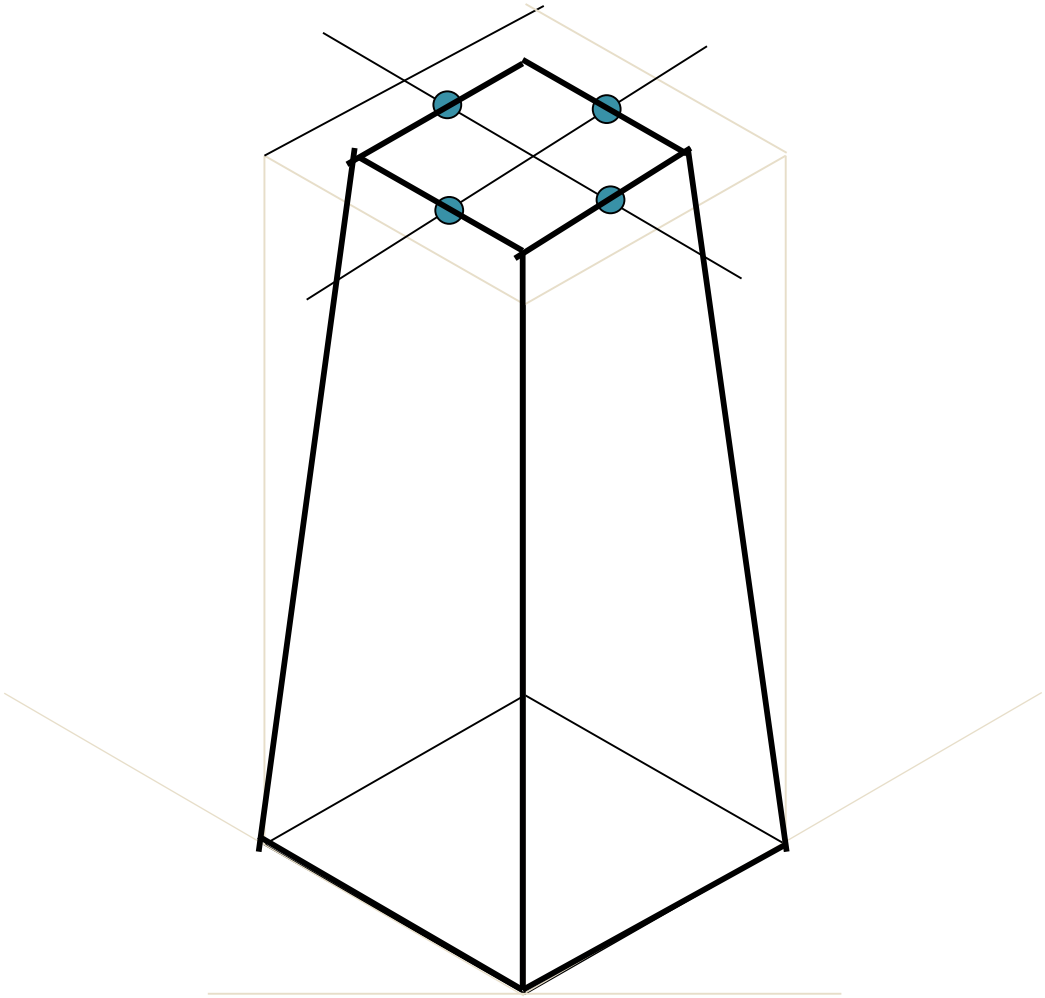


HALF CYLINDER LYING ON H.P.
(with flat face // to H.P.)

STUDY ILLUSTRATIONS

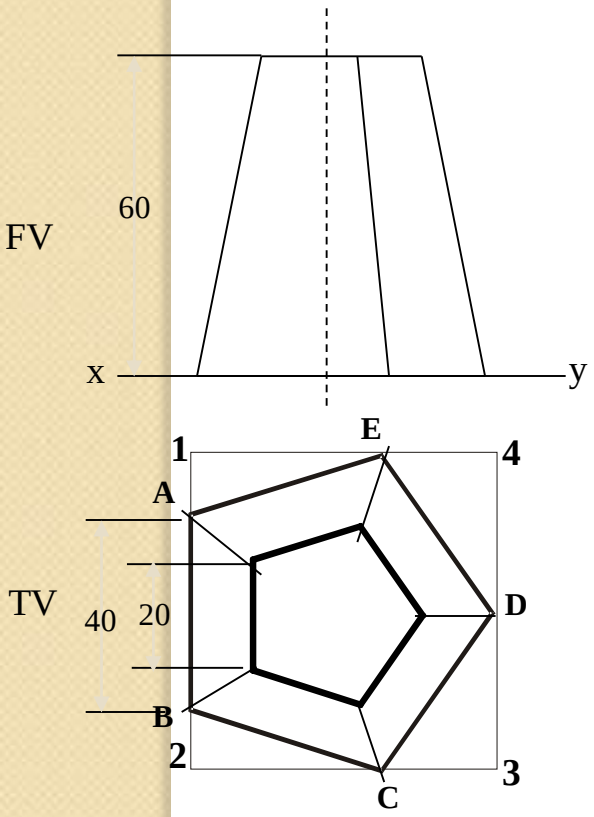
ISOMETRIC VIEW OF
A FRUSTOM OF SQUARE PYRAMID
STANDING ON H.P. ON IT'S LARGER BASE.





STUDY ILLUSTRATION

PROJECTIONS OF FRUSTOM OF PENTAGONAL PYRAMID ARE GIVEN. DRAW IT'S ISOMETRIC VIEW.



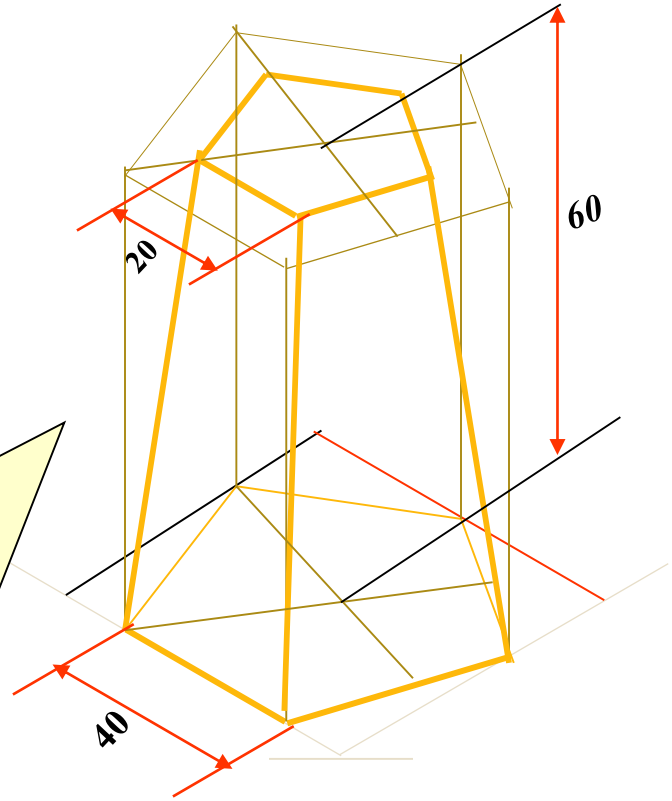
SOLUTION STEPS:

FIRST DRAW ISOMETRIC OF IT'S BASE.

THEN DRAWSAME SHAPE AS TOP, 60 MM ABOVE THE BASE PENTAGON CENTER.

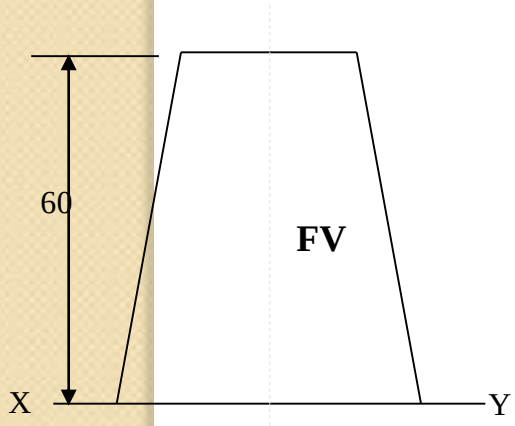
THEN REDUCE THE TOP TO 20 MM SIDES AND JOIN WITH THE PROPER BASE CORNERS.

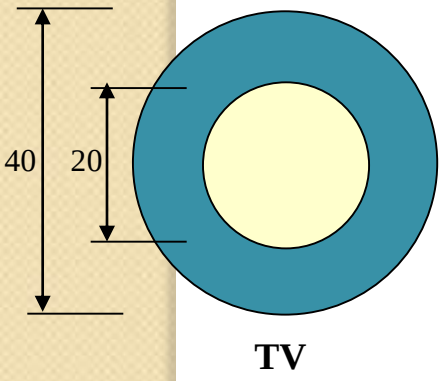
ISOMETRIC VIEW OF FRUSTOM OF PENTAGONAL PYRAMID

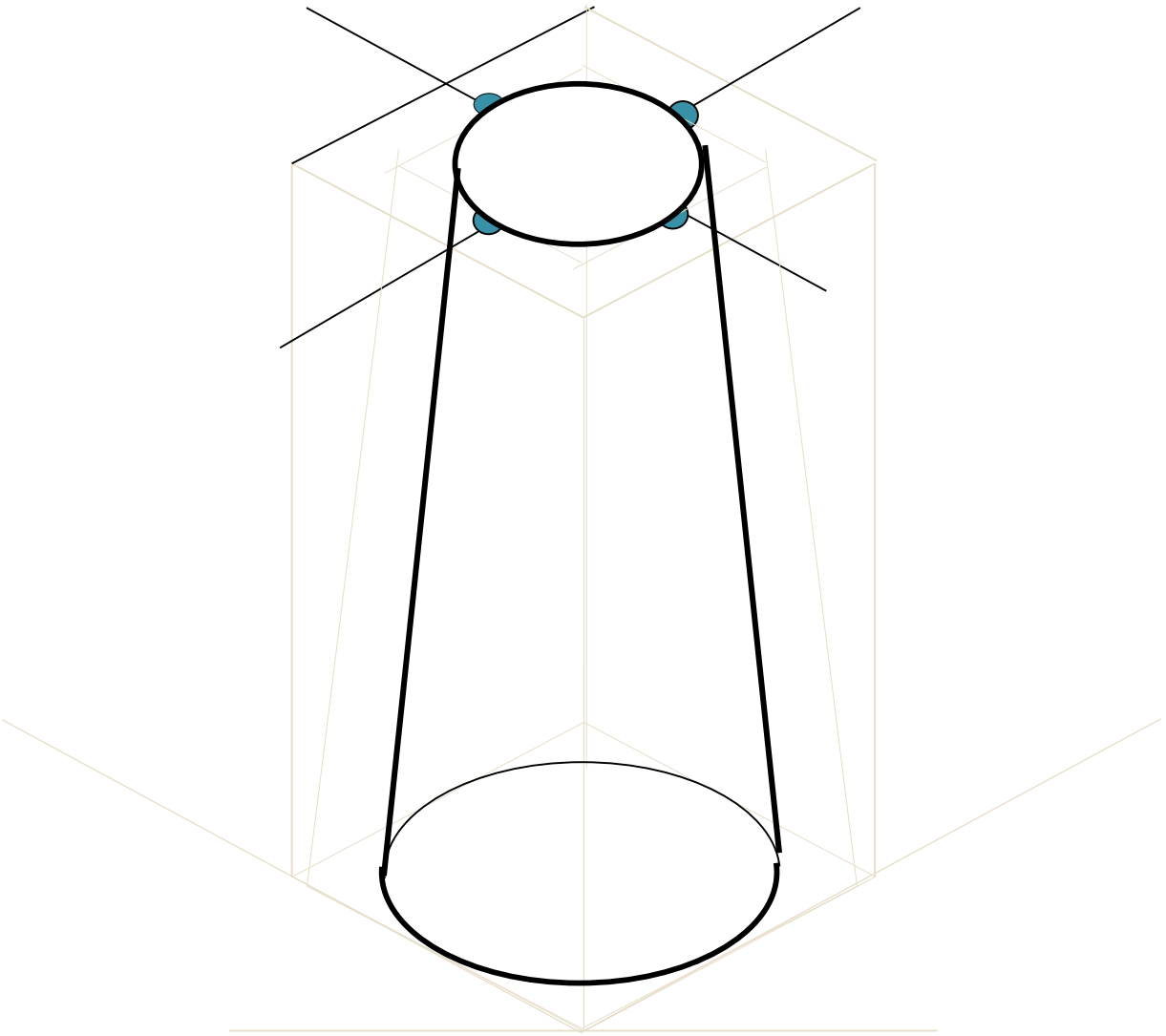


STUDY ILLUSTRATIONS

ISOMETRIC VIEW OF A FRUSTOM OF CONE STANDING ON H.P. ON IT'S LARGER BASE.

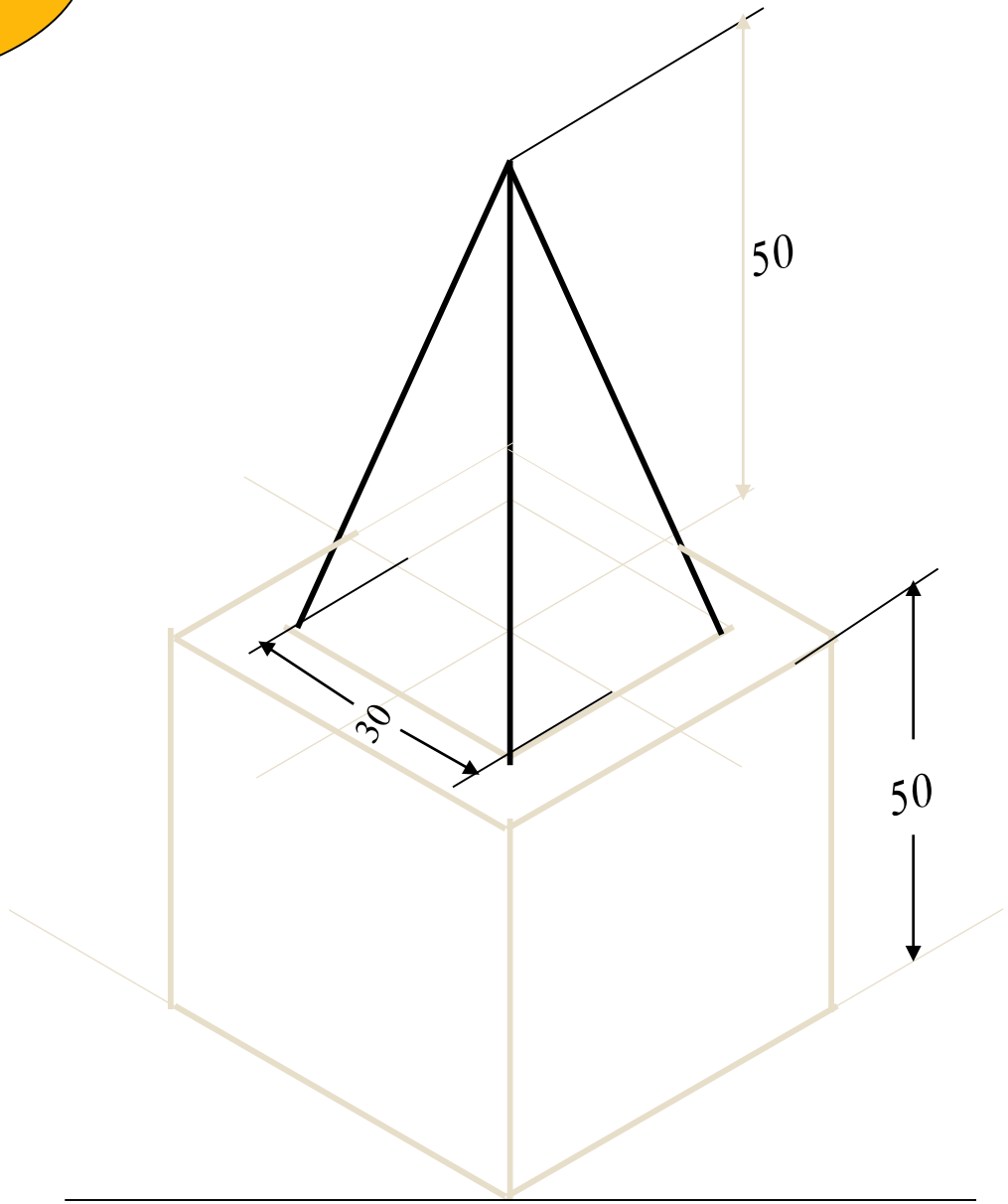






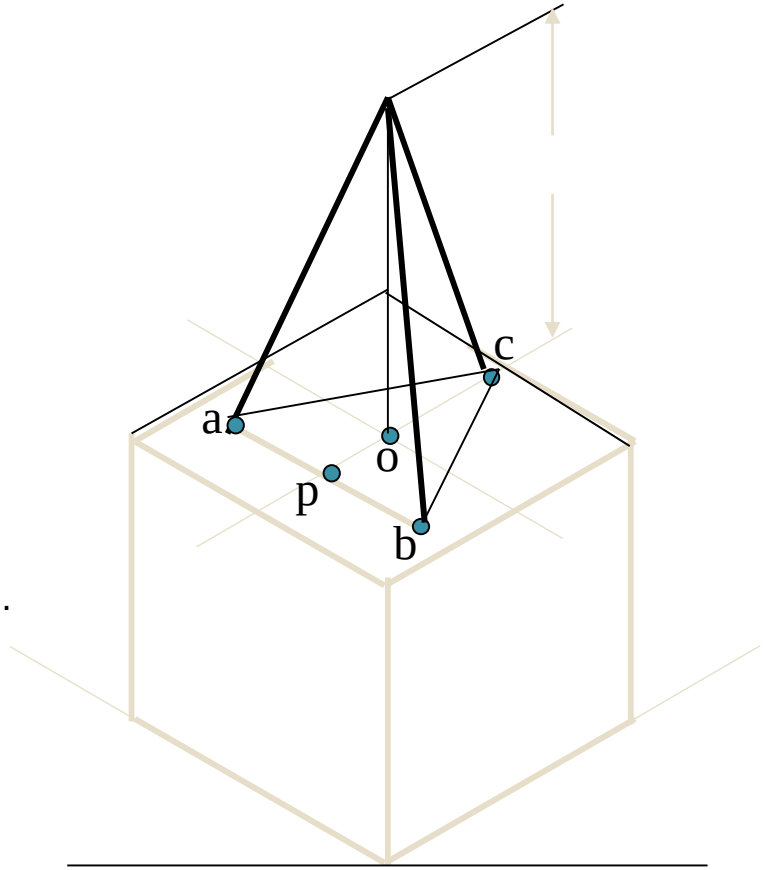
STUDY ILLUSTRATIONS

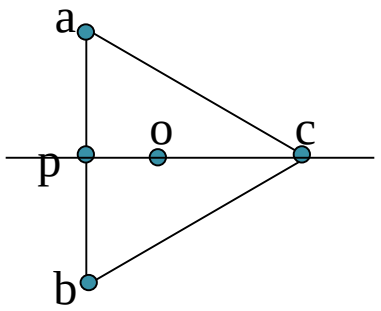
PROBLEM: A SQUARE PYRAMID OF 30 MM BASE SIDES AND 50 MM LONG AXIS, IS CENTRALLY PLACED ON THE TOP OF A CUBE OF 50 MM LONG EDGES.DRAW ISOMETRIC VIEW OF THE PAIR.



STUDY ILLUSTRATIONS

PROBLEM: A TRIANGULAR PYRAMID OF 30 MM BASE SIDES AND 50 MM LONG AXIS, IS CENTRALLY PLACED ON THE TOP OF A CUBE OF 50 MM LONG EDGES.
DRAW ISOMETRIC VIEW OF THE PAIR.





SOLUTION HINTS.

TO DRAW ISOMETRIC OF A CUBE IS SIMPLE. DRAW IT AS USUAL.

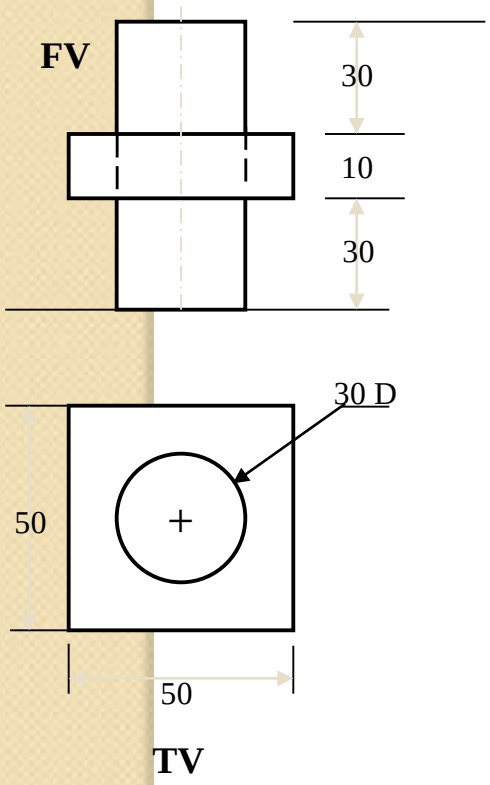
BUT FOR PYRAMID AS IT'S BASE IS AN EQUILATERAL TRIANGLE, IT CAN NOT BE DRAWN DIRECTLY.SUPPORT OF IT'S TV IS REQUIRED.

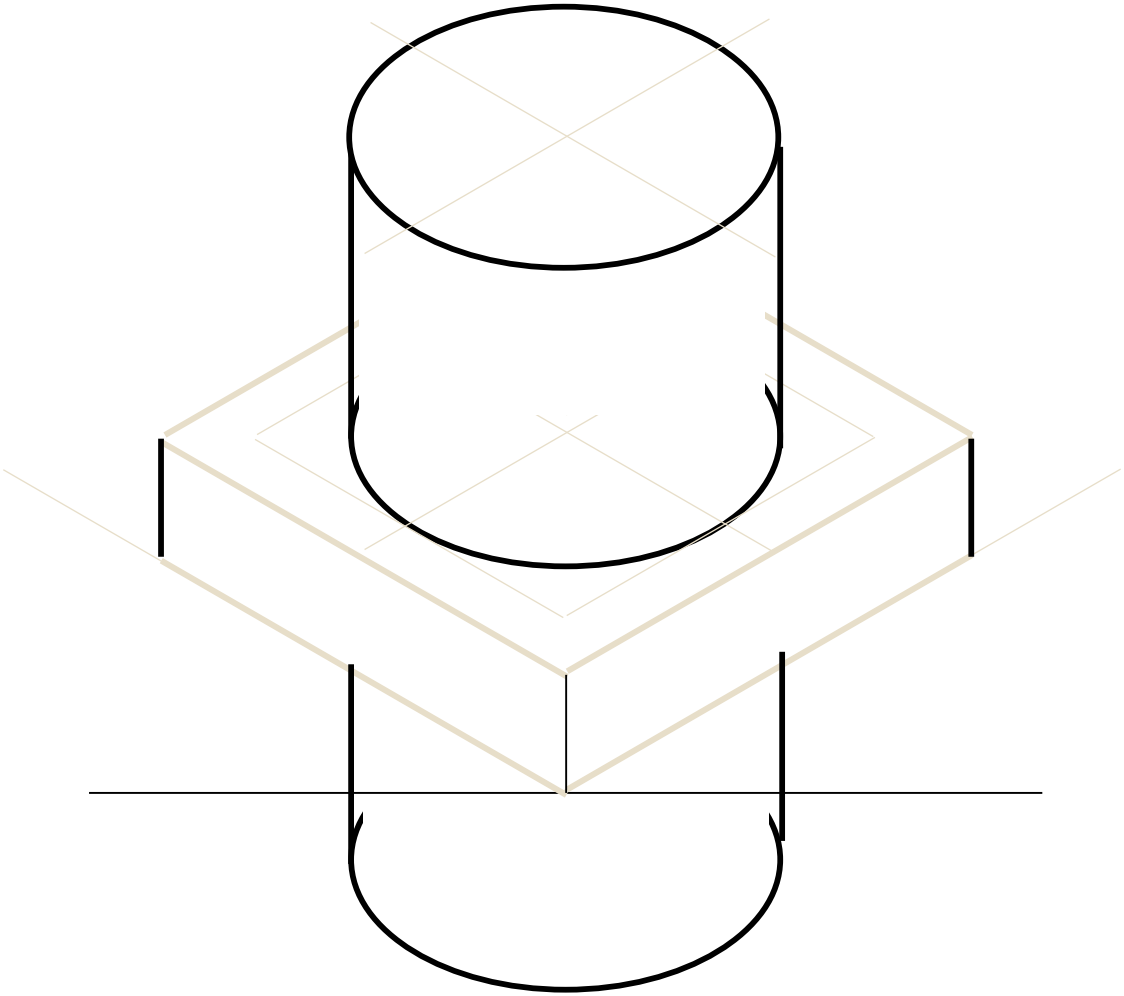
SO DRAW TRIANGLE AS A TV, SEPARATELY AND NAME VARIOUS POINTS AS SHOWN.
AFTER THIS PLACE IT ON THE TOP OF CUBE AS SHOWN.
THEN ADD HEIGHT FROM IT'S CENTER AND COMPLETE IT'S ISOMETRIC AS SHOWN.

STUDY ILLUSTRATIONS

PROBLEM:

A SQUARE PLATE IS PIERCED THROUGH CENTRALLY BY A CYLINDER WHICH COMES OUT EQUALLY FROM BOTH FACES OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC VIEW.

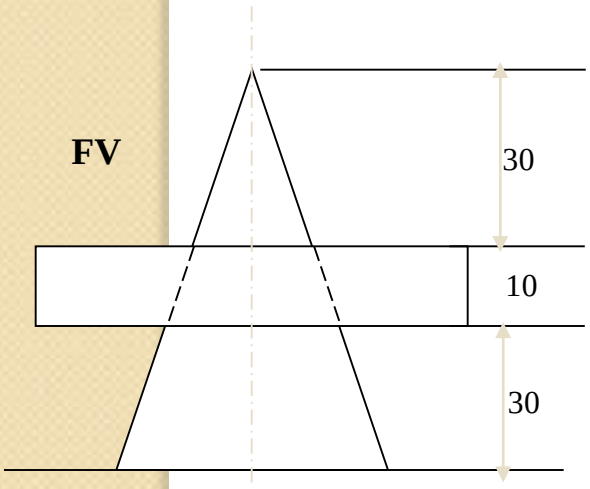


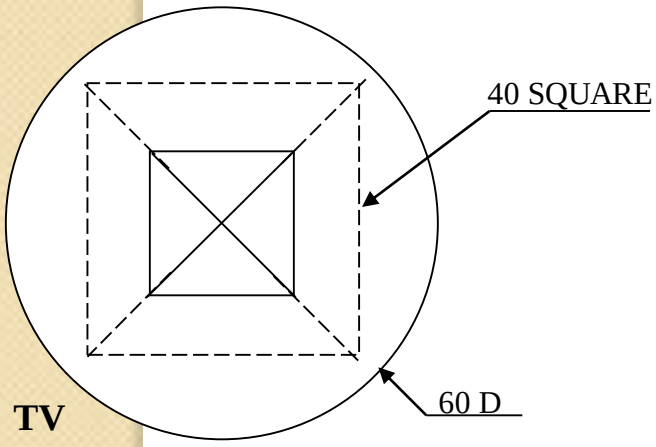


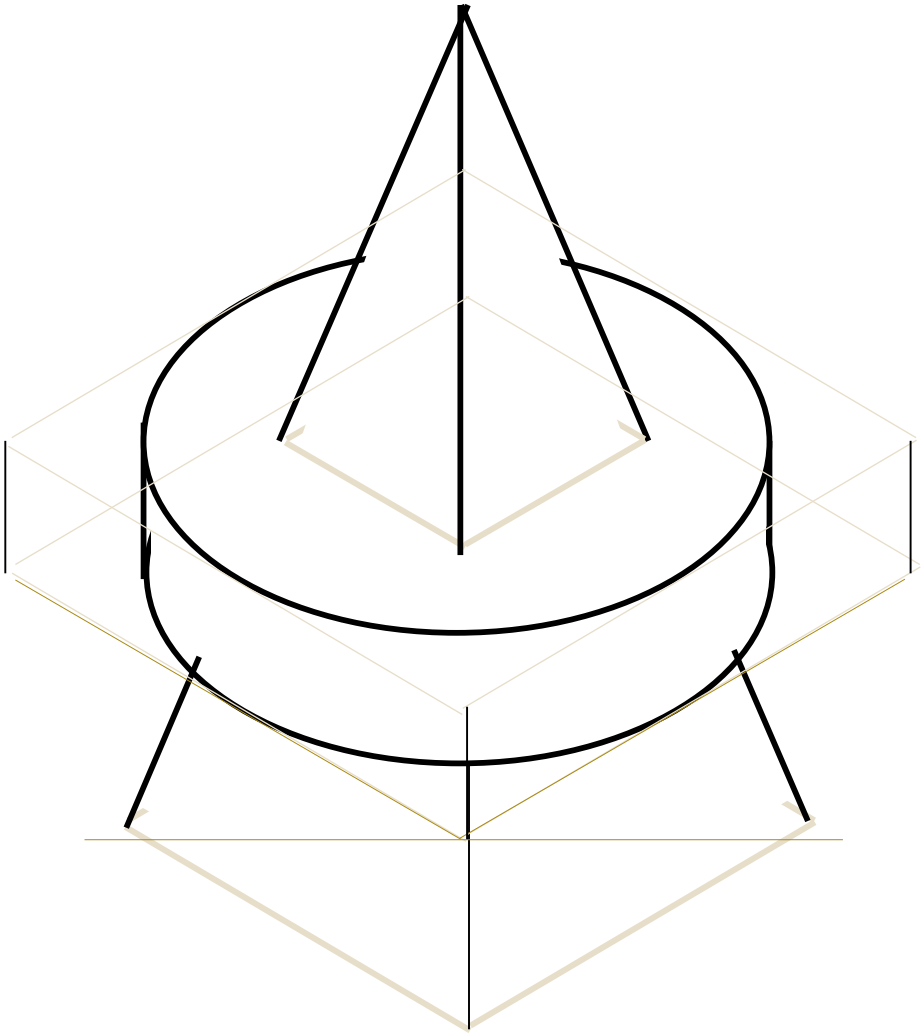
STUDY ILLUSTRATIONS

PROBLEM:

A CIRCULAR PLATE IS PIERCED THROUGH CENTRALLY BY A SQUARE PYRAMID WHICH COMES OUT EQUALLY FROM BOTH FACES OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC VIEW.

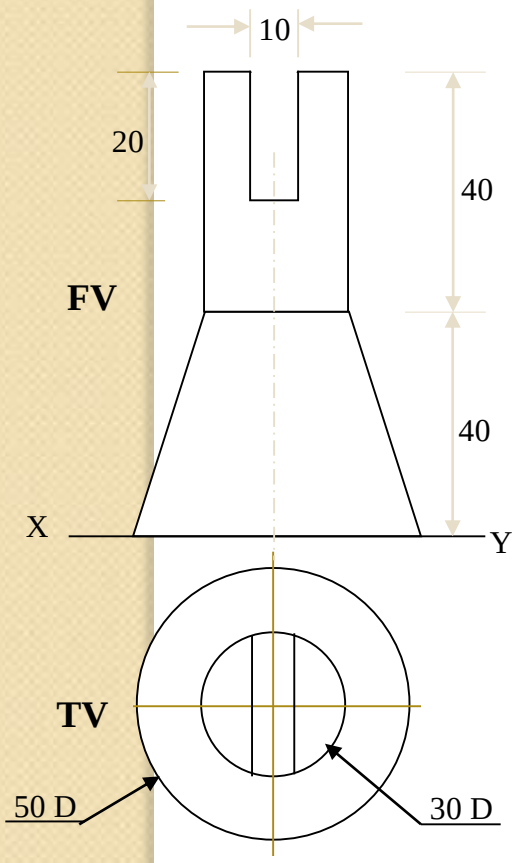


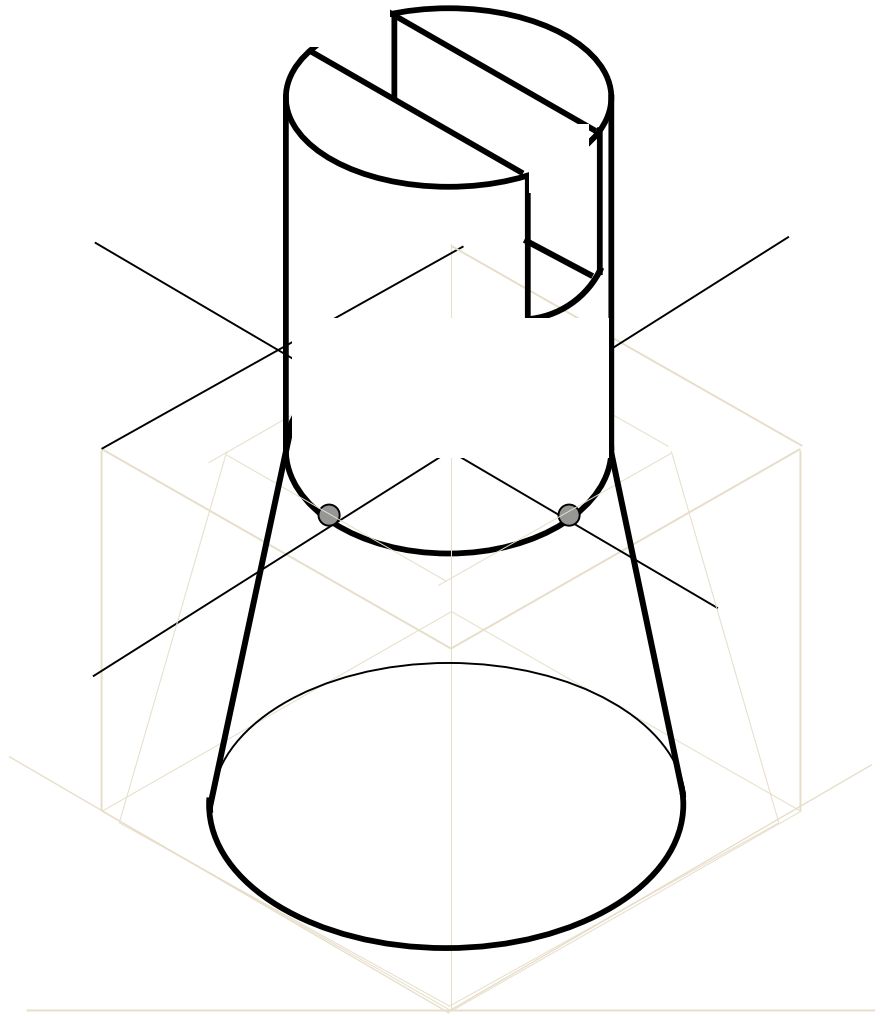




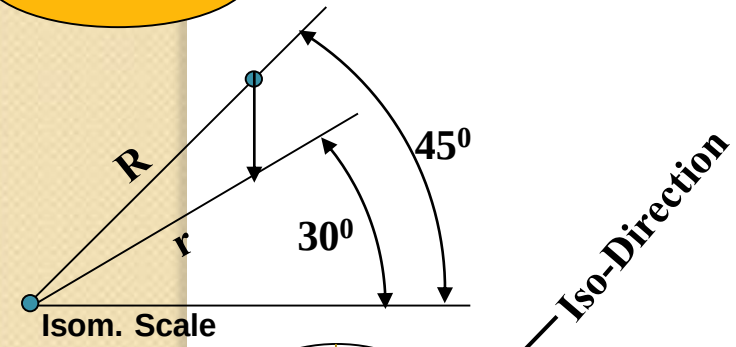
STUDY ILLUSTRATIONS

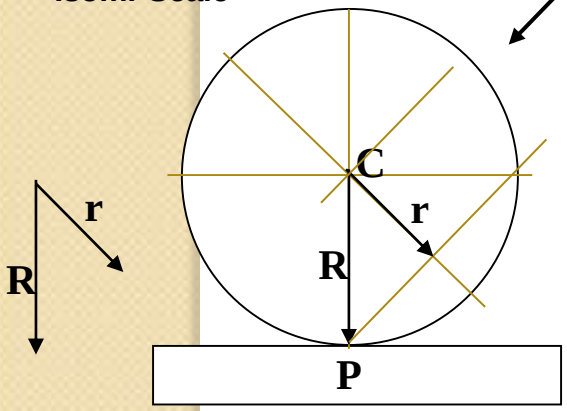
F.V. & T.V. of an object are given. Draw it's isometric view.



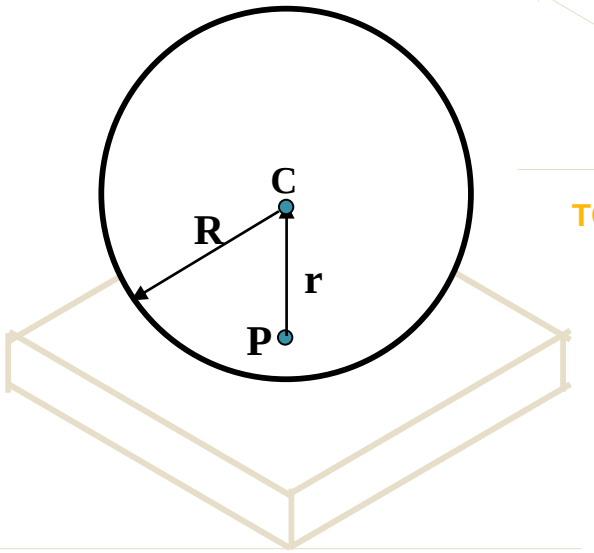


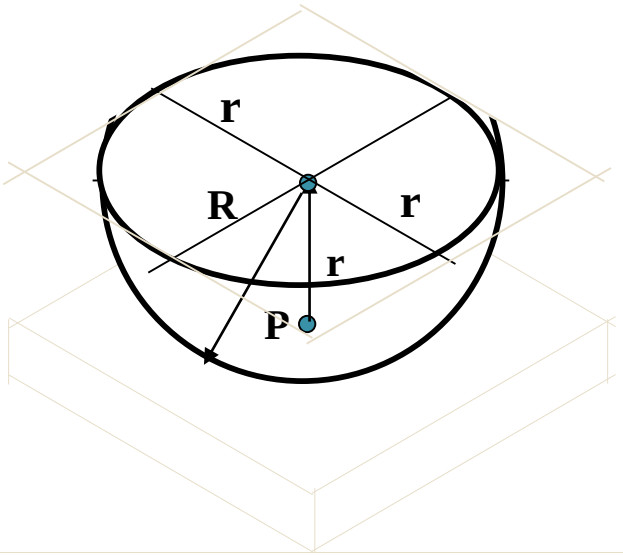
ISOMETRIC PROJECTIONS OF SPHERE & HEMISPHERE





C = Center of Sphere.
P = Point of contact
R = True Radius of Sphere
r = Isometric Radius.





TO DRAW ISOMETRIC PROJECTION OF A HEMISPHERE

Adopt same procedure. Draw lower semicircle only. Then around 'C' construct Rhombus of Sides equal to Isometric Diameter. For this use iso-scale. Then construct ellipse in this Rhombus as usual And Complete Isometric-Projection of Hemi-sphere.

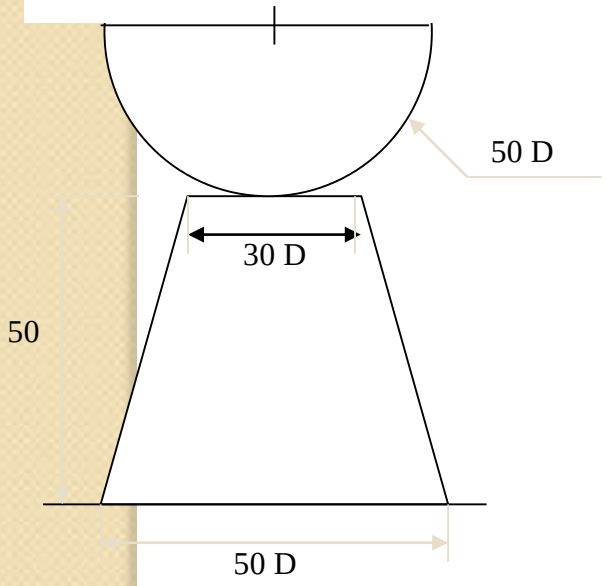
TO DRAW ISOMETRIC PROJECTION OF A SPHERE

1. FIRST DRAW ISOMETRIC OF SQUARE PLATE.
2. LOCATE IT'S CENTER. NAME IT P.
3. FROM PDRAW VERTICAL LINE UPWARD, LENGTH ' r mm' AND LOCATE CENTER OF SPHERE "C"
4. 'C' AS CENTER, WITH RADIUS 'R' DRAW CIRCLE.

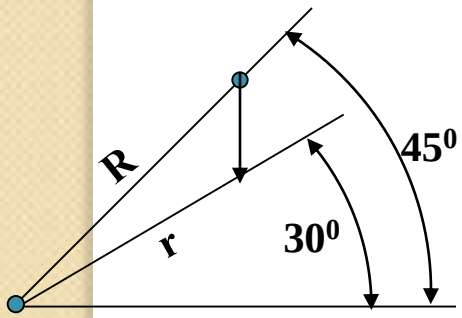
THIS IS ISOMETRIC PROJECTION OF A SPHERE.

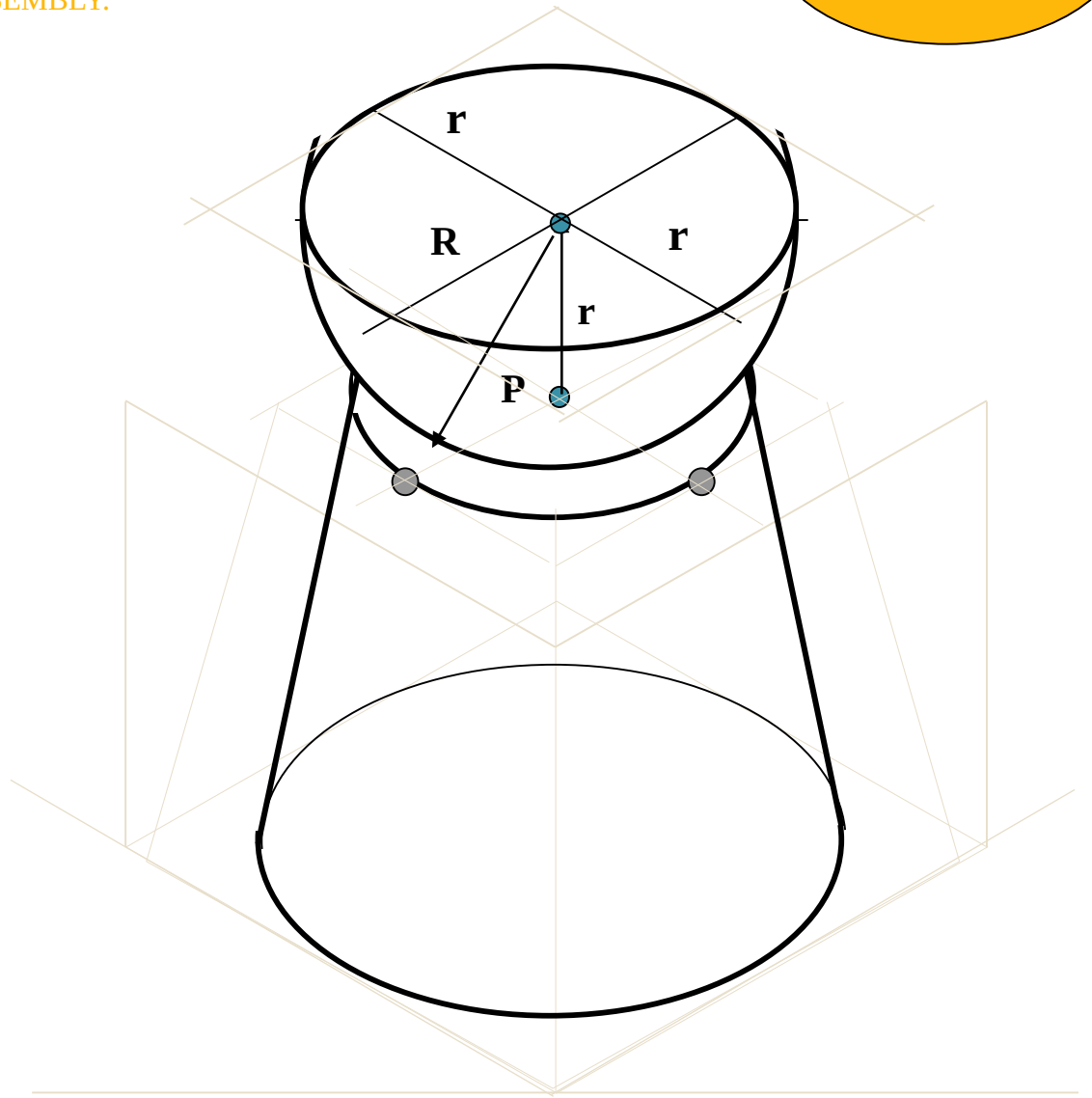
PROBLEM:

A HEMI-SPHERE IS CENTRALLY PLACED ON THE TOP OF A FRUSTOM OF CONE. DRAW ISOMETRIC PROJECTIONS OF THE ASSEMBLY.



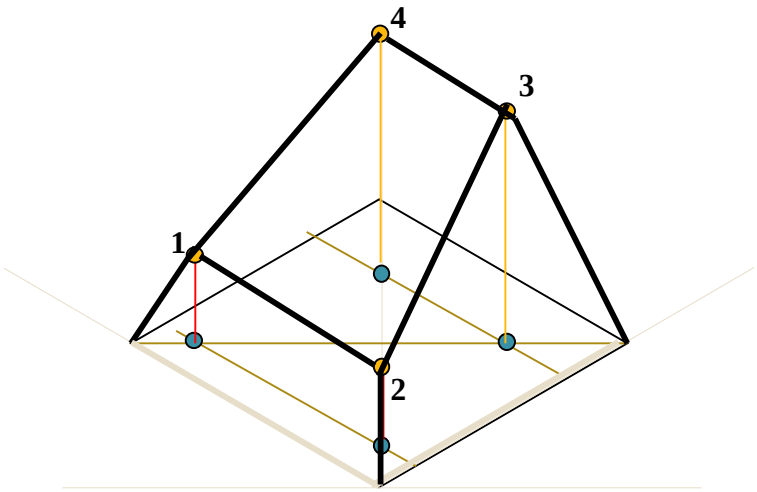
FIRST CONSTRUCT ISOMETRIC SCALE. USE THIS SCALE FOR ALL DIMENSIONS IN THIS PROBLEM.

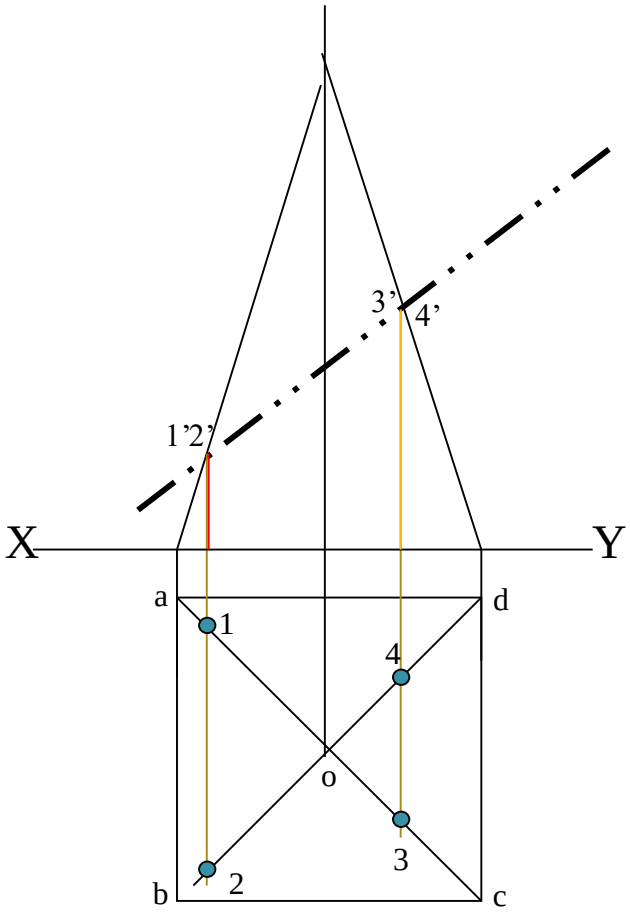




STUDY ILLUSTRATIONS

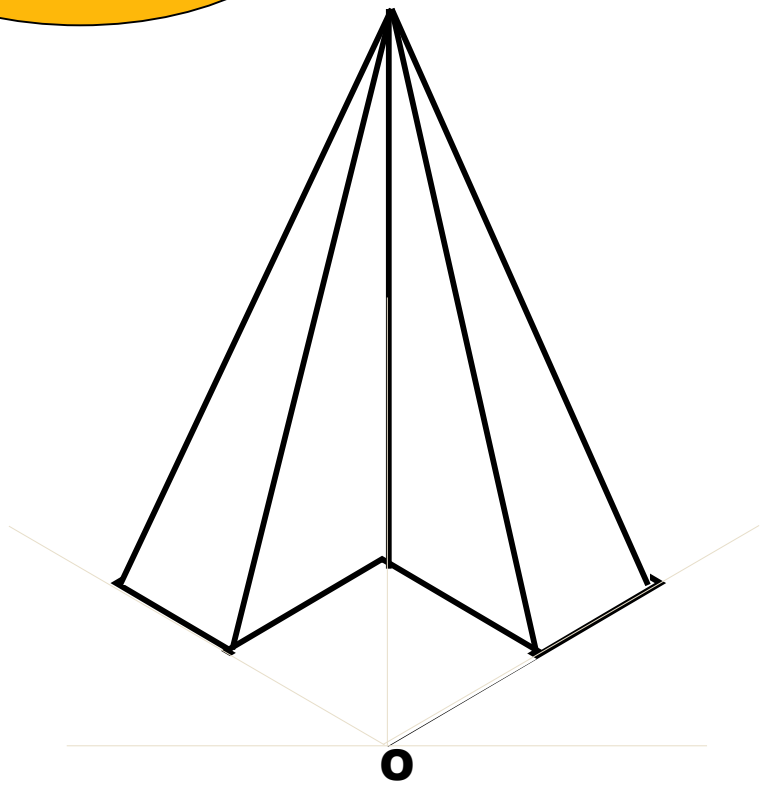
A SQUARE PYRAMID OF 40 MM BASE SIDES AND 60 MM AXIS IS CUT BY AN INCLINED SECTION PLANE THROUGH THE MID POINT OF AXIS AS SHOWN.DRAW ISOMETRIC VIEW OF SECTION OF PYRAMID.

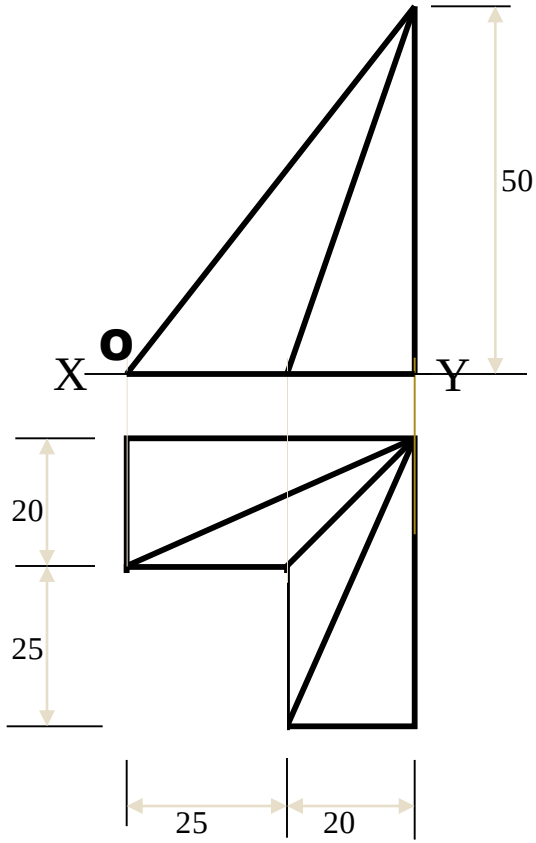




STUDY ILLUSTRATIONS

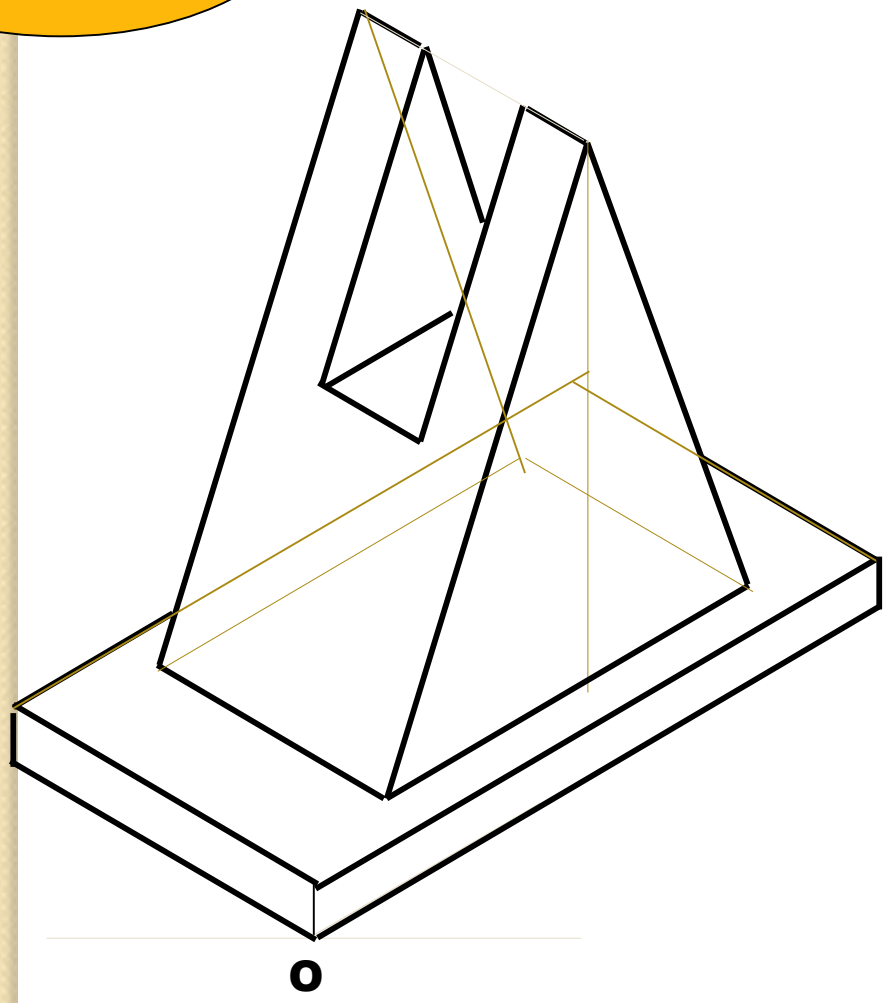
F.V. & T.V. of an object are given. Draw it's isometric view.

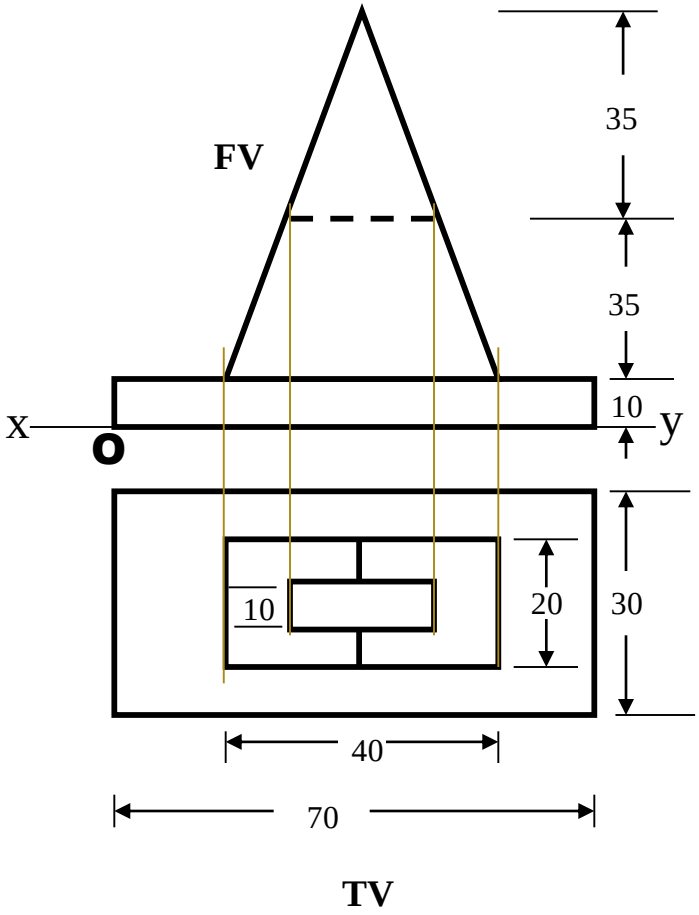




STUDY ILLUSTRATIONS

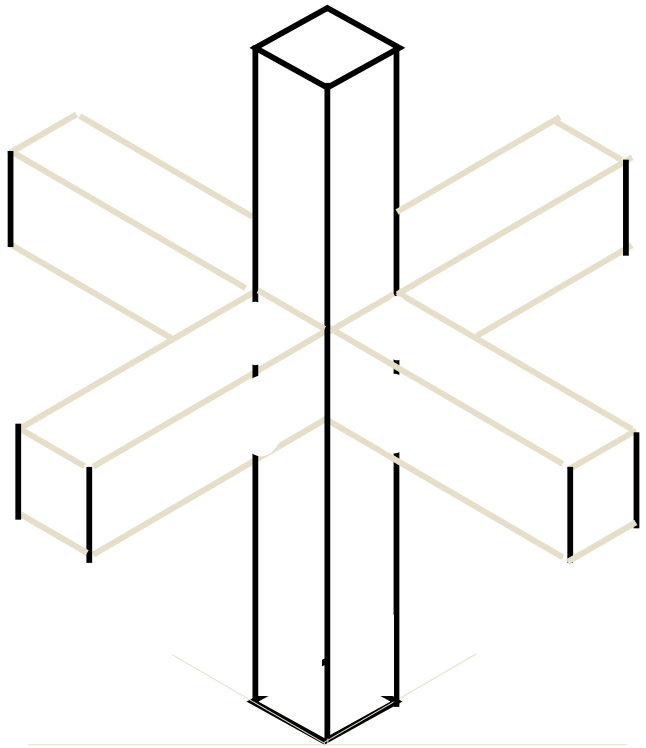
F.V. & T.V. of an object are given. Draw it's isometric view.

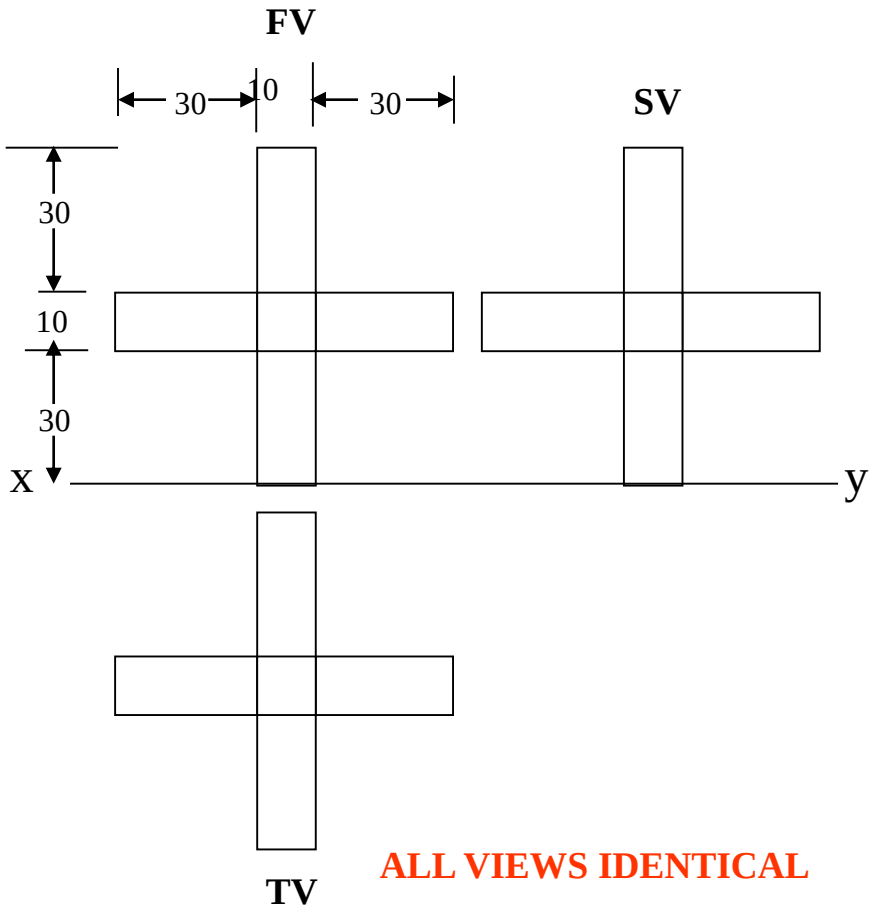




STUDY ILLUSTRATIONS

F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.



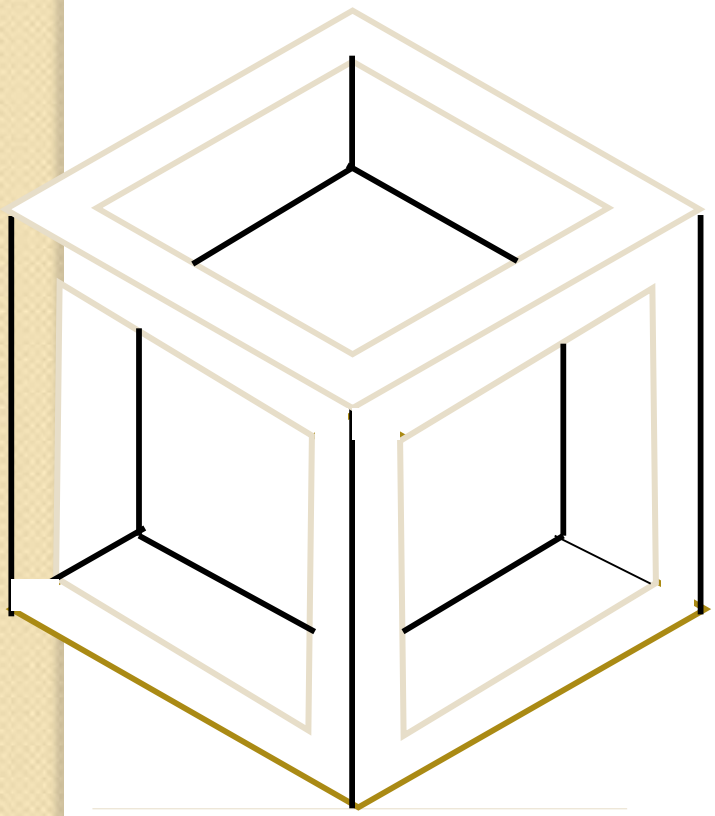


ALL VIEWS IDENTICAL

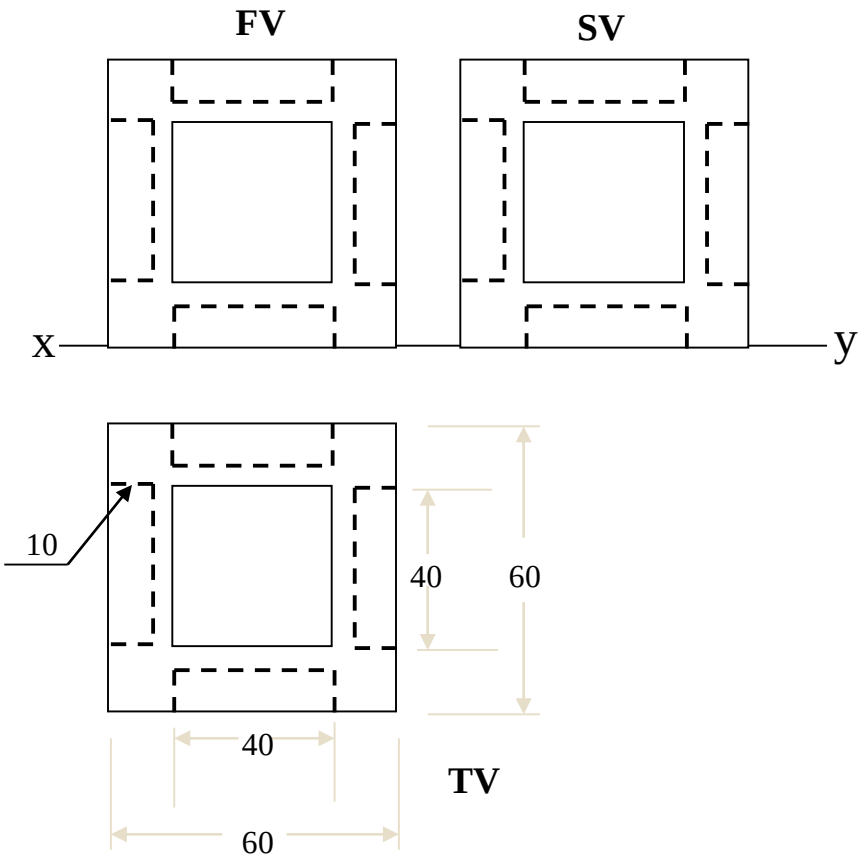
STUDY ILLUSTRATIONS

Z

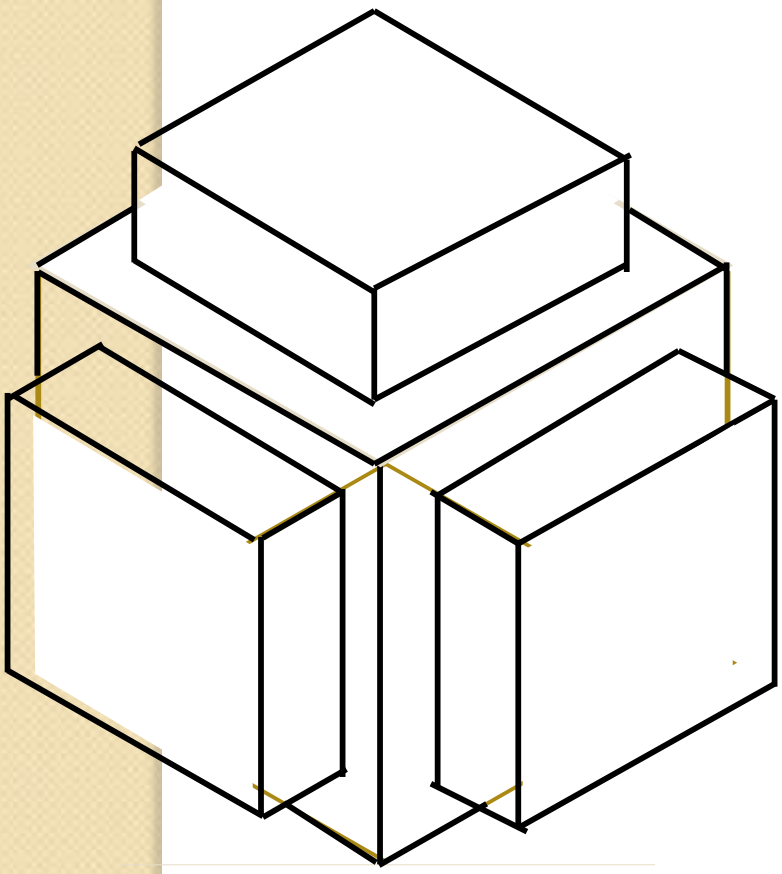
F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.



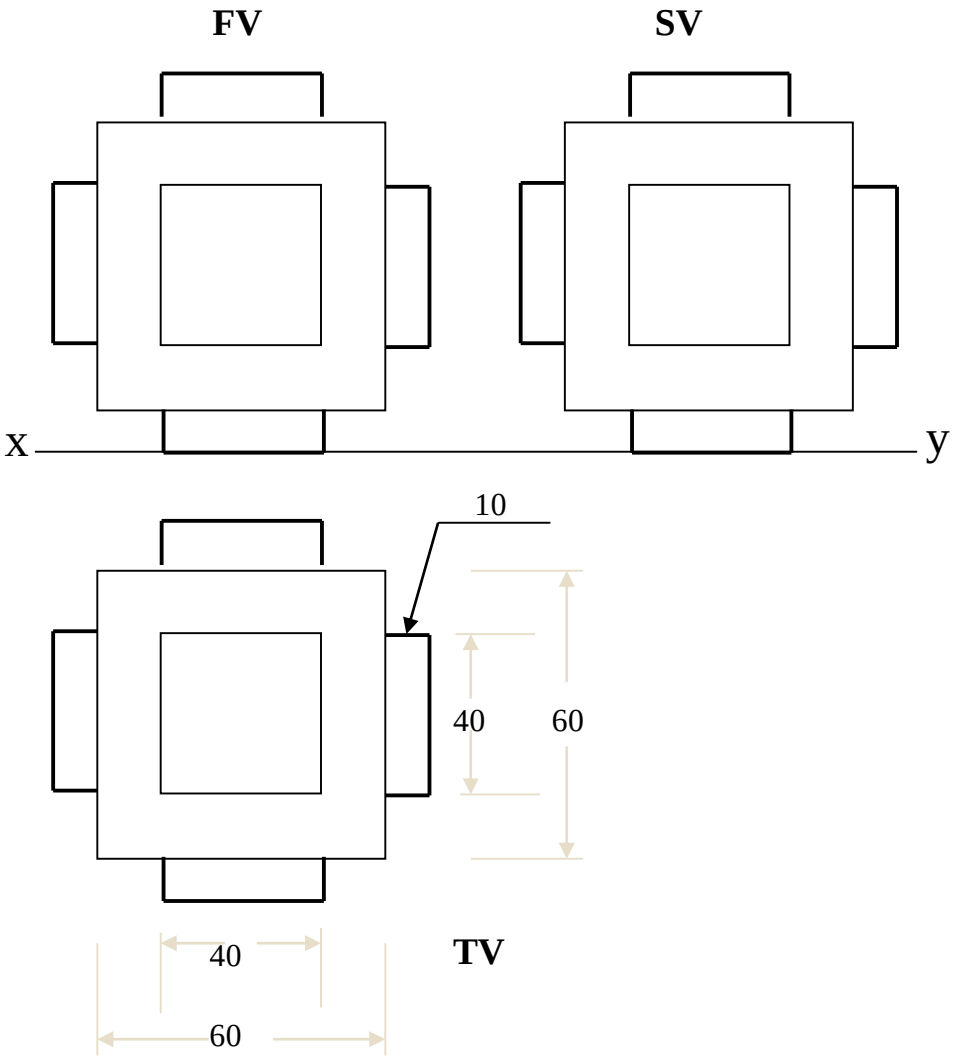
ALL VIEWS IDENTICAL



F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.

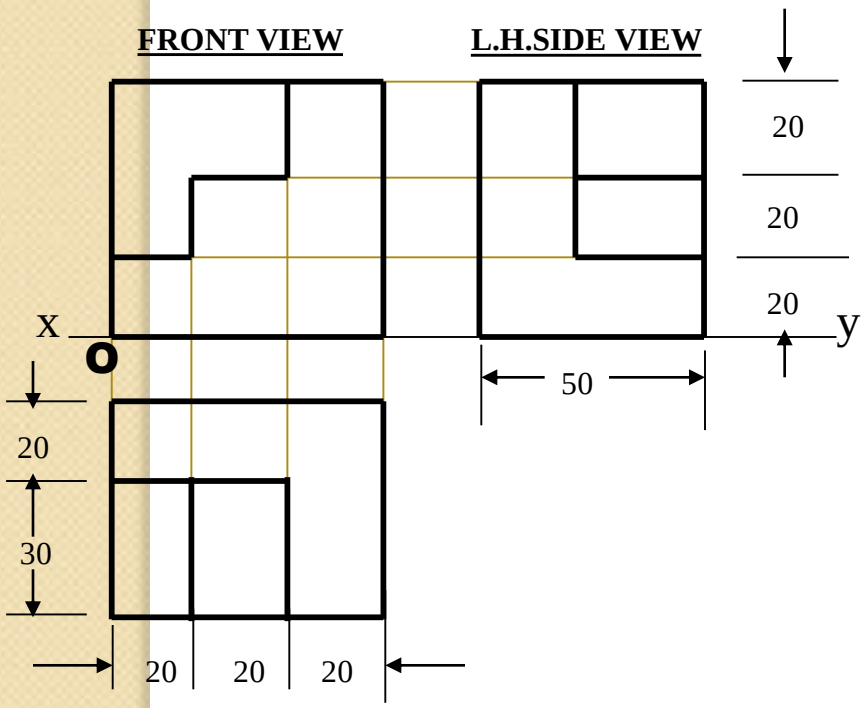


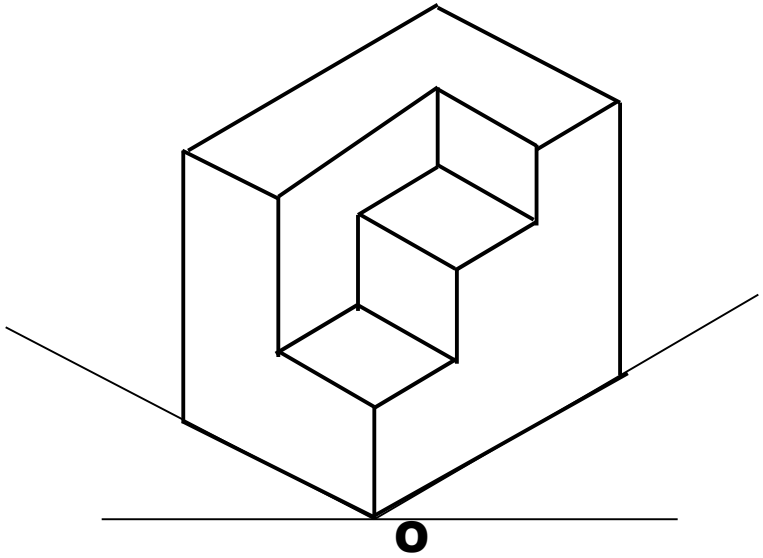
ALL VIEWS IDENTICAL



F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.

ORTHOGRAPHIC PROJECTIONS

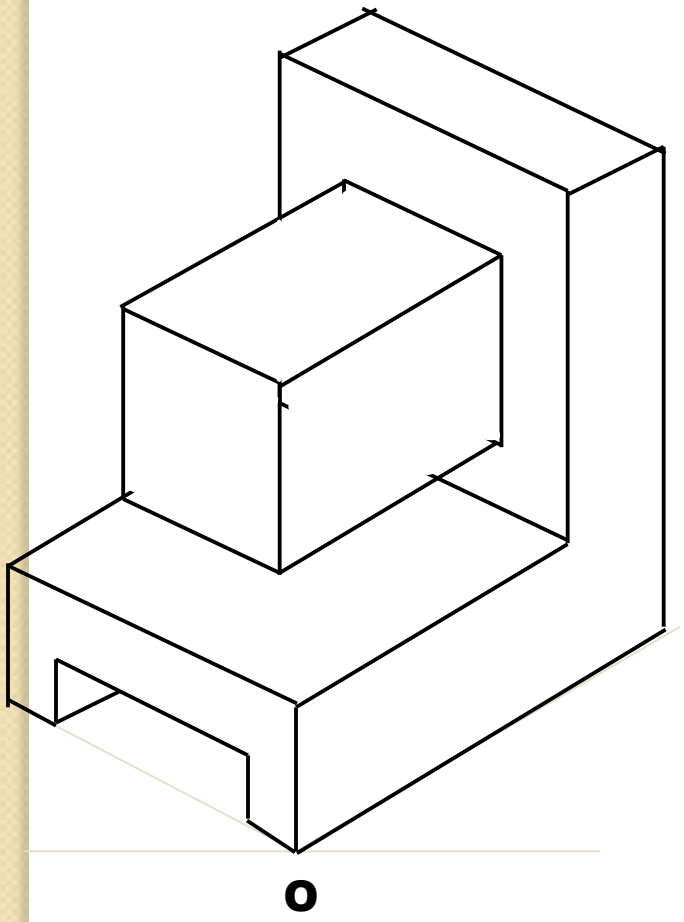


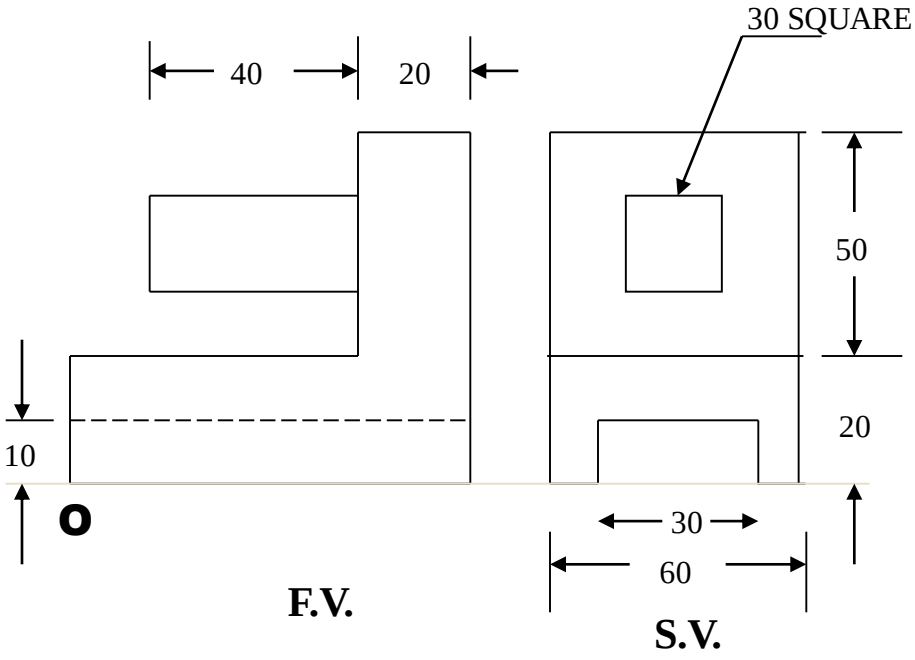


STUDY ILLUSTRATIONS

7.

F.V. and S.V.of an object are given. Draw it's isometric view.

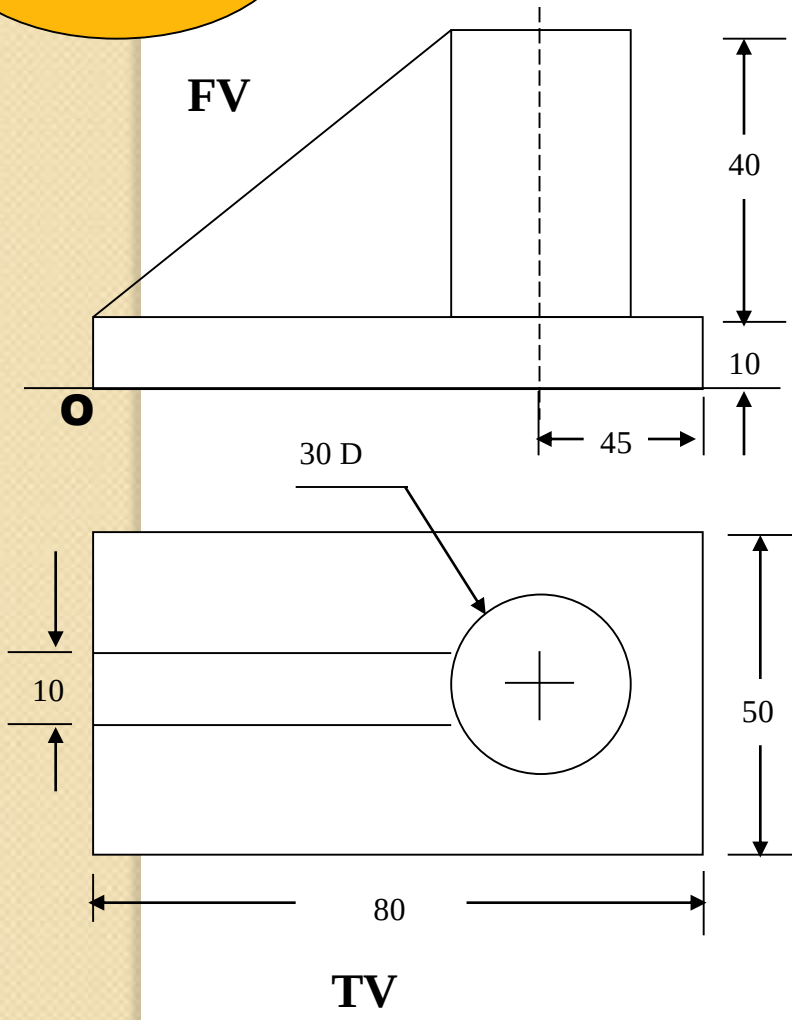


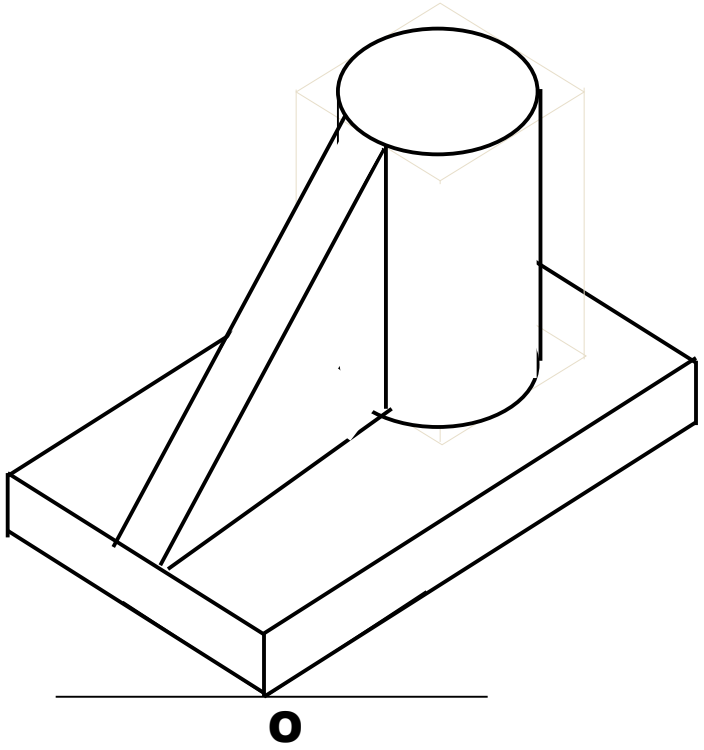


STUDY ILLUSTRATIONS

7.

F.V. & T.V. of an object are given. Draw it's isometric view.





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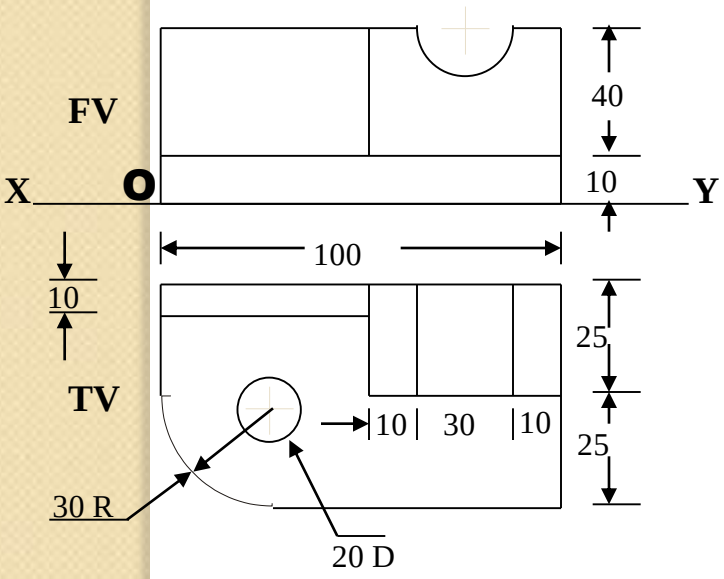

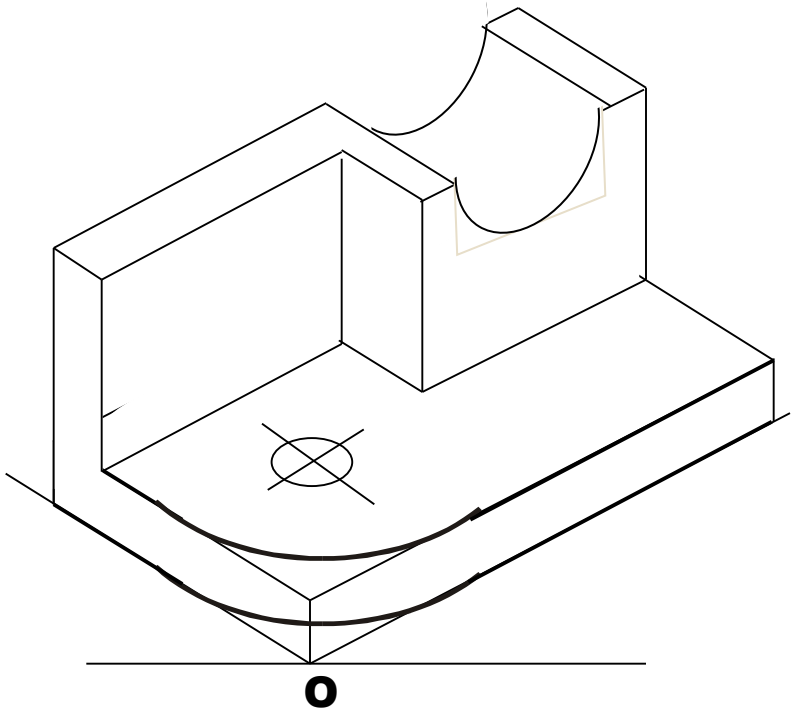

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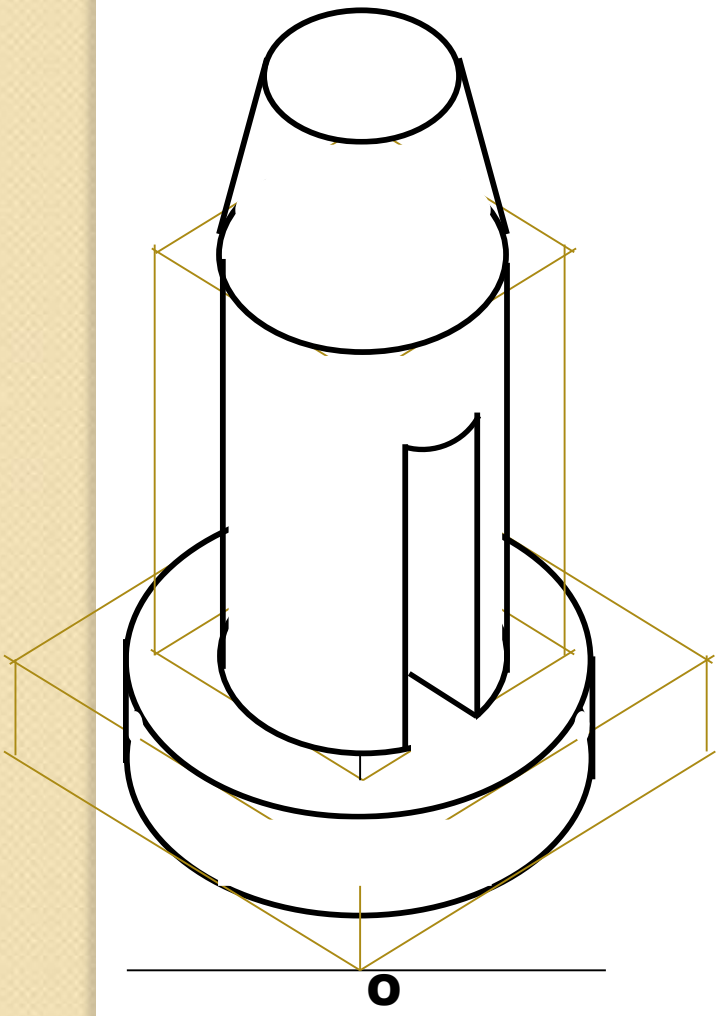
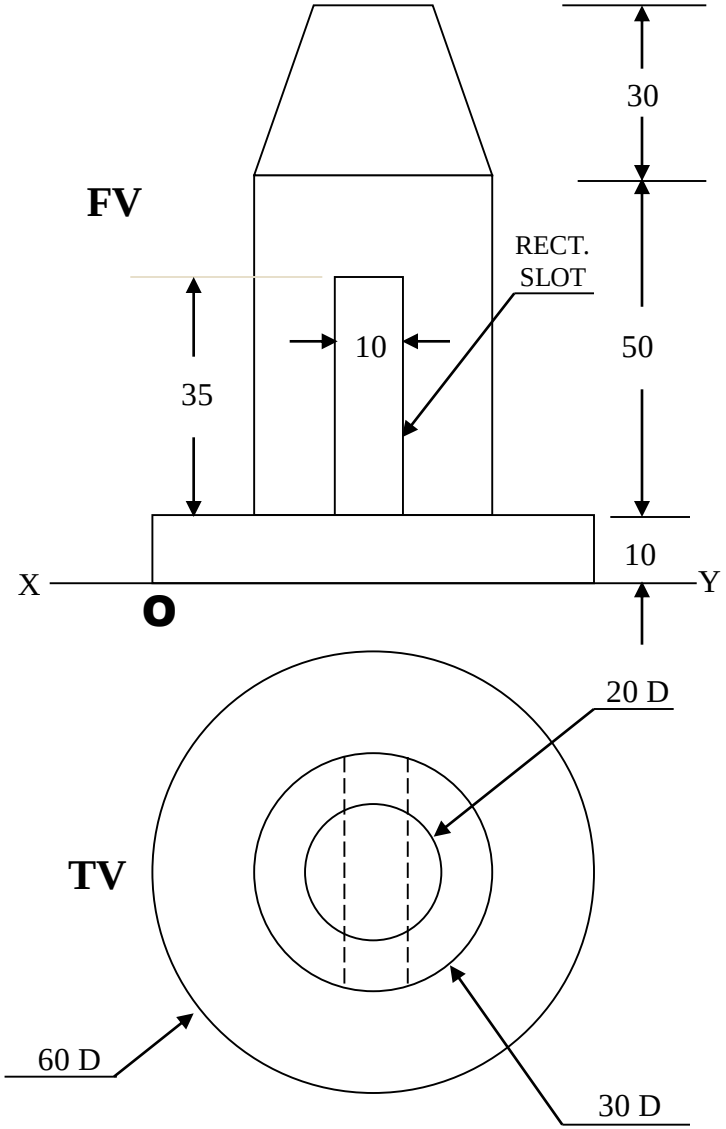
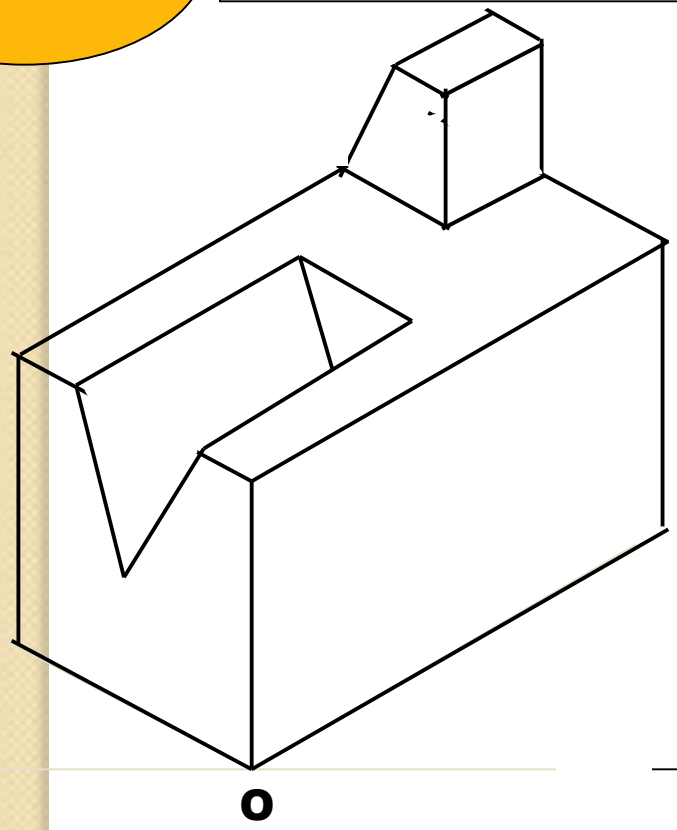


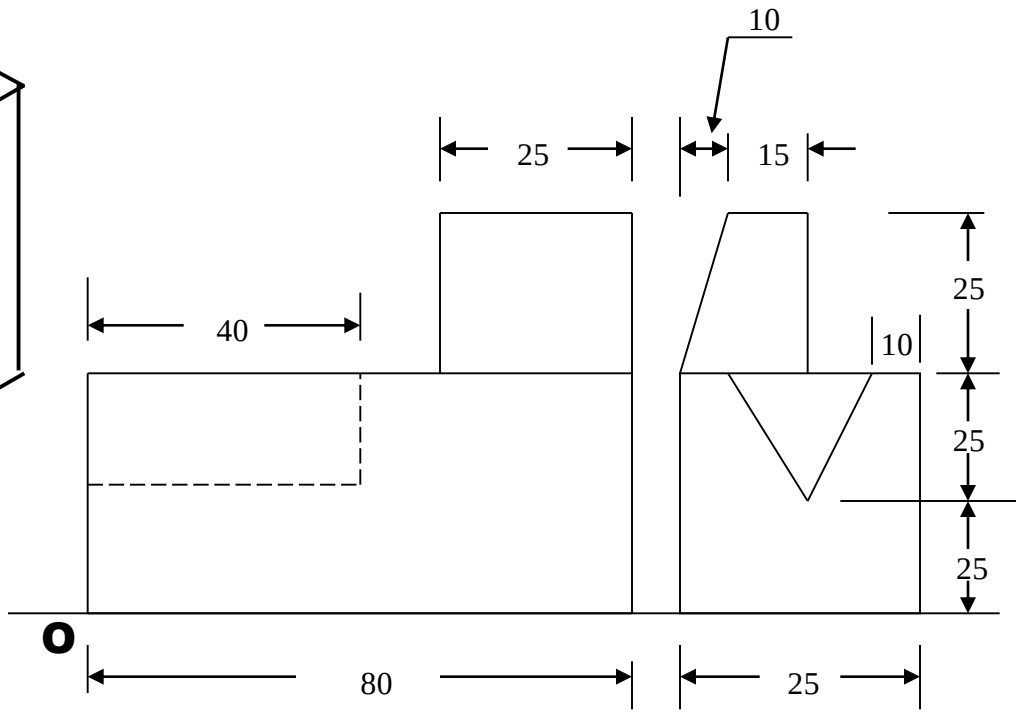


STUDY ILLUSTRATIONS

7.

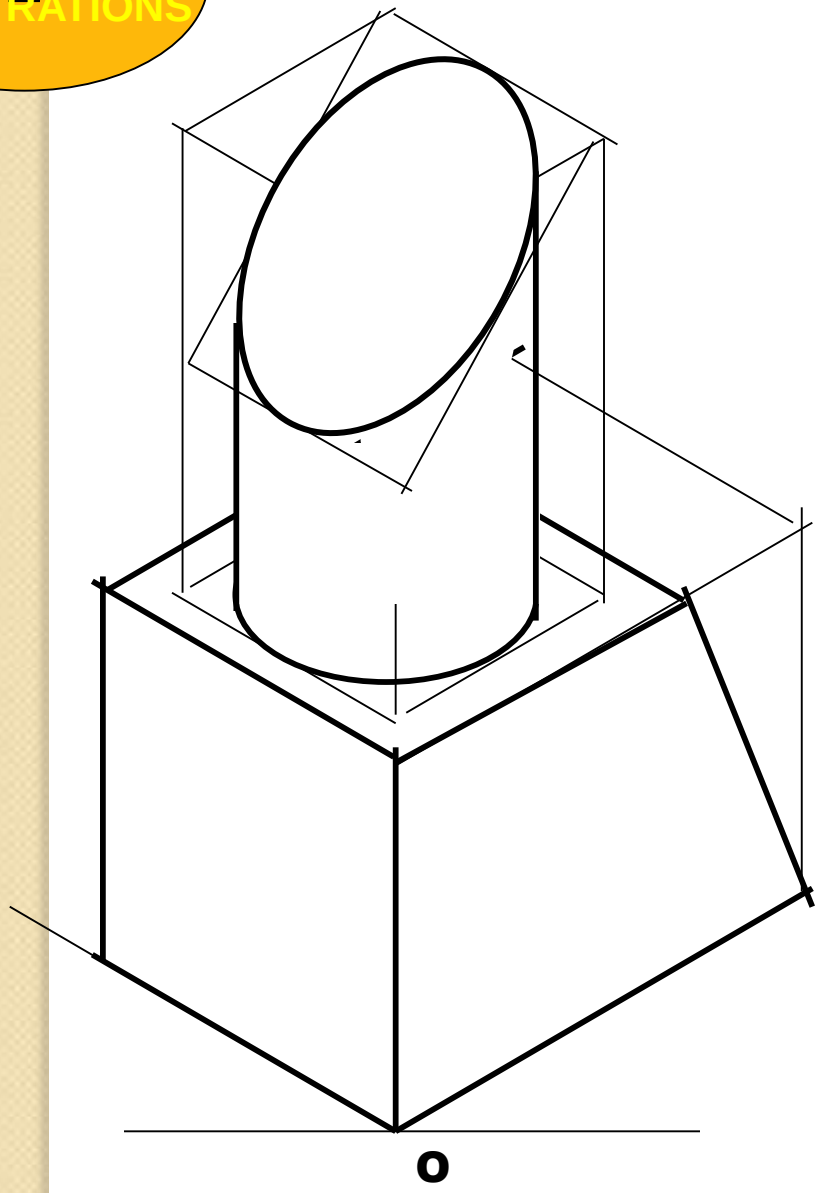
F.V. and S.V.of an object are given. Draw it's isometric view.

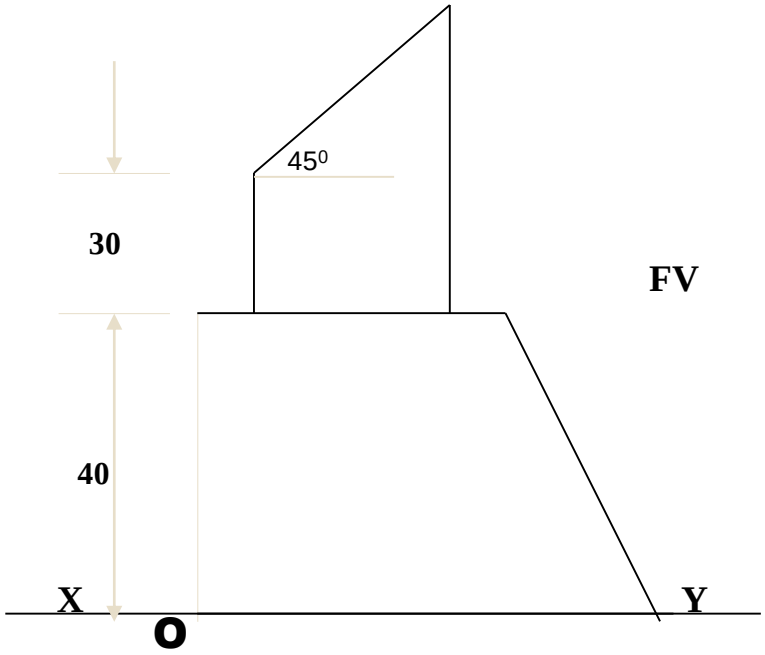


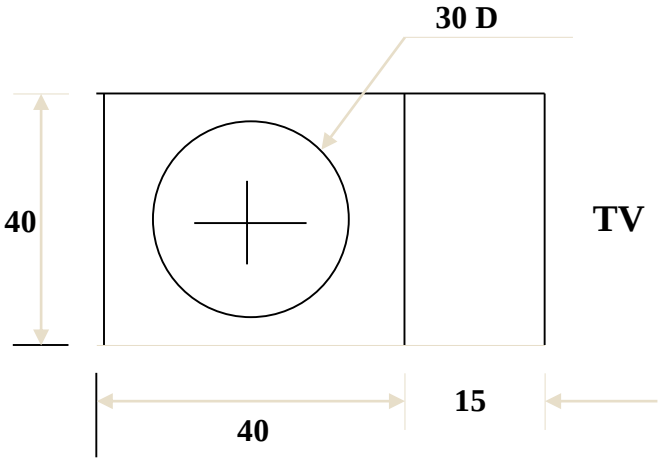


F.V. S.V.

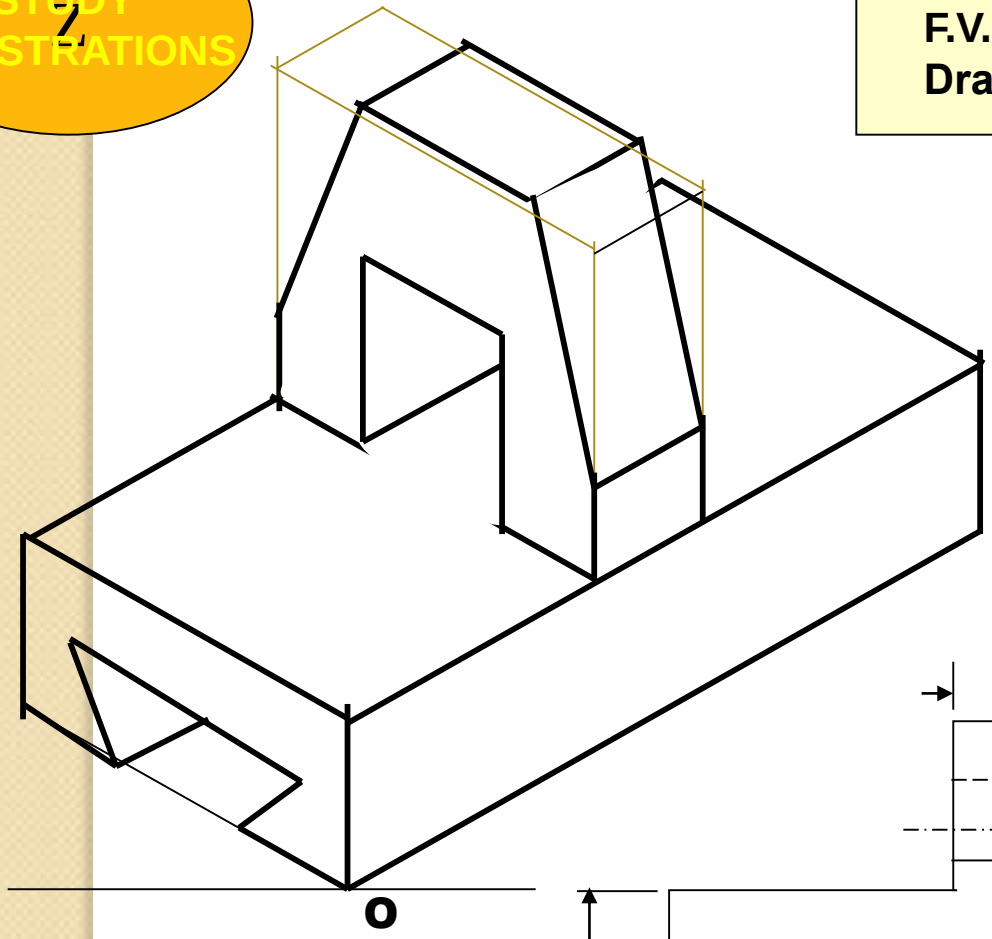
F.V. & T.V. of an object are given. Draw it's isometric view.

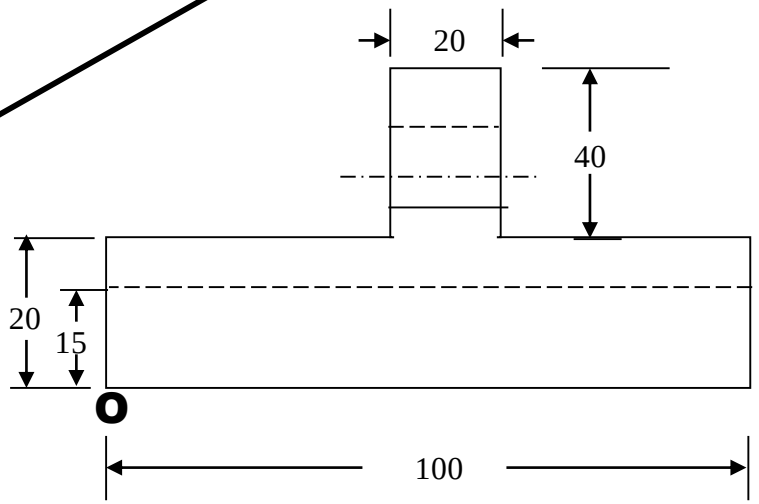


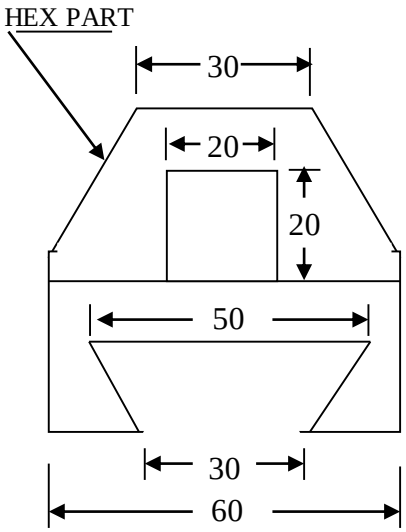




F.V. and S.V.of an object are given. Draw it's isometric view.



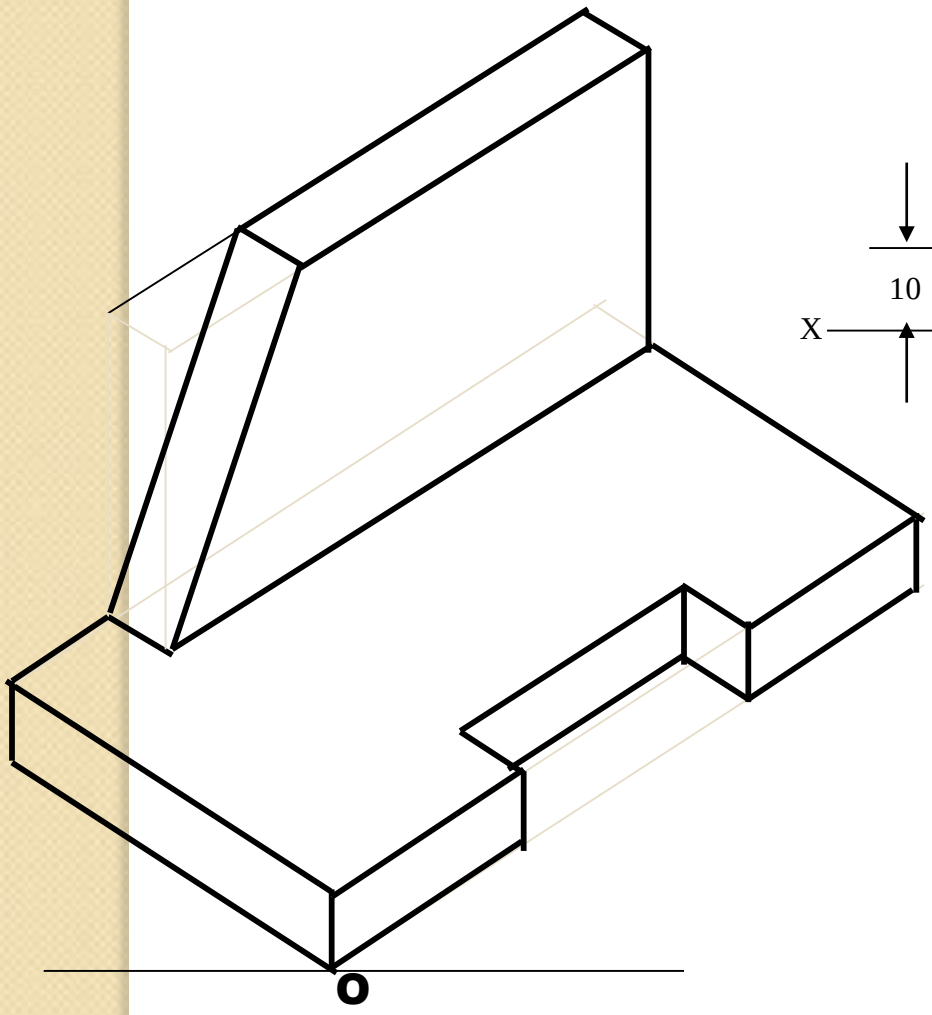


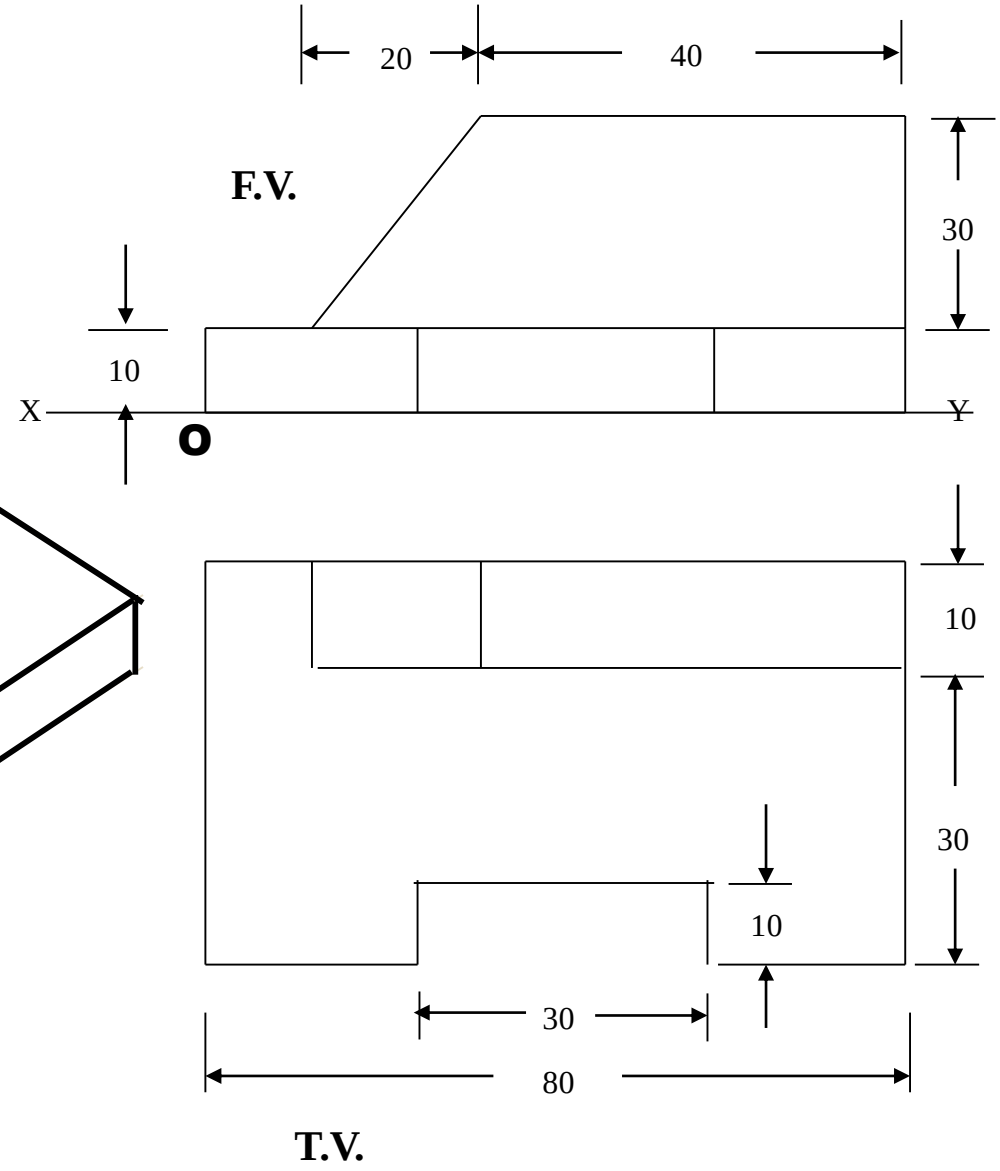


STUDY ILLUSTRATIONS

7.

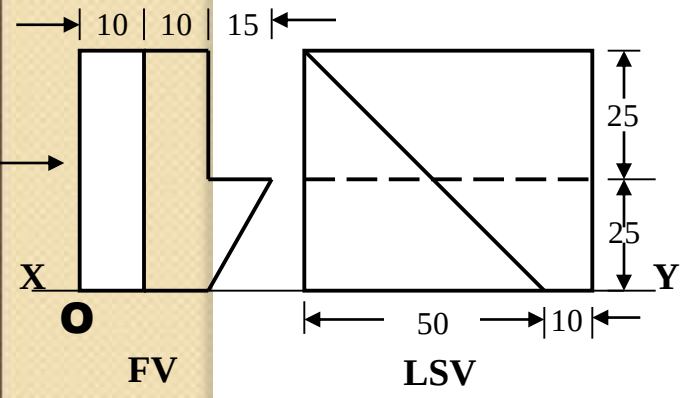
F.V. & T.V. of an object are given. Draw it's isometric view.

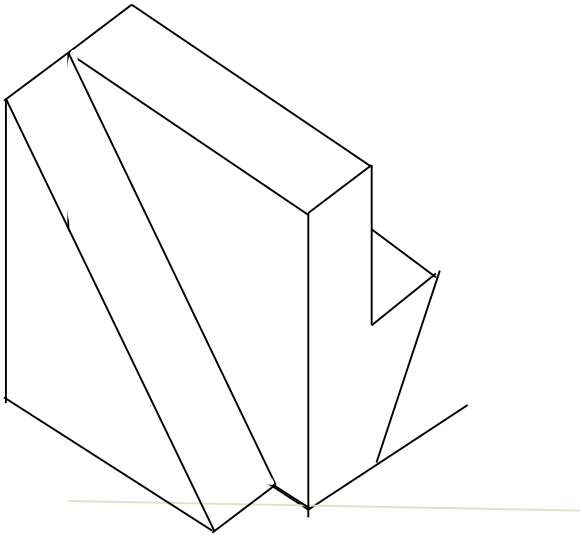




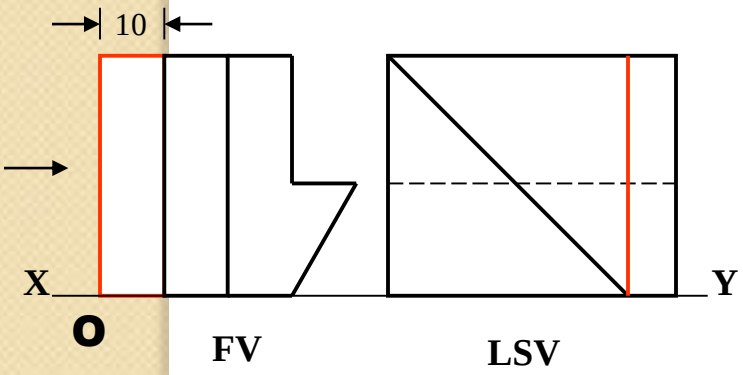
F.V. and S.V.of an object are given.
Draw it's isometric view.

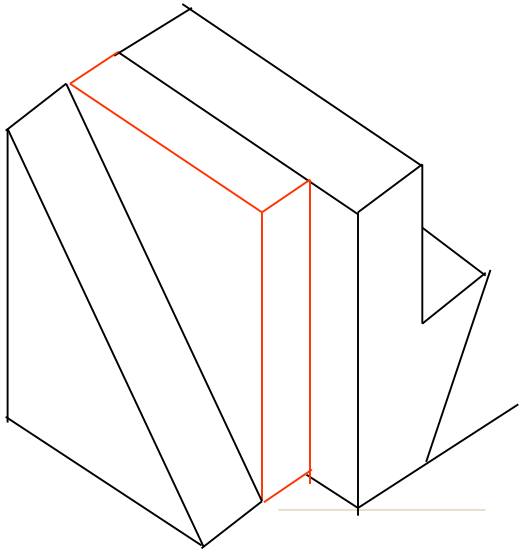
STUDY ILLUSTRATIONS





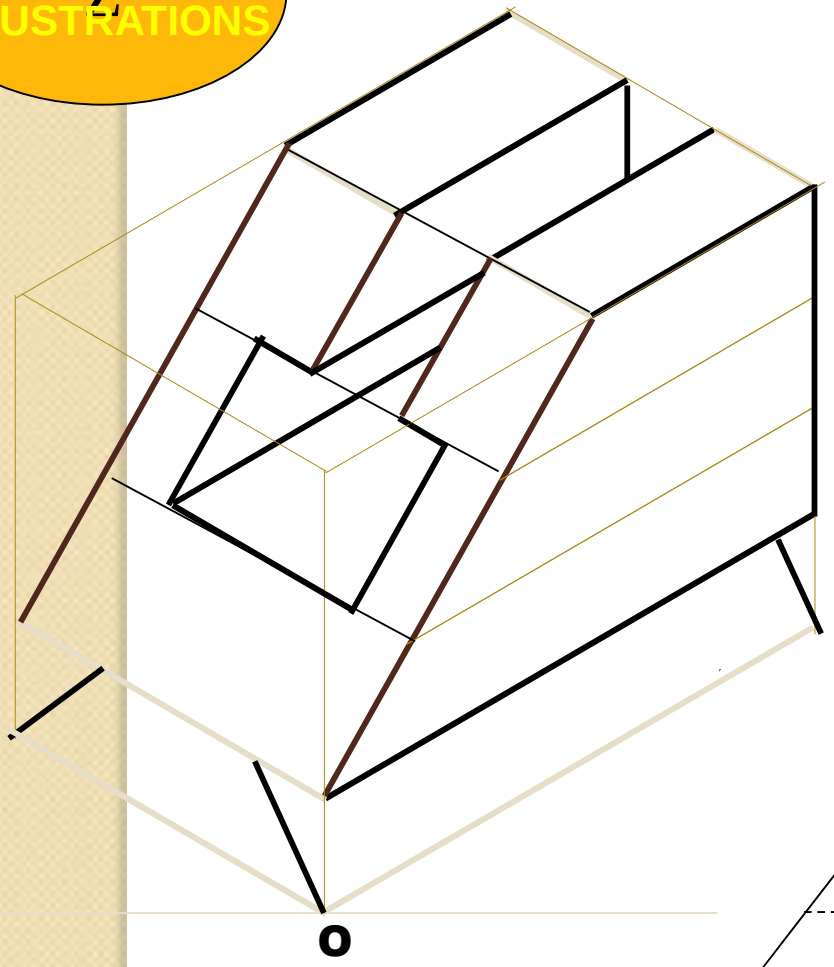
NOTE THE SMALL CHZNGE IN 2ND FV & SV.
DRAW ISOMETRIC ACCORDINGLY.



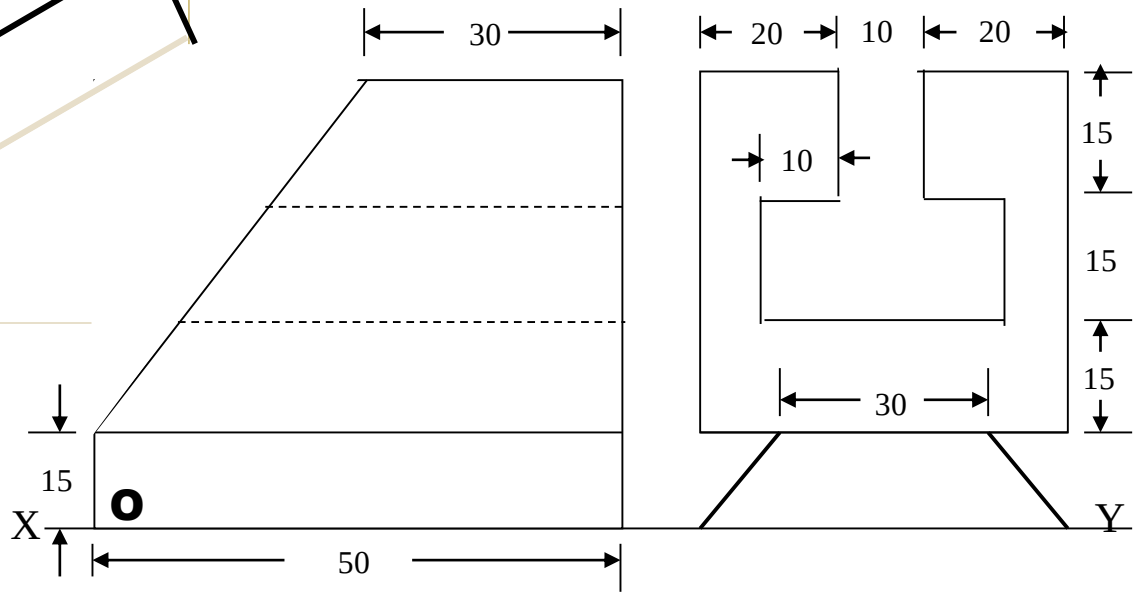


STUDY ILLUSTRATIONS

Z



F.V. and S.V.of an object are given. Draw it's isometric view.



F.V. **LEFT S.V.**

F.V. and S.V.of an object are given. Draw it's isometric view.