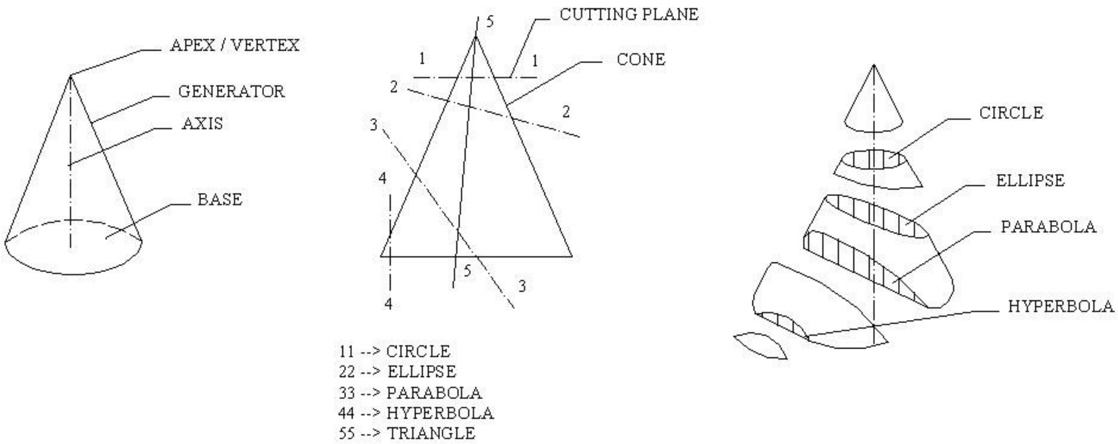
UNIT I

PLANE CURVES AND FREE HAND SKETCHING

CONIC SECTIONS

Definition:

The sections obtained by the intersection of a right circular cone by a cutting plane in different positions are called conic sections or conics.



Circle:

When the cutting plane is parallel to the base or perpendicular to the axis, then the true shape of the section is circle.

Ellipse:

When the cutting plane is inclined to the horizontal plane and perpendicular to the vertical plane, then the true shape of the section is an ellipse.

Parabola:

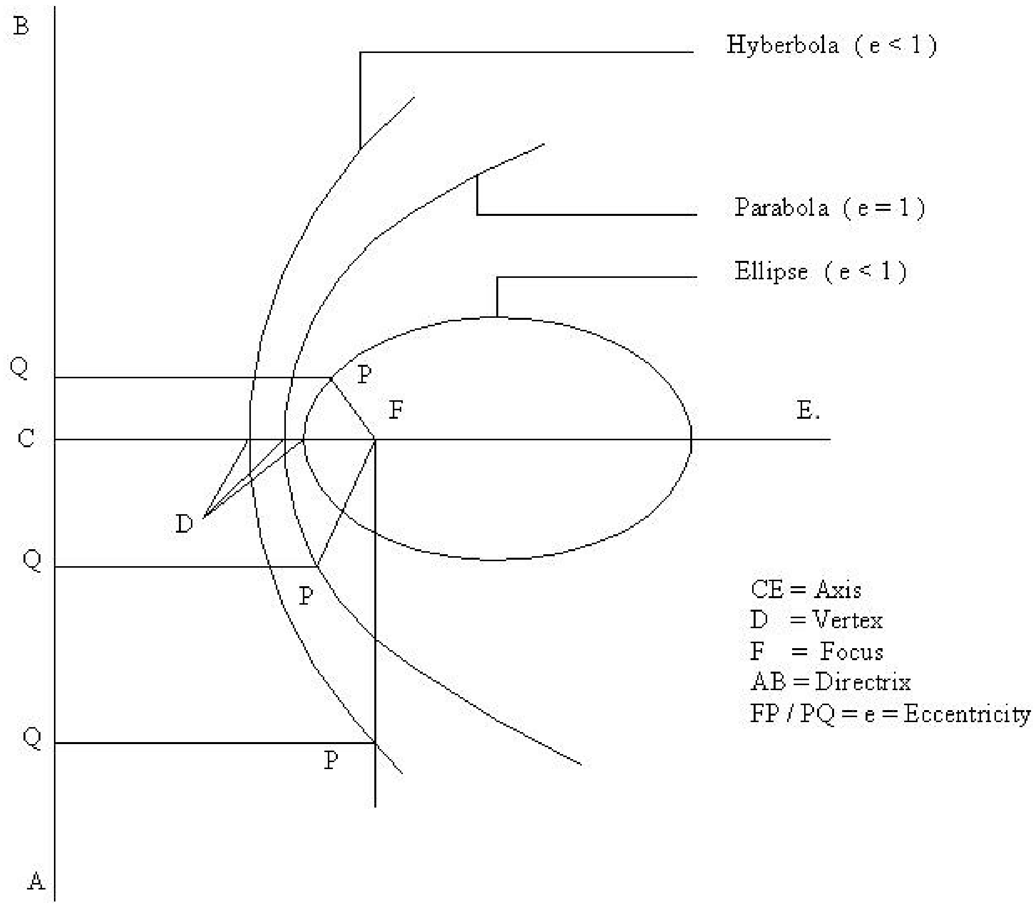
When the cutting plane is inclined to the axis and is parallel to one of the generators, then the true shape of the section is a parabola.

Hyperbola:

When the cutting plane is parallel to the axis of the cone, then the true shape of the section is a rectangular hyperbola.

Focus & Directrix:

Conic may be defined as the locus of a point moving in a plane in such away that the ratio of its distances from a fixed point, called focus and a fixed straight line called directrix.



Eccentricity:

The ratio of shortest distance from the focus to the shortest distance from the directrix is called eccentricity.

For ellipse, eccentricity is < 1

For Parabola, eccentricity is = 1

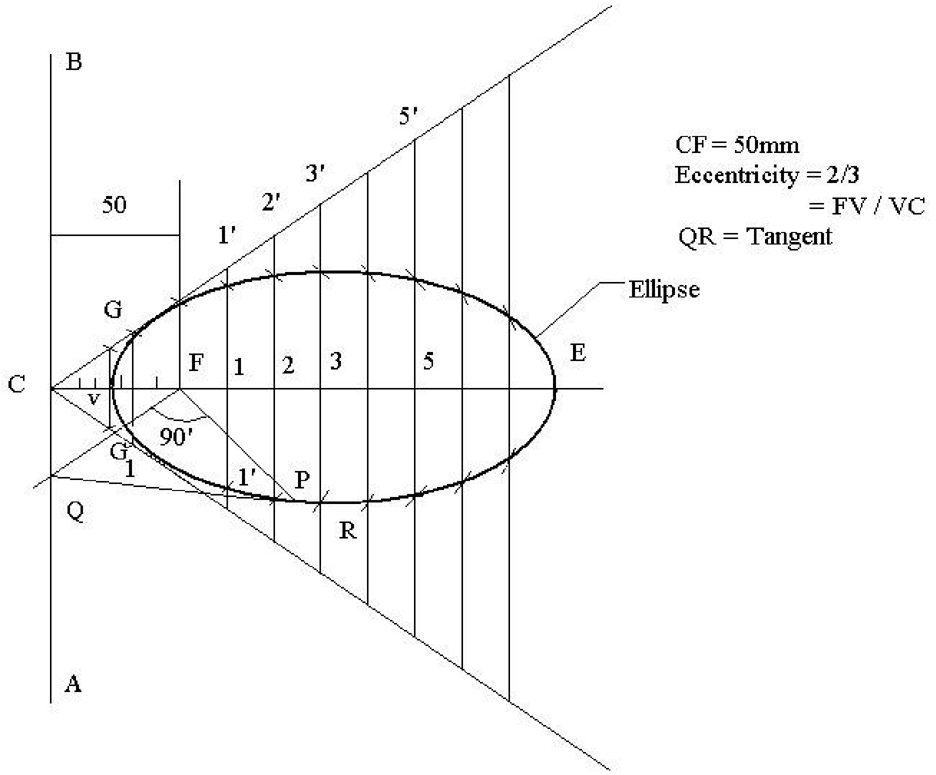
For hyperbola, eccentricity is > 1

Axis: The line passing through the focus and perpendicular to the dirctrix is called axis.

Vertex: The point at which the curves cut the axis is called vertex.

CONSTRUCTION OF ELLIPSE:

1. **Draw an ellipse when the distance between the focus and directrix is 50mm and eccentricity is 2/3.**



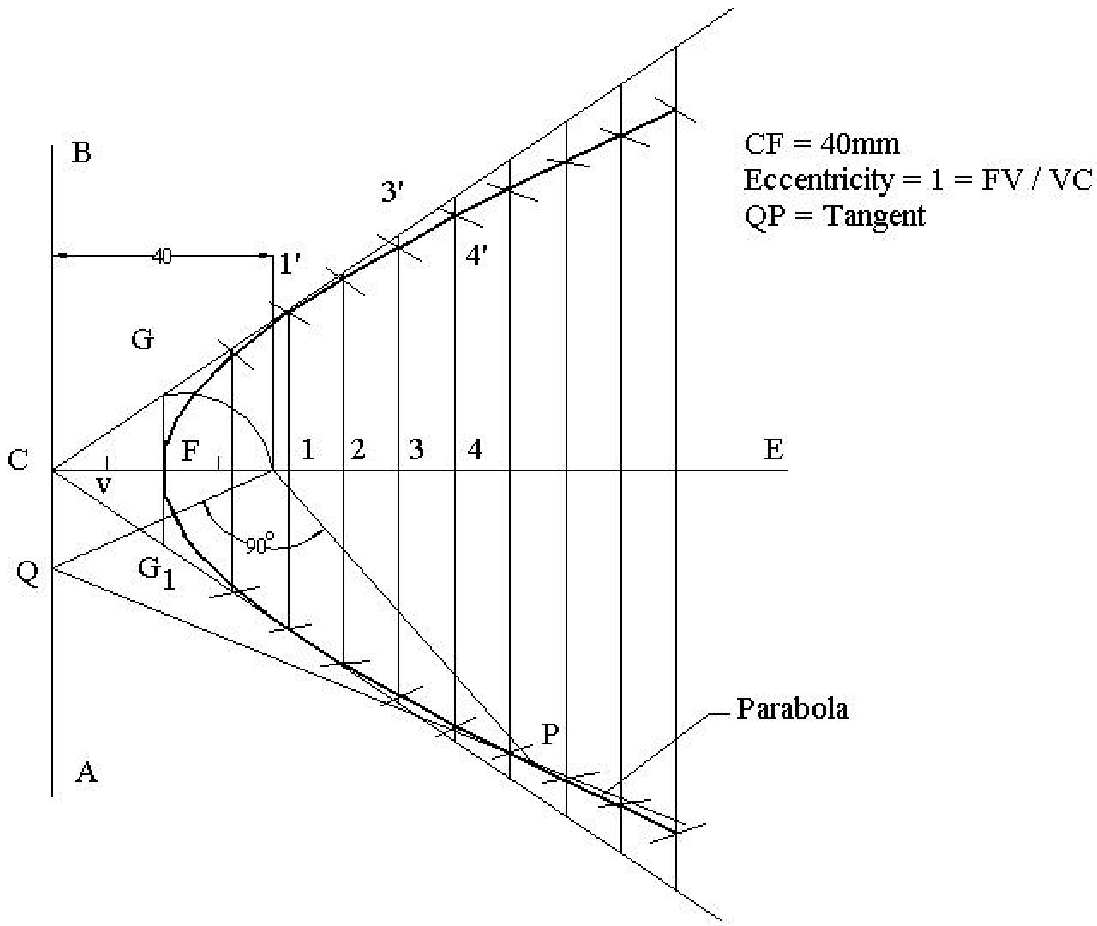
Procedure:

- Draw a perpendicular line AB (directrix) and a horizontal line CE (axis).
- Mark the focus point F on the axis line 50mm from the directrix.
- Divide the CF in to 5 equal parts.
- **As per the eccentricity mark the vertex 'V' in the second division of CF**
- **Draw a perpendicular line from vertex V and mark the point 'G' with the distance VF.**
- Join the points C& G and extend the line. Similarly mark the point G_1 below the axis line.
- Now join the points C& G_1 and extend it.
- Draw number of smooth vertical lines 1,2,3,4,5,6,etc., as shown in figure.
- **Now mark the points 1′, 2′, 3′, 4′, 5′…**
- **Take the vertical distance of 11′** and with F as center draw an arc cutting the vertical **line 11′ above and below the axis.**
- **Similarly draw the arcs in all the vertical lines (22′, 33′, 44′…)**
- Draw a smooth curve through the cutting points to get the required ellipse by free hand.

CONSTRUCTION OF PARABOLA:

2. Construct a parabola when the distance of the focus from the directrix is 40mm.

Note: Eccentricity, e = 1.



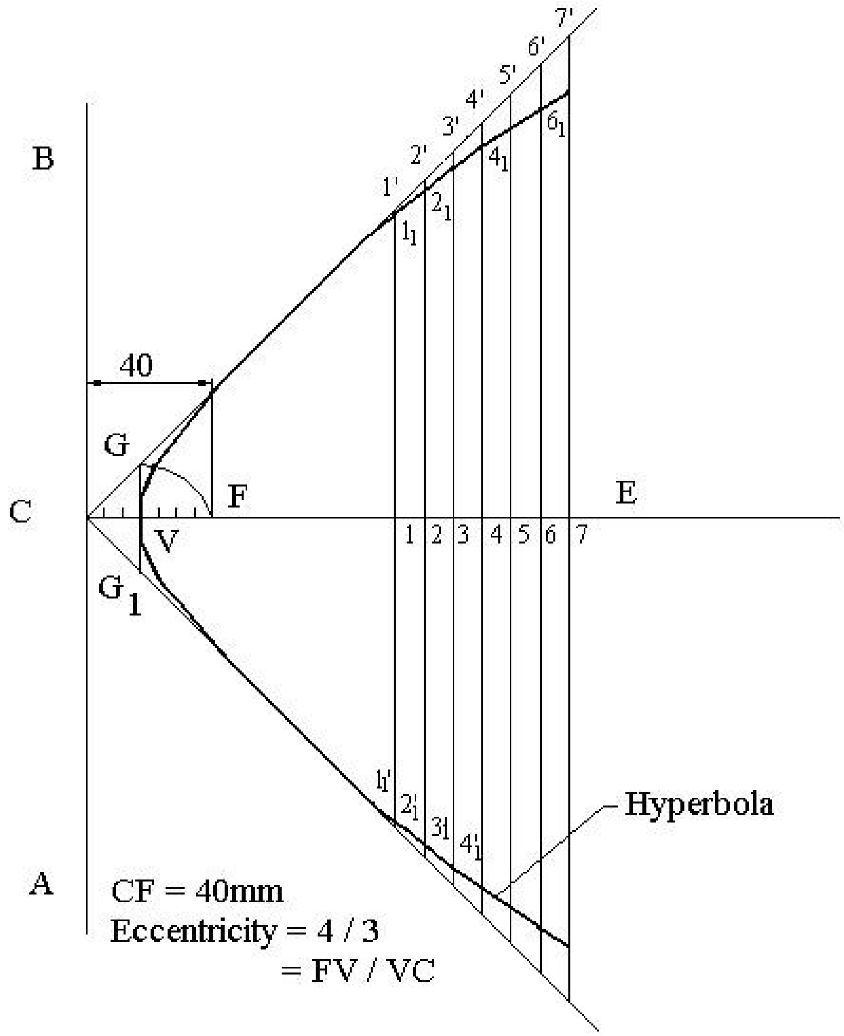
Procedure:

- Draw a perpendicular line AB (directrix) and a horizontal line CE (axis).
- Mark the focus point F on the axis line 40 mm from the directrix.
- Divide the CF in to 2 equal parts.
- **As per the eccentricity mark the vertex 'V' in the mid point of CF**
- **Draw a perpendicular line from vertex V and mark the point 'G' with the distance VF.**
- Join the points C& G and extend the line. Similarly mark the point G_1 below the axis line.
- Now joint the points C& G_1 and extend it.
- Draw number of smooth vertical lines 1,2,3,4,5,6,etc., as shown in figure.

- **Now mark the points 1′, 2′, 3′, 4′, 5′…**
- Take the vertical distance of **11′ and with F as center draw an arc cutting the vertical line 11′ above and below the axis.**
- **Similarly draw the arcs in all the vertical lines (22′, 33′, 44′…)**
- Draw a smooth curve through the cutting points to get the required parabola by free hand.

CONSTRUCTION OF HYPERBOLA:

3. Draw a hyperbola when the distance of the focus from the directrix is 60 and eccentricity is 4/3.



Procedure:

- Draw a perpendicular line AB (directrix) and a horizontal line CE (axis).
- Mark the focus point F on the axis line 40 mm from the directrix.
- Divide the CF in to 2 equal parts.
- As per the eccentricity mark the vertex V, in the third division of CF

- Draw a perpendicular line from vertex V, and mark the point G, with the distance VF.
- Join the points C& G and extend the line. Similarly mark the point G_1 below the axis line.
- Now join the points C& G_1 and extend it.
- Draw number of smooth vertical lines 1,2,3,4,5,6,etc., as shown in figure.
- **Now mark the points 1′, 2′, 3′, 4′, 5′…**
- **Take the vertical distance of 11′** and with F as center draw an arc cutting the vertical **line 11′ above and below the axis.**
- **Similarly draw the arcs in all the vertical lines (22′, 33′, 44′…)**
- Draw a smooth curve through the cutting points to get the required hyperbola by free hand.

CYCLOIDAL CURVES:

- Cycloidal curves are generated by a fixed point on the circumference of a circle, which rolls without slipping along a fixed straight line or a circle.
- In engineering drawing some special curves **(cycloidal curves)** are used in the profile of teeth of gear wheels.
- The rolling circle is called **generating circle**.
- The fixed straight line or circle is called **directing line** or **directing circle**.

CYCLOIDS:

Cycloid is a curve generated by a point on the circumference of a circle which rolls along a straight line.

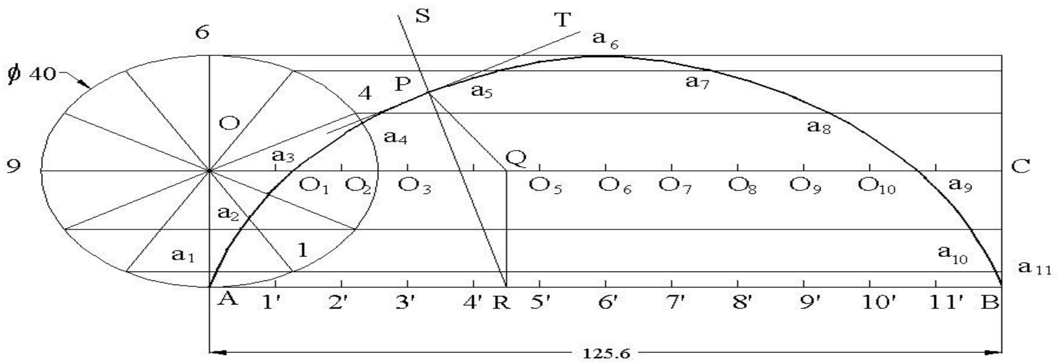
Epicycloidal:

An epicycloidal is a curve generated by a point on the circumference of a circle, which rolls without slipping along another circle outside it.

Hypocycloidal:

Hypo-is a curve generated by a point on the circumference of a circle, when the circle rolls along another circle inside it.

1. Construct a cycloid when the diameter of the generating circle is 40 mm.



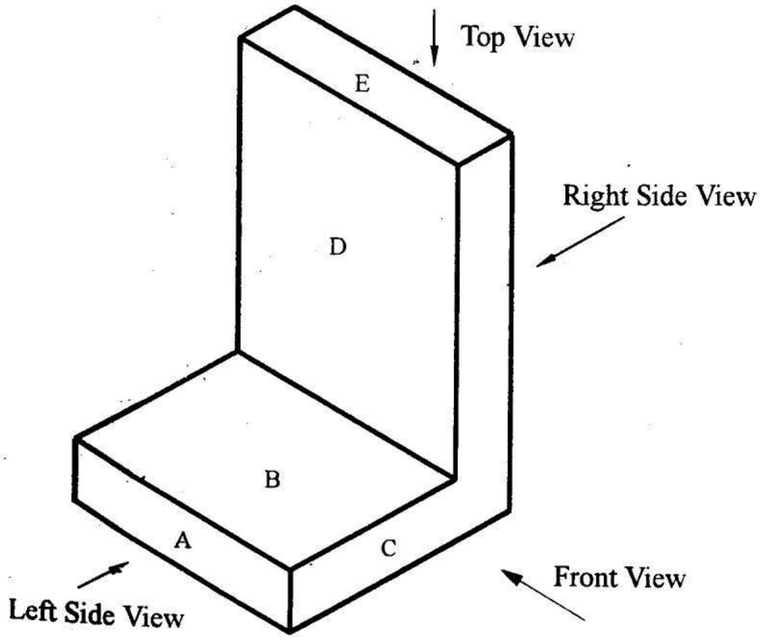
Procedure:

- Draw a circle with diameter 40mm and mark the center O.
- **Divide the circle in to**SVCET**12equalpartsas1,2,3…12.**
- Draw horizontal line from the bottom points of the circle, with the distance equal to **the circumference of the circle (ΠD) and mark the other end point B.**
- **Divide the line AB in to 12 equal parts. (1′, 2′, 3′…12′)**
- Draw a horizontal line from O toand mark the equal distance point O_1, O_2, O_3**…**$\mathbf{O_{12}}$.
- **Draw smooth horizontal lines from the points 1,2,3…12.**
- **When the circle starts rolling towards right hand side, the point 1coincides with 1′ at** the same time the center O moves to O_1.
- Take OA as radius, O_1 as center draw an arc to cut the horizontal line 1 to mark the point a_1.
- Similarly O_2 as center and with same radius OA draw an arc to cut the horizontal line 2 to mark the point a_2.
- Similarly mark a_3, a_4**…**$\mathbf{a_{11}}$.
- Draw a smooth curve through the points a_1, a_2, a_3,**….** $\mathbf{a_{11}}$, B by free hand.
- The obtained curve is a cycloid.

ORTHOGRAPHIC PROJECTIONS

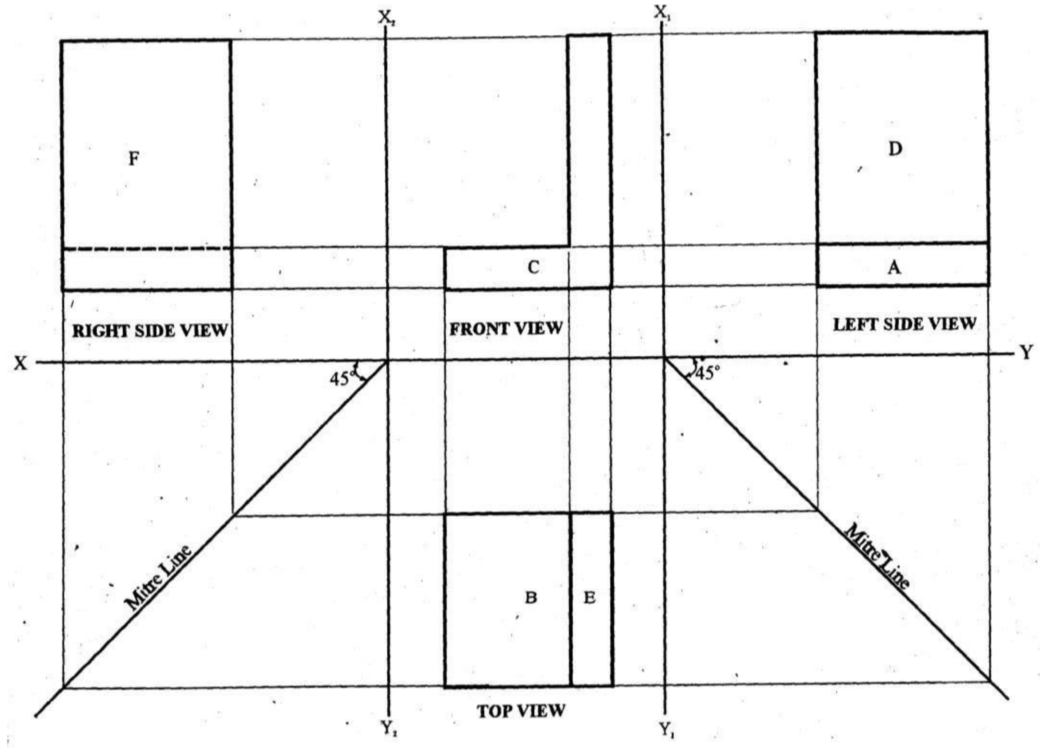
In orthographic projections, the principle views – Front view, Top view, & Side views of an object are drawn by the direct observation. These views are drawn from the pictorial view of an object. The pictorial view is a three dimensional representation. By observing pictorial view, it is very easy to visualize the shape when the object is viewed from front, top & sides.

REPRESENTATION OF ORTHOGRAPHIC VIEWS

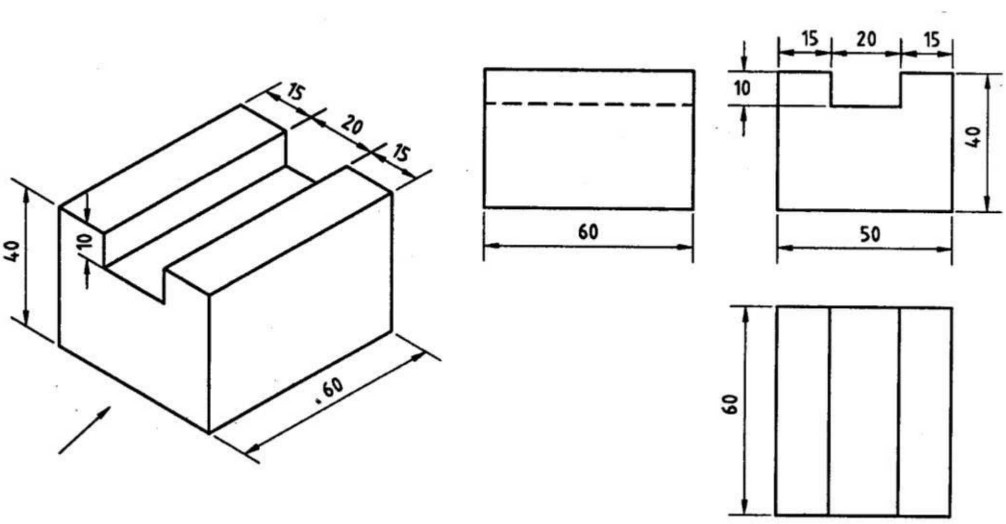


Consider a pictorial view as shown in the above diagram, to draw the orthographic views. Assume different surfaces – A, B, C, D, E, & F.

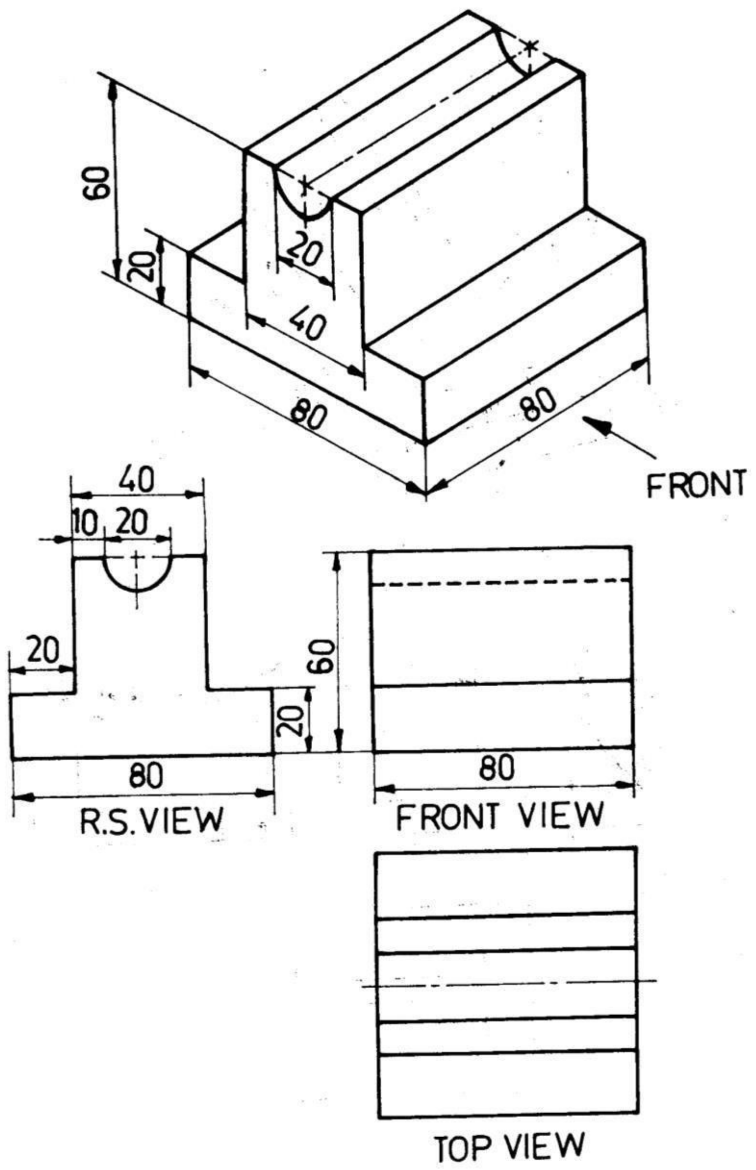
By visualizing the given pictorial view, identify the following principle views – Front view, Top view, left side view and Right side view.



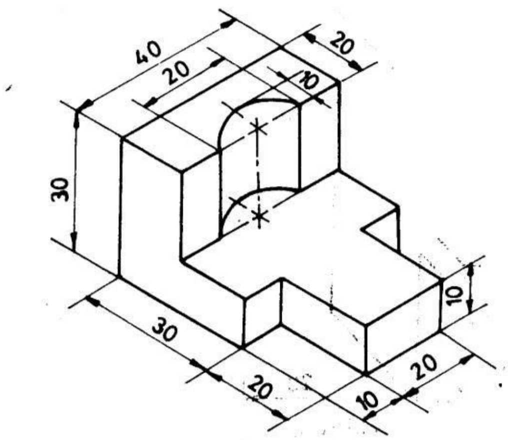
[1] Draw the front view , top view and right side view of the object as shown in fig.

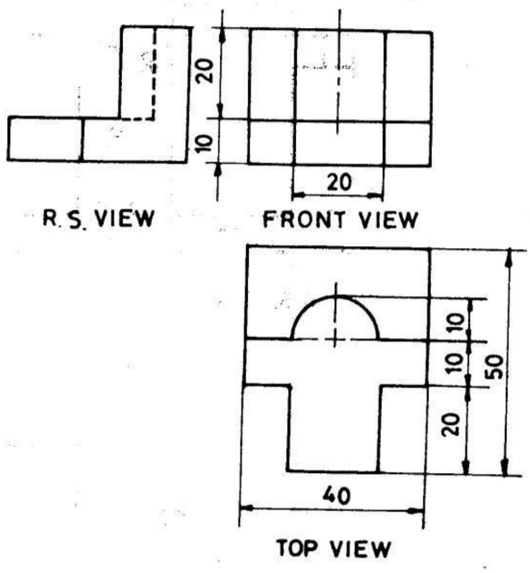


[2] Draw the front view, top view and right side view of the object as shown in fig.



[3] Draw the front view, top view and right side view of the object as shown in fig.





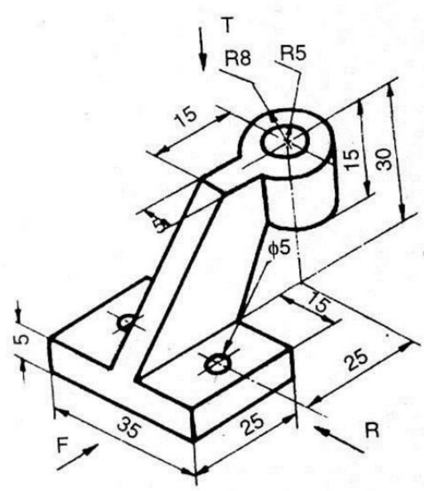


FIG.1

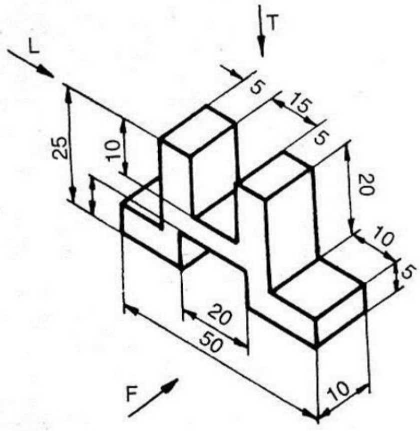


FIG.2

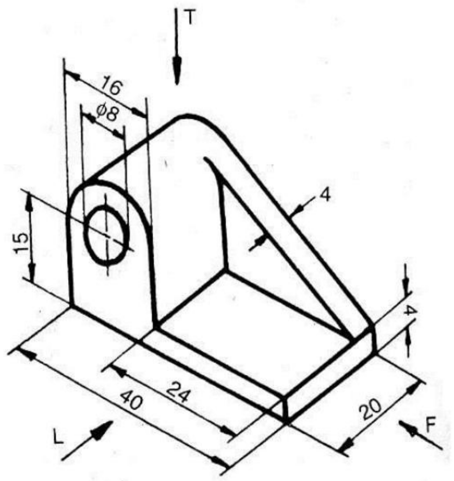


FIG.3

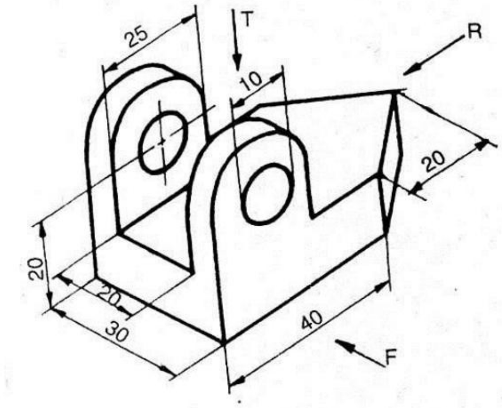


FIG.4

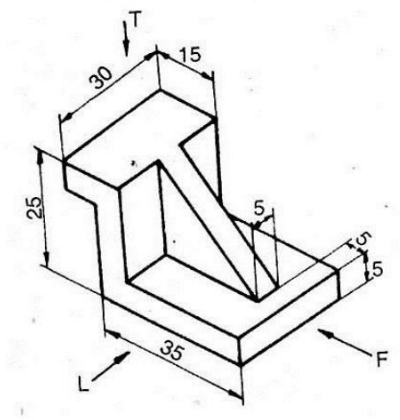


FIG.5

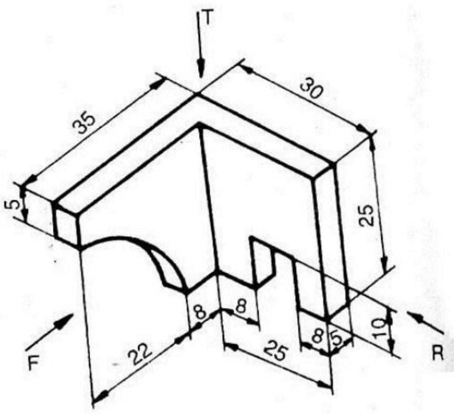


FIG.6

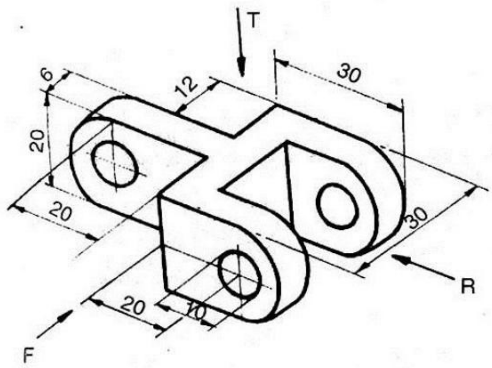


FIG. 7

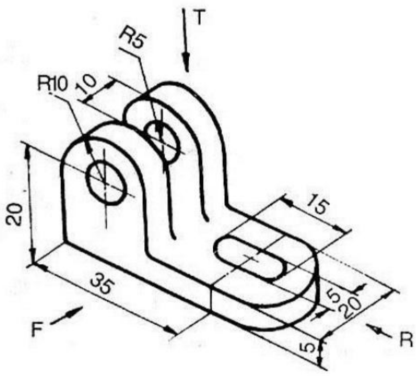


FIG. 8

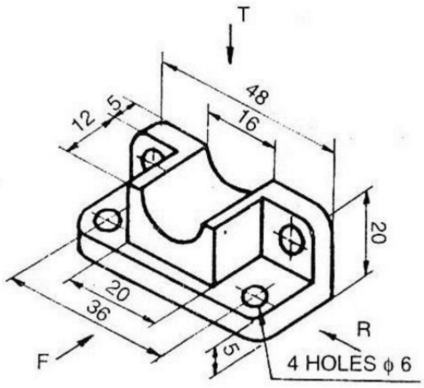


FIG. 9

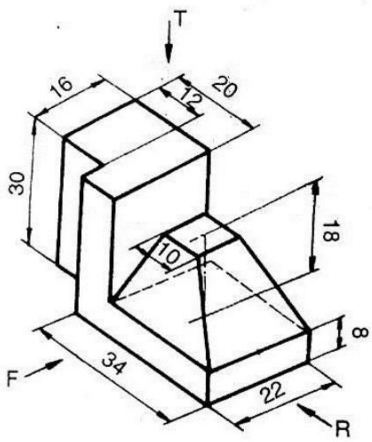


FIG. 10

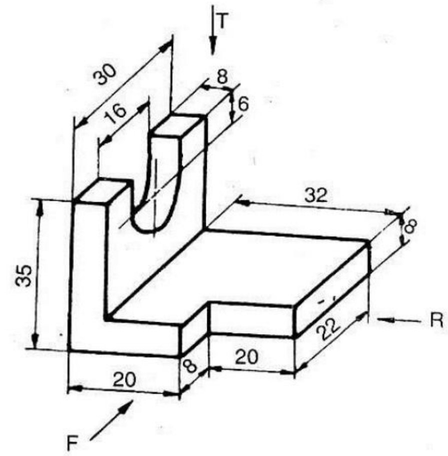


FIG. 11

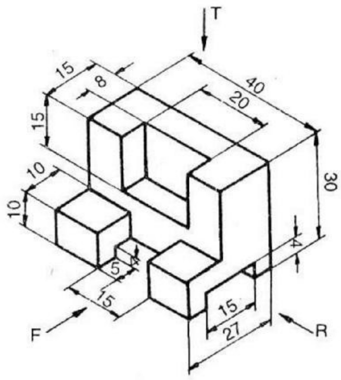


FIG. 12

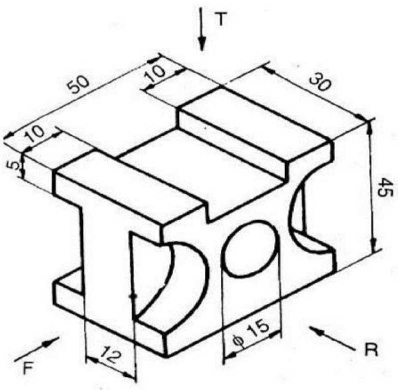


FIG. 13

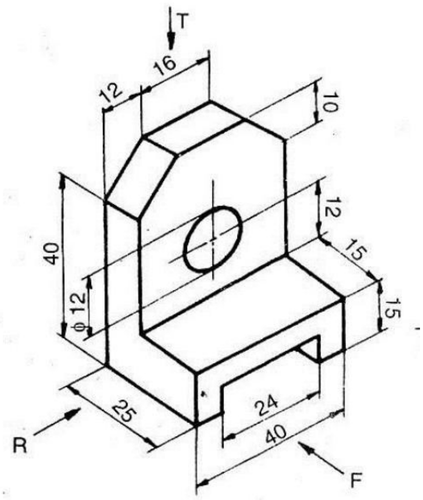


FIG. 14

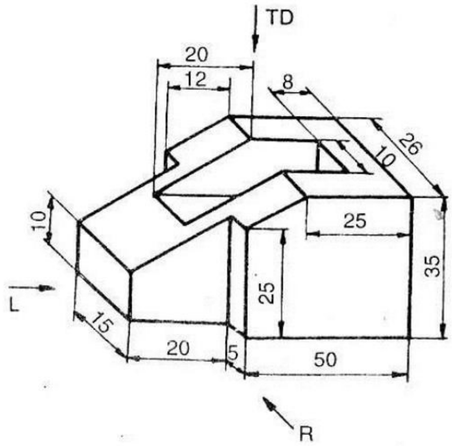


FIG. 15

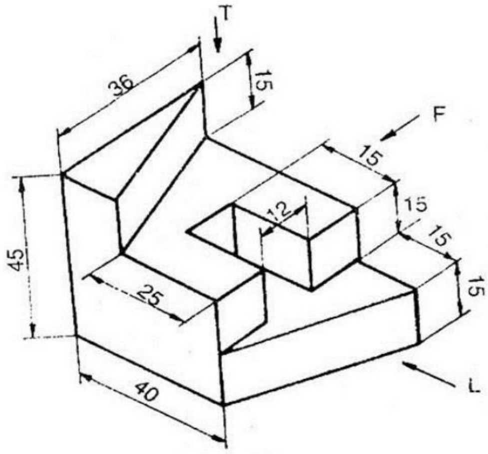


FIG. 16

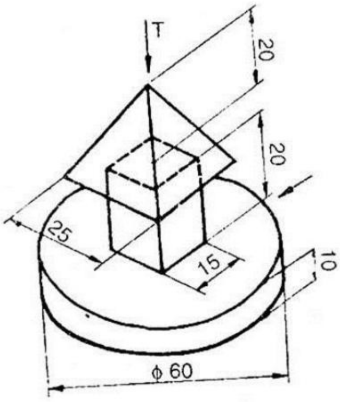


FIG. 17

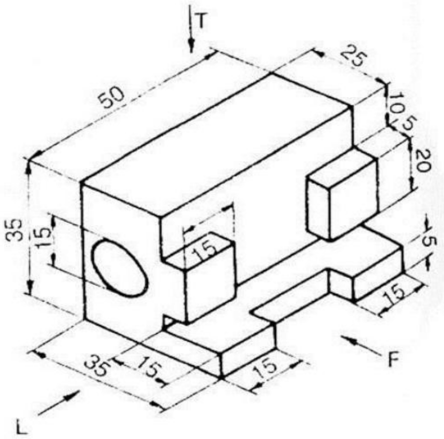
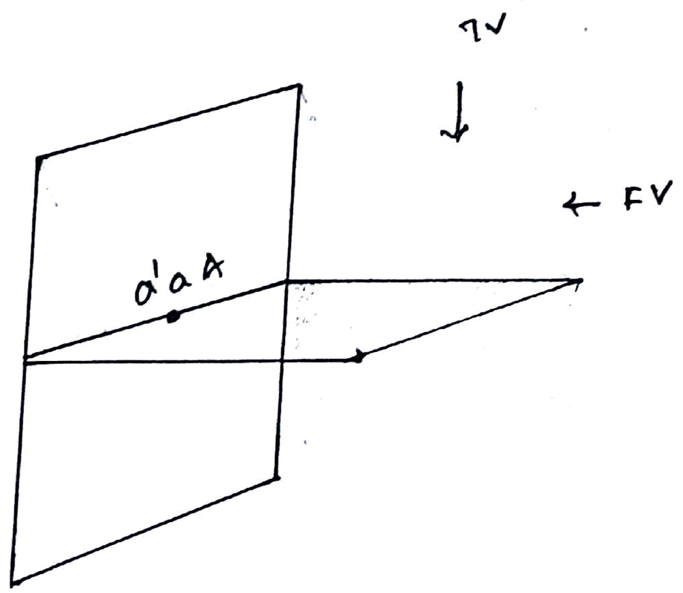


FIG. 18

UNIT - II

Projection of Points :-



Above HP - Above RP

Below HP - Below RP

Infront of VP - Below RP

Behind VP - Above RP.

Projection of Straight Line :-

Straight Line :-

A Line Joining any two Points along the shortest route is called a straight line.

Projection of Straight Line :-

* Parallel to both the planes
* Contained by one or both the planes
* Line Perpendicular to one plane & Parallel to another plane.
  (a) $\perp^r$ to HP & Parallel to VP
  (b) Perpendicular to VP & Parallel to HP
* Line Parallel to one plane & inclined to other.
  (a) Parallel to HP & inclined to VP.
  (b) Parallel to VP & inclined to HP.
* Inclined to both the Plane.

Projection of Plane.

plane :-

A Plane is a two dimensional surface having only Length and breadth

Position of Plane :-

* Plane Perpendicular to both reference planes.
* Plane Perpendicular to one plane & Parallel to another
  (a) Perpendicular to HP & Parallel to VP.
  (b) Perpendicular to Vp & Parallel to HP.
* Plane Perpendicular to one plane & Inclined to other.
  (a) Perpendicular to HP & inclined to Vp
  (b) Perpendicular to Vp & inclined to HP.
* Plane Inclined to both HP and Vp.

Important Notes :-

* The front View and top View are always in line vertically.

* The front and side Views are always in line horizontally

* The width of the top View is the same as the width of the front View

* The height of the side View is the same as the height of the front View.

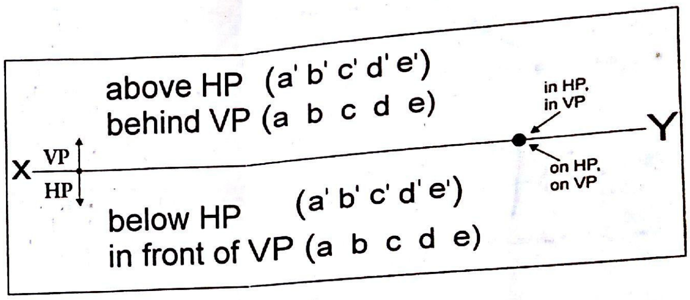
* The depth of the top View is the same as the width of the side View.

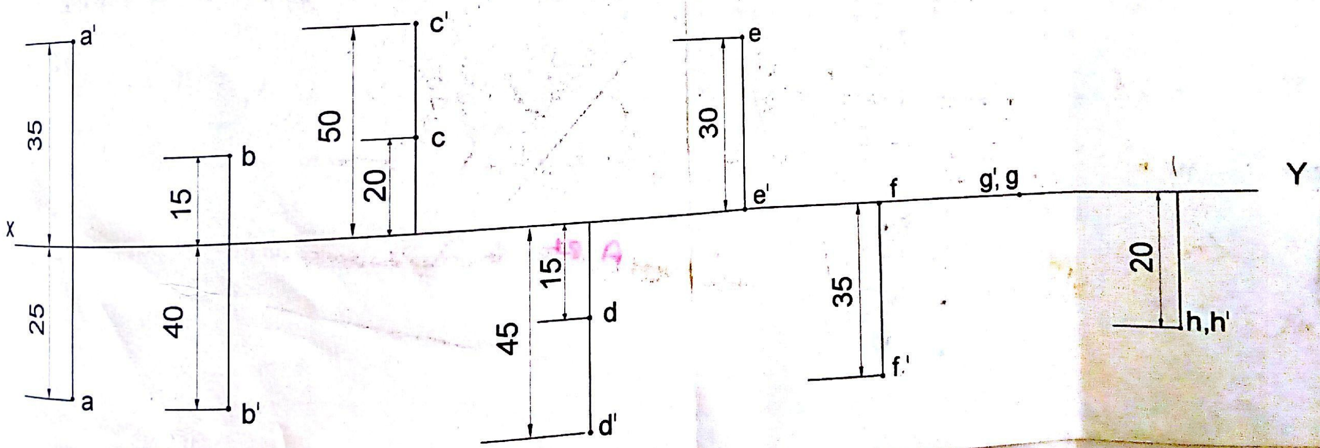
ENGINEERING GRAPHICS UNIT - II

PROJECTIN OF POINTS

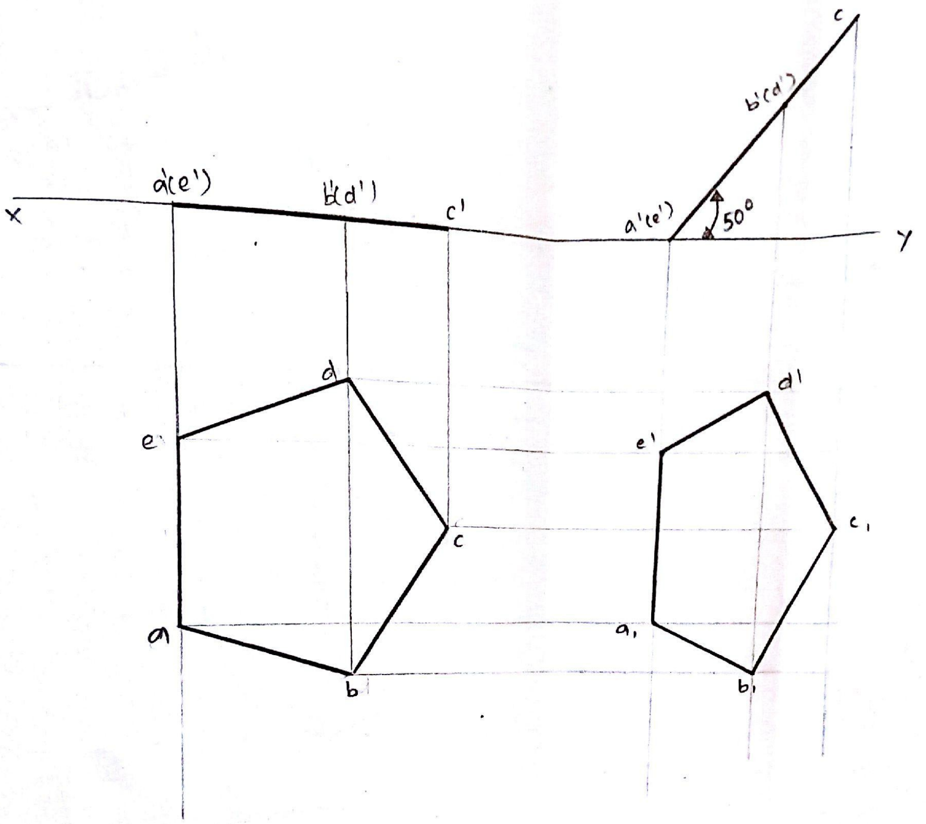
Draw the projection of the following points on a common reference line.
Take 30mm distance between the projections.

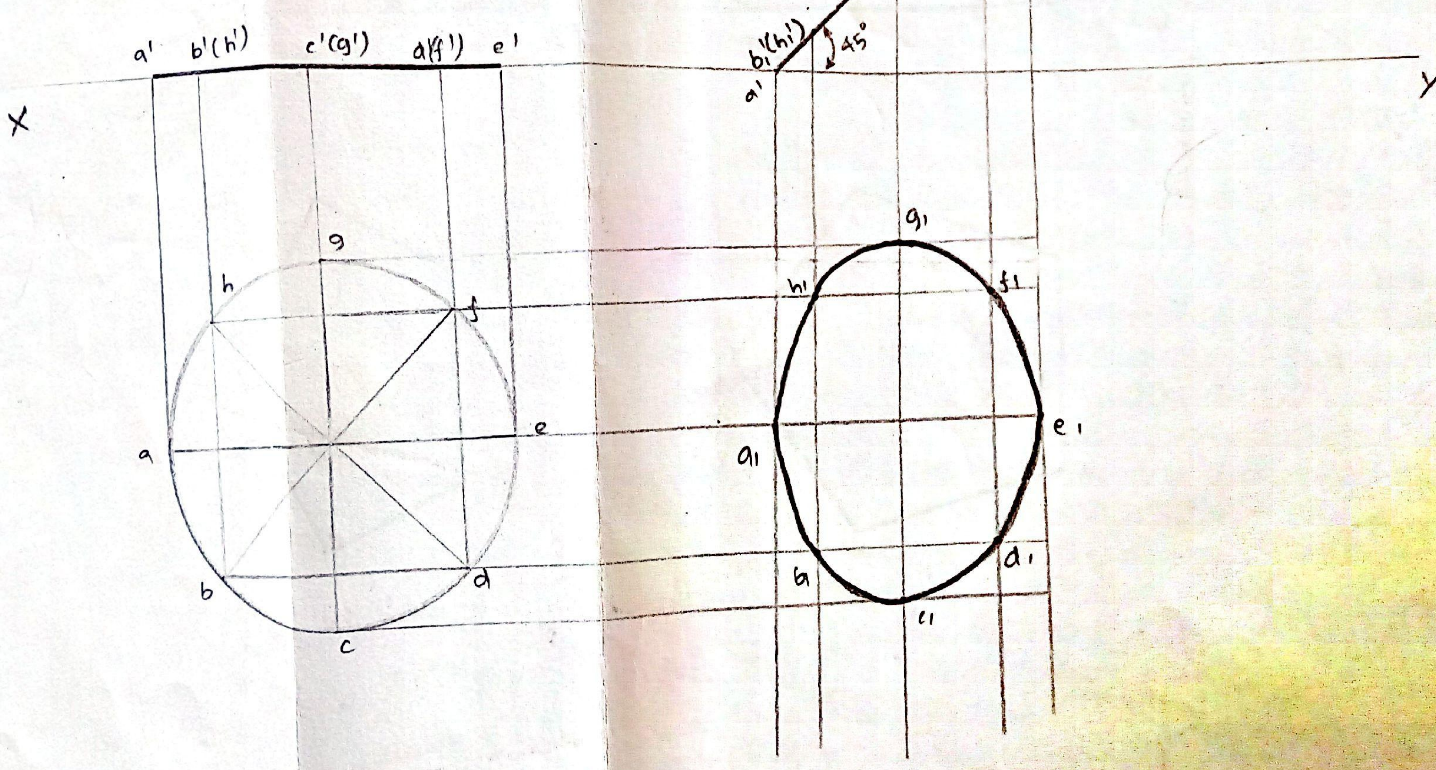
A, 35mm above HP and 25mm in front of VP (1st q)
B, 40mm below HP and 15mm behind VP (2nd q)
C, 50mm above HP and 20mm behind VP (3rd q)
D, 45mm below HP and 15mm infront of VP (4th q)
E, 30mm behind VP and on HP
F, 35mm below HP and on VP
G, on both Hp and VP
H, 20mm below HP and infront of VP





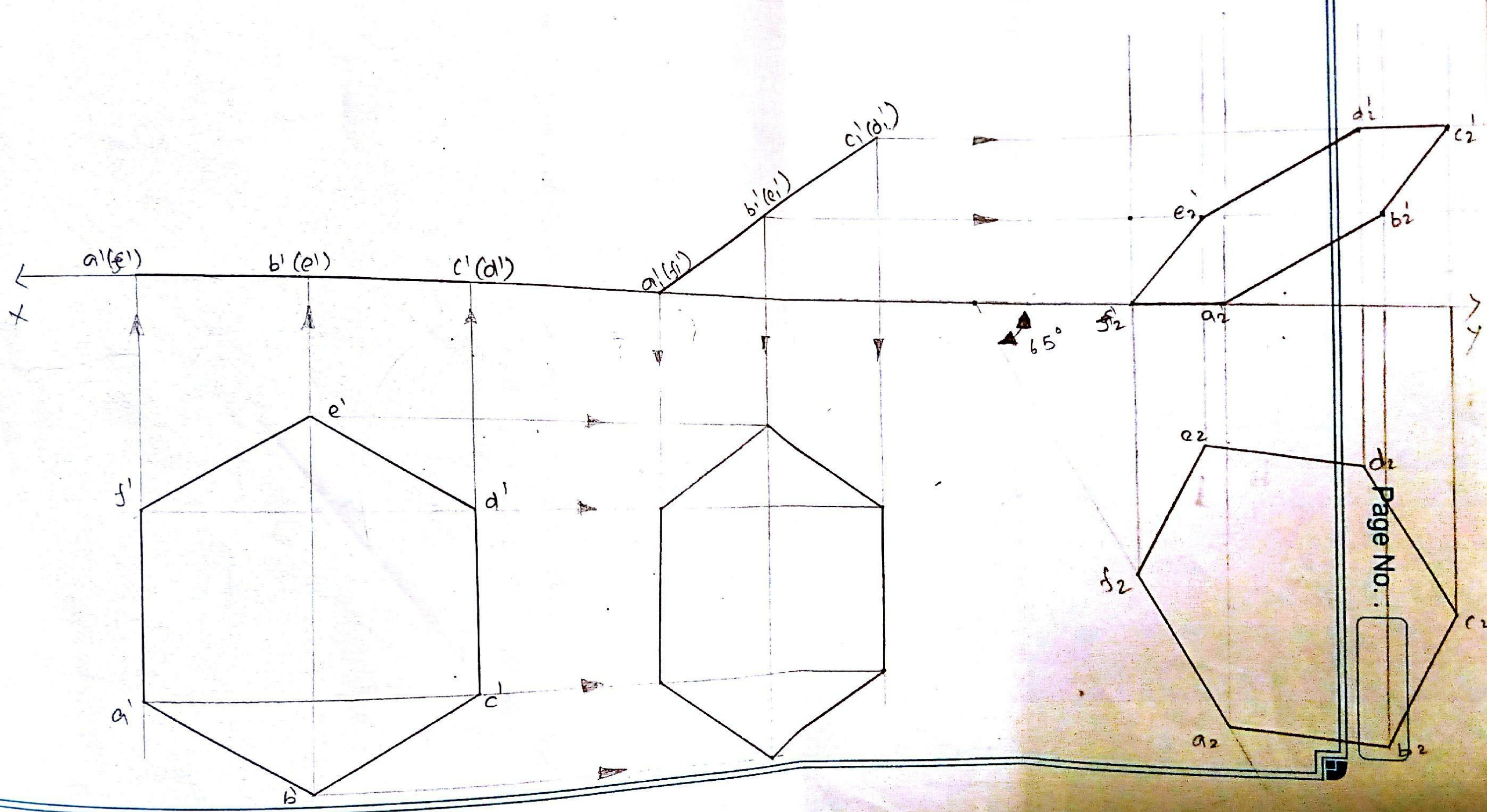
Projection of Planes inclined to One Plane



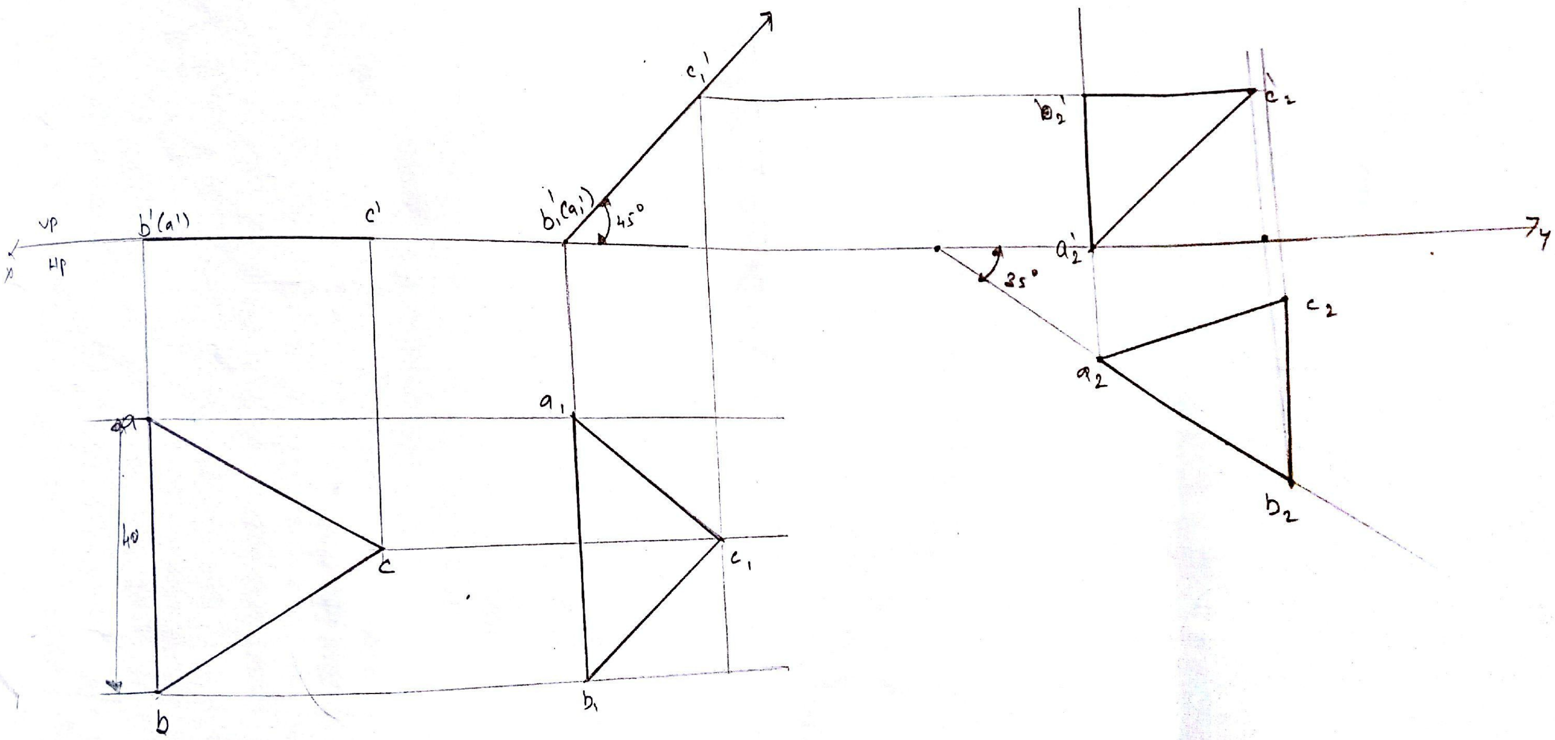


a'
b'(h')
c'(g')
d'(f')
e'
X
Y
g
h
f
a
e
b
d
c
a'
b1'(h1')
c1'(g1')
d1'(f1')
e'
45°
g1
h1
f1
a1
e1
b1
d1
c1

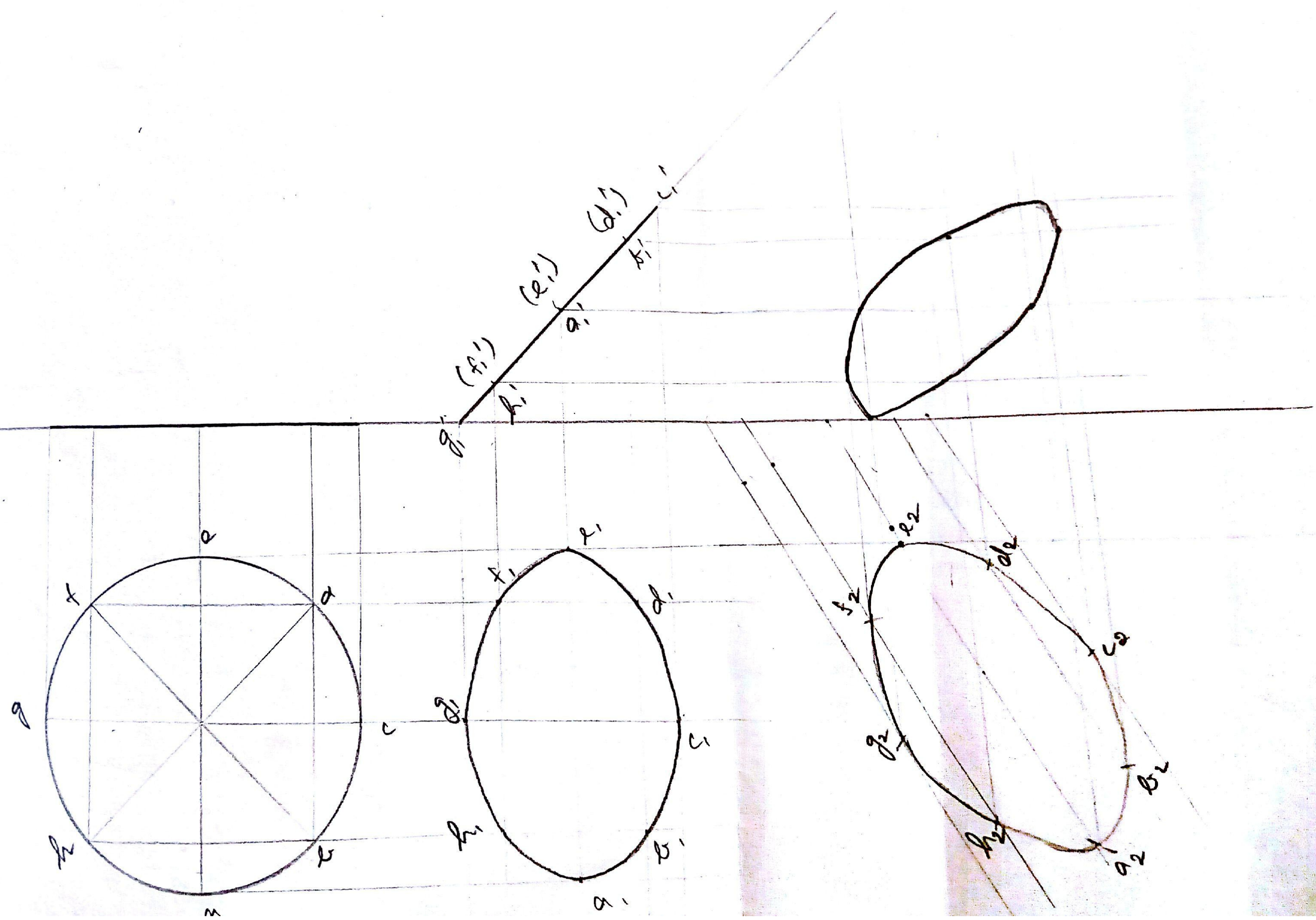
Projection of Plane inclined to ∝ Planes.



Triangle



Projection of planes inclined to 2 planes



Unit - 2

Lines :-

Examples :-

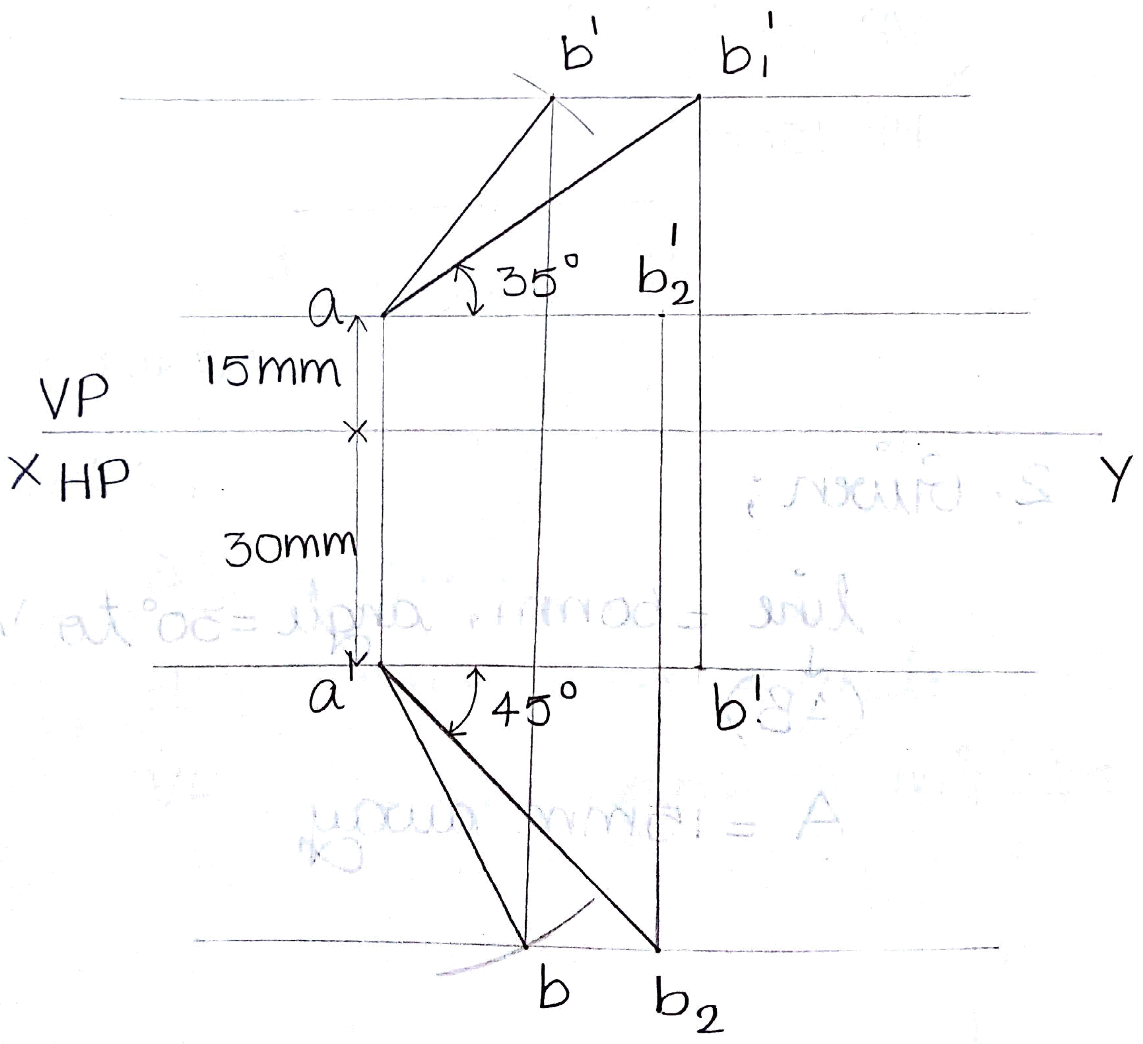
12. Given ;

line = 50mm, HP = 15mm above,

VP = 30mm in front

line inclined at 35° to HP &

45° to VP



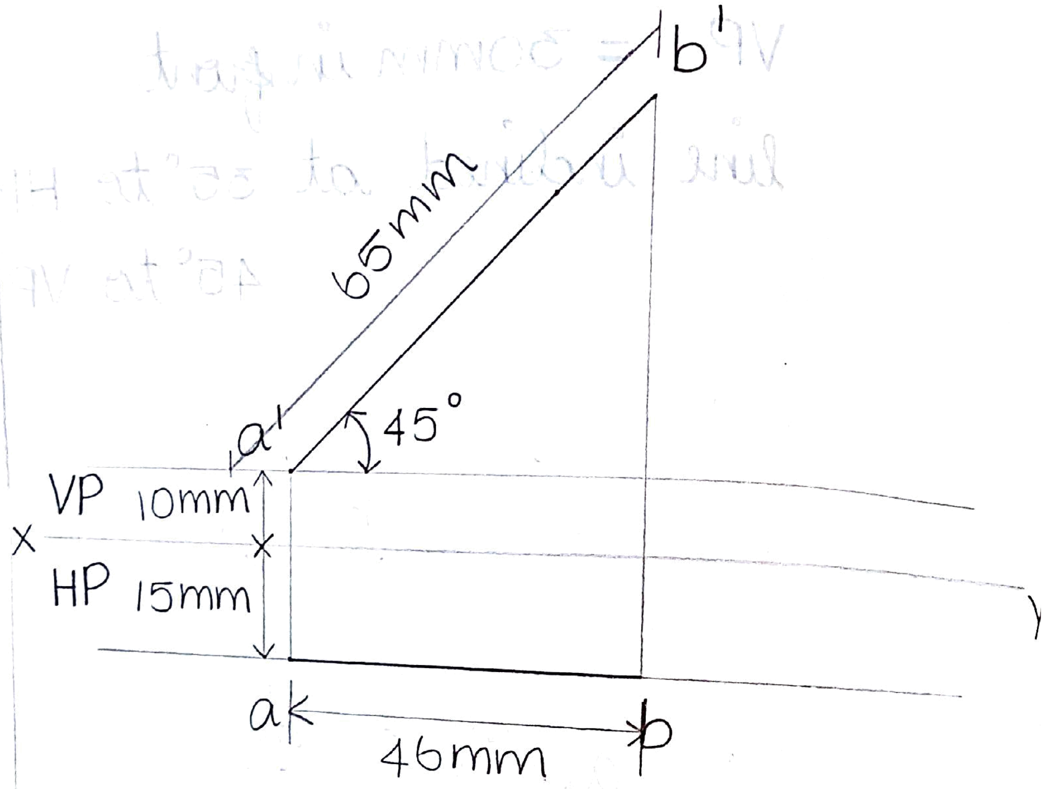
Exercises :-

1. Given ;

line = 65 mm , angle = 45° to HP

HP = 10mm above

VP = 15mm in front



2. Given ;

line = 60mm, angle = 30° to VP
(AB)

A = 15mm away

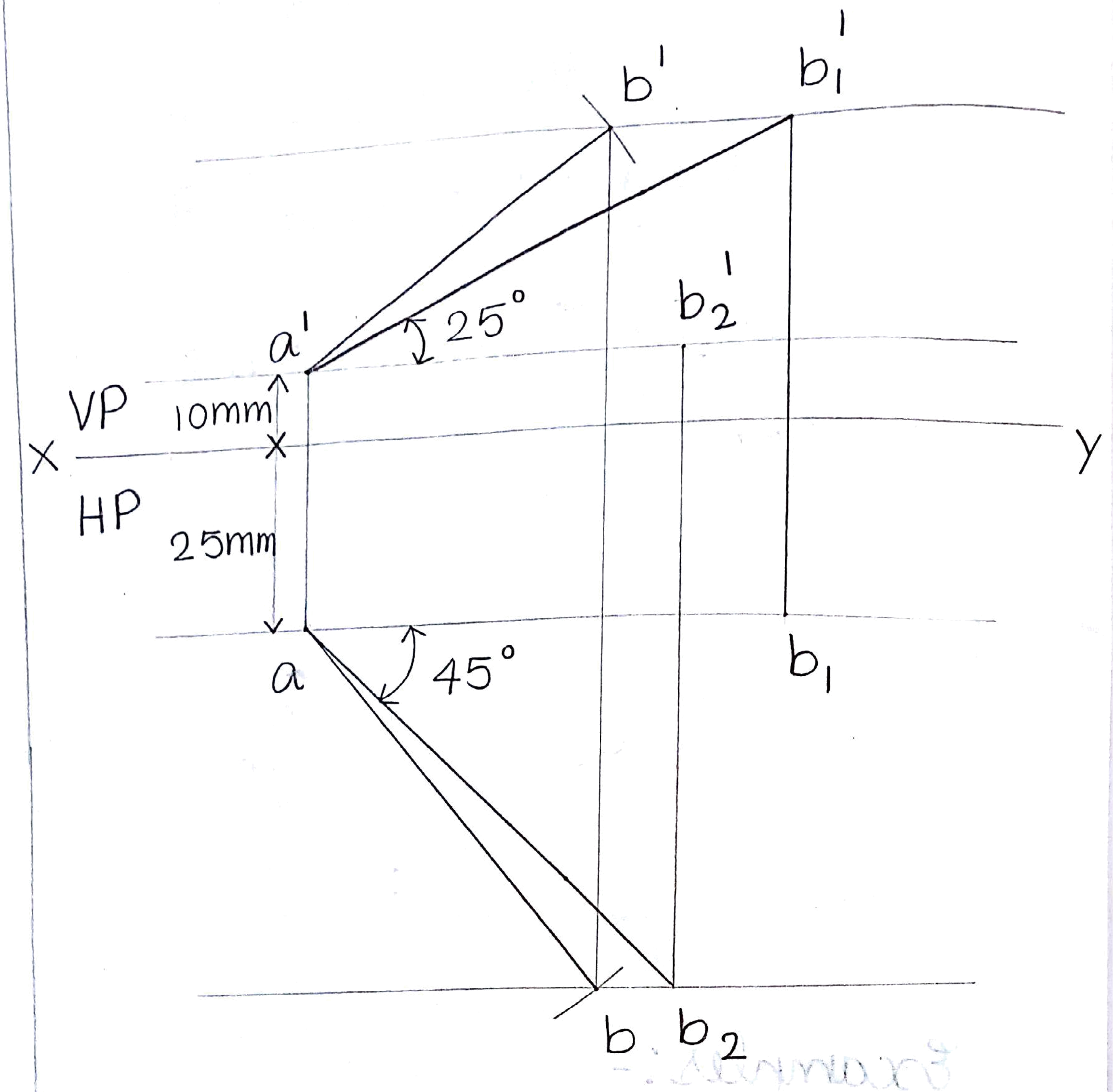
Examples:-

13. Given;

AB = 70 mm

HP = 10 mm above ⇒ angle = 25°

VP = 25 mm infront ⇒ angle = 45°



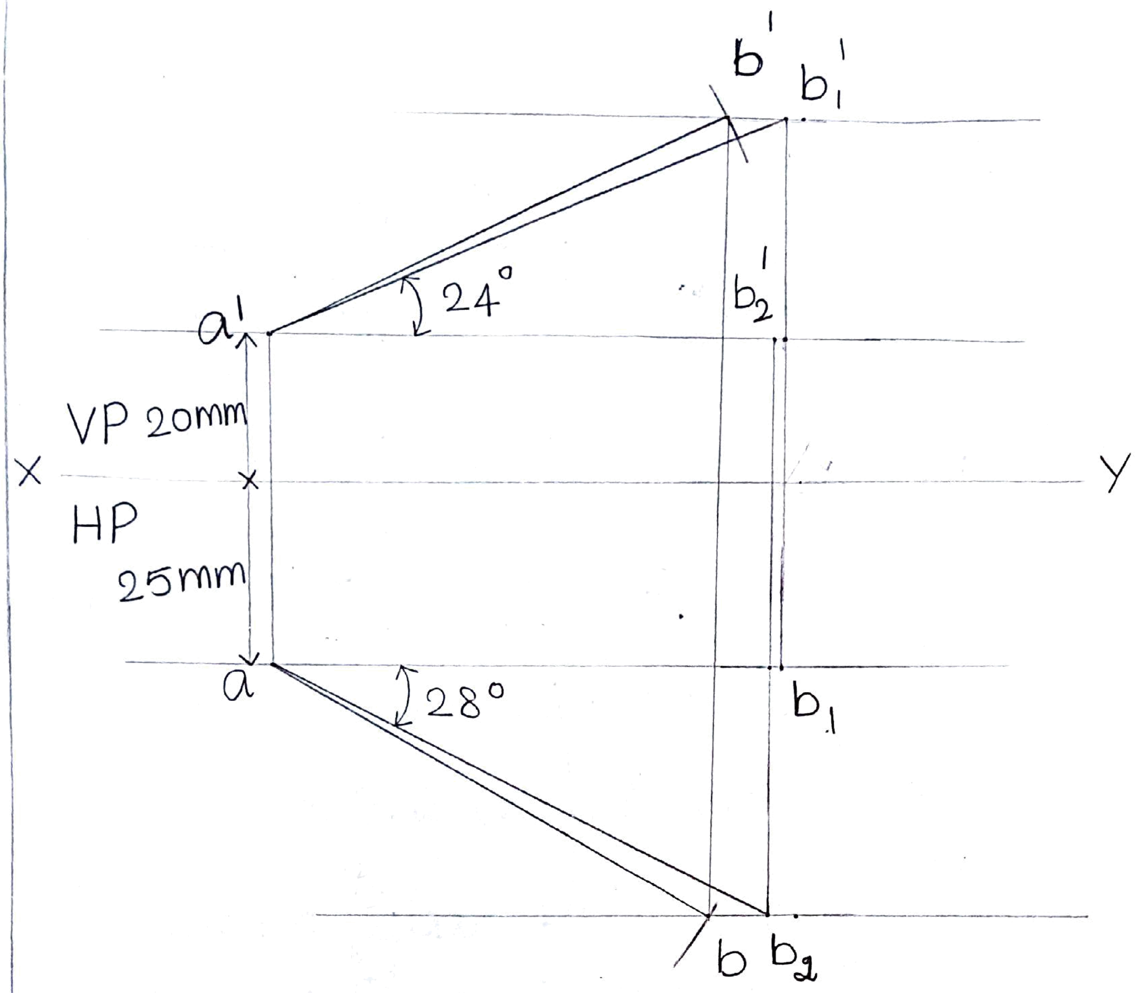
14. Given;

AB = 75 mm, A = 20 mm above HP,

B = 25 mm infront of VP

B = 50mm above HP, 60mm infront of VP.

To find: Inclinations with HP & VP



Anna University Questions

January 2009 :-

1.a) Given ;

$2r = 50mm$

$r = 25mm$

Degree $= \frac{360°}{12} = 30°$

circle $= 360°$

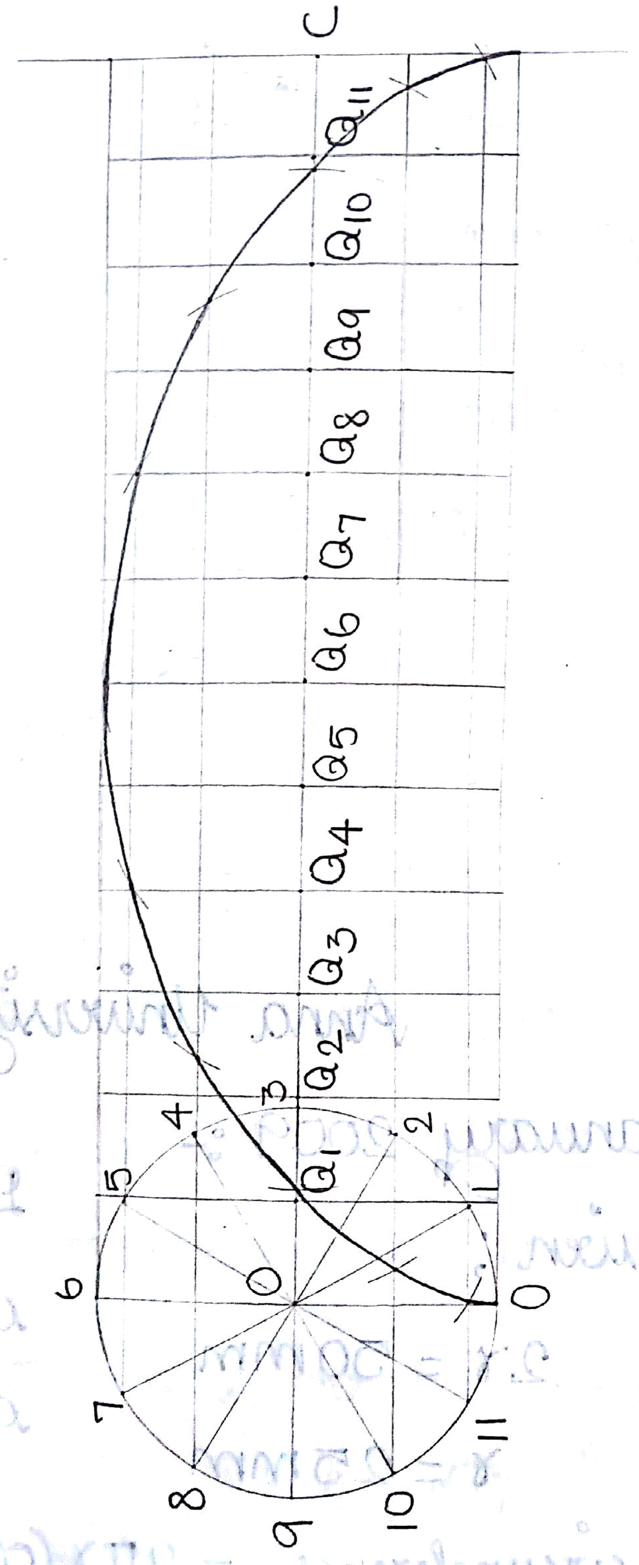
divisions $= 12$

circumference $= 2\pi r$ (or) πd

$= 2 \times 3.14 \times 25$

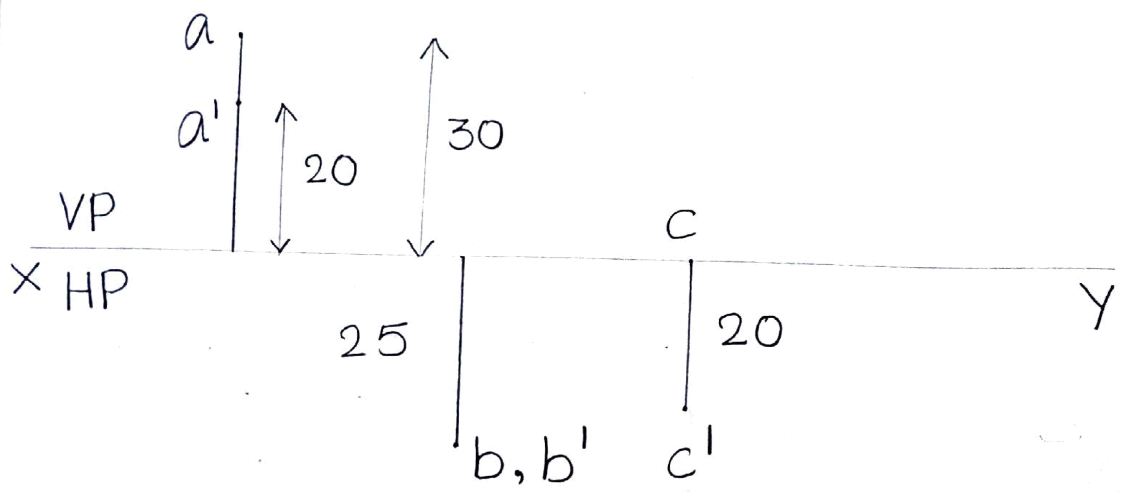
$= 157 mm$

ie., $\frac{157}{12} = 13 mm$


C
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
0
1
2
3
4
5
6
7
8
9
10
11

2. a)

i)

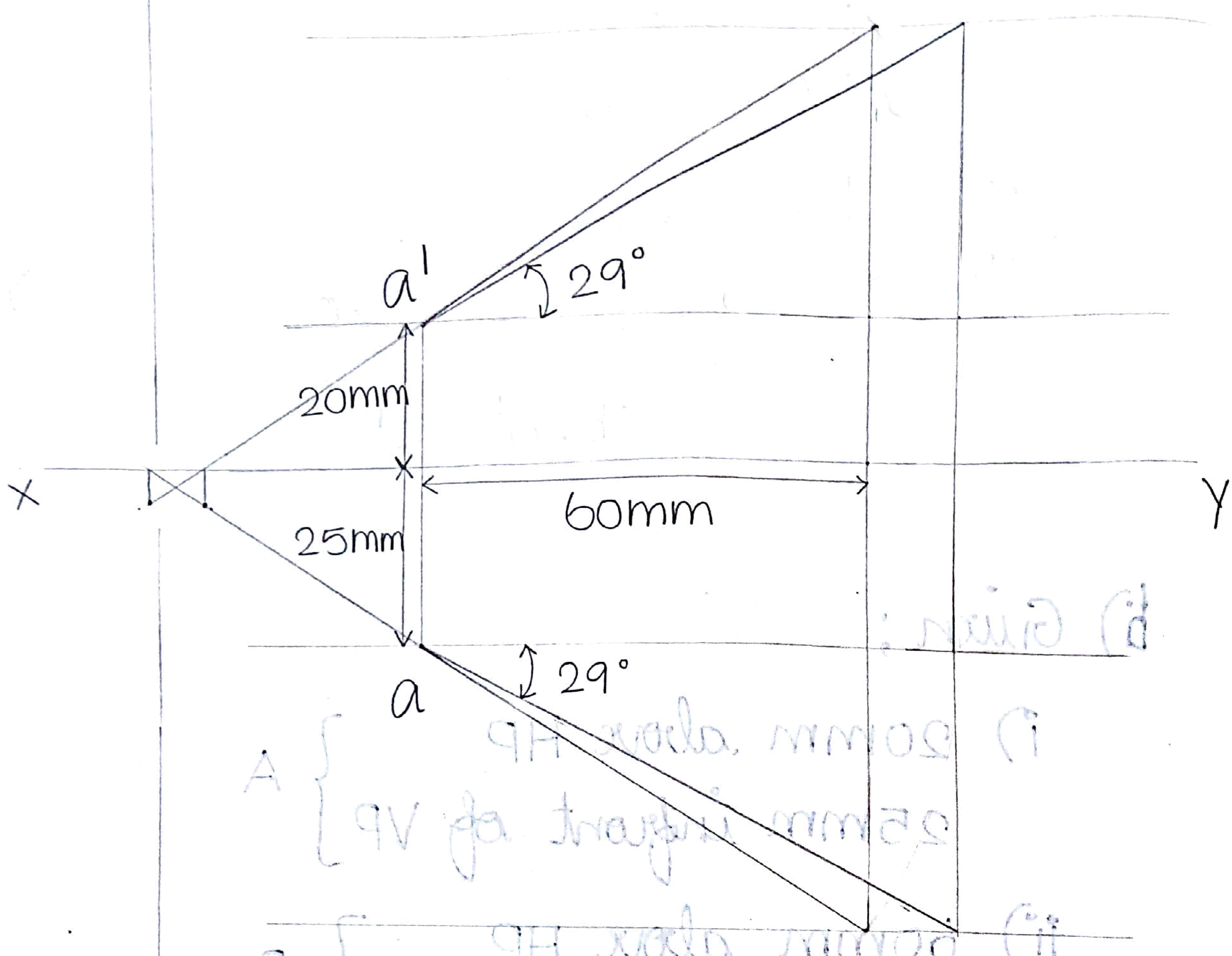


ii) Given ;

i) 20mm above HP } A
25mm infront of VP

ii) 60mm above HP } B
65mm infront of VP

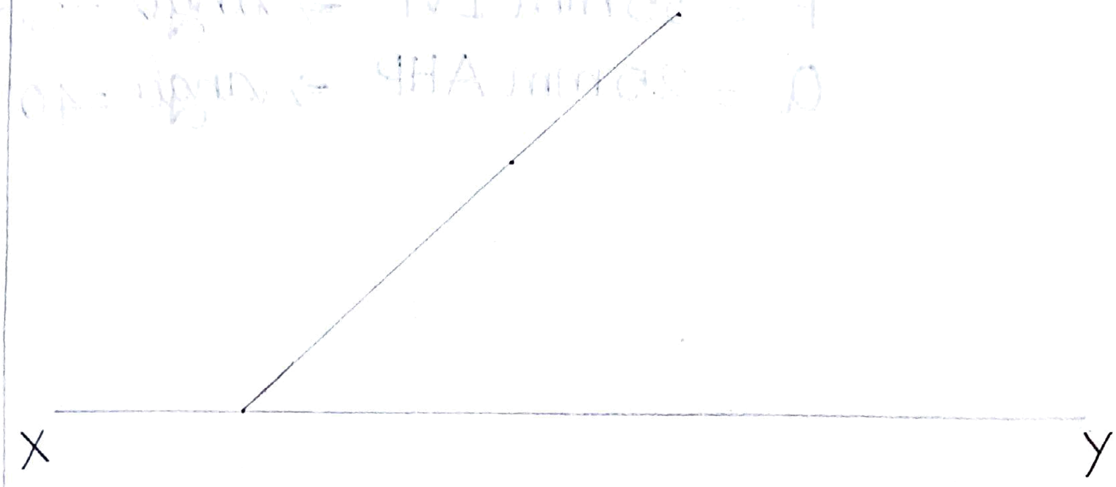
iii) Distance between the projectors = 60mm



2.a.

ii) Given;

AB = 80mm → XY { angle = 35°, elevation angle = 45° }

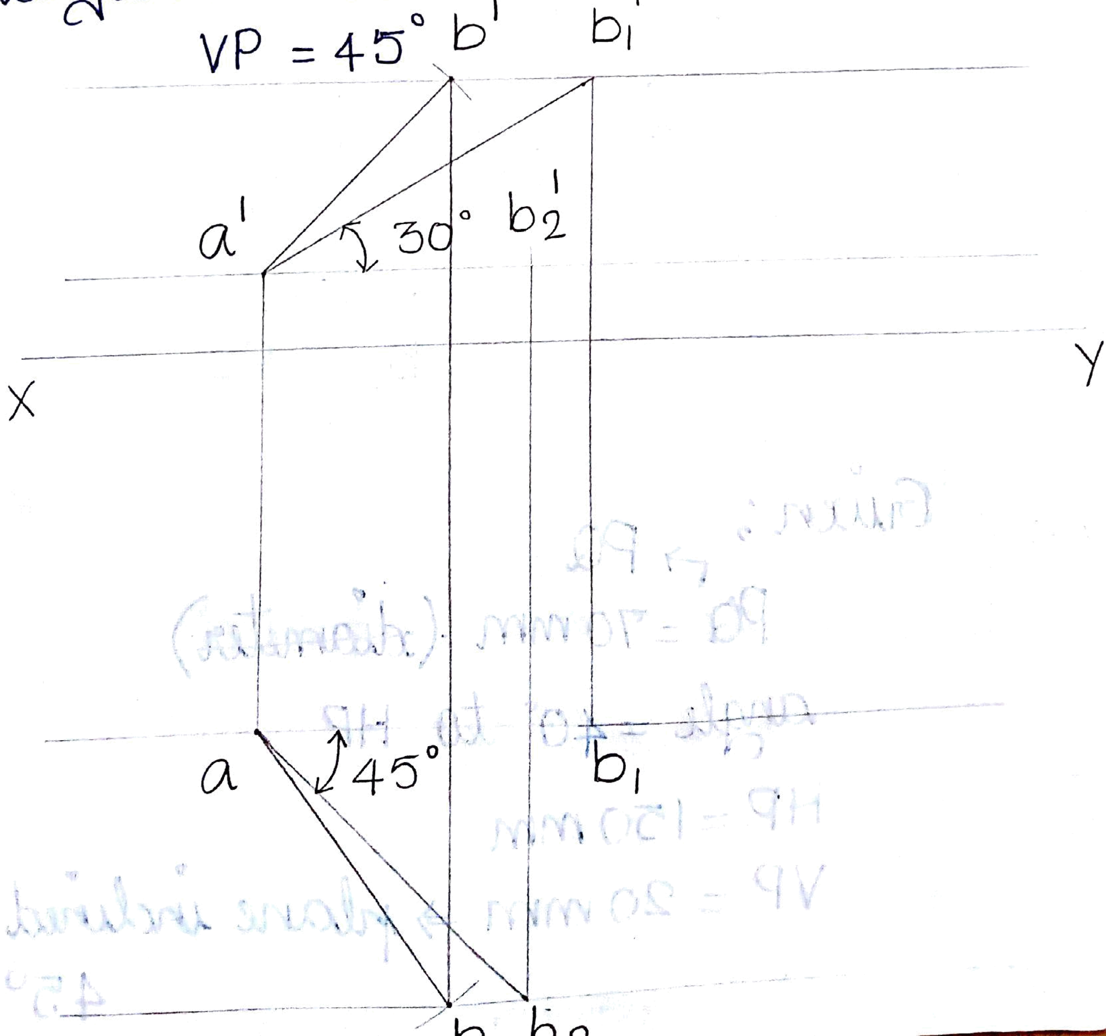


2.a) Given; AB = 50mm, A = 10mm AHP

B = 50mm IVP

angle : HP = 30°

VP = 45°

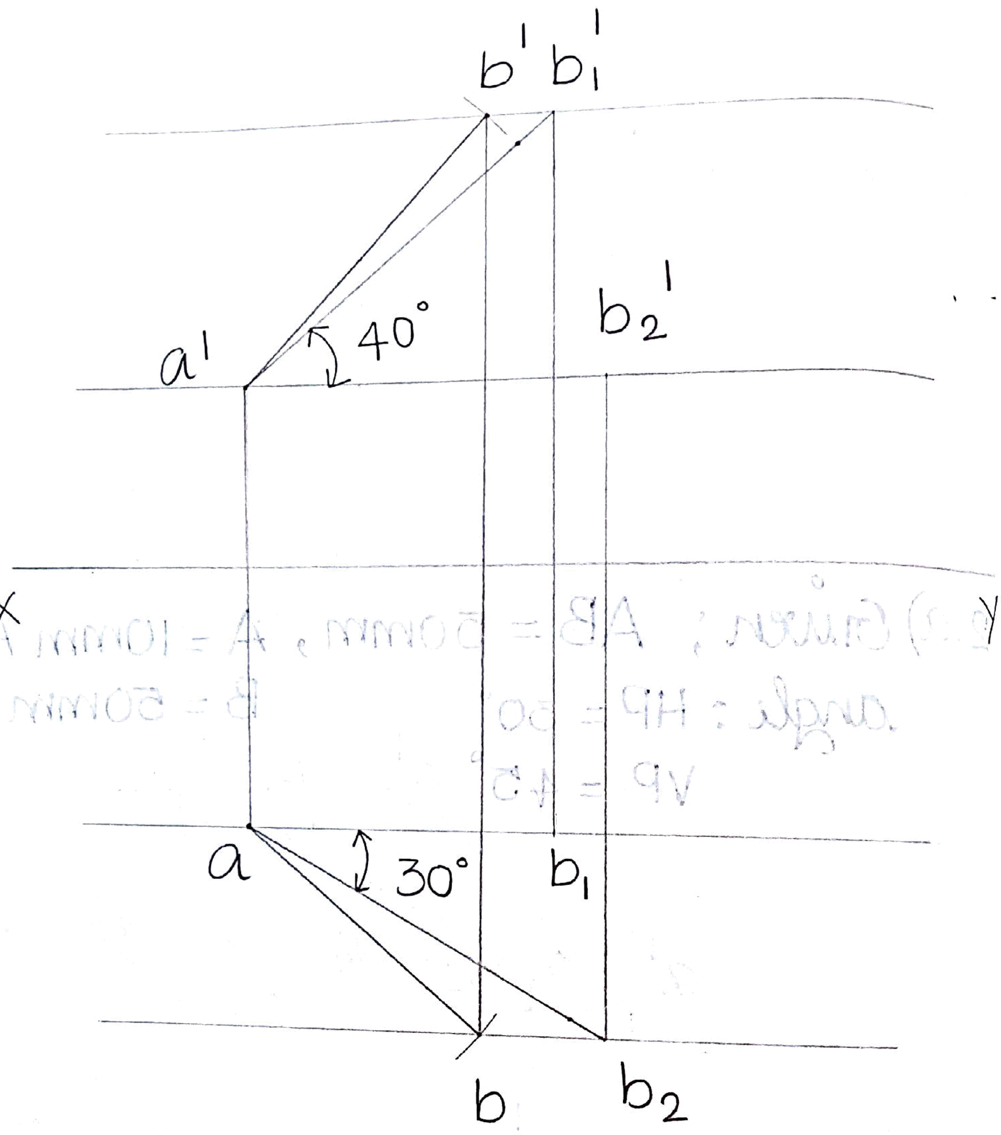


Given;

PQ = 55 mm

P = 35 mm IVP ⇒ angle = 30°

Q = 25 mm AHP ⇒ angle = 40°



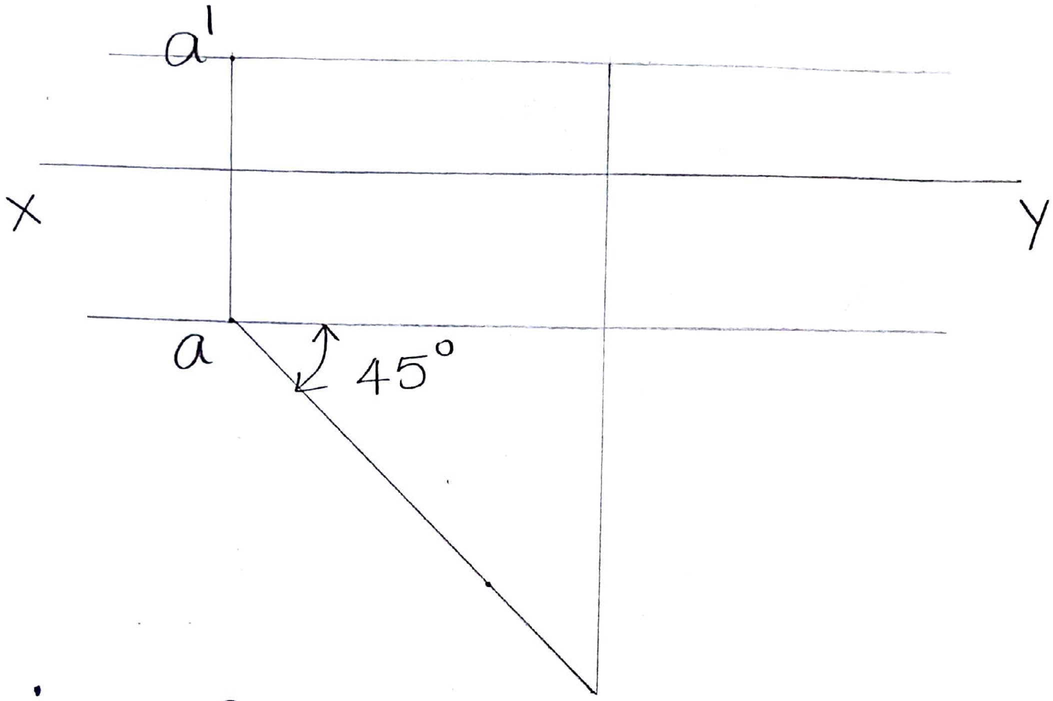
Given;

PQ = 70 mm (~~diameter~~)

angle = 40° to HP

HP = 150 mm

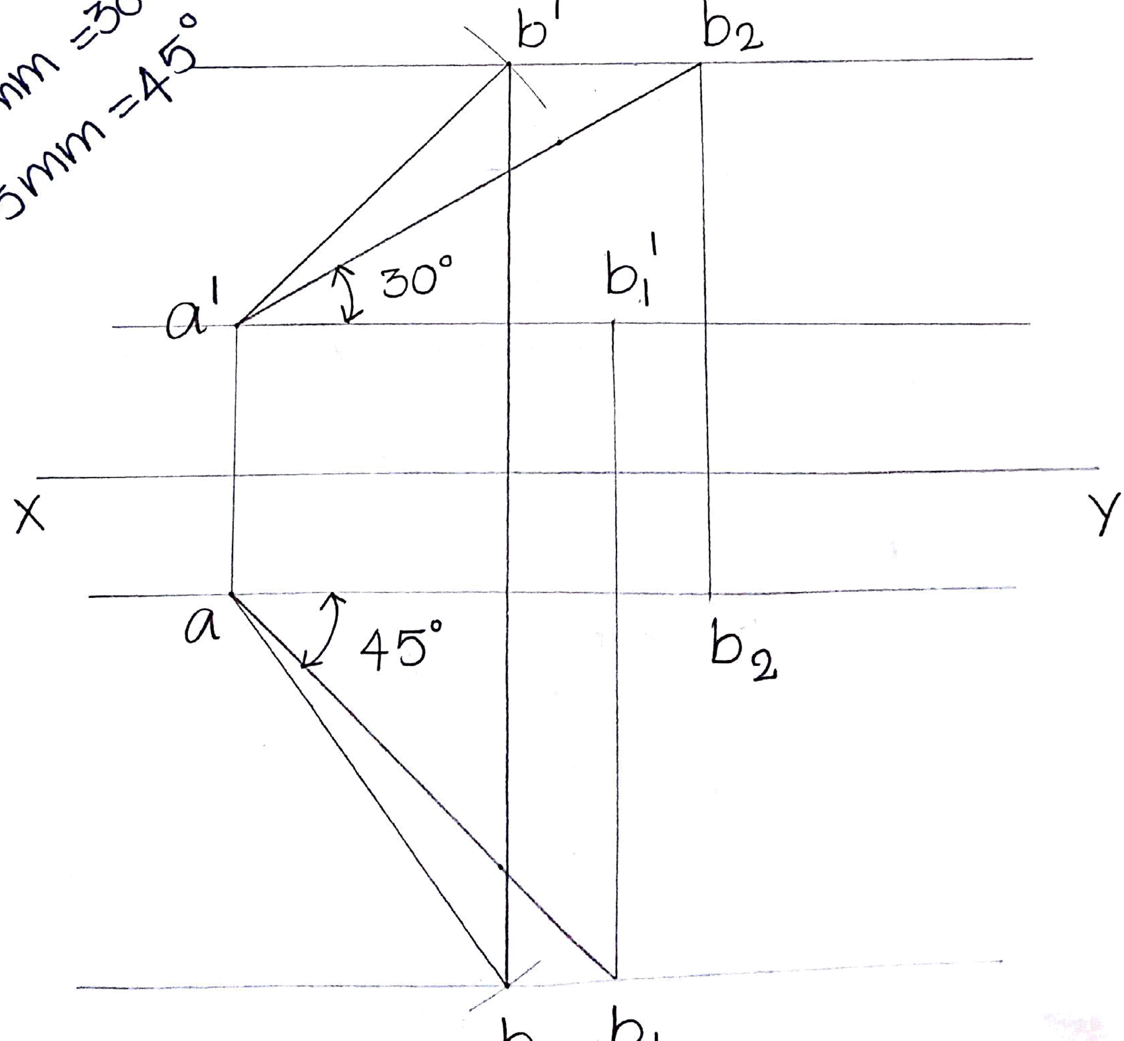
VP = 20 mm ⇒ plane inclined at 45°

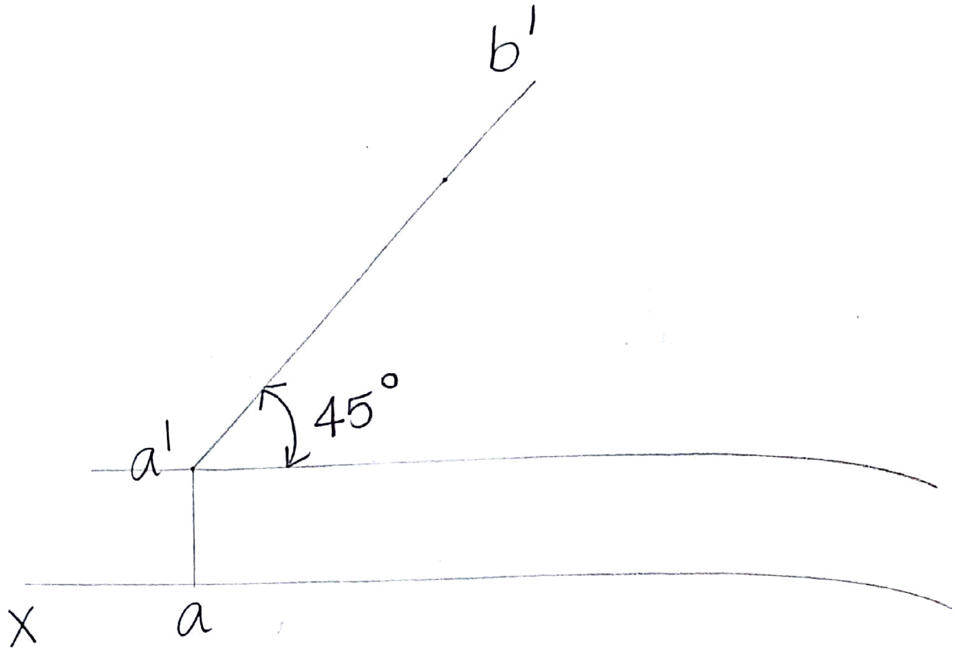


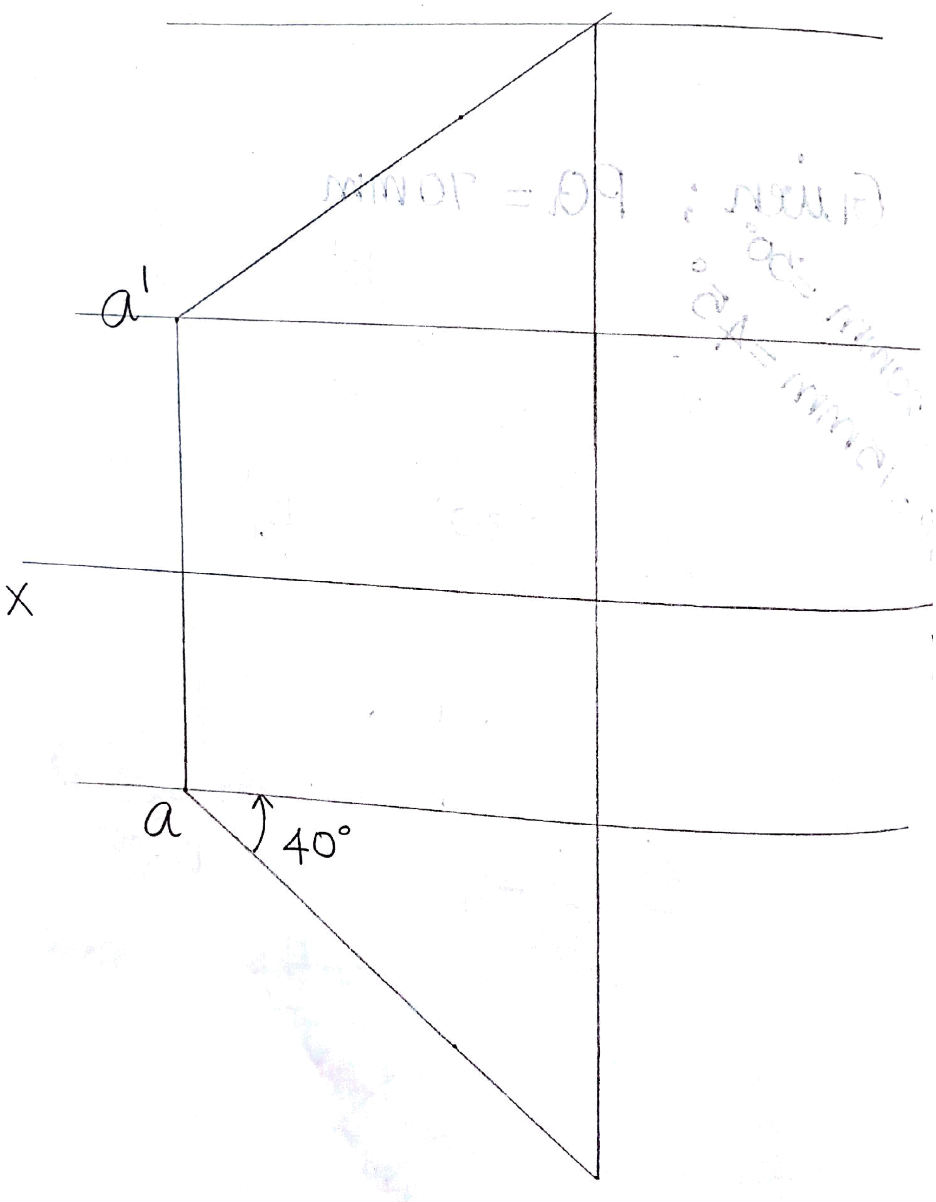
Given ; PQ = 70mm

AHP = 20mm = 30°

IVP = 15mm = 45°




b'
45°
a'
X
a

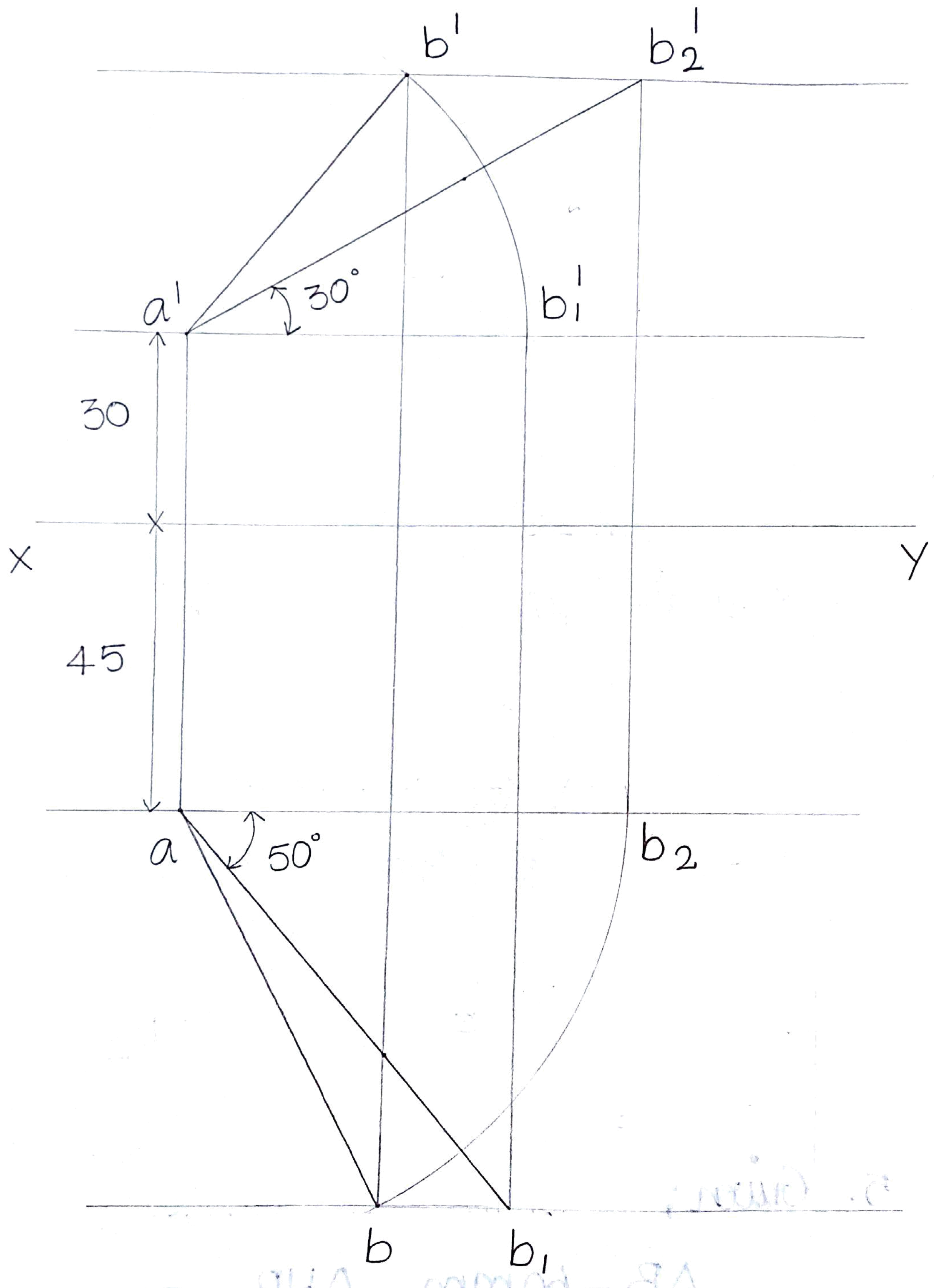

a'
X
a
40°

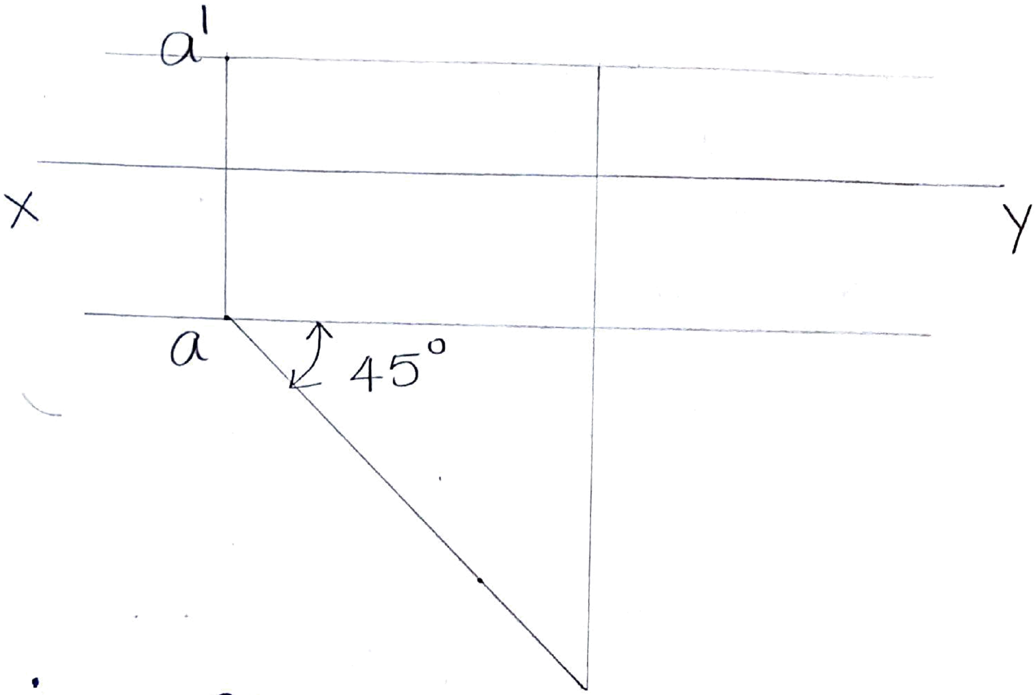
Exercises :

24. Given ;

AB = 80mm , AHP = 30mm , IVP = 45mm

angle : HP = 30° , VP = 50°

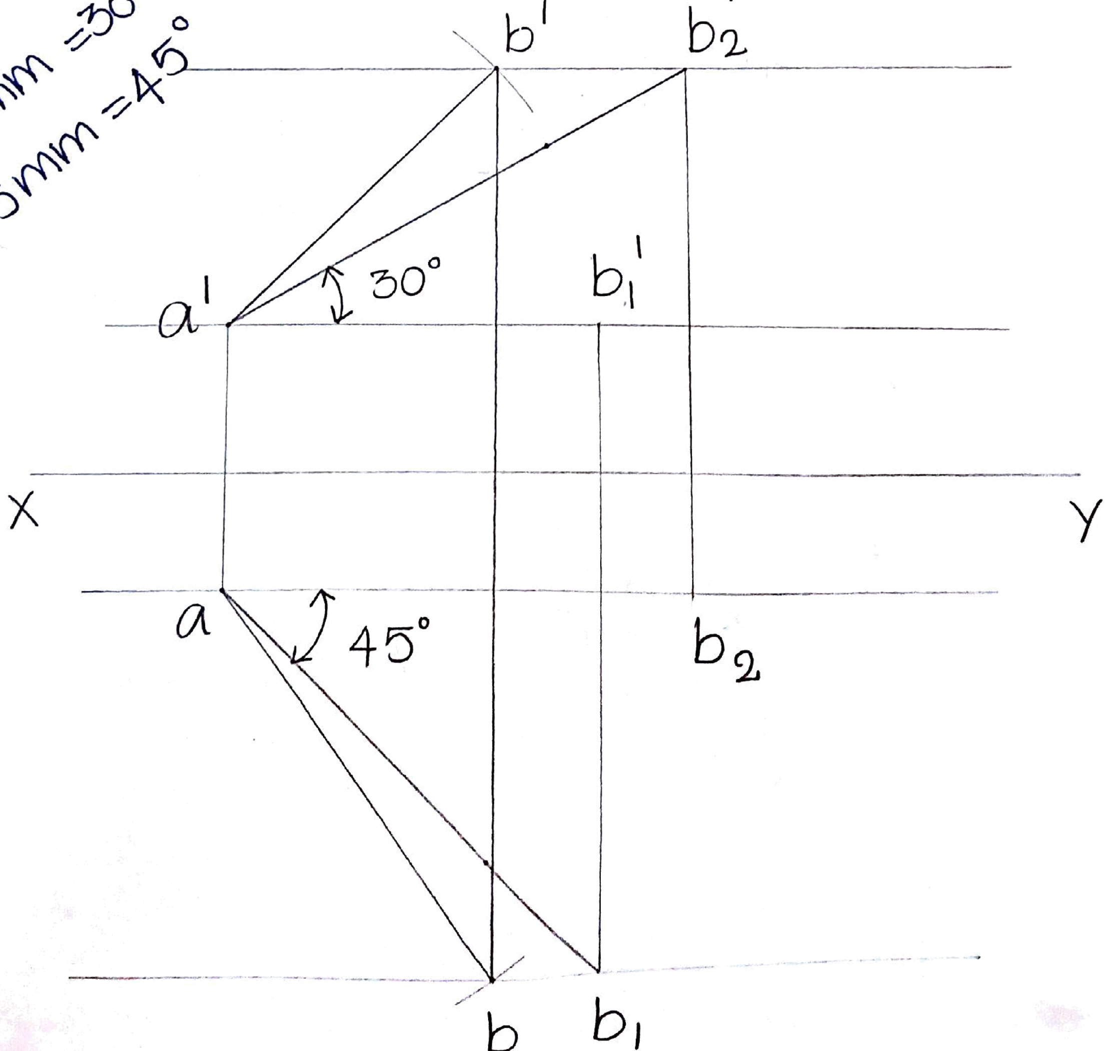


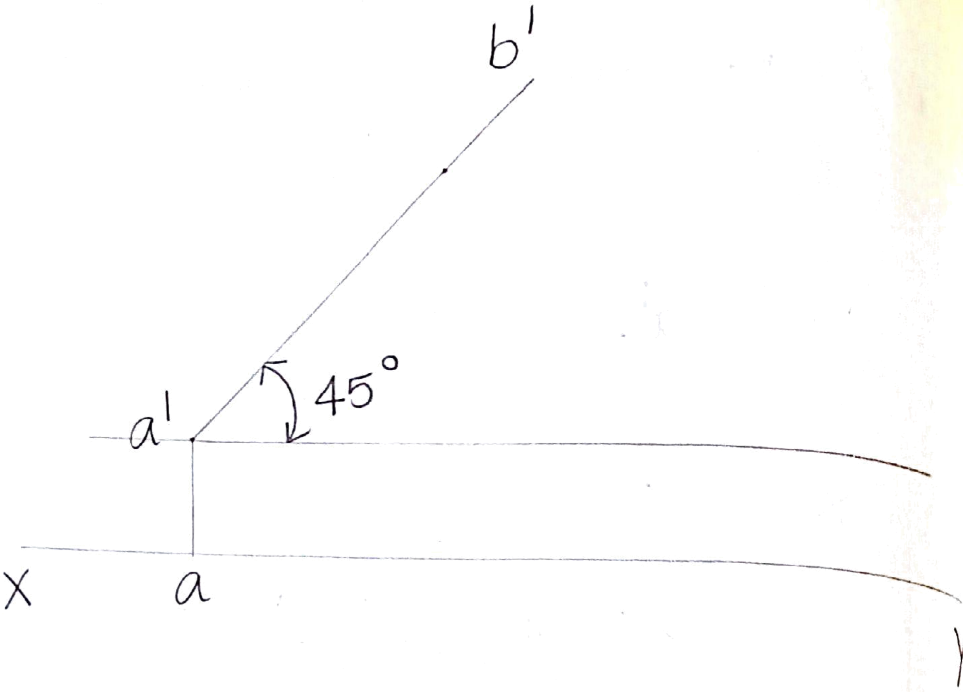


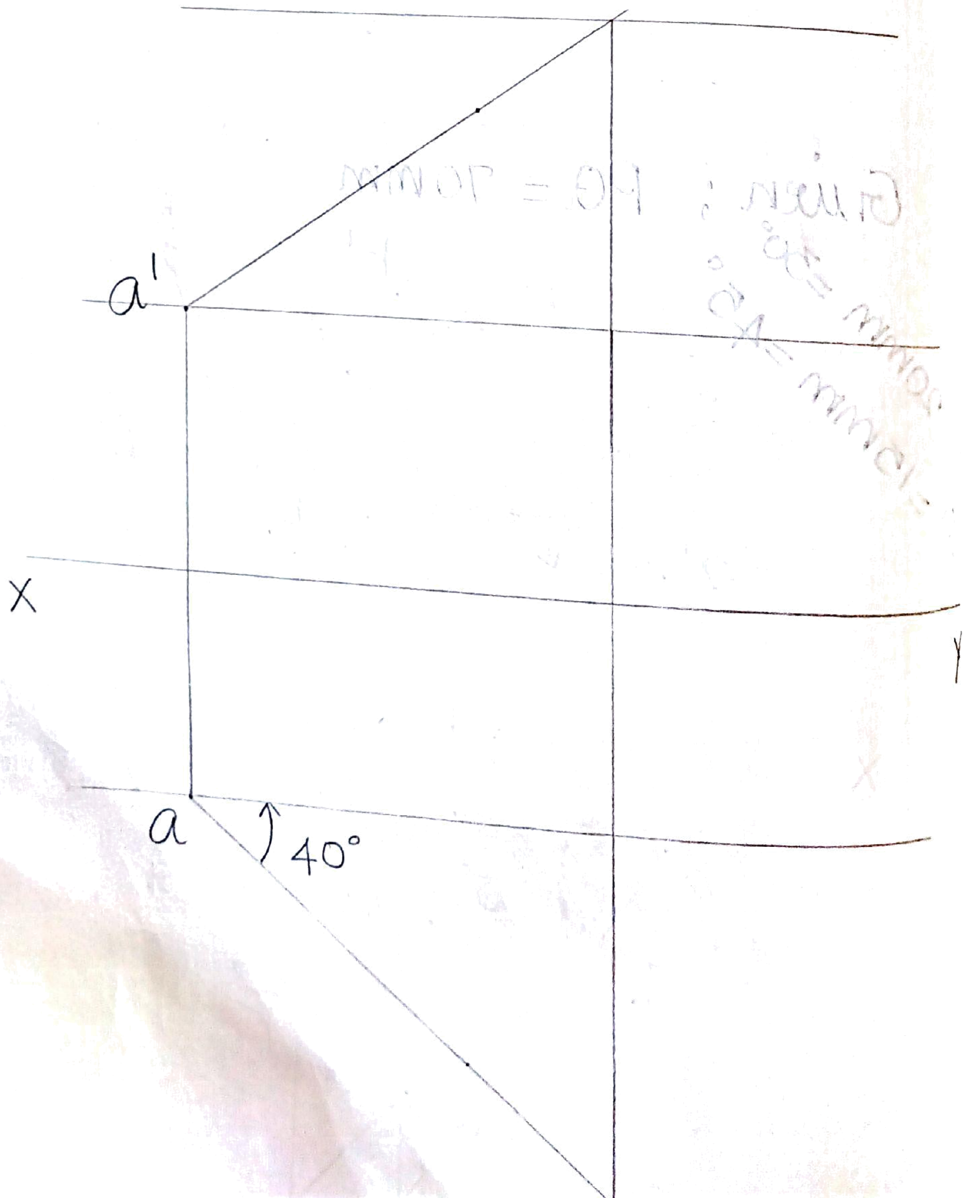
Given ; PQ = 70mm

AHP = 20mm = 30°

IVP = 15mm = 45°




b'
45°
a'
X
a
Y

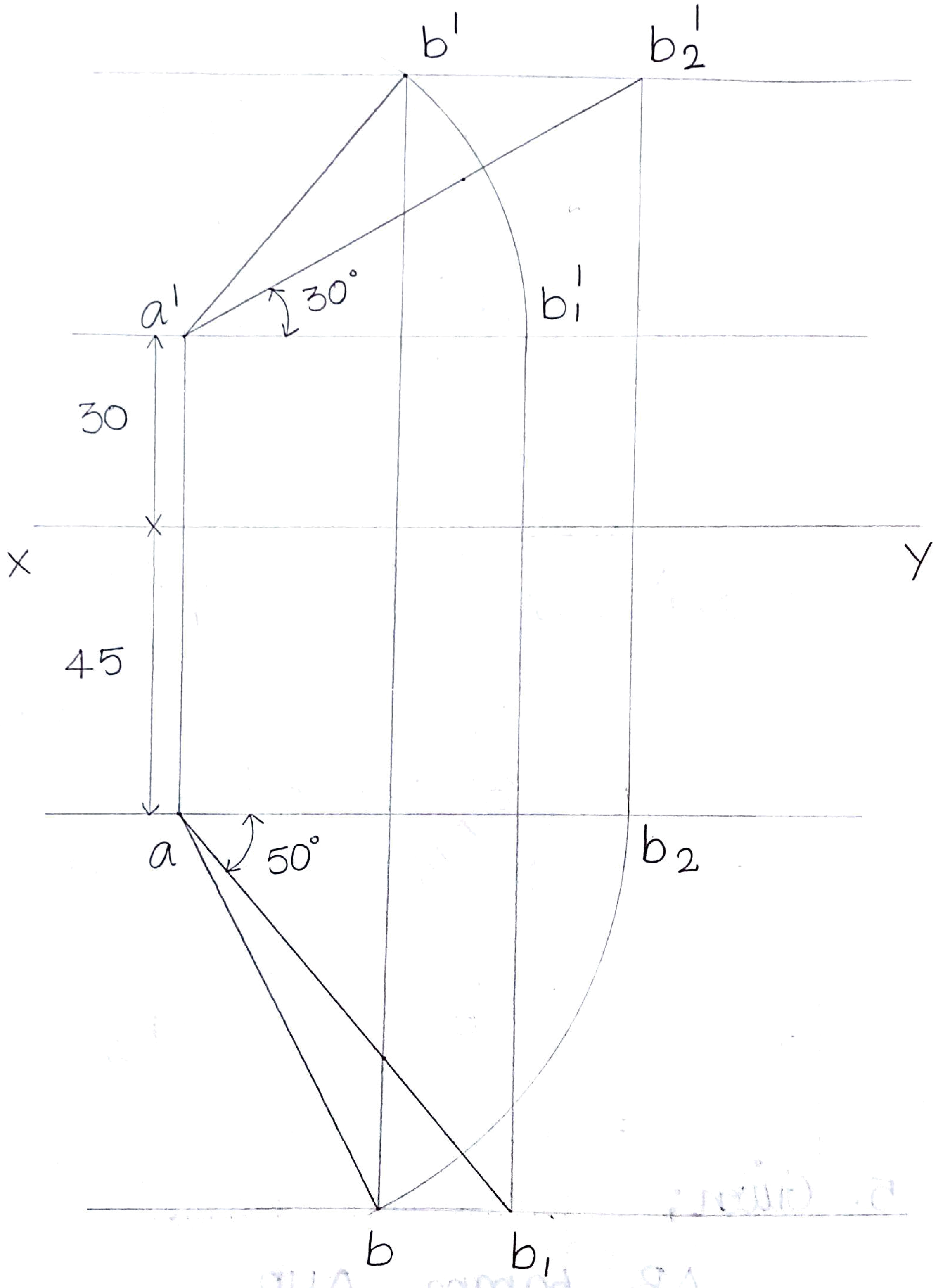

a'
X
Y
a
40°

Exercises :

24. Given ;

AB = 80mm , AHP = 30mm , IVP = 45mm

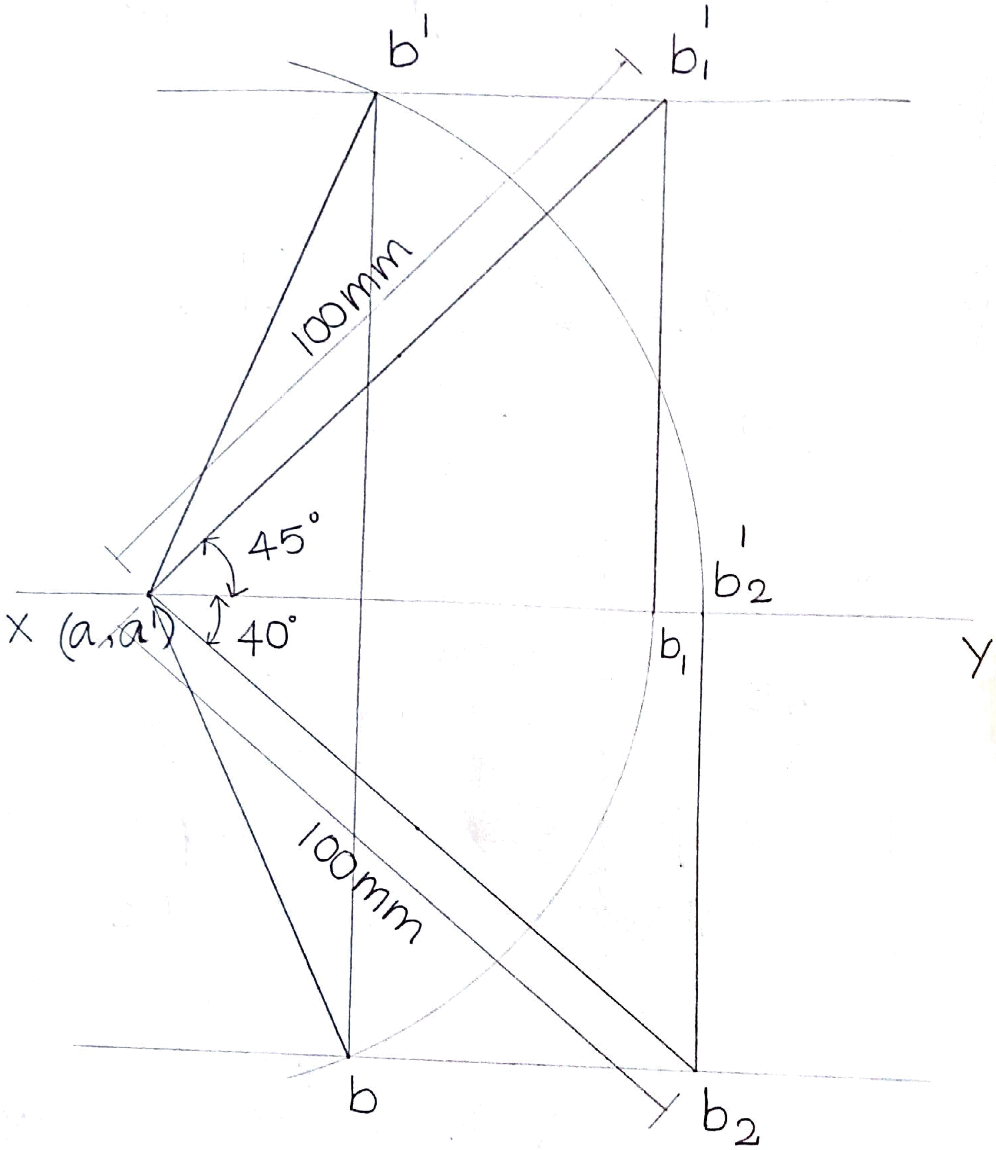
angle : HP = 30° , VP = 50°



8. Given;

AB = 100mm, angle : HP = 45°

VP = 40°

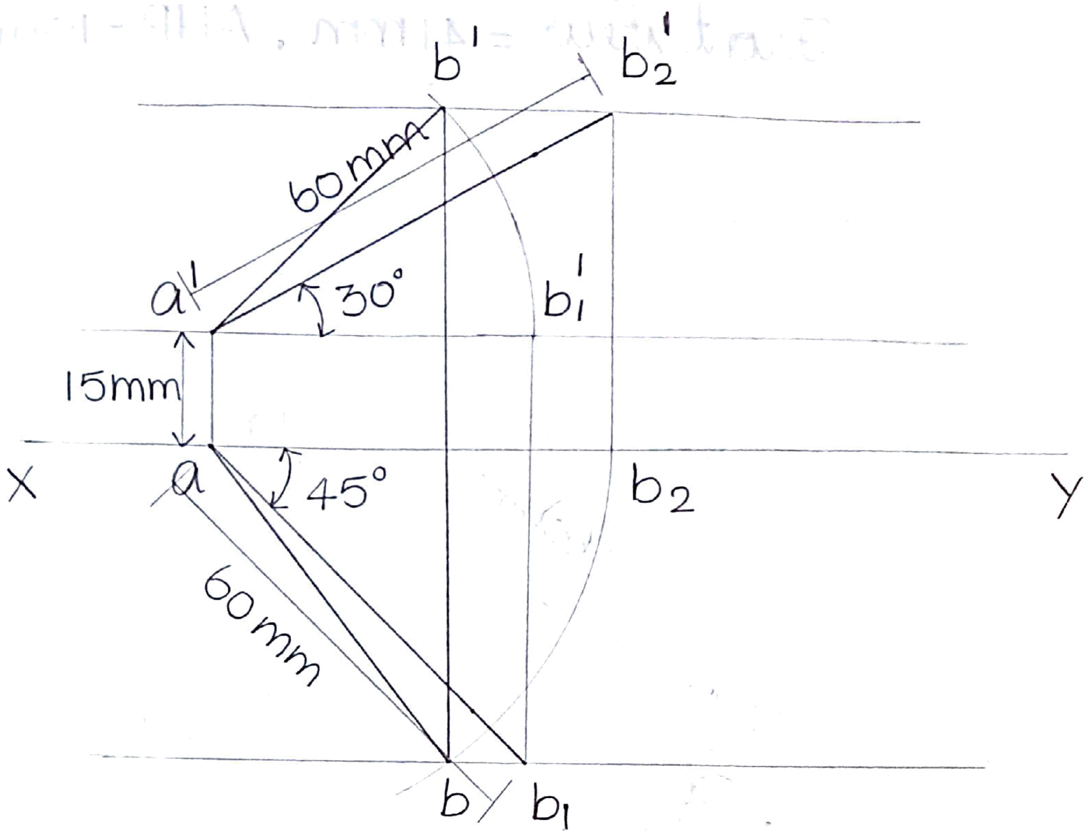


5. Given;

AB = 60mm, AHP = 15mm.

angle ⇒ HP = 30°

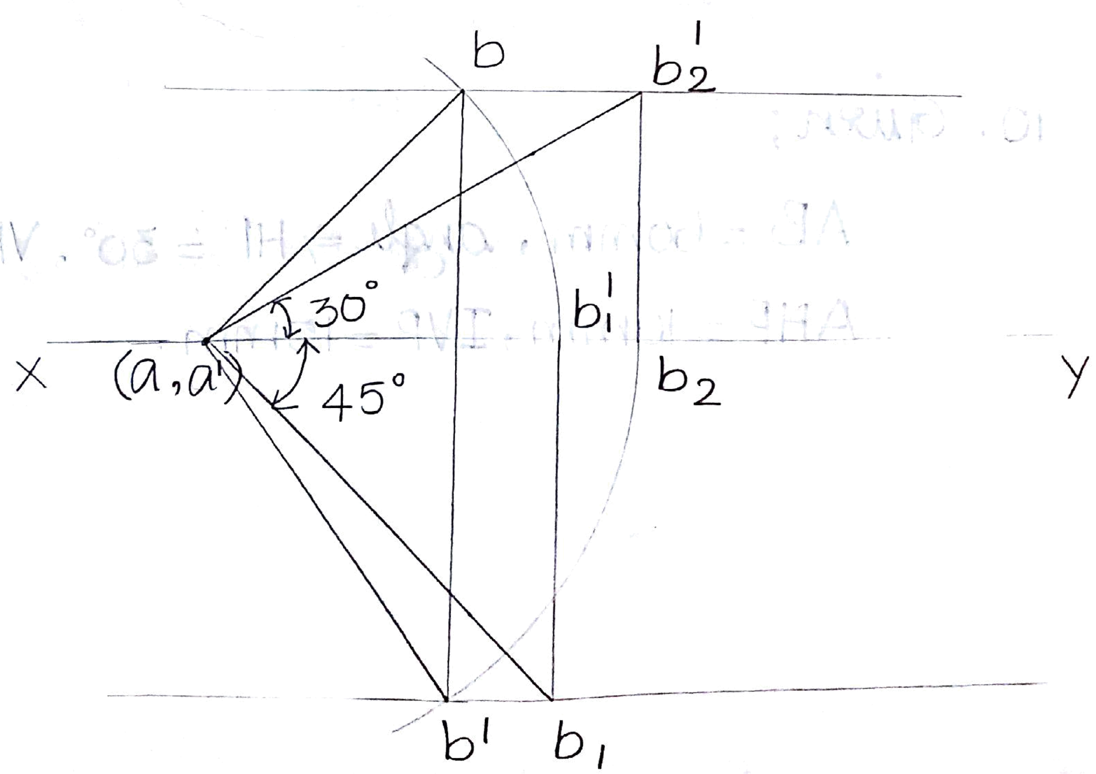
VP = 45°



4. Given :

AB = 65mm,

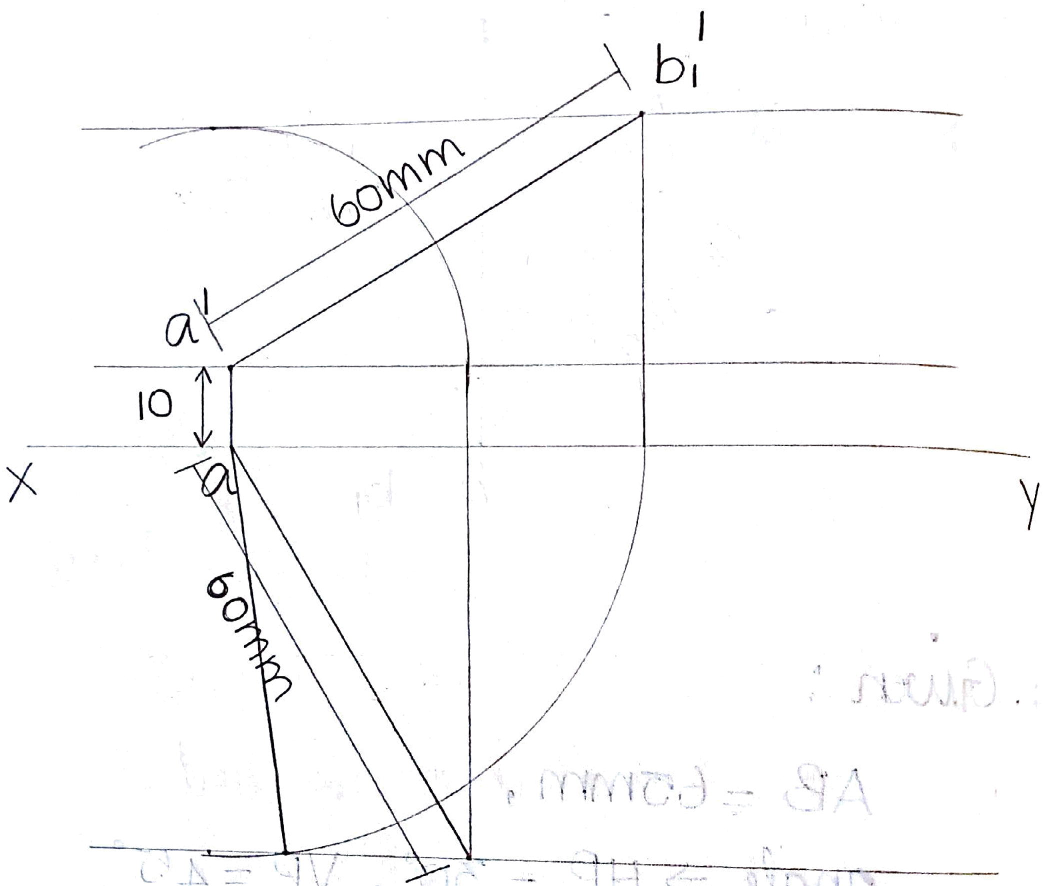
angle ⇒ HP = 30°, VP = 45°



7. Given;

AB = 60mm, Top view = 52mm

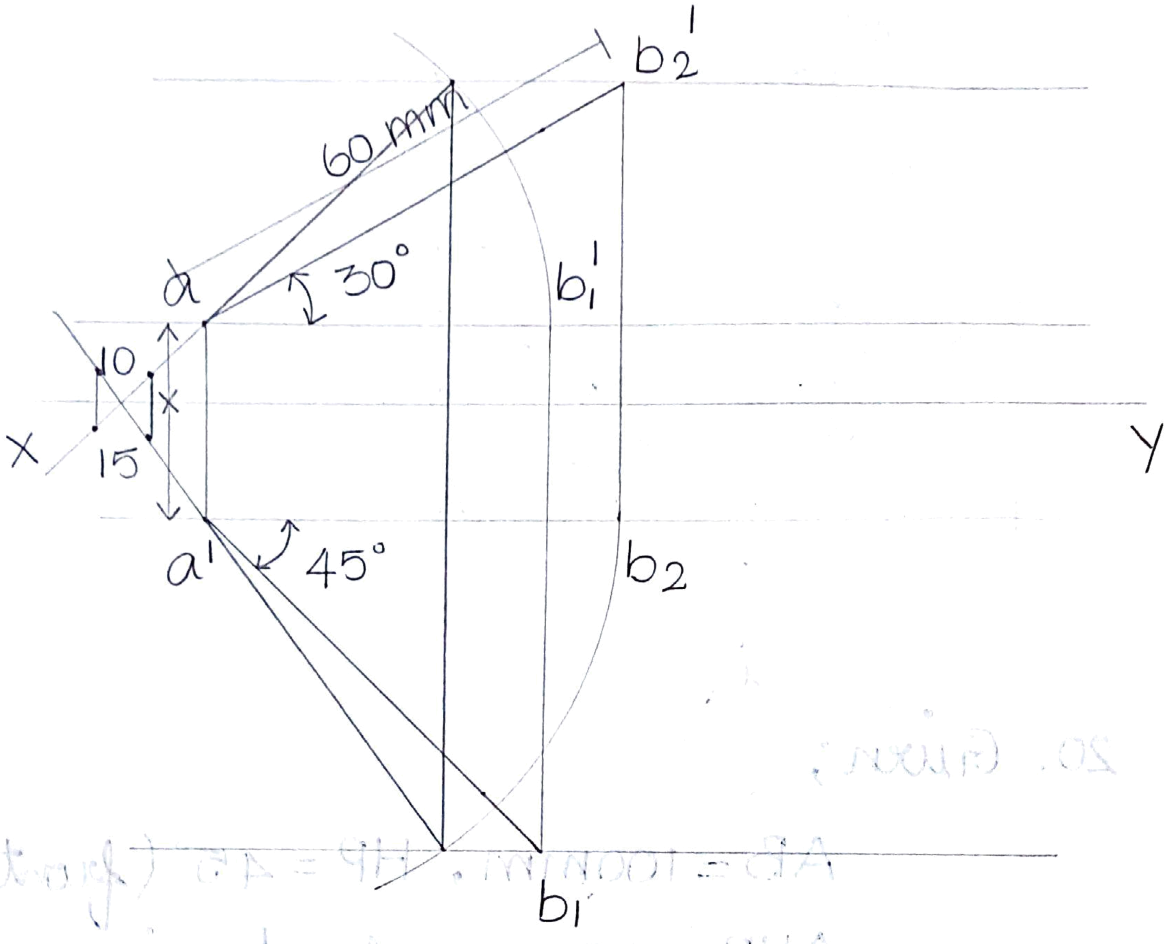
Front view = 41mm, AHP = 10mm.



10. Given;

AB = 60mm, angle ⇒ HP = 30°, VP = 45°,

AHP = 10mm, IVP = 15mm.

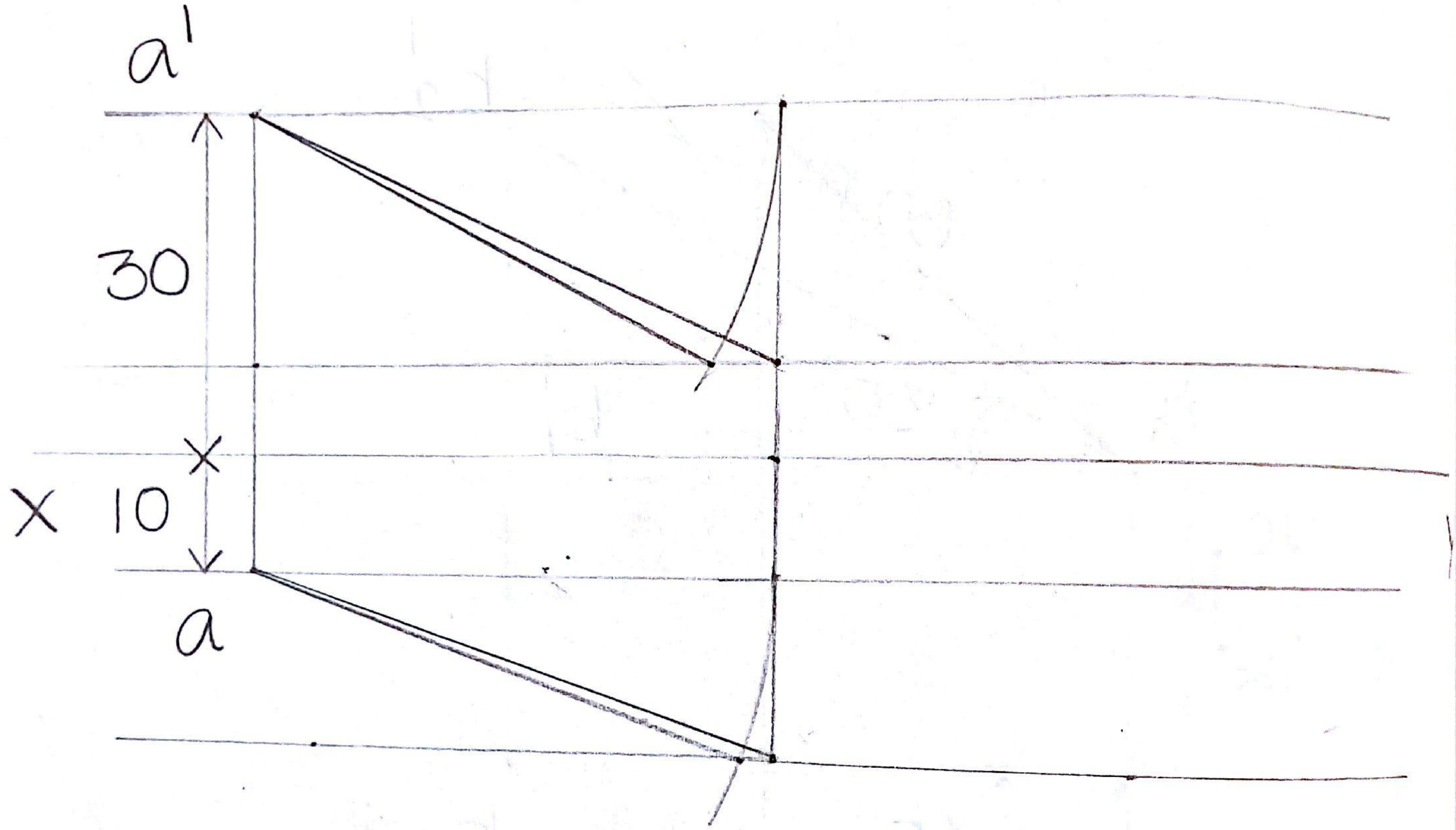


9. Given;

AHP (A) = 30mm, AHP (B) = 8mm

IVP (A) = 10mm, IVP (B) = 25mm.

Distance between the projectors = 45mm


a'
30
X
10
a

UNIT III
Projections of Solids

Introduction

An object having three dimensions, i.e., length, breadth and height is called as solid. In orthographic projection, minimums of two views are necessary to represent a solid. Front view is used to represent length and height and the top view is used to represent length and breadth. Sometimes the above two views are not sufficient to represent the details. So a third view called as side view either from left or from right is necessary.

Objectives

At the end of this session, you will be able to

- Classify the different types of solids
- Draw the projections of solids in various positions in the given quadrant

Classification of Solids

Solids are classified into two groups. They are

- Polyhedra
- Solids of Revolution

Polyhedra

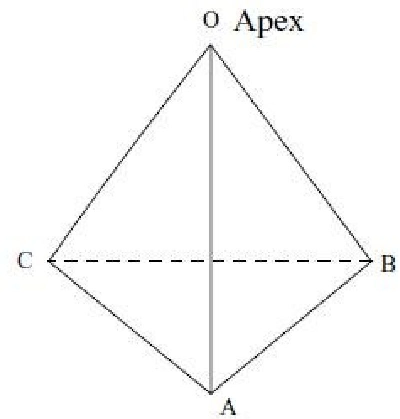
A solid, which is bounded by plane surfaces or faces, is called a polyhedron. Polyhedra are classified into three sub groups; these are

1. Regular Polyhedra
2. Prisms
3. Pyramids

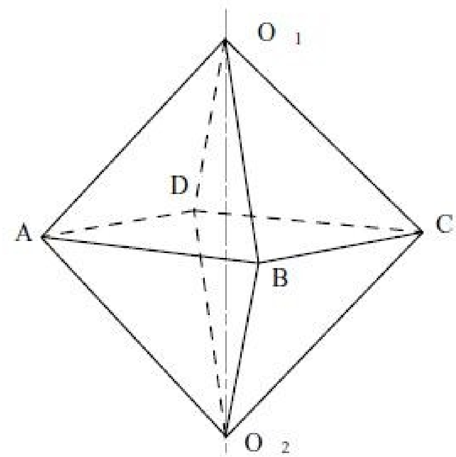
Regular Polyhedra

Polyhedra are regular if all their plane surfaces are regular polygons of the same shape and size. The regular plane surfaces are called "Faces" and the lines connecting adjacent faces are called "edges".

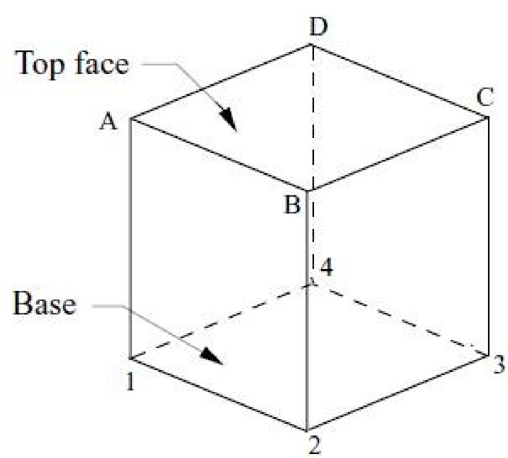
Tetrahedran



Octahedran



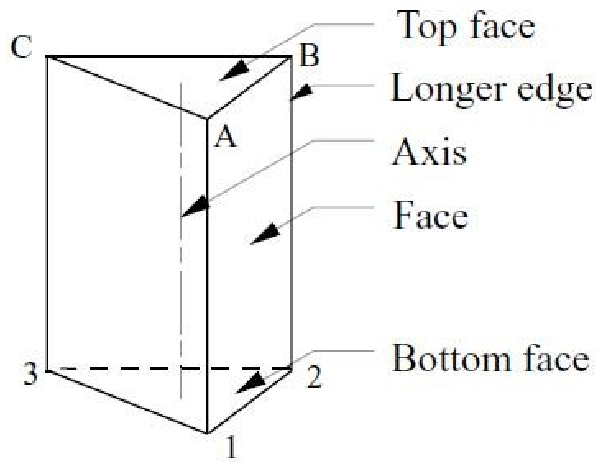
Hexahedran



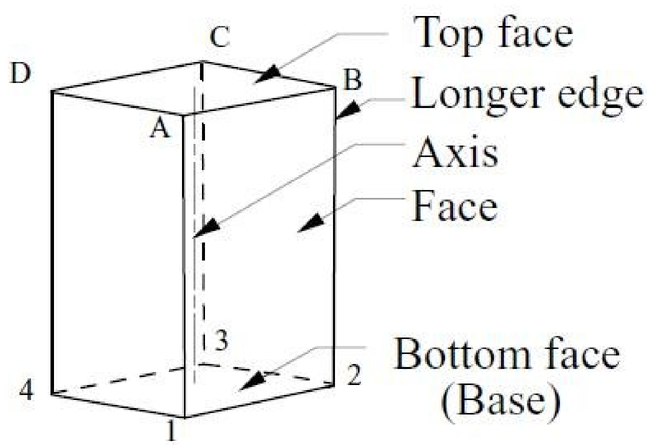
Prisms:

A prism has two equal and similar end faces called the top face and the bottom face or (base) joined by the other faces, which may be rectangles or parallelograms.

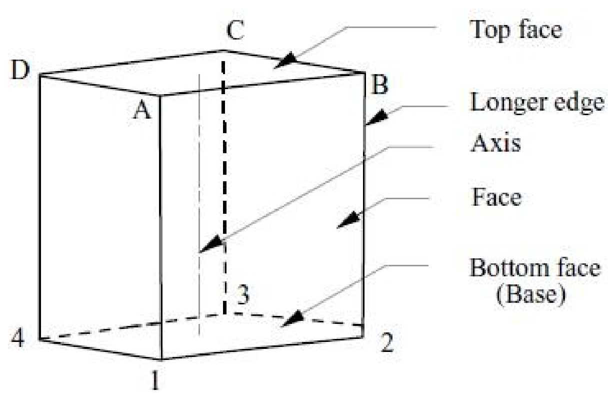
Triangular prism



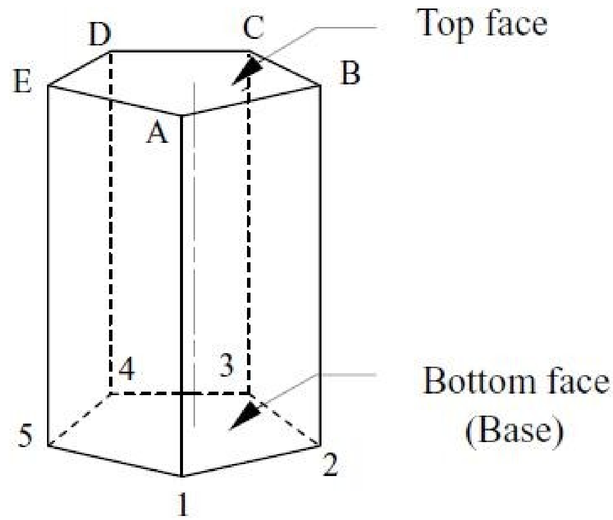
Square Prism



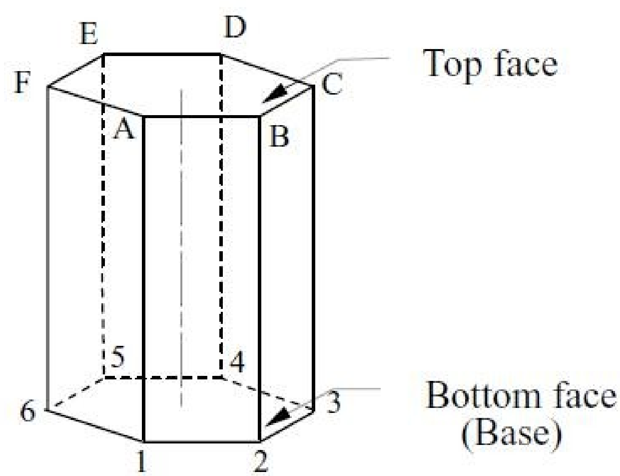
Rectangular Prism



Pentagonal Prism



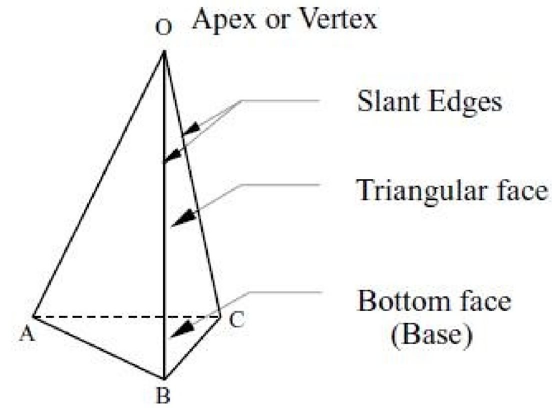
Hexagonal Prism



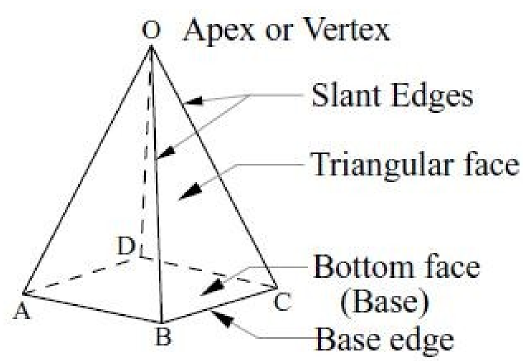
3. Pyramids:

A pyramid has a plane figure as at its base and an equal number of isosceles triangular faces that meet at a common point called the "vertex" or "apex". The line joining the apex and a corner of its base is called the slant edge. Pyramids are named according to the shapes of their bases.

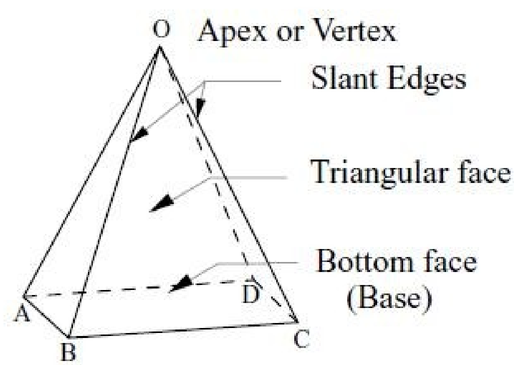
Triangular Pyramid



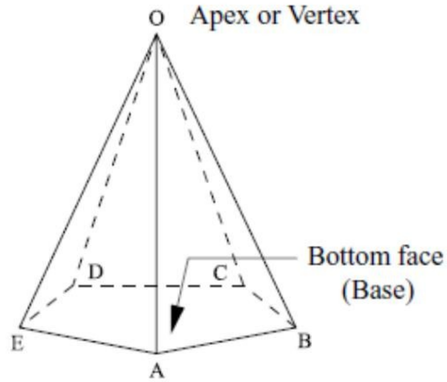
Square Pyramid



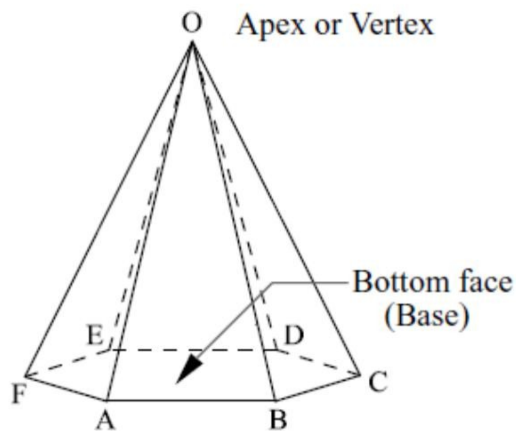
Rectangular Pyramid



Pentagonal Pyramid



Hexagonal Pyramid

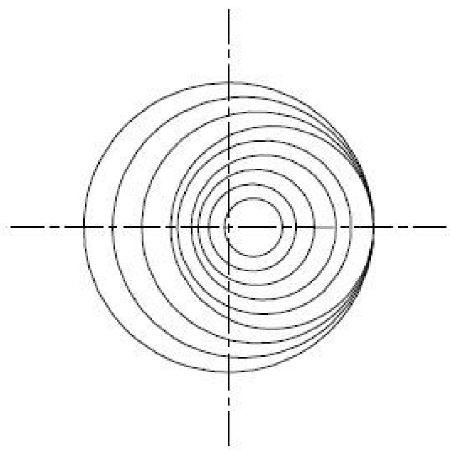


Solids of Revolution:

If a plane surface is revolved about one of its edges, the solid generated is called a Solid of Revolution.

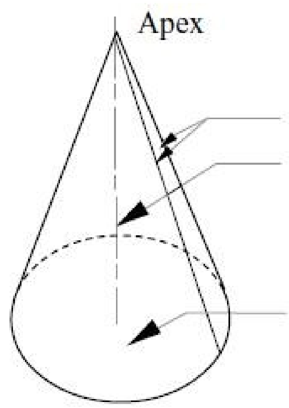
Sphere

A sphere can be generated by the revolution of a semi-circle about its diameter that remains fixed.



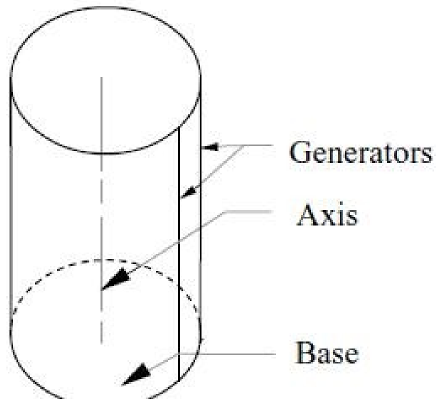
Cone

A cone can be generated by the revolution of a right-angled triangle about one of its perpendicular sides, which remains fixed. A cone has a circular base and an apex. The line joining apex and the centre of the base is called the "Axis" of the cone.



Cylinder

A right circular cylinder is a solid generated by the revolution of a rectangular surface about one of its sides, which remains fixed. It has two circular faces. The line joining the centres of the top and the bottom faces is called "Axis".

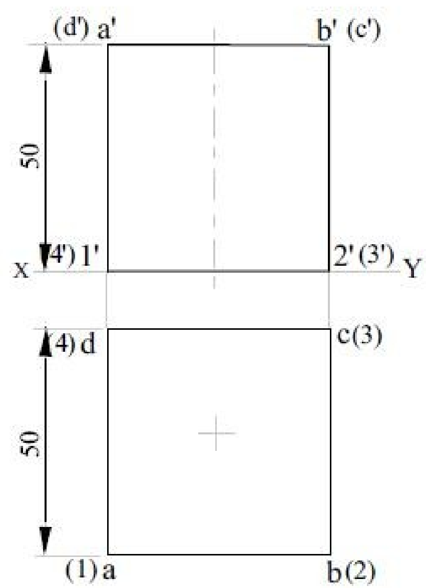


Projections of Solids

Perpendicular to the HP

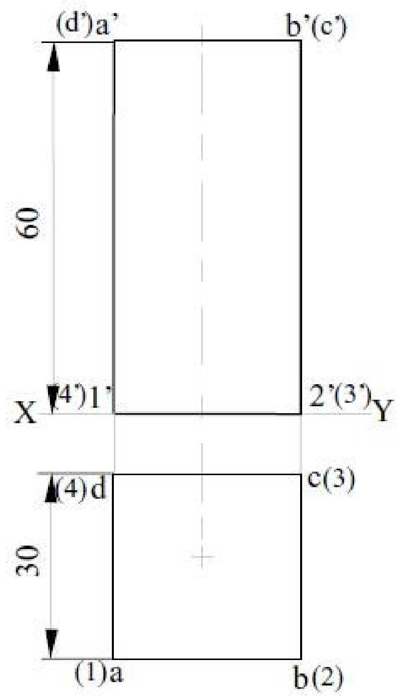
1. OK...! Let us imagine that a cube of 50mm side is resting with one of its square faces on the HP.

1. Draw the line XY.
2. Draw the top view as a square (Side 50 mm) and name its corners.
3. Draw projectors at each corner of the top view through line XY.
4. Draw the front view as a square (Side 50 mm) and name its corners.
5. Dimension the completed drawing.



2. **Ok...!** Let us imagine that a square prism of base 30mm and height 60mm is resting with its base on the HP and one of its vertical faces perpendicular to the VP.

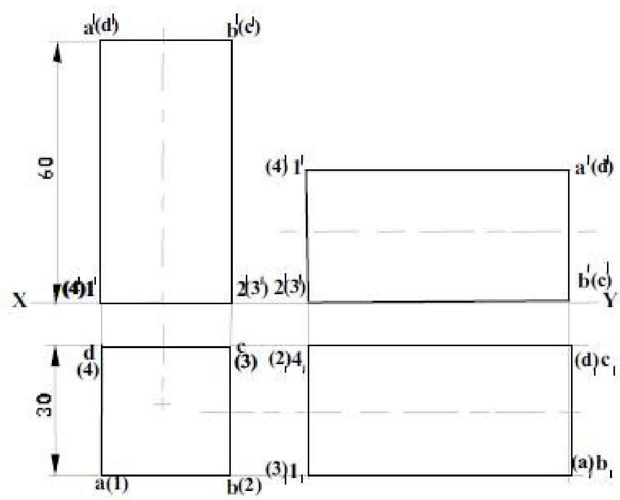
1. Draw the line XY
2. Draw the top view as square and name its corners.
3. Draw projectors from each corner of the top view through XY.
4. Draw the front view as shown and name its corners.
5. Dimension the completed drawing.



Parallel to the HP and the VP

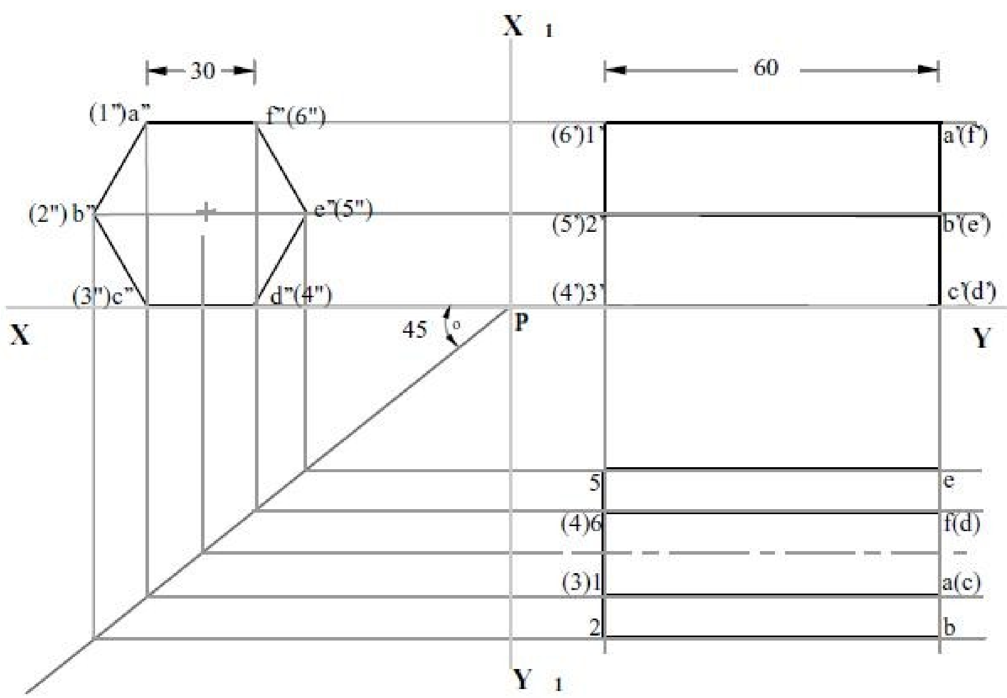
1. OK...! Let us imagine that a square prism of base 30mm and axis 60mm long lies on the HP, such that its axis is parallel to both the HP and the VP.

1. Draw the line XY.
2. Draw the projections (top and front views) of the solid in simple position (an edge of its base is perpendicular to the VP).
3. Rotate the front view through 90°.
4. Draw projectors from the rotated front view and the initial top view and name the points of intersection.
5. Join the points correspondingly to get the final top view.



2. OK...!Let us imagine that a hexagonal prism of base 30mm and axis 60mm long lies on one of its rectangular faces on the HP, such that its axis is parallel to both the HP and the VP. (Side View Method)

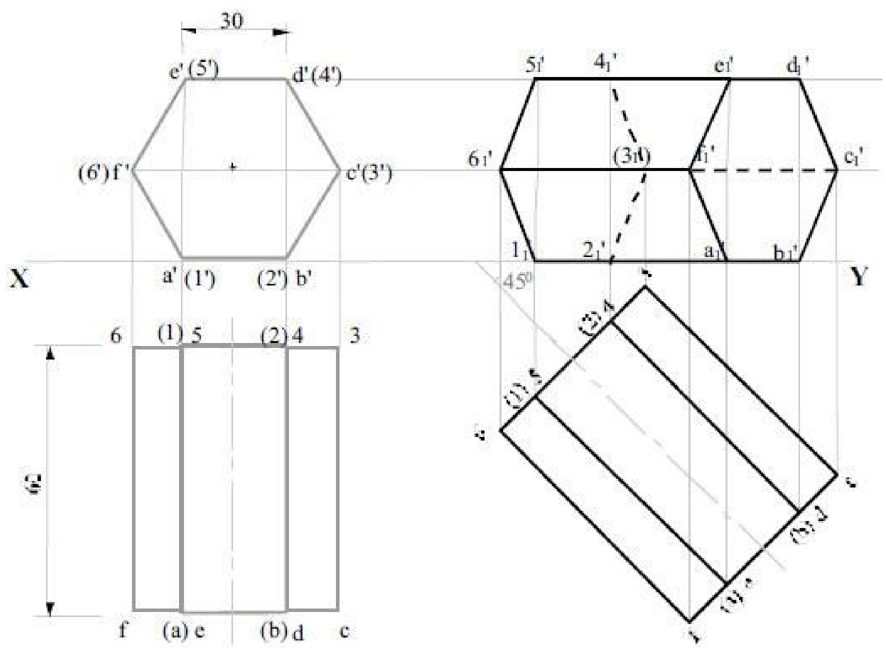
1. Draw the lines XY and X_1Y_1 perpendicular to each other, intersecting at P as shown.
2. Draw the side view of the hexagonal prism and name its corners.
3. Draw projectors from the corners of the side view perpendicular to X_1Y_1.
4. Draw the front view and name its corners.
5. From P draw a line at 45° to XY and X_1Y_1. (This line is called the Miter line).
6. From the side view draw projectors to meet the Miter line.
7. From the Miter line draw projectors parallel to XY.
8. From the front view draw projectors parallel to X_1Y_1 and name the intersection points.
9. Draw the final top view.



Parallel to the HP and Inclined to the VP

1. Ok...! Let us imagine that a hexagonal prism of base 30mm and height 60mm lies on one of its rectangular faces lies on the HP, such that its axis is inclined at 45° to the VP.

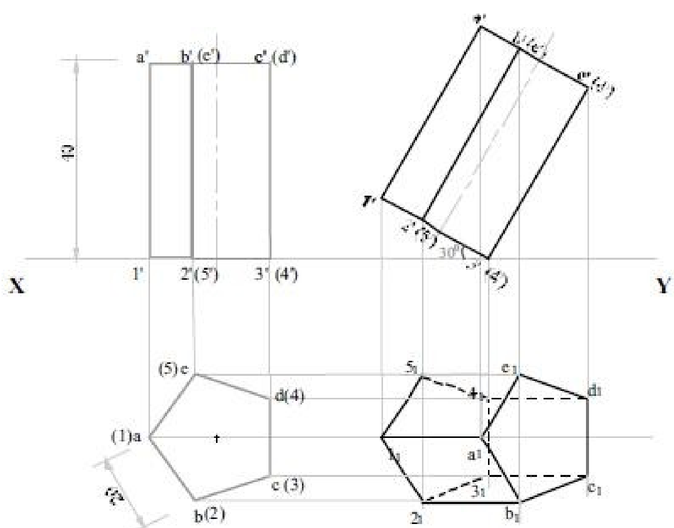
1. Draw the line XY.
2. Draw the projections of the prism in simple position.
3. Rotate the axis of the top view through 45° with respect to XY.
4. Draw projectors from the rotated top view and the initial front view and name the points of intersection..
5. Join all the points correspondingly to get the final front view.



Parallel to the VP and Inclined to the HP

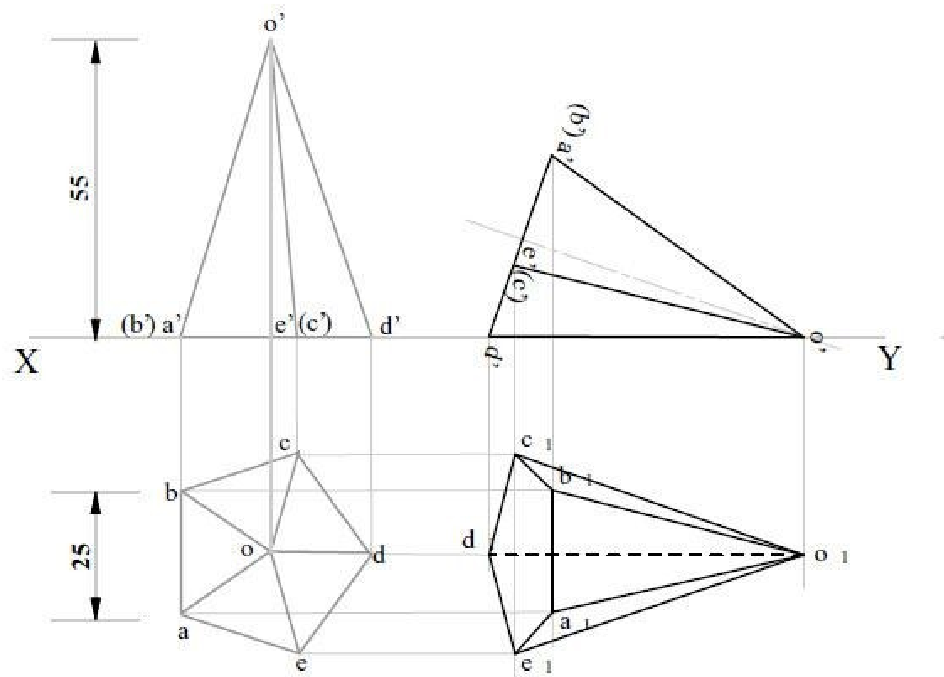
1. OK...! Let us imagine that a pentagonal prism of base 20mm and axis 40mm long rests on one of the edges of its base on the HP. The edge makes an angle of 30° to the HP and the axis of prism is parallel to the VP.

1. Draw the line XY.
2. Draw the projection of the prism in simple position.
3. Rotate the base of the front view through 30^0 with respect to XY so that only the edge (3',4') rests on the HP.
4. Draw projectors from the rotated front view and the initial top view and name the points of intersections.
5. Join the points correspondingly to get the final top view.



2. OK...!Let us imagine that a pentagonal pyramid of base 25mm and axis 55mm long lies on one of its longer edges on the HP and its axis is parallel to the VP.

1. Draw the line XY.
2. Draw the projection of solid in simple position.
3. Rotate the Front view such that one of the slant edge o'd' will lie on XY Line.
4. Draw projectors from the rotated front view and the initial top view and name it.
5. Join the points correspondingly to get the final top view.



Projection of Solids – Exercises

1. A cube of side 55mm resting on the HP on one of its faces with one of its vertical faces inclined at 30^0 to the VP, draw the top view and front view.

2. A pentagonal prism side of base 25mm and axis 55mm resting on the HP on its base with one of the rectangular faces inclined at 45° to VP draw the top view and front view.

3. A hexagonal pyramid side of base 25mm and axis 55mm resting on its base HP, and the base edge is inclined at 45° to VP draw the top view and front view.

4. A cone of radius 20mm and axis 60mm resting with its base on HP, draw the projections.

5. Draw the projection of hexagonal prism of base 30mm and axis 65mm rests with its base on HP and the base side is parallel to and 20mm in front of VP.

6. A tetrahedron of side 50 mm and rests on HP draw the projections when one of its edge is parallel to VP.

7. Draw the projections of hexagonal prism of base 30mm and axis 55mm resting on one corner of the base on HP and the base containing the edge 45° to HP and axis perpendicular to VP.

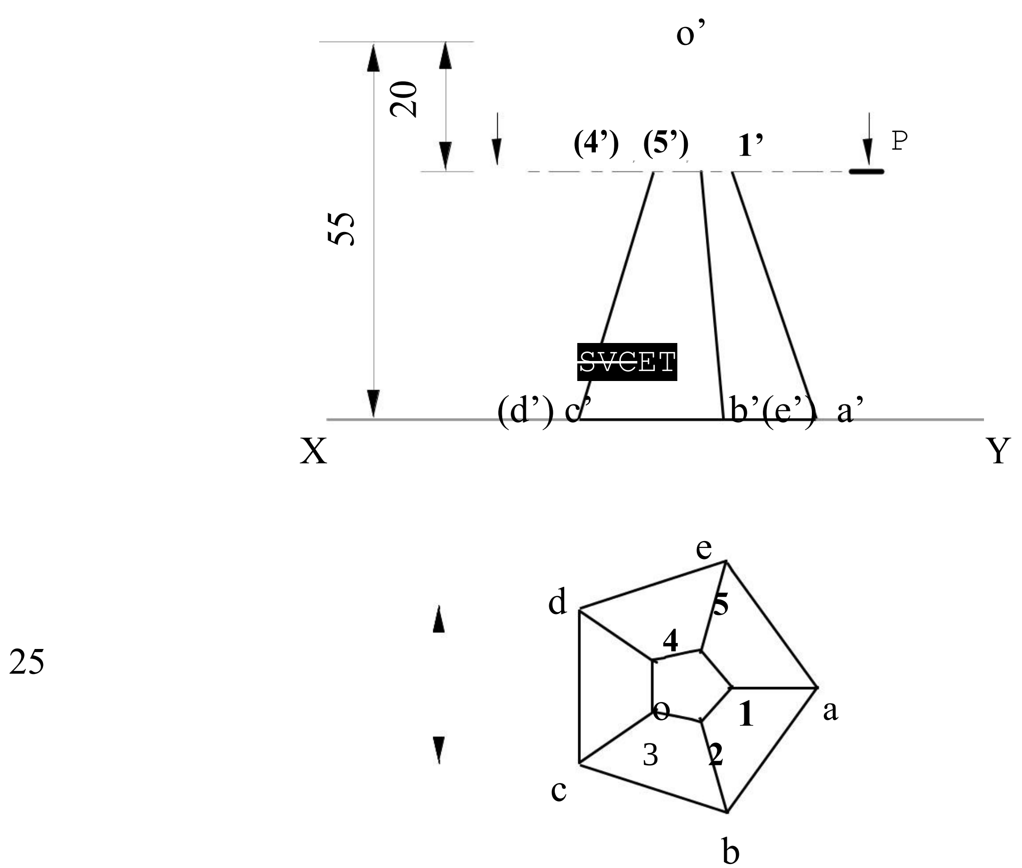
8. A square prism, side of base 35mm and axis 60mm long lies with one of its longer edge on HP. Draw the projection of prism when the axis is perpendicular to VP and one of its rectangular faces is inclined to 35° to HP.

Sections of Solids

Perpendicular to the VP and Parallel to the HP:

1. Ok..! Let us imagine that a pentagonal pyramid of base 25mm and height 55mm rests with its base on the HP such that one of its edges is perpendicular to the VP. A section plane parallel to the HP and perpendicular to the VP cuts the pyramid at 20mm from the apex.

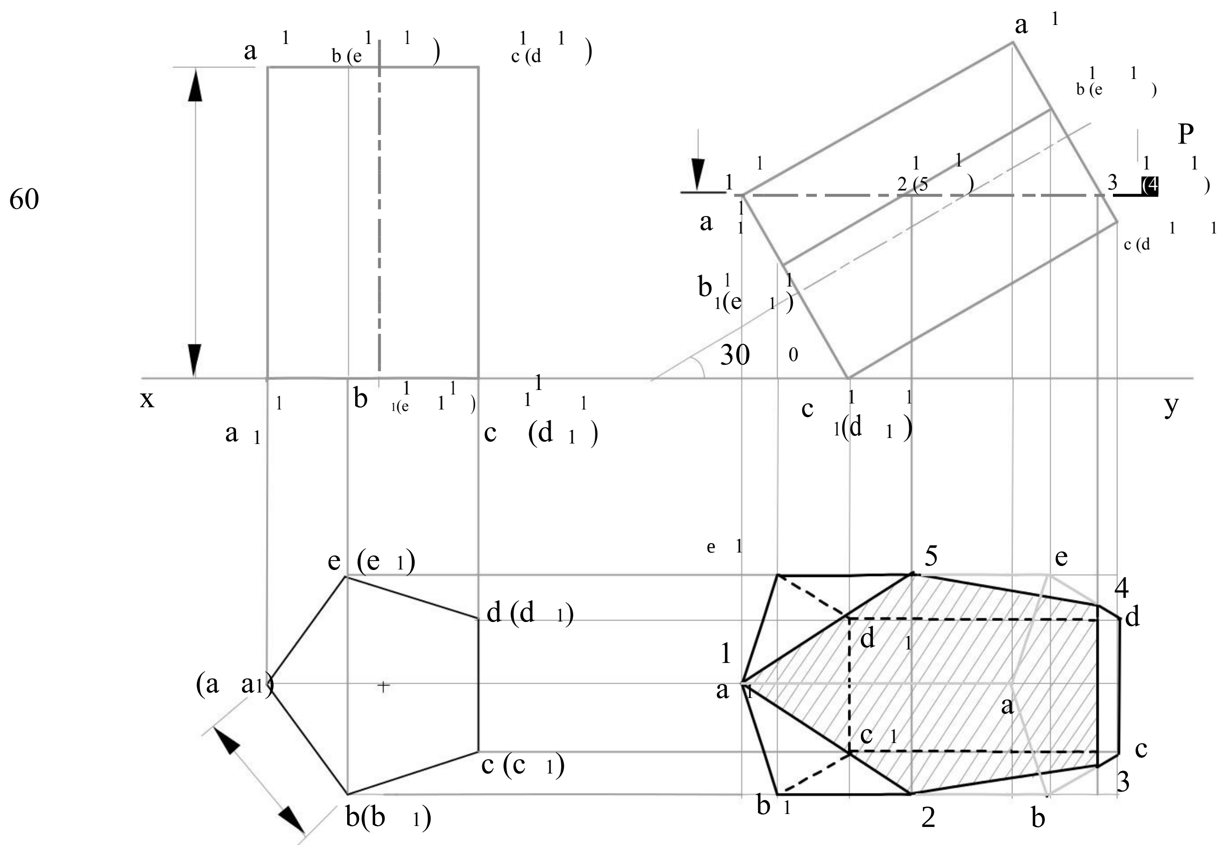
1. Draw the line XY.
2. Draw the top view as a pentagon and name its corners.
3. Draw projectors from each corner of the top view through XY.
4. Draw the front view as shown in the figure and name its corners.
5. Draw the section plane in the front view at 20mm from the apex and name the sectional points.
6. Draw projectors from each sectional point in front view so that they cut the corresponding edges in the top view.
7. Name these points and join them.
8. Draw the hatching lines to get the sectional top view.



2. Ok ..! Let us imagine that a regular pentagonal prism of base edge 25mm and height 60mm rests on the HP on one of the edges of its base and with its axis inclined at 30 to the HP. A section plane parallel to the HP and perpendicular to the VP cuts the prism at the highest corner of the prism's base.

1. Draw the line XY.
2. Draw the projections of the prism placed in the simple position (the axis is perpendicular to the HP and parallel to the VP).
3. Rotate the front view so that the axis is inclined at 30° to XY.
4. Draw projectors from the front view through XY and from the initial top view.
5. Draw the rotated top view as shown in the figure and name its corners.
6. Draw the section plane in the rotated front view through the top corner of the base and name the sectional points.

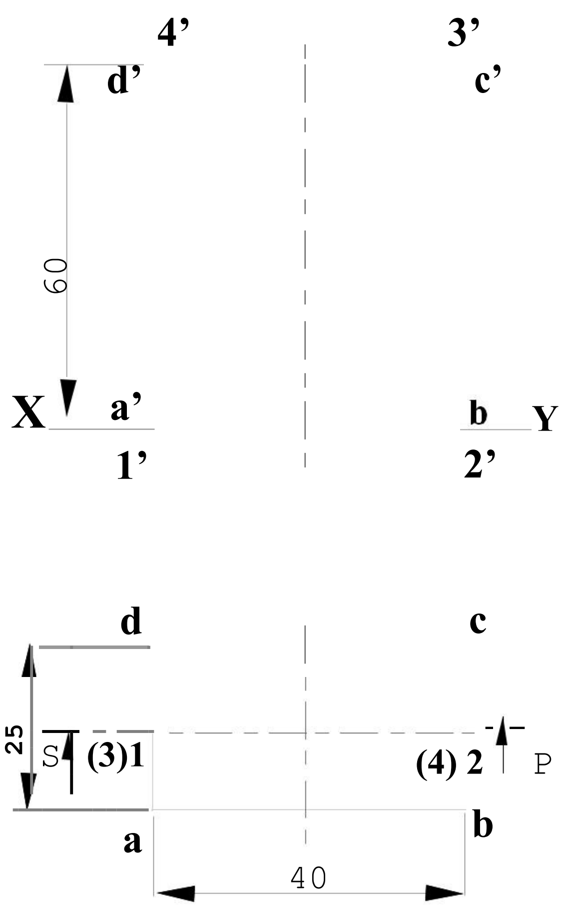
7. Draw projectors from each sectional point of the front view through XY to cut the corresponding edges of the top view.
8. Name the points and join them, as shown.
9. Draw the hatching lines to get the sectional top view.



Perpendicular to the HP and Parallel to the VP:

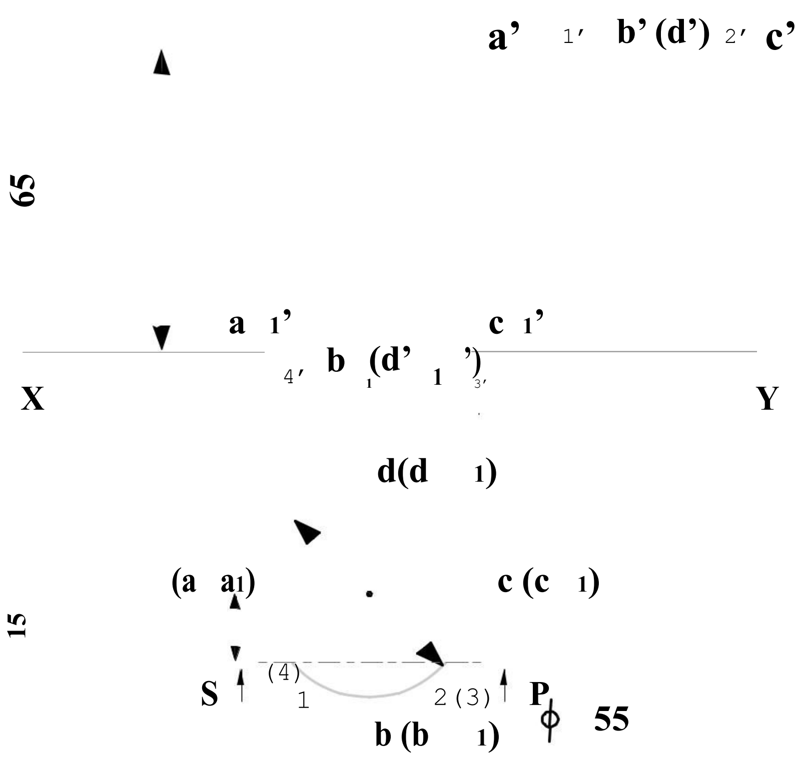
1. **Ok ..!** Let us imagine that a rectangular prism 40 x 25mm and height 60mm rests with its base on the HP such that one of its rectangular faces is parallel to the VP. A section plane parallel to the VP and perpendicular to the HP bisects the prism.

1. Draw the line XY.
2. Draw the top view as a rectangle (40x25) and name its corners.
3. Draw projectors from each corner of top view up to line XY.
4. Draw the front view as a rectangle (40x60) and name its corners.
5. Draw the section plane in the top view at the center and name the sectional points.
6. Draw projectors from each sectional point in the top view so that they cut the corresponding edges of the front view.
7. Name the points and Join them.
8. Draw the hatching lines (inclined at 45°) to get the sectional front view.



2. **Ok ..!** Let us imagine that a cylinder of diameter 55mm and axis 65mm long, rests with its base on the HP such that its axis is parallel to the VP. A section plane parallel to the VP and perpendicular to the HP cuts the cylinder 15mm in front of the axis.

1. Draw the line XY.
2. Draw the top view as a circle and name it as shown.
3. Draw projectors from the top view through XY.
4. Draw the front view as a rectangle and name its corners.
5. Draw the section plane in the top view at 15mm in front of the axis and name the sectional points.
6. Draw projectors from each sectional point in the top view so that they cut the corresponding edges of the front view.
7. Name these points and join them.
8. Draw the hatching lines to get the sectional front view.



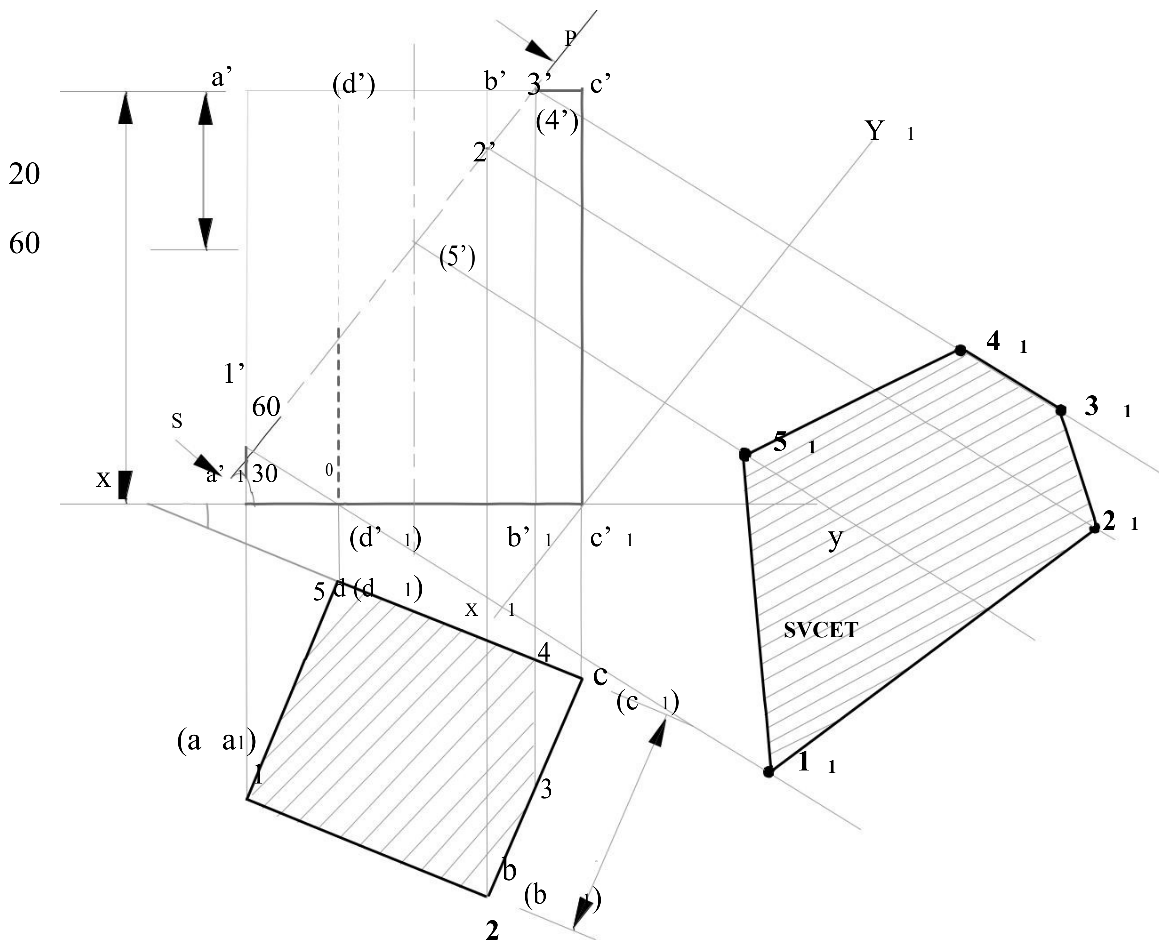
Perpendicular to the VP and Inclined to the HP:

Ok ..! Let us imagine that a square prism of base 35mm and height 60mm rests with its base on the HP such that one of its edges is inclined at 30° to the VP. A section plane inclined at 60° to the HP and perpendicular to the VP cuts the prism through a point on the axis 20mm from the top of the prism.

1. Draw the line XY.
2. Draw the top view as a square such that it is inclined at 30° to XY and name its corners.
3. Draw projectors from each corner of the top view to XY.
4. Draw the front view as shown in the figure and name its corners.
5. Draw the section plane in the front view through a point on the axis 20mm from the top of the prism such that it is inclined at 60° to XY, and name the sectional points.
6. Draw projectors from each sectional point through XY.
7. The projectors cut the corresponding edges of the top view. Name the points and join them.
8. Draw the hatching lines to get the sectional top view

To get the True Shape of the section:

9. Draw a line X1Y1 parallel to SP, as shown.
10. Draw projectors from each sectional point in the front view through X1Y1.
11. Transfer the distances, from XY, of the sectional points in the top view to the corresponding projectors through X1Y1, measuring from X1Y1 in each case.
12. Join these points as shown and draw the hatching lines to get the true shape of the section.

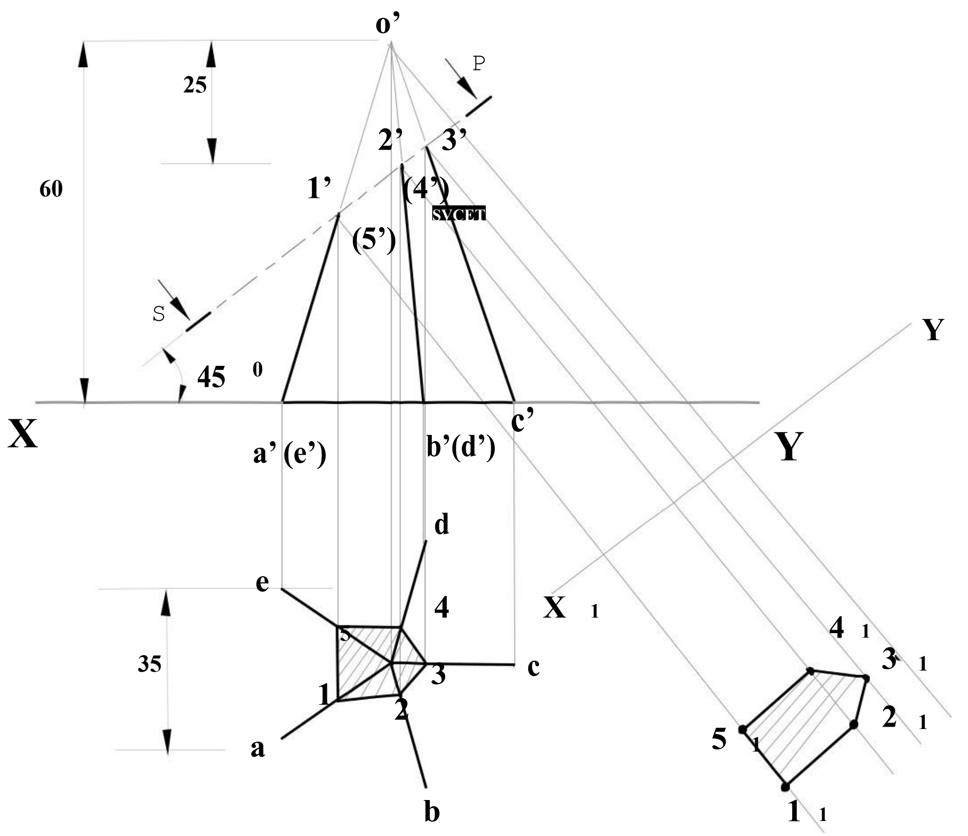

P
a'
(d')
b'
3'
c'
(4')
Y 1
2'
20
60
(5')
4 1
3 1
1'
60
5 1
S
a' 1
30
0
2 1
X
(d' 1)
b' 1
c' 1
y
5
d (d 1)
X 1
SVCET
4
c
(c 1)
(a a1)
1
1 1
3
b
(b 1)
2

2. Ok ..! Let us imagine that a pentagonal pyramid of base 35mm and height 60mm, rests with its base on the HP such that one of its edges is perpendicular to the VP. A section plane inclined at 45° to the HP and perpendicular to the VP cuts the pyramid through its axis at 25mm from the apex.

1. Draw the line XY.
2. Draw the top view as a pentagon such that one of its edges is perpendicular to XY. Name the corners of the pentagon.
3. Draw projectors from the top view to XY.
4. Draw the front view as shown in the figure and name its corners.
5. Draw the section plane in the front view through a point on the axis 25mm below the apex and inclined at 45° to XY and name the sectional points.
6. Draw projectors from the sectional points through XY.
7. The projectors cut the corresponding edges of the top view. Name the points of intersection and join them.
8. Draw the hatching lines to get the sectional top view

To get the True Shape of the section:

9. Draw a line X_1Y_1 parallel to SP, as shown.
10. Draw projectors from each sectional point in the front view through X_1Y_1.
11. Transfer the distances, from XY, of the sectional points in the top view to the corresponding projectors through X_1Y_1, measuring from X1Y1 in each case.
12. Join these points as shown and draw the hatching lines to get the true shape of the section.


o'
25
P
60
2'
3'
1'
(4')
SVCET
(5')
S
Y 1
45 0
X
Y
c'
a' (e')
b'(d')
d
e
X 1
4
4 1
35
5
3
c
3 1
1
2
2 1
a
5 1
1 1
b

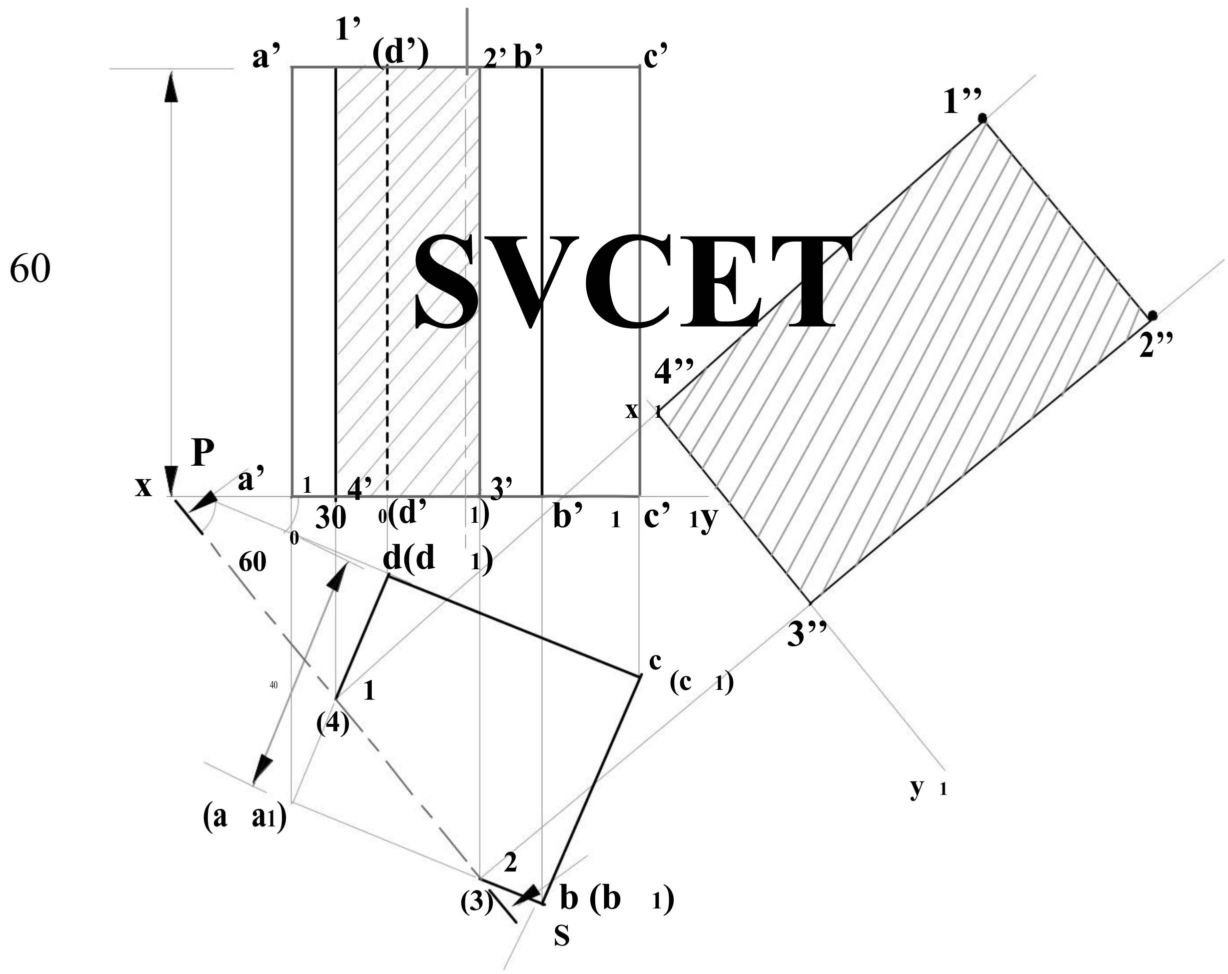
Perpendicular to the HP and Inclined to the VP

1.Ok ..! Let us imagine that a square prism of base 40mm and height 60mm rests with its base on the HP such that one of its edges is inclined at 30° to the VP. A section plane inclined at 60° the VP and perpendicular to the HP bisects one of the rectangular faces is nearer to the VP.

1. Draw the line XY.
2. Draw the top view as a square such that an edge of its base edge is inclined at 30(to XY and name its corners.
3. Draw projectors from each corner of the top view to XY.
4. Draw the front view as shown in the figure and name its corners.
5. Draw the section plane in the top view such that it is at 60(to XY and bisects an edge of the prism as shown in the figure. Name the sectional points.
6. Draw projectors from each sectional point in the topview through XY to meet the corresponding edges of the front view. Name the points of intersection.
7. Join the sectional points in the front view and draw the hatching lines to get the sectional front view.

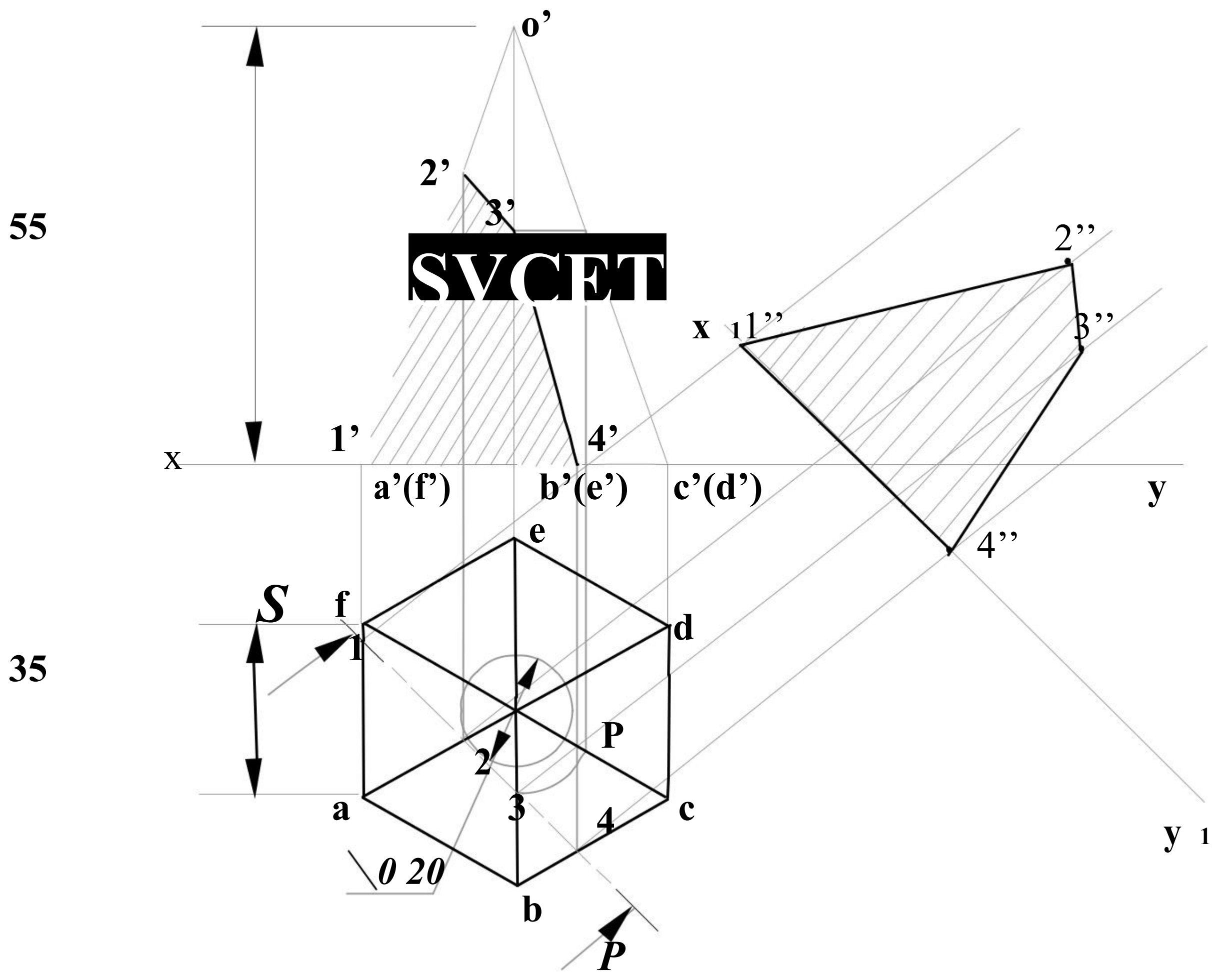
To get the True Shape of the section:

8. Draw a line X1Y1 Parallel to SP as shown
9. Draw projectors from each sectional point in the top view through X1Y1.
10. Transfer the distances, from XY, of the sectional points in the front view to the corresponding projectors through X1Y1, measuring from X1Y1 in the case. Name these points.
11. Join these points and draw the hatching lines to get the true shape of the section.


1'
a'
(d')
2' b'
c'
1''
60
2''
4''
x
P
a'
1
4'
3'
x
30
(d'
1)
b'
1
c'
1y
0
60
d(d
1)
3''
c
(c
1)
40
1
(4)
y 1
(a
a1)
2
(3)
b (b
1)
S

2. **Ok ..!**Let us imagine that a hexagonal pyramid of base 35mm and height 55mm, rests with its base on the HP such that one of its edges is perpendicular to the VP. A section plane inclined at 60° to the VP and perpendicular to the HP cuts the pyramid at 10mm from the axis.

1. Draw the line XY.
2. Draw the top view as a hexagon such that an edge is perpendicular to the VP and name its corners.
3. Draw projectors from the top view through XY.
4. Draw the front view as shown in the figure and name its corners.
5. Draw a circle of radius 10mm at the center of the top view. Draw the section plane in the top view tangential to this circle and inclined at 60° to XY and in front of the axis. Name the sectional points.
6. Draw projectors from each sectional point in the top view so that they cut the corresponding edges of the front view. Name the sectional points in the front view.
7. Join the sectional points and draw the hatching lines to get the sectional front view.
   To get the True Shape of the section:
8. Draw a line X_1Y_1 parallel to SP as shown.
9. Draw projectors from each sectional point in the top view through X_1Y_1.
10. Transfer the distances, from XY, of the sectional points in the front view to the corresponding projectors through X_1Y_1, measuring from X1Y1 in each case. Name these points.
11. Join these points and draw the hatching lines to get the true shape of the section.


o'
2'
3'
55
SVCET
x_1
1''
2''
3''
1'
4'
x
y
a'(f')
b'(e')
c'(d')
4''
e
S
f
d
1
35
P
2
a
3
4
c
y_1
0 20
b
P