KNOWLEDGE INSTITUTE OF TECHNOLOGY

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Kakapalayam (PO), Salem – 637504.

ENGINEERING GRAPHICS
Materials

Department of Mechanical Engineering

UNIT 1

Conic Section:

Eccentricity, e = distance from Vertex(V) to Focus(F) / from Directrix(D) toVertex(V)
=VF/DV

Ellipse , e<1
Parabola, e=1
Hyperbola, e>1

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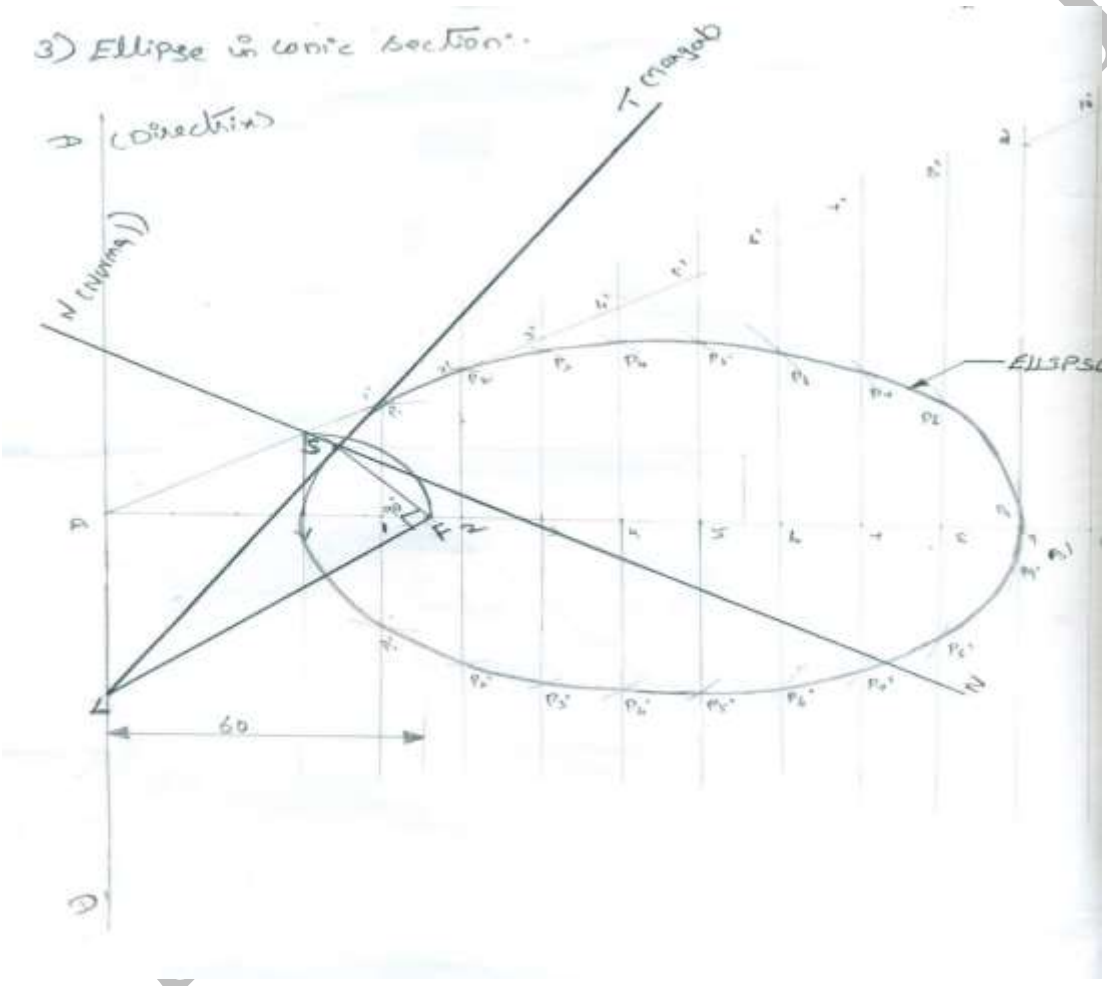
1. One focus of an ellipse is at a distance of 60 mm from its directrix. Draw the ellipse, given the eccentricity as 2/3. Draw a tangent and a normal at a point 50 mm from the directix.

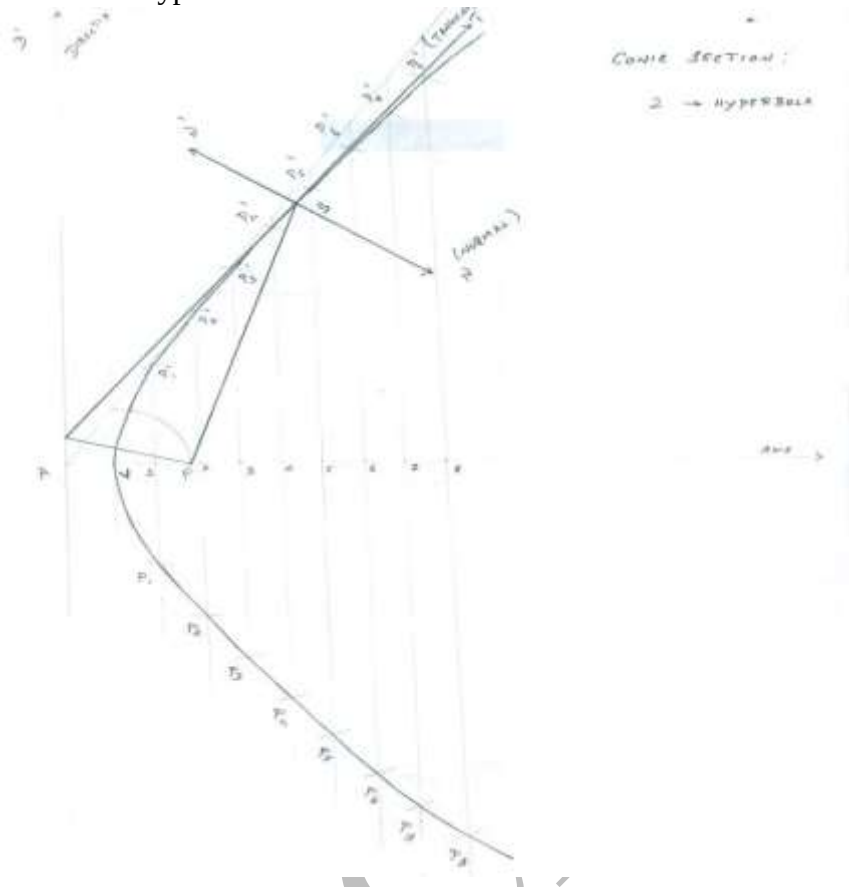


CALCULATION:
Eccentricity, e = VF / DV
= 2/3

VF=60 * 2/5= 24 mm DV=60*3/5=36mm

2. Construct a conic when the distance of a point P between the directrix and the focus is a constant of 30 mm. Draw the curve if the eccentricity is 5/3. Draw a tangent and a normal at any point on the curve.

The curve is hyperbola because e=5/3 >1



CALCULATION:

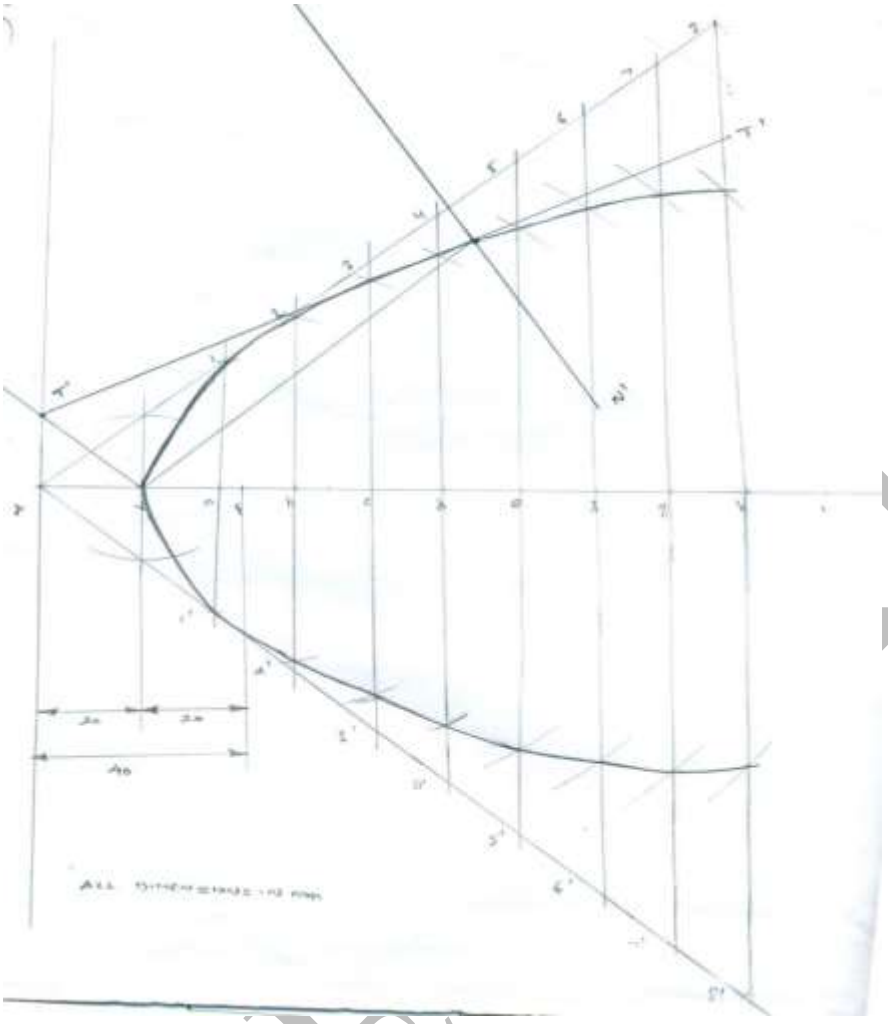
Eccentricity, e = VF / DV

= 5/3

VF=30 * 5/8= 18.75 mm

DV=30*3/8= 11.25 mm

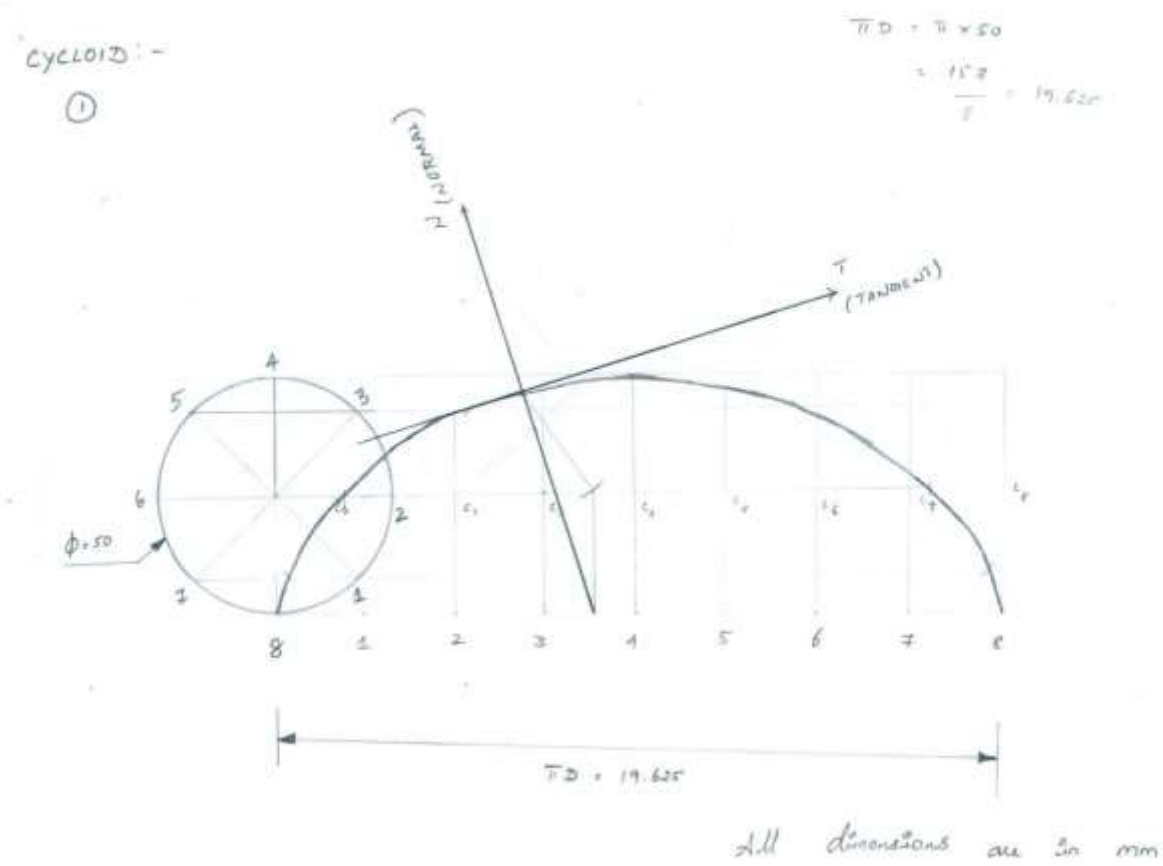
3. Draw a parabola with 20 mm distance from directrix to vertex And also draw normal and tangent at any point on the curve.



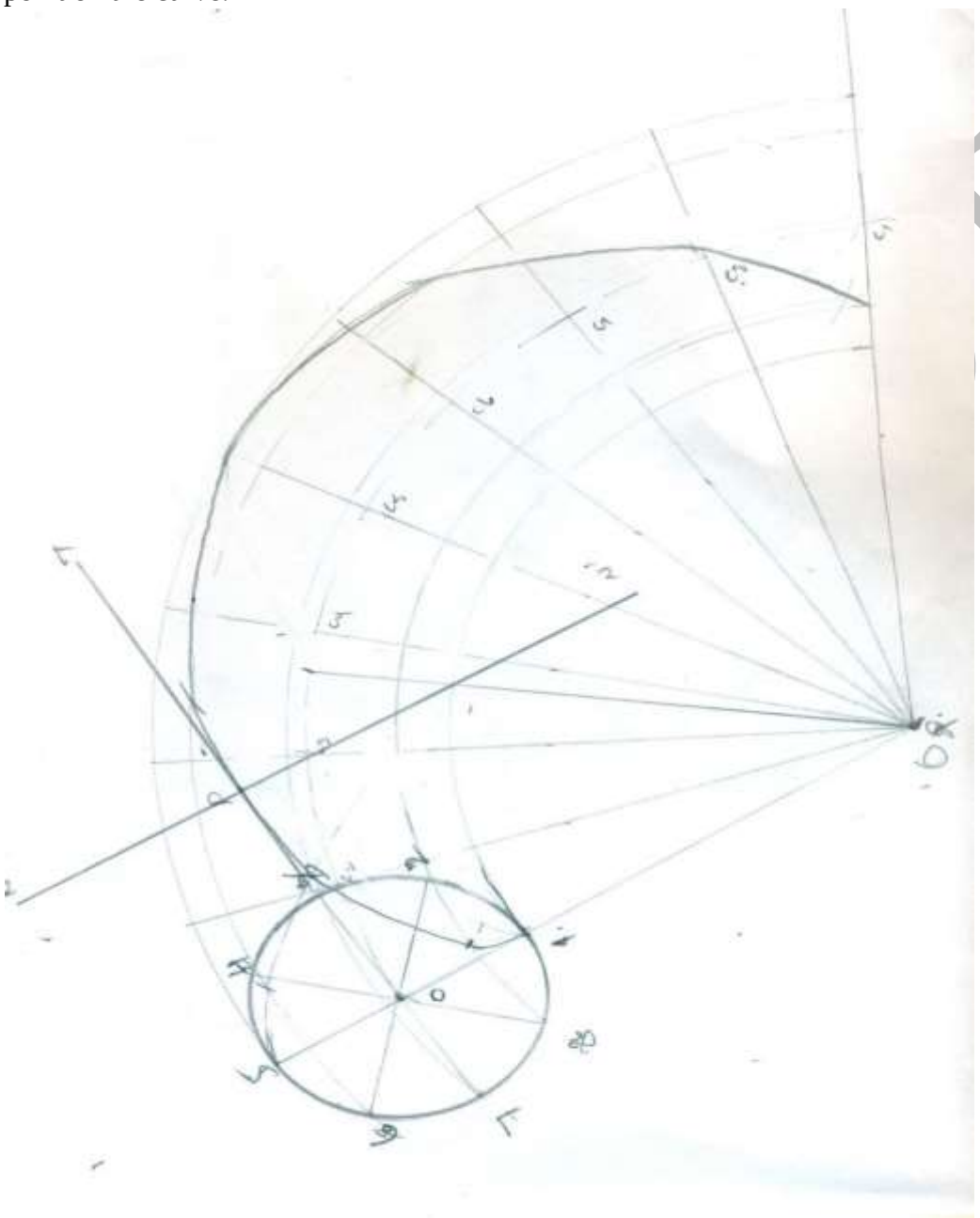
CALCULATION:
Eccentricity, e = VF / DV = 1
VF=1*DV
VF=20 mm

Cycloid:

1. Construct a cycloid, given the radius of rolling circle as 25 mm. Also draw a tangent and normal at any point on the curve.

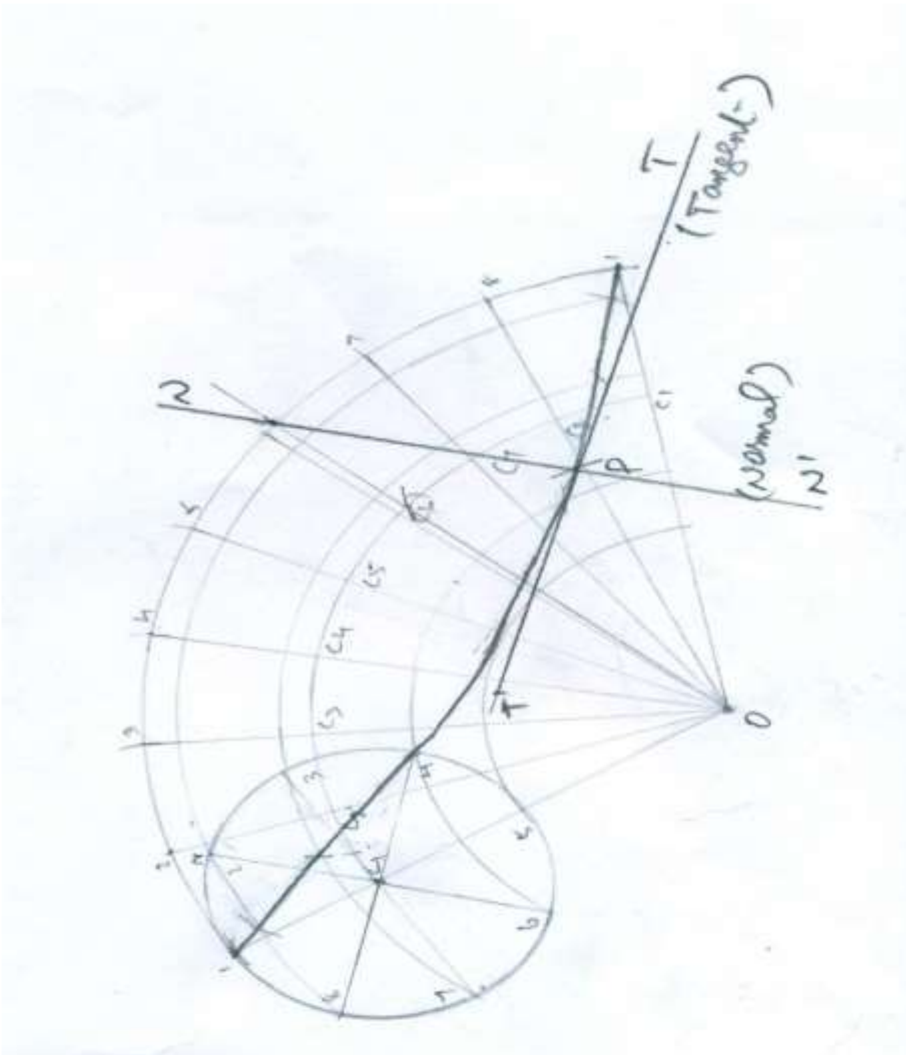


2. A generating circle of diameter 50mm rolls without slipping over a directing circle of 150mm diameter. Draw the path traced by a point on the generating circle, which is initially in contact with the directing circle for one revolution. Also draw a tangent and normal at any point on the curve.



Hint:
Included angle θ= r/R *360 = 25/75 *360=120
where r- radius of rolling circle
R – radius of directing circle

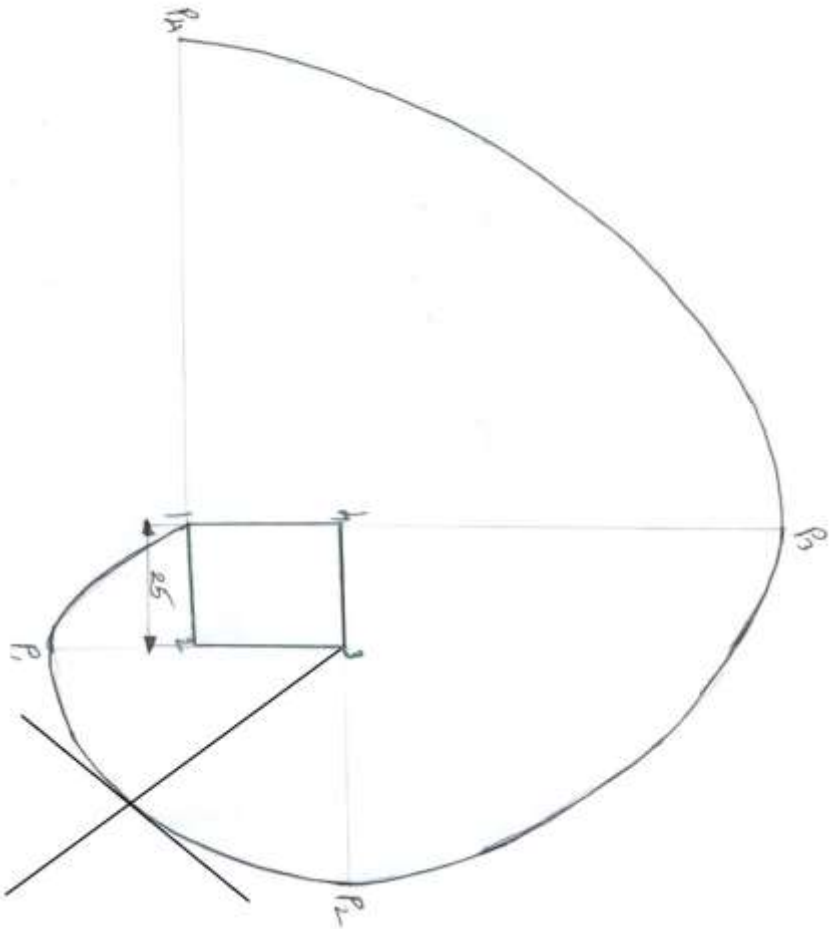
3. Construct a hypocycloid, rolling circle 50mm diameter and directing circle diameter 170mm. Draw a tangent to it and at a point 50mm from the centre of the directing circle.



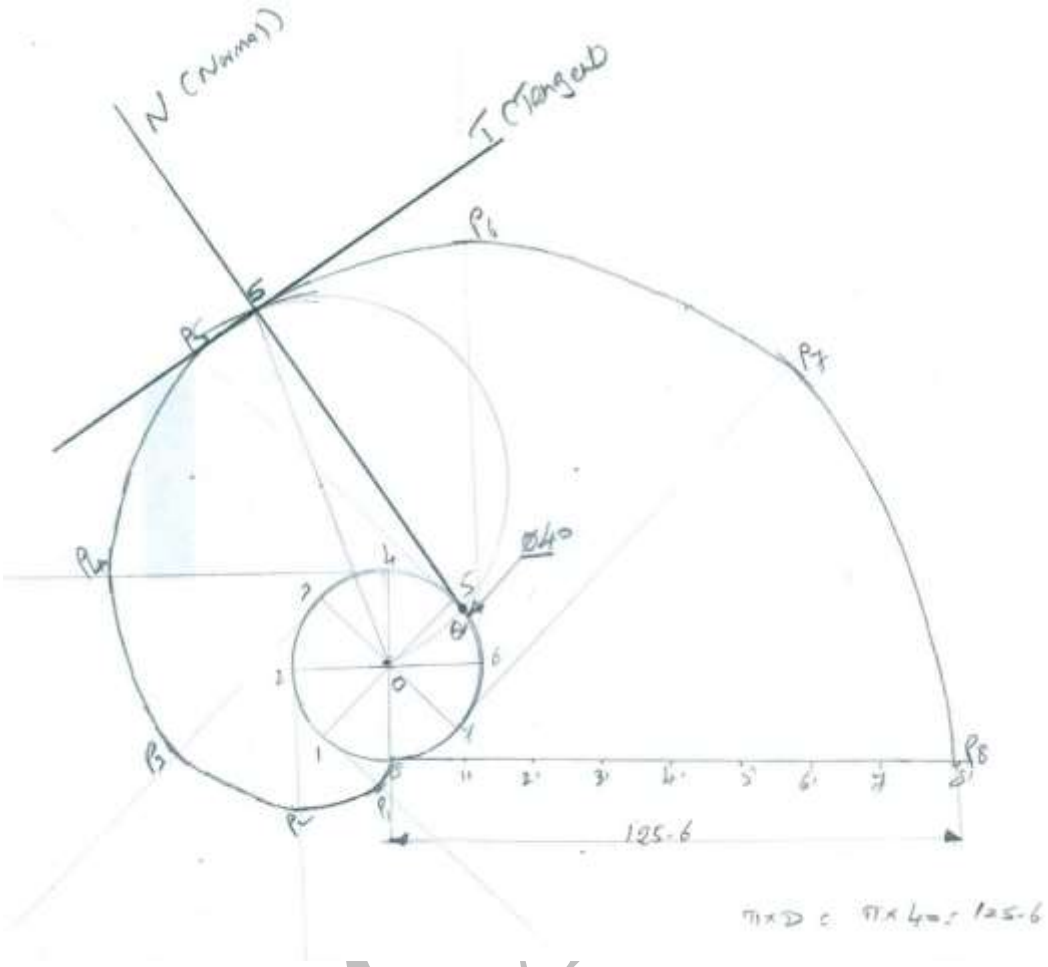
Hint :
Included angle θ= r/R *360= 25 /85*360 = 105
where r- radius of rolling circle
R – radius of directing circle

Involute:

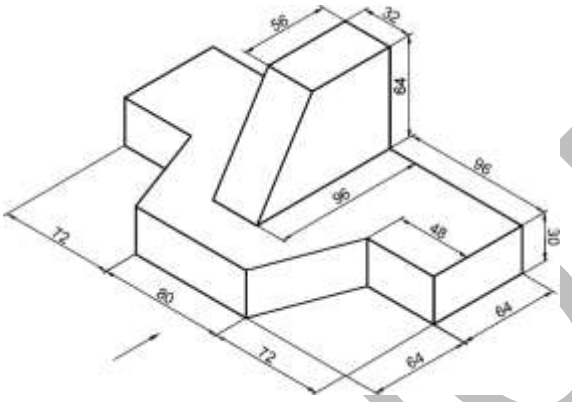
1. Draw an involute of a square of side 25mm.

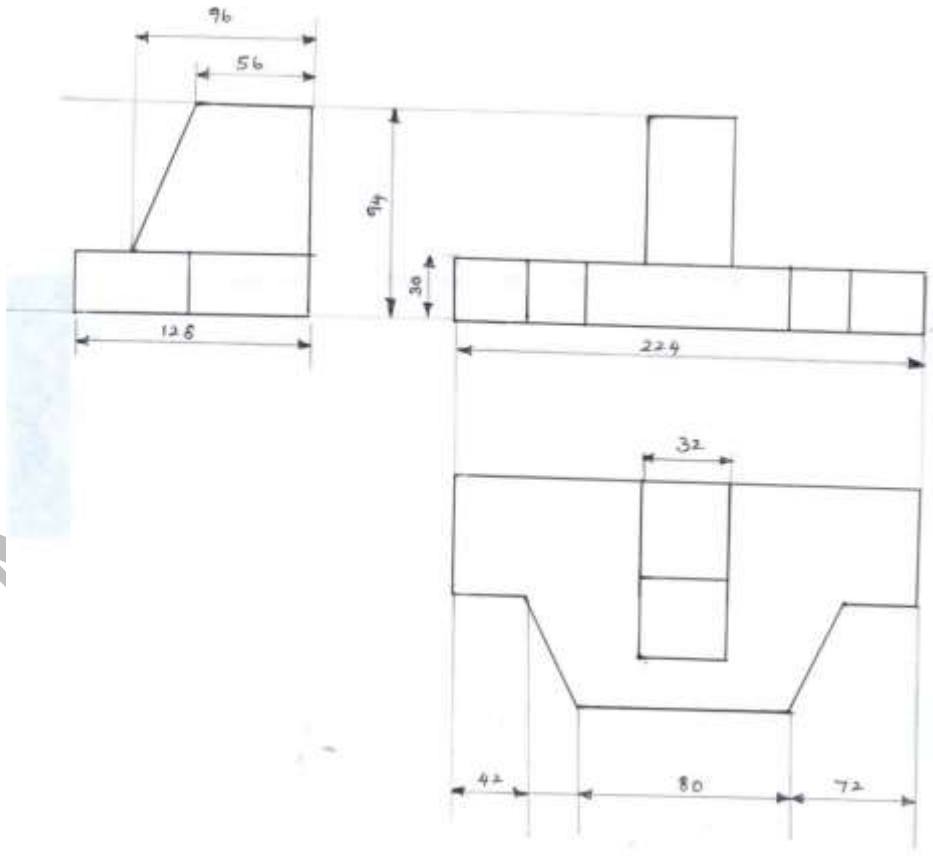


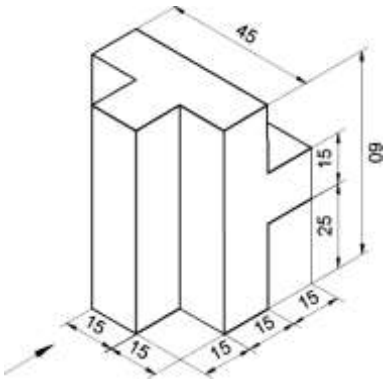
2. Draw the involute of a circle of diameter 40mm. Draw a tangent and normal at any point on the curve.



FREE HAND SKETCHING:(Draw front view,top view and side view)



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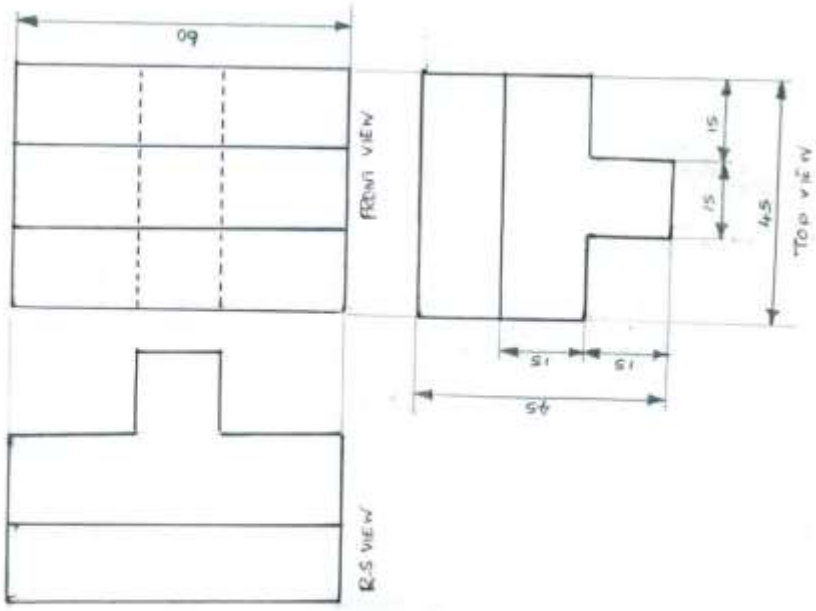
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FRONT VIEW
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TOP VIEW
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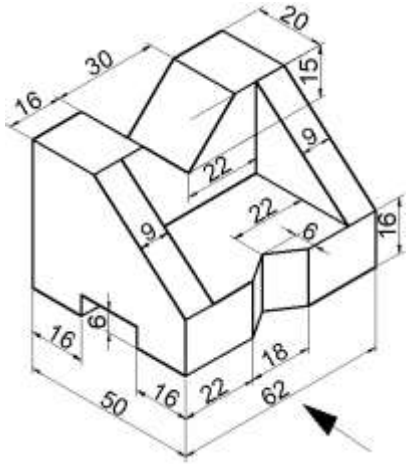
R.S VIEW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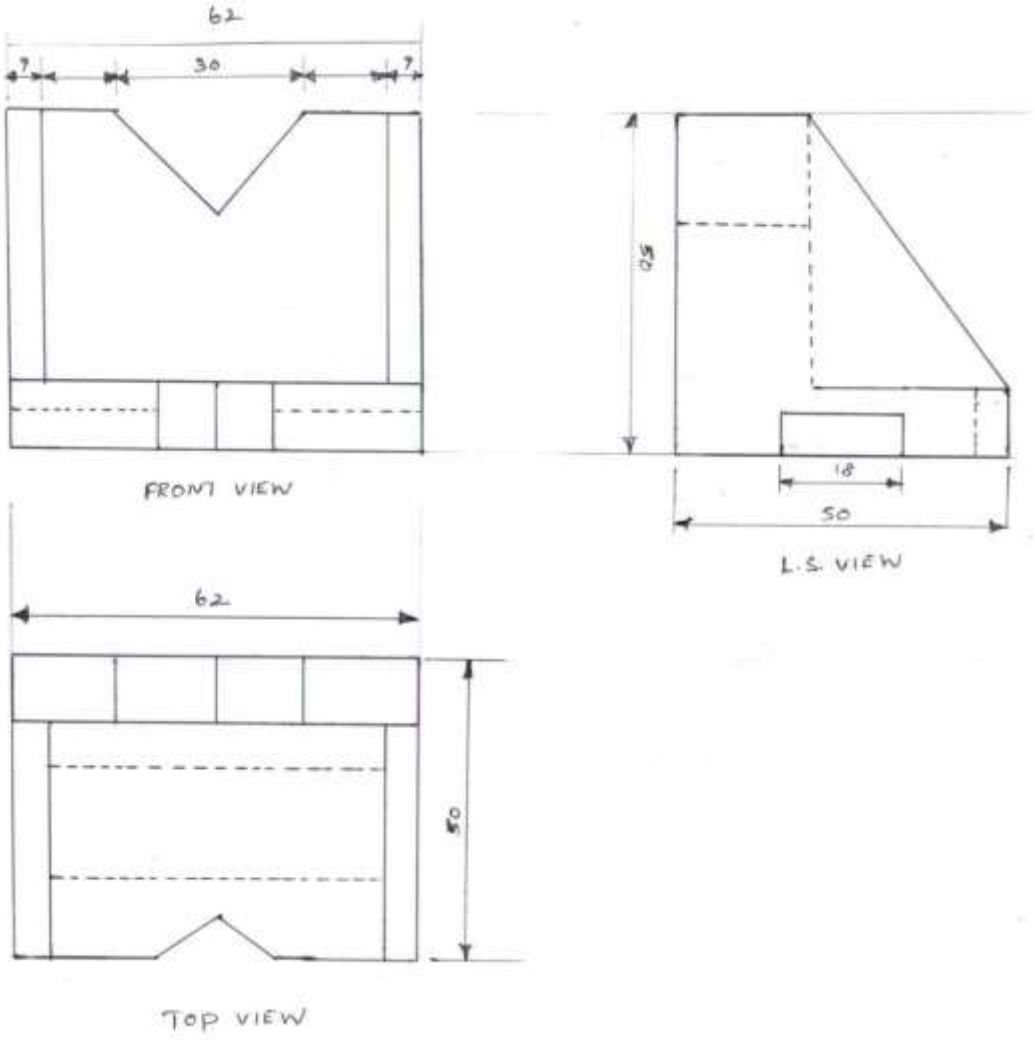
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FRONT VIEW
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L.S. VIEW
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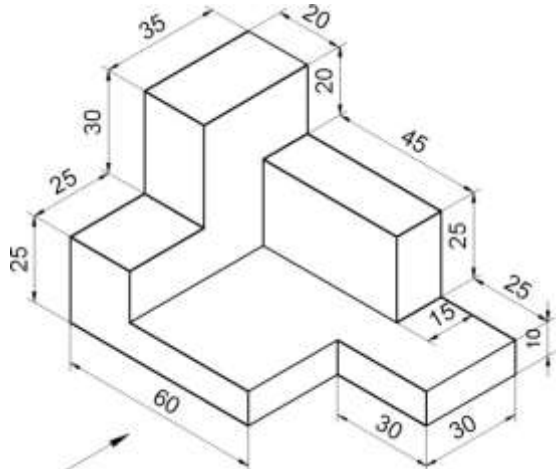
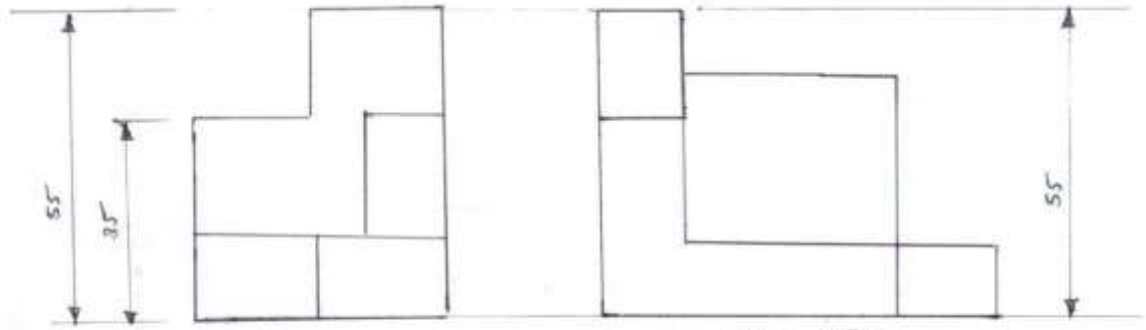
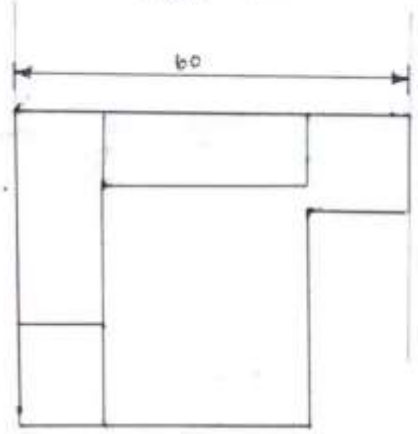
TOP VIEW



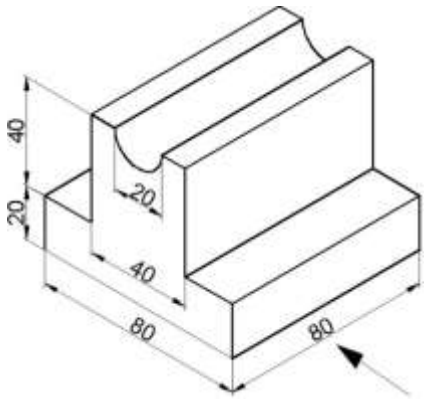


R.S.VIEW

FRONT VIEW



TOP VIEW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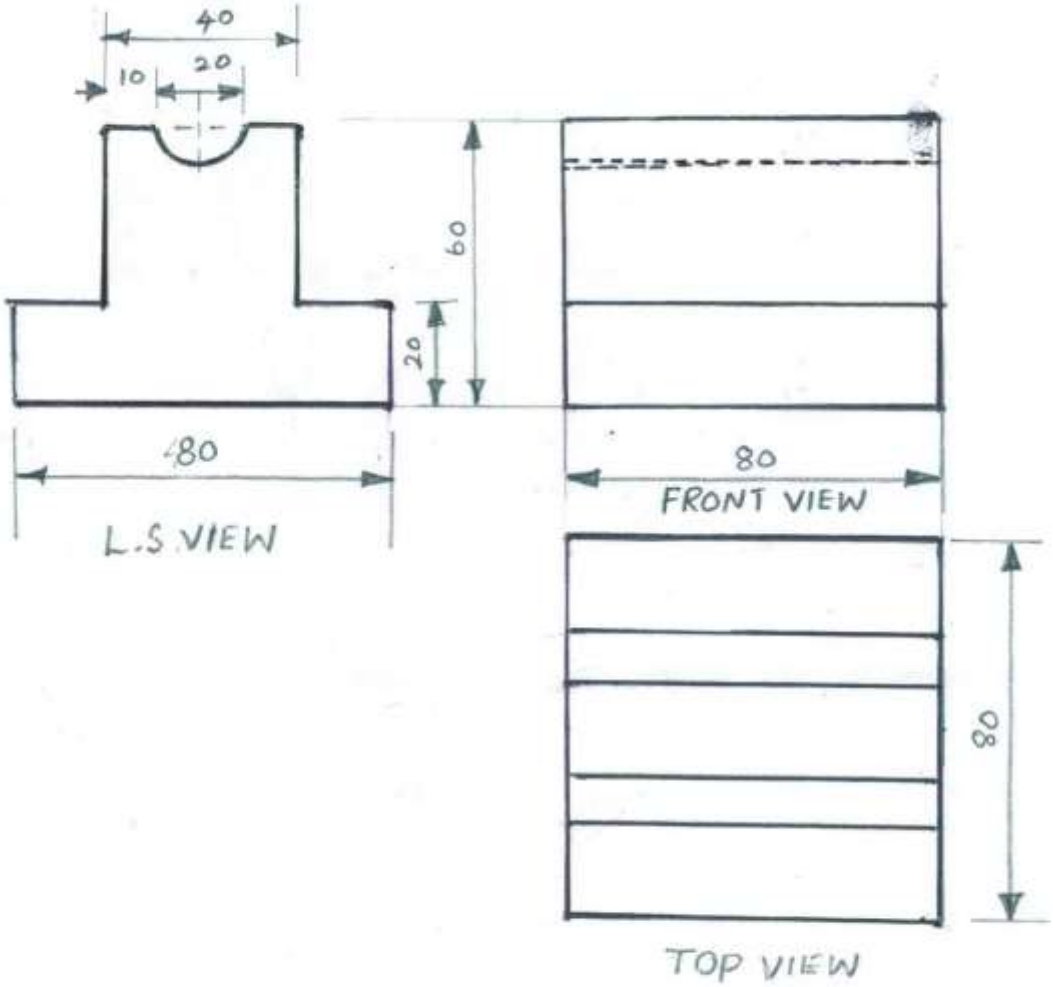
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L.S VIEW
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FRONT VIEW
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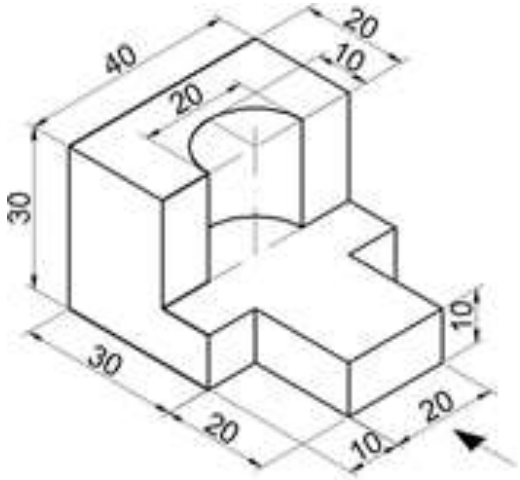
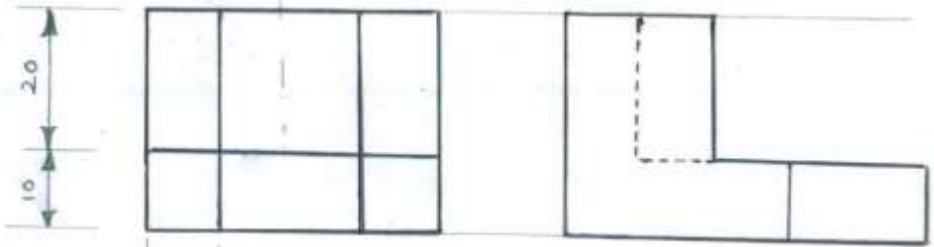
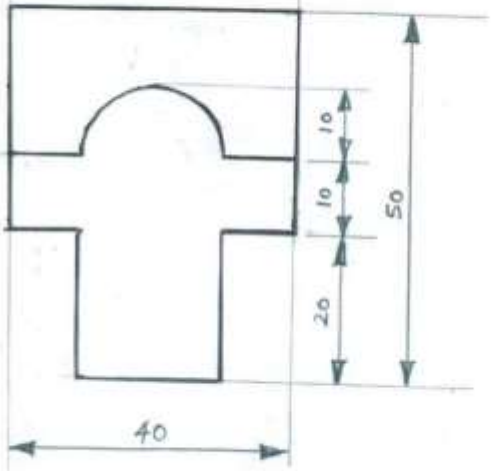
TOP VIEW



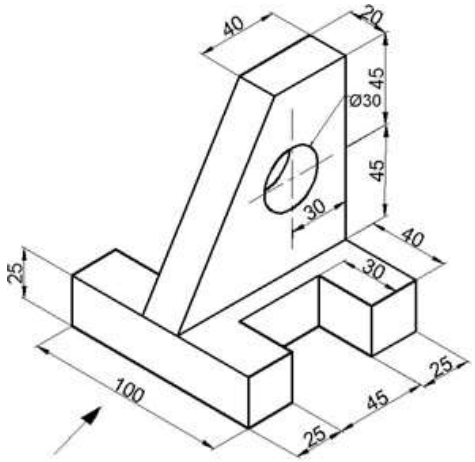


FRONT VIEW

L.S. VIEW



TOP VIEW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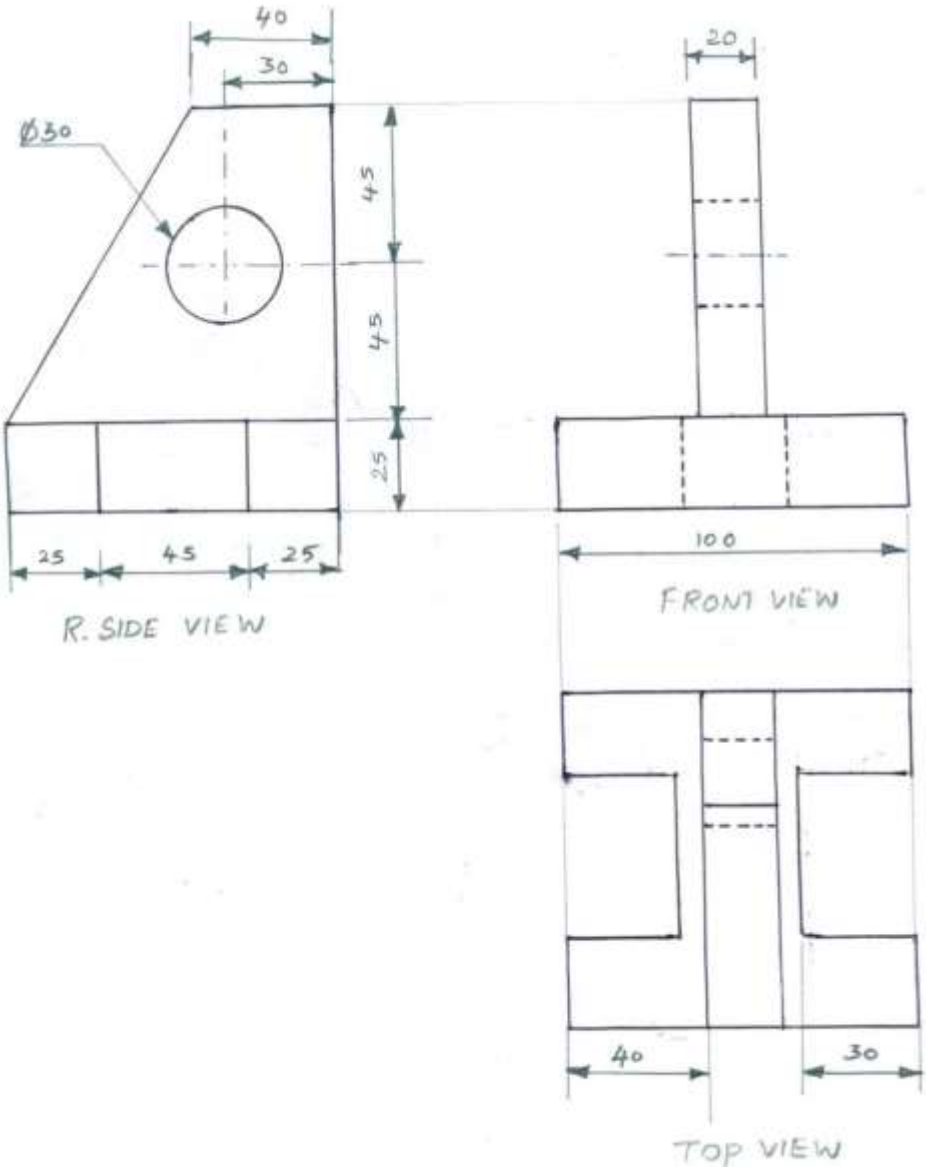
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R. SIDE VIEW
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FRONT VIEW
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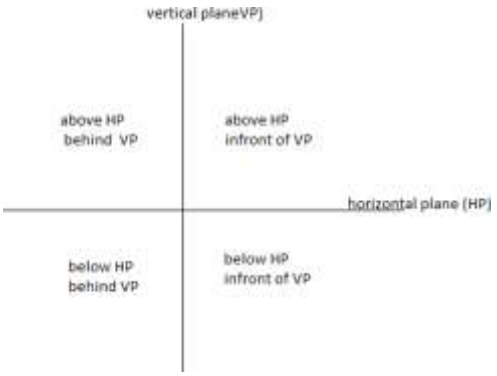
TOP VIEW

UNIT – II

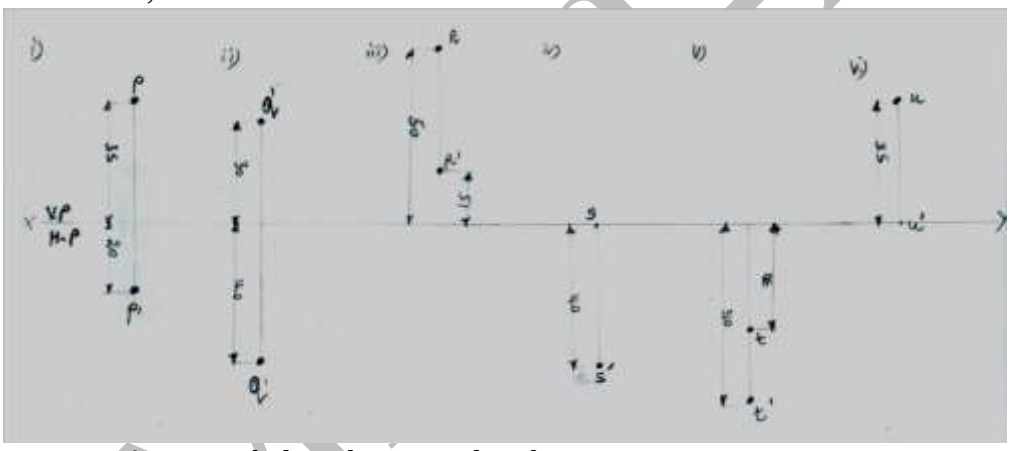
Projection of points:



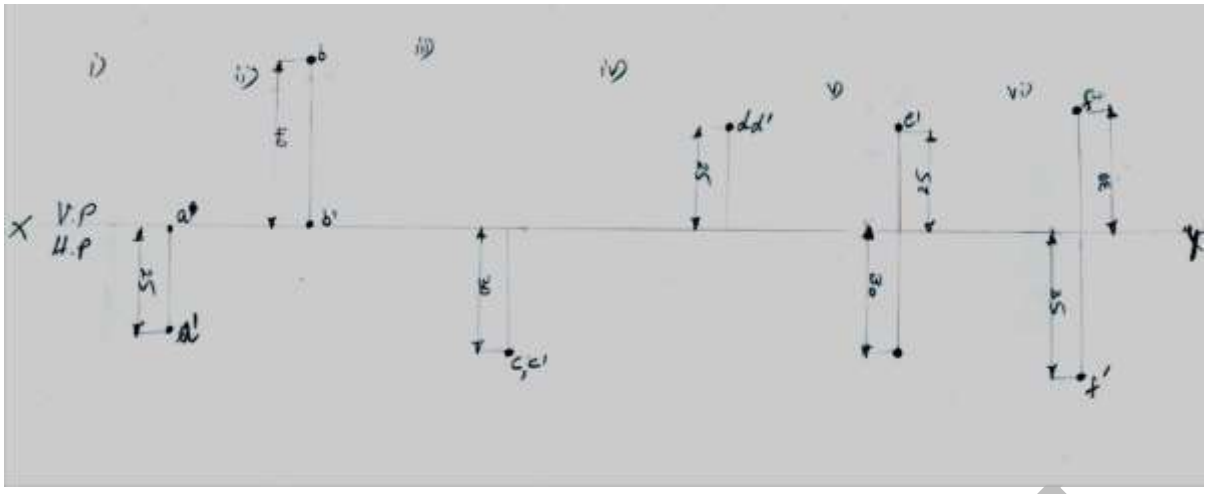
Points are placed in all four quadrants
Above HP and Below HP dimensions should be given single quote i.e., a'
For the case *In HP or VP*, point is in xy line

POINTS

1. i.P,35mm behind the VP and 20 mm below HP.
   ii.Q, 40mm in front of VP and 30mm above HP.
   iii.R, 50mm behind the VP and 15mm above HP.
   iv.S,40mm below HP and in the VP.
   v.T,30mm in front of the VP and 50mm below the HP.
   vi.U,35mm behind the VP and in the HP.



2. i.A, 25mm below the HP and in the VP.
   ii.B, 40mm behind the VP and in the HP.
   iii.C,30mm below the HP and 30mmin front of the VP.
   iv.D,25mm above the HP and 25mm behind the VP.
   v.E,25mm above HP and 30mm in front of the VP.
   vi.F,35mm below the HP and 30mm behind the VP.

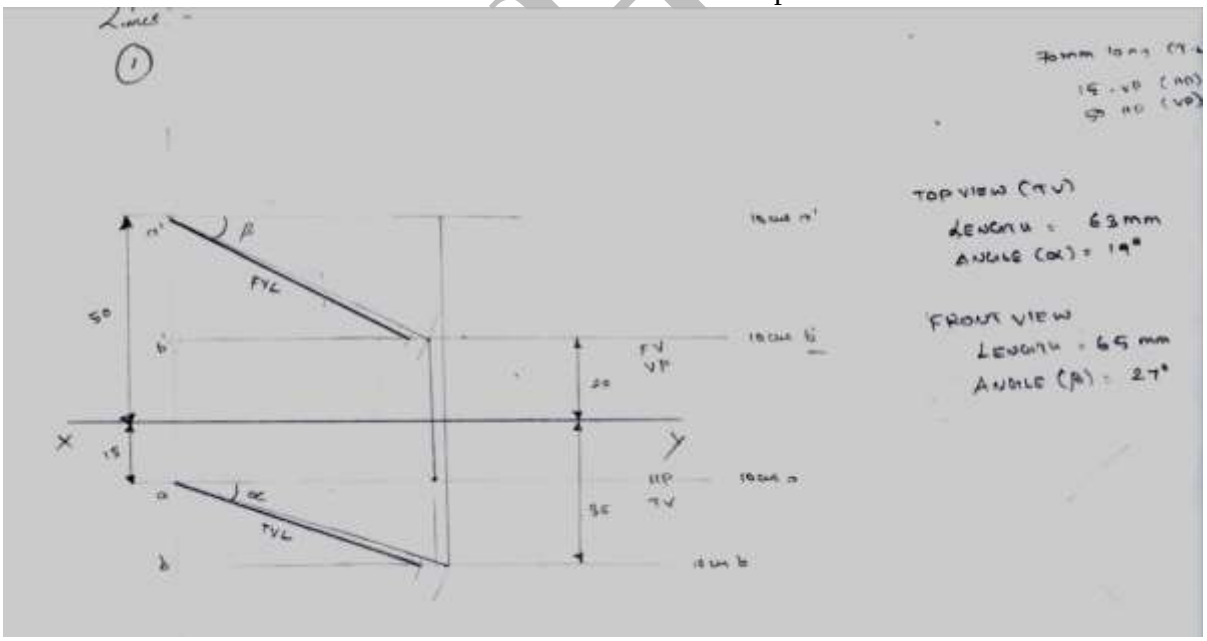


Projection of lines:

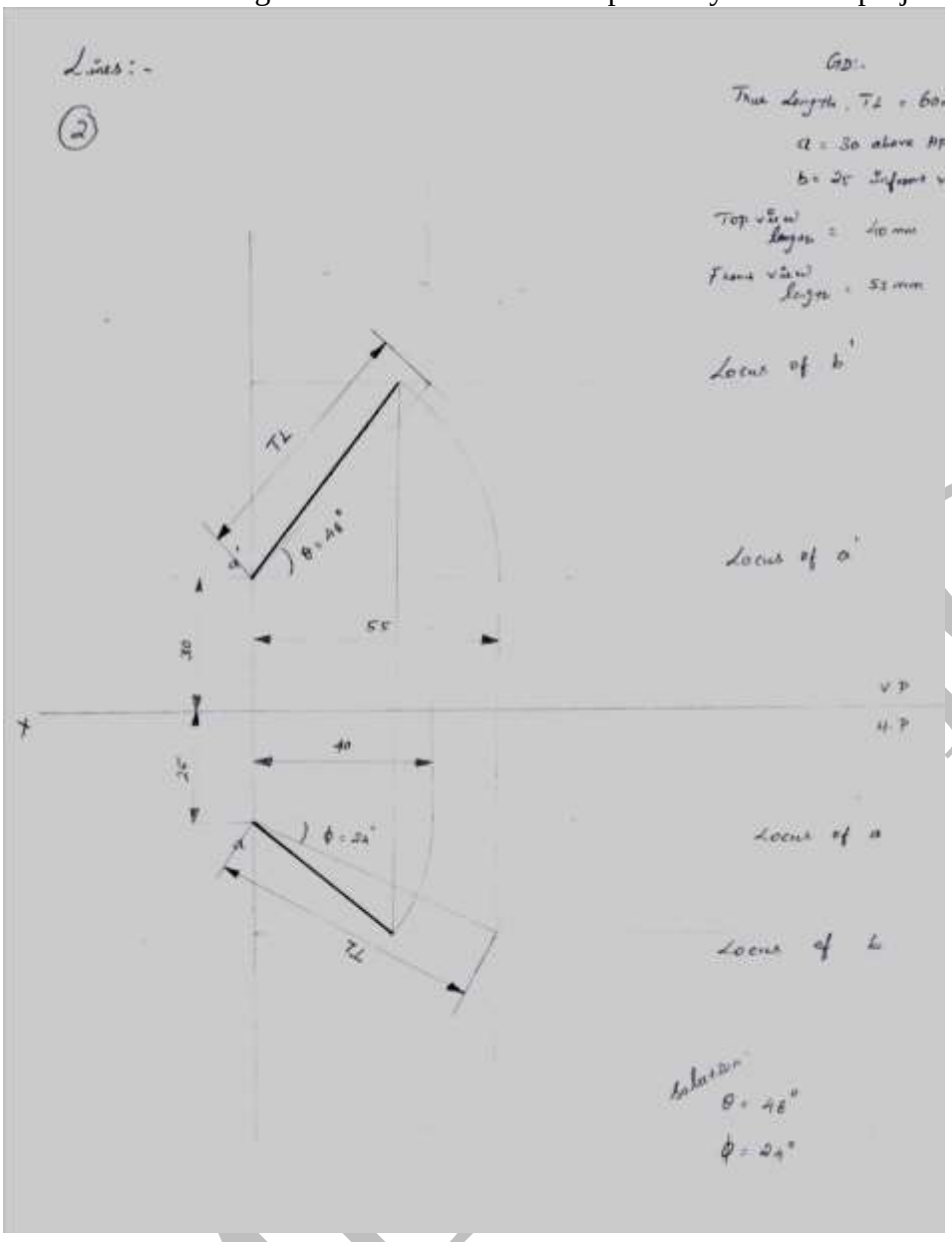
- Line is placed in first quadrant only
- Get 4 locuses
- TL- true length of the line
- FVL-front view length
- TVL-top view length
- Two ends of the FVL and TVL are in same vertical line
- plan (top view) and elevation (front view)

LINES:

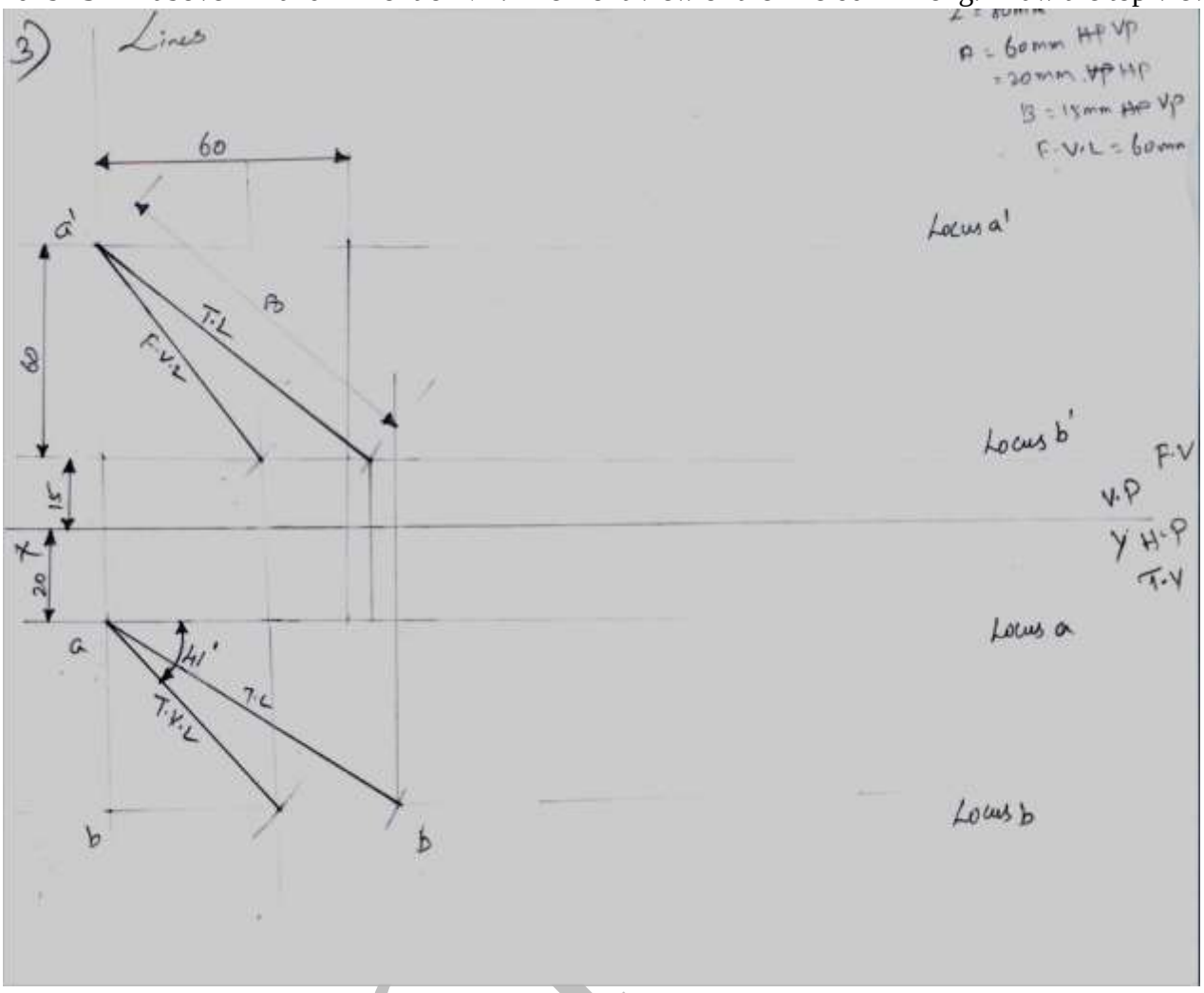
1.A straight line 70mm long has one end 15mm in front of VP and 50mm above HP. While the other end is 35mm in front of VP and 20mm above HP. Draw the plan and elevation of the line.



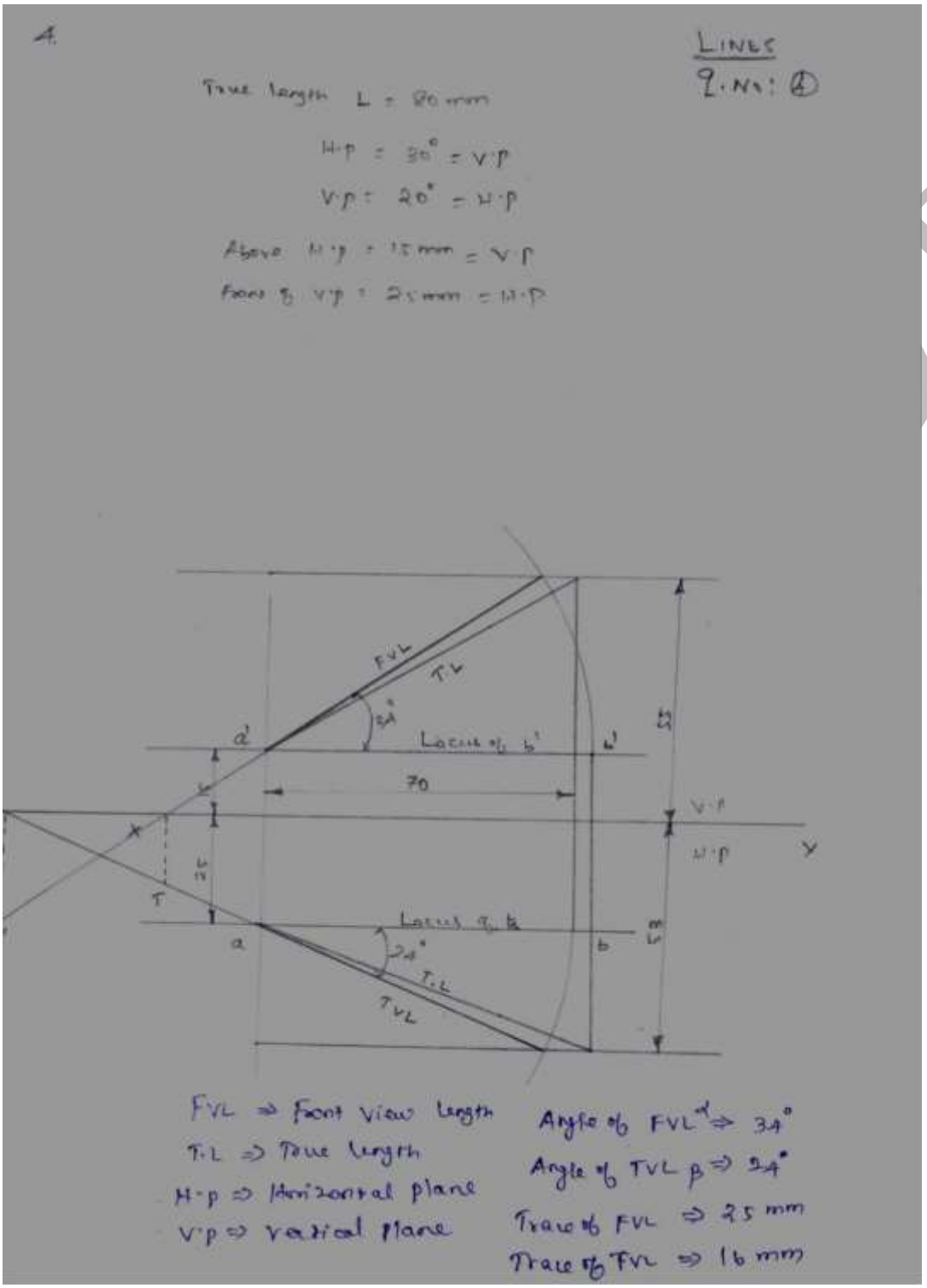
2.A line AB 60mm long has its end A 30mm above HP and 25mm in front of VP. The top view and front view has a length of 40mm and 55mm respectively. Draw its projections.



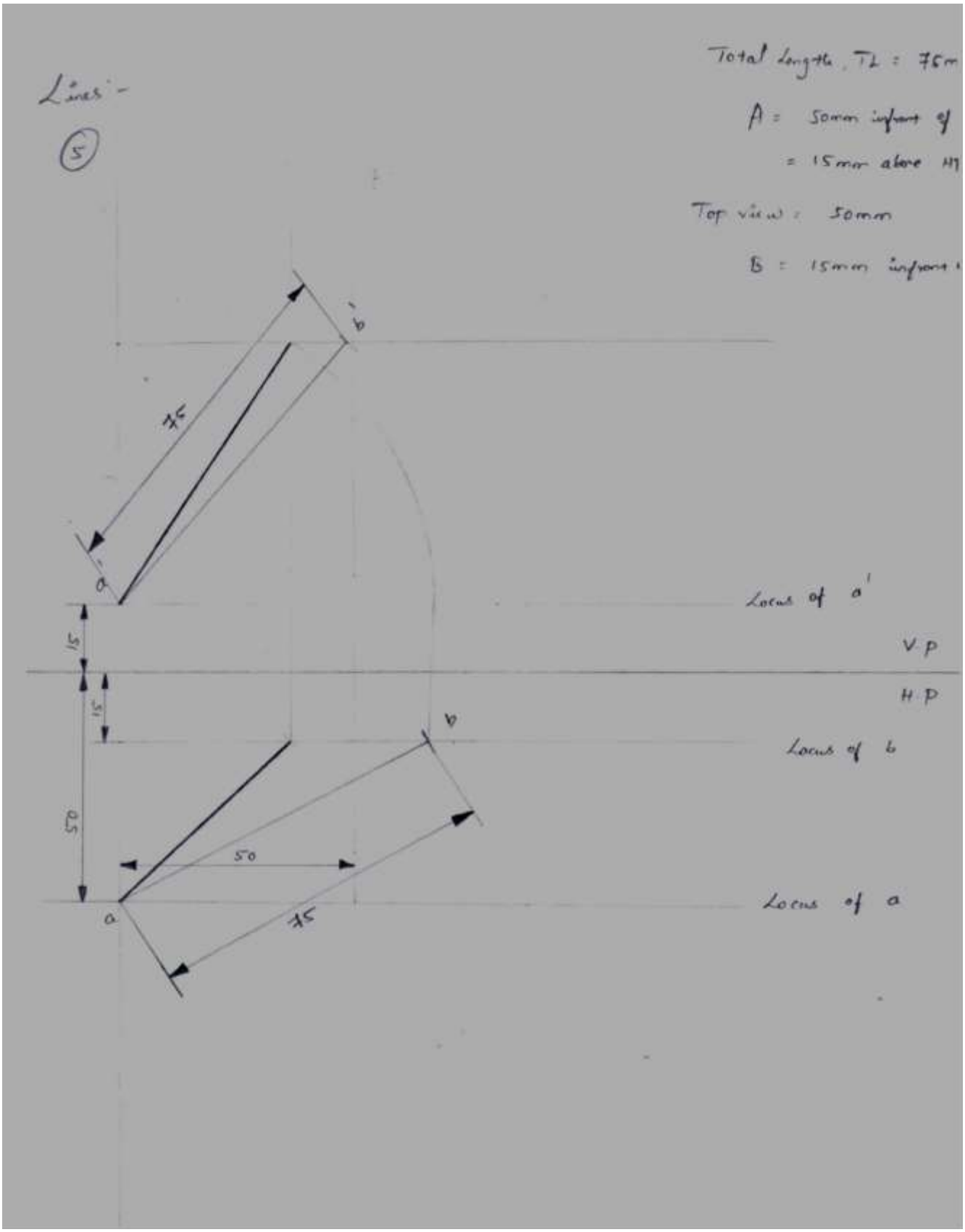
3.A line measuring 80mm long has one of its ends 60mm above HP and 20mm in front of VP. The other end is 15mm above HP and in front of VP. The front view of the line 60mm long. Draw the top view.



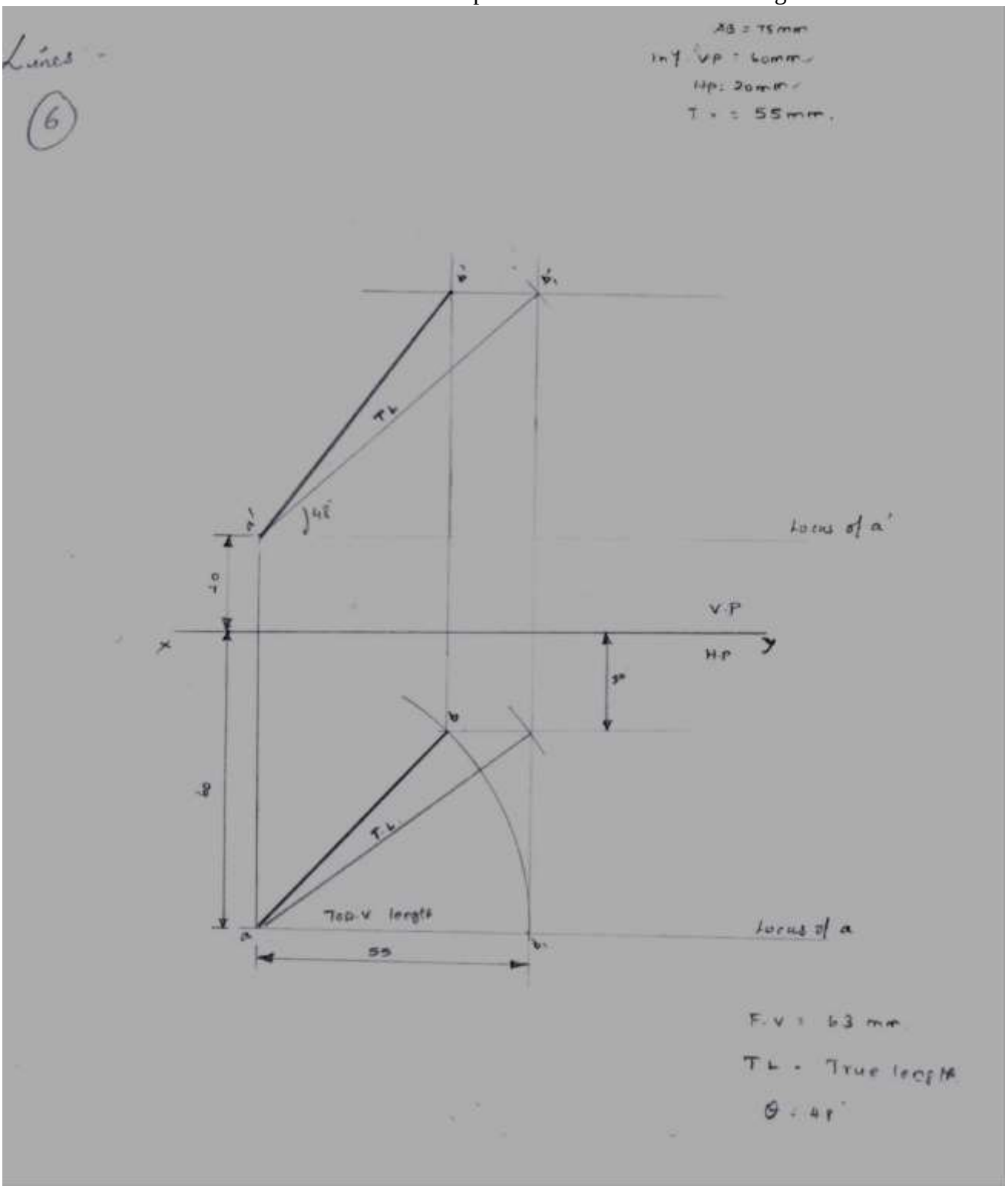
4.A line JK 80mm long makes an angle of 30° with H.P. and 20° with V.P. The line is such that its lower most point J is 15mm above H.P. and *25mm*infront of V.P. with the line in first quadrant. Draw the projections of the line JK and also draw its traces.



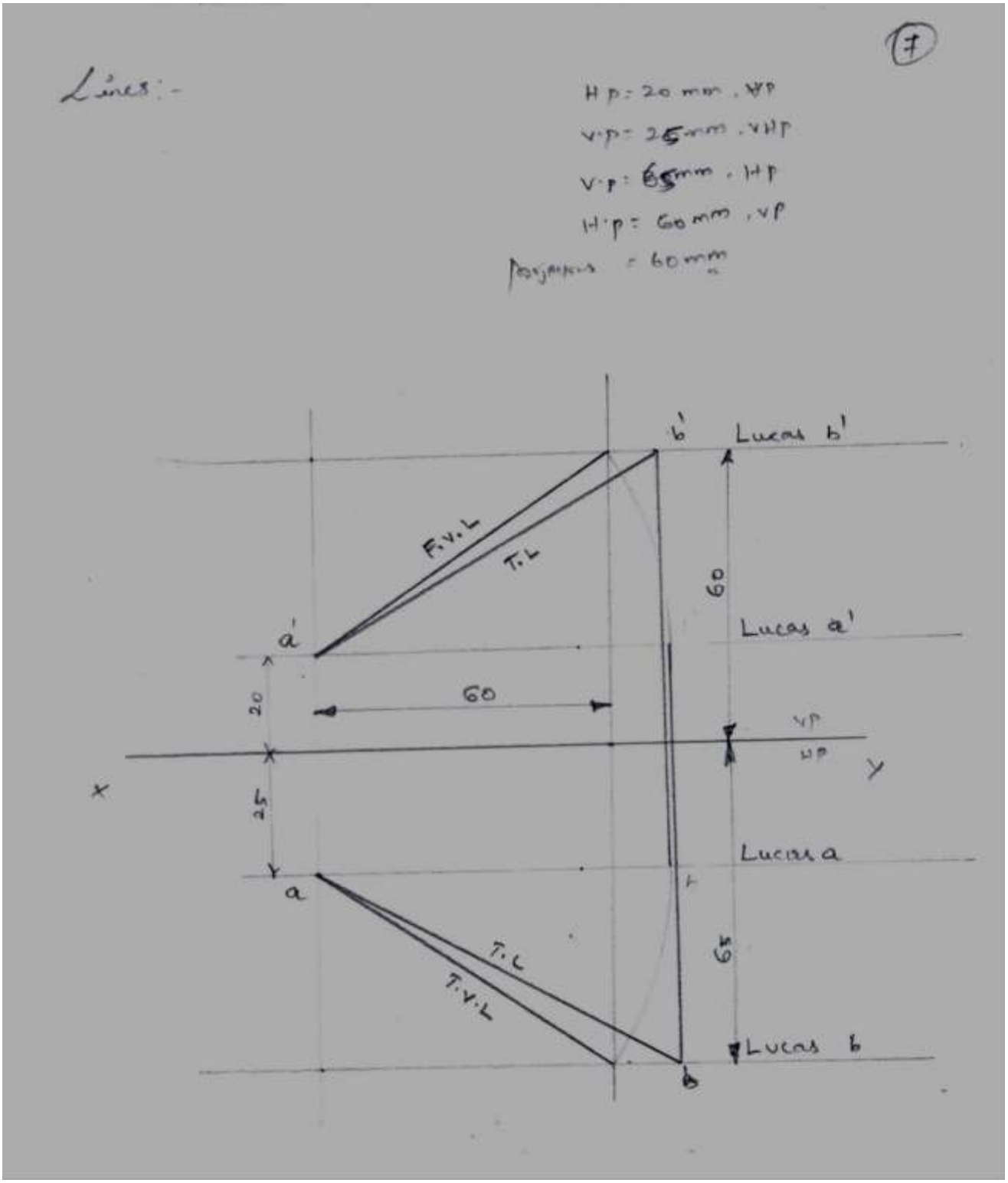
5.A line PQ measuring 75mm long has one of its ends, 50mm in front of V.P. and 15mm above H.P. The top view of the line is 50mm long. Draw and measure the front view. The other end is 15mm in front of V.P. and is above H.P. Determine the true inclinations of the line and also determines its traces.



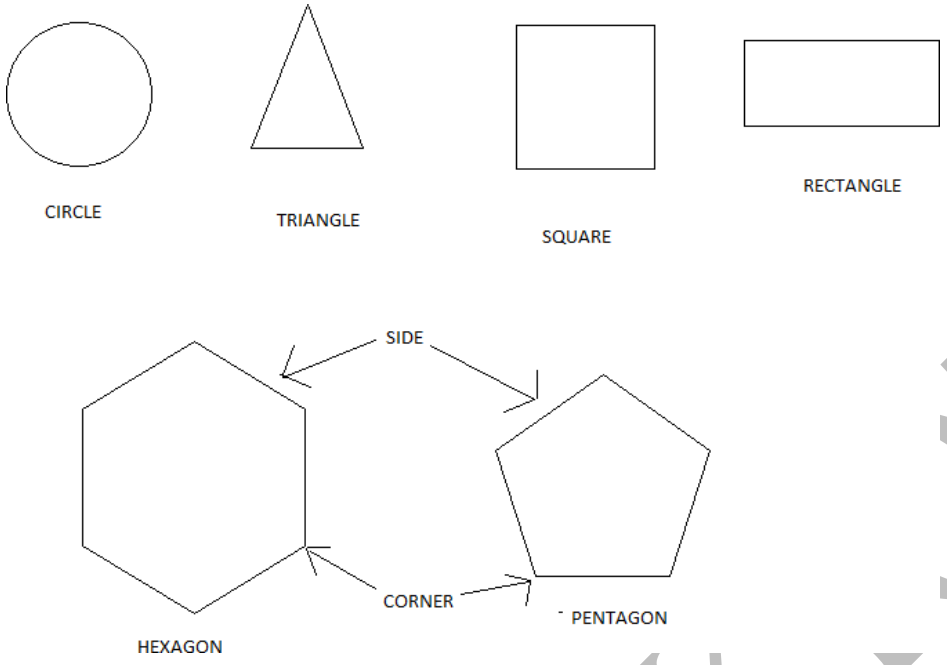
6. A line AB of 75mm long has one of its ends 60mm in front of VP and 20mm above HP the other end is 20mm in front of VP and is above HP .The top view of the line is 55mm long. Draw the front view.



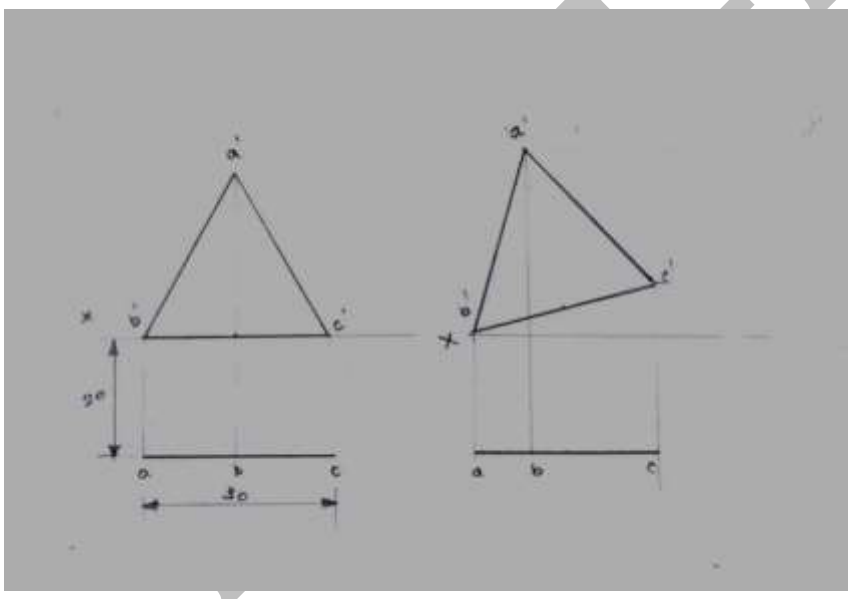
7.A straight line AB has its end A, 20mm above HP and 25mm infront of V.P. The other end B is 60mm above H.P. and 65mm infront of V.P. the ends of the line on the same projector .And the distance between projectors is 60mm. Find the true length and true inclinations of the line with H.P and V.P. Also mark its traces.



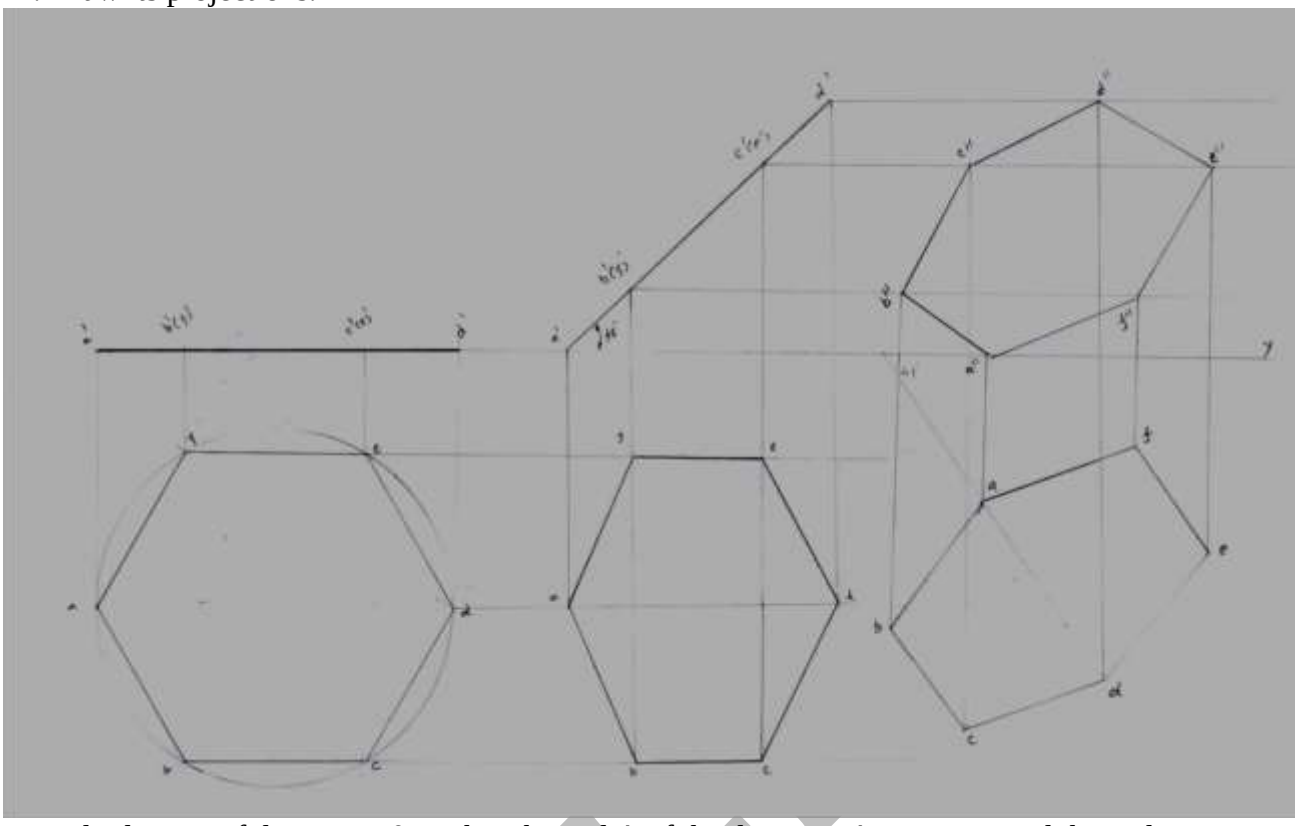
PLANES:



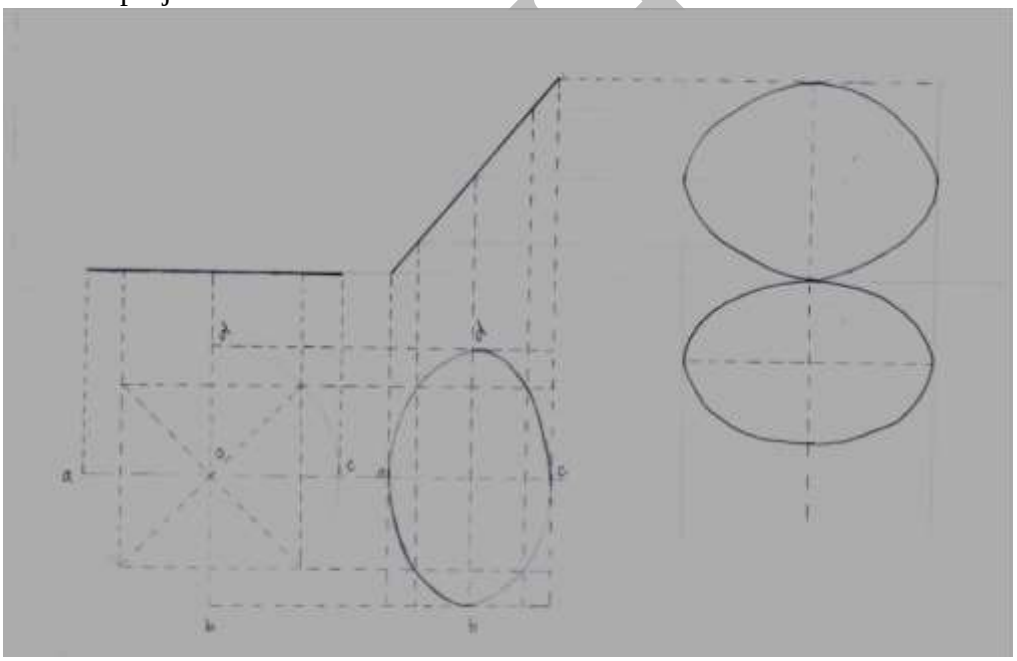
1. An equilateral triangle of side 30mm stands on H.P. and one of its edges is inclined at 15° to H.P. The lamina is parallel to V.P. and 20mm in front of it. Draw its projections.



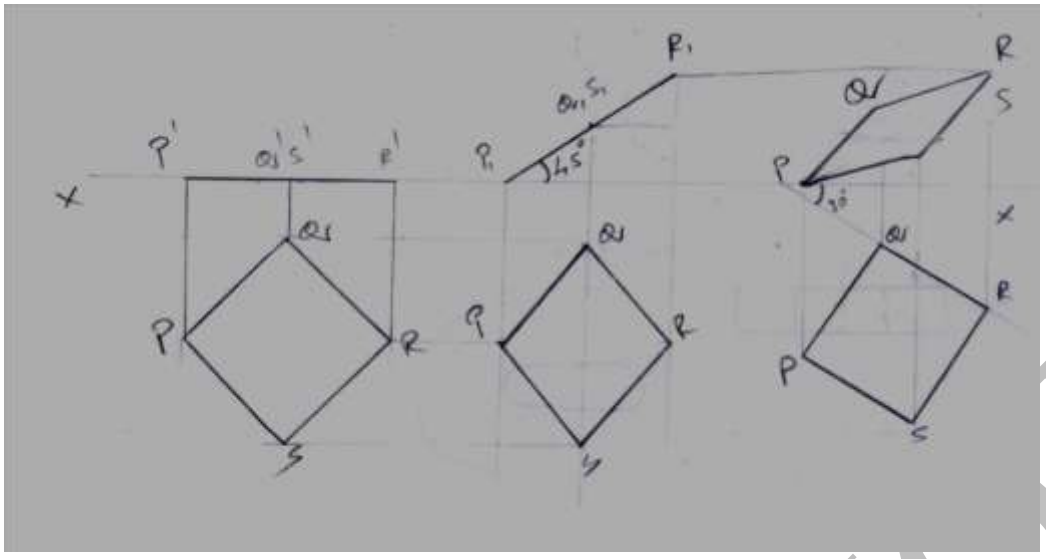
2.A regular hexagonal lamina of 40mm side is resting on one of its corner on H.P. Its surface is inclined at 45° to H.P. The plan of the diagonal through the corner which on H.P. makes an angle of 45° with XY. Draw its projections.



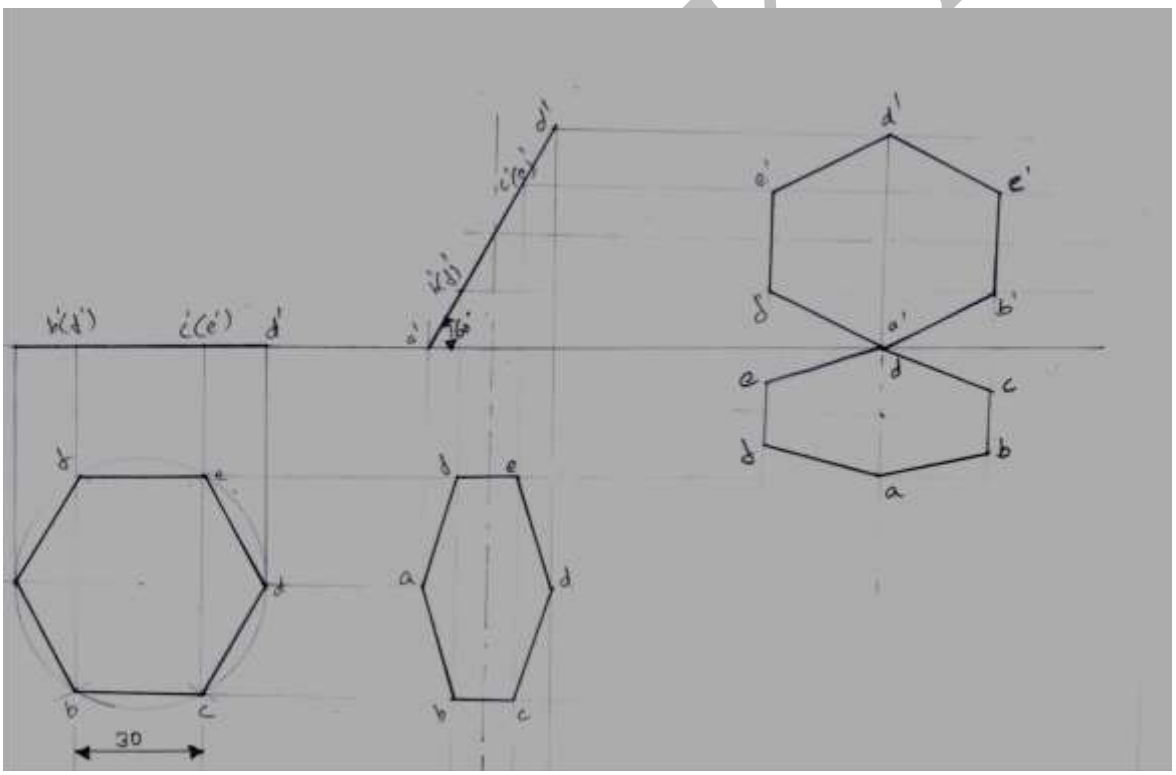
3. circular lamina of diameter 70mm has the end A of the diameter AB on H.P. and the end B on V.P. Draw its projections when its surface is inclined at 50° to H.P. and 40° to V.P.



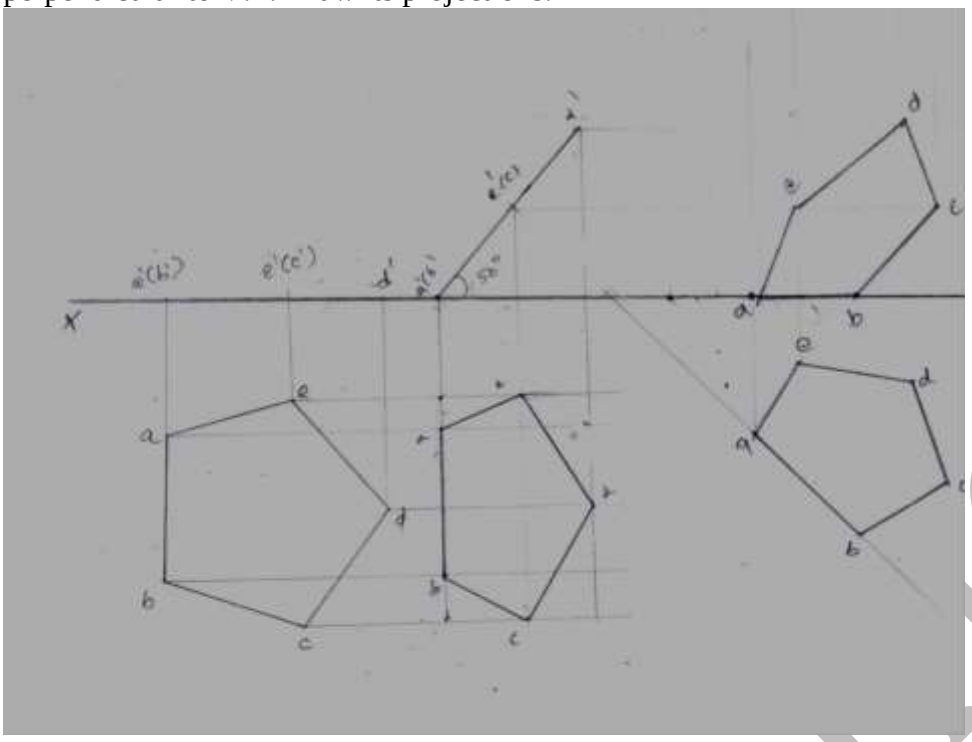
4.A square lamina ABCD of 60mm side with one of its edge on H.P. and the lamina inclined at an angle 45° to H.P. and one of its edge inclined at an angle 30° to V.P.



5.A hexagonal plate of side 30mm has one of its corners on H.P. and the opposite corner on V.P. The plate makes 60 degrees with H.P. and 30degrees with V.P. Draw the projections of the plate.



6.A pentagonal plate of side 30 mm is placed with one side on HP and the surface inclined at 50 degree to HP perpendicular to V.P. Draw its projections.



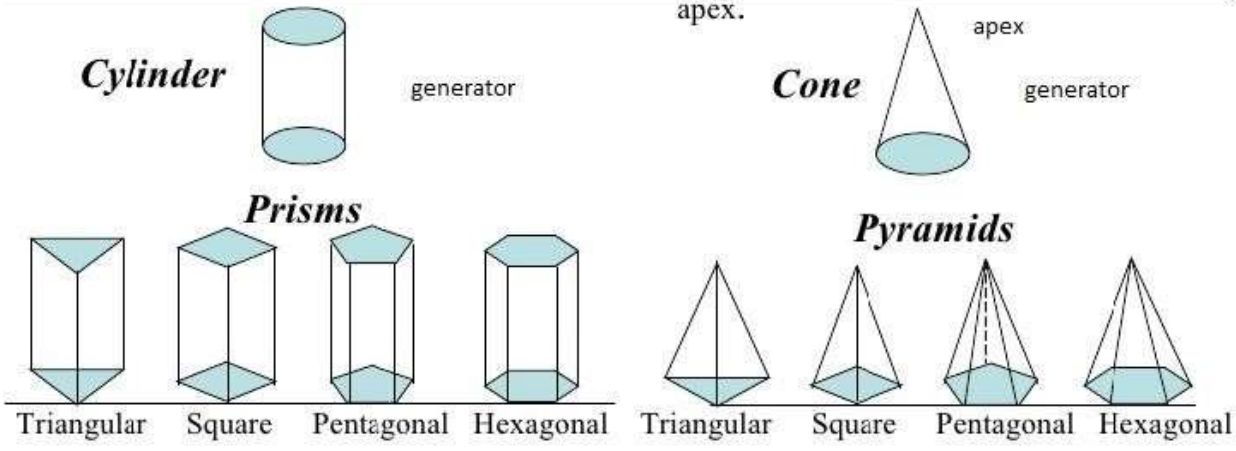
UNIT – III

PROJECTION OF SOLIDS

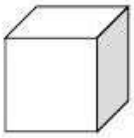
SOLIDS

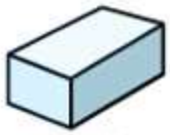
To understand and remember various solids in this subject properly, those are classified & arranged in to two major groups.

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

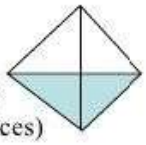


Cube
(A solid having six square faces)

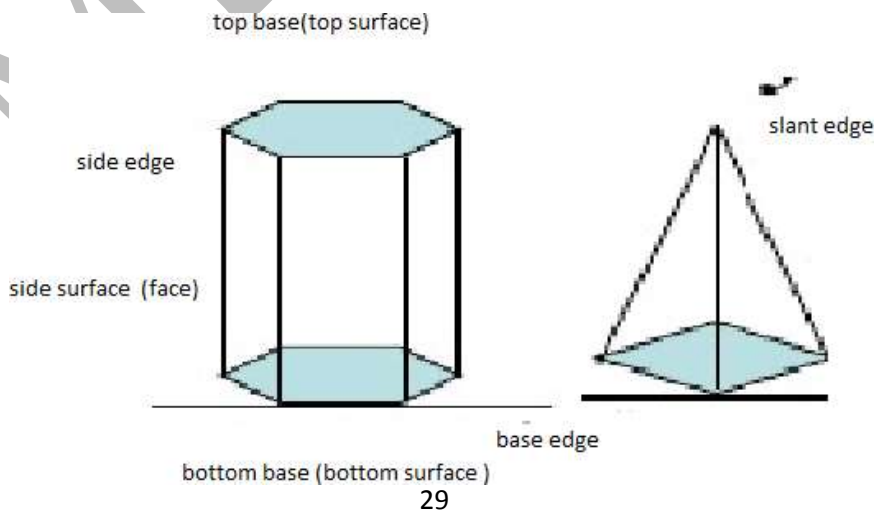




Tetrahedron
(A solid having Four triangular faces)

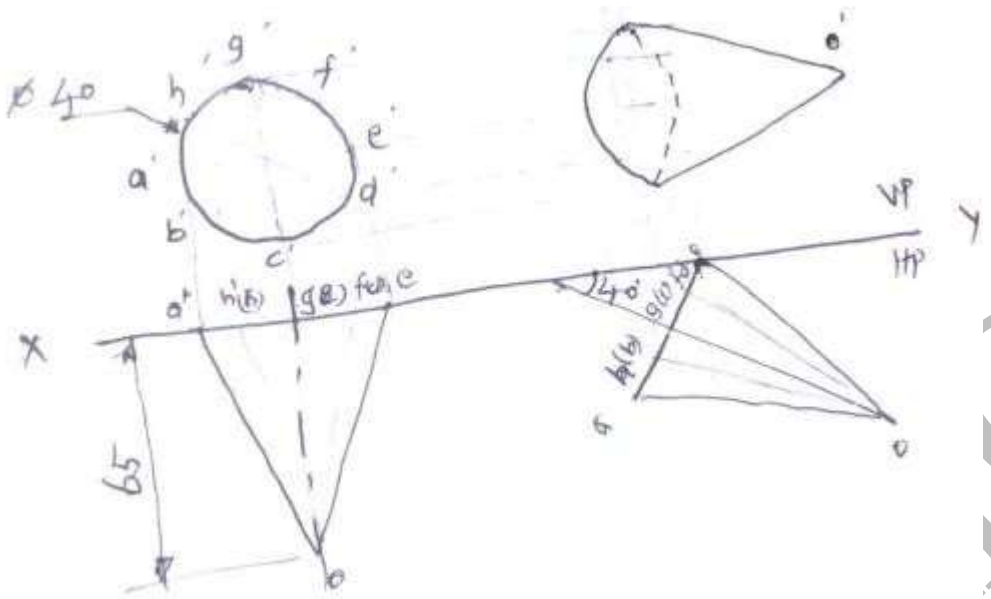


Parts name(terminologies) of prims and pyramid

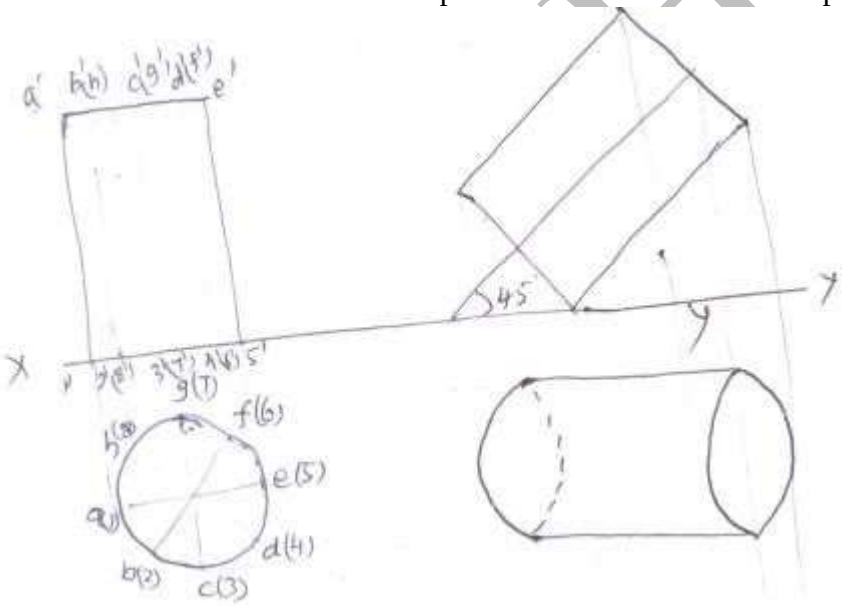


Change of position method :

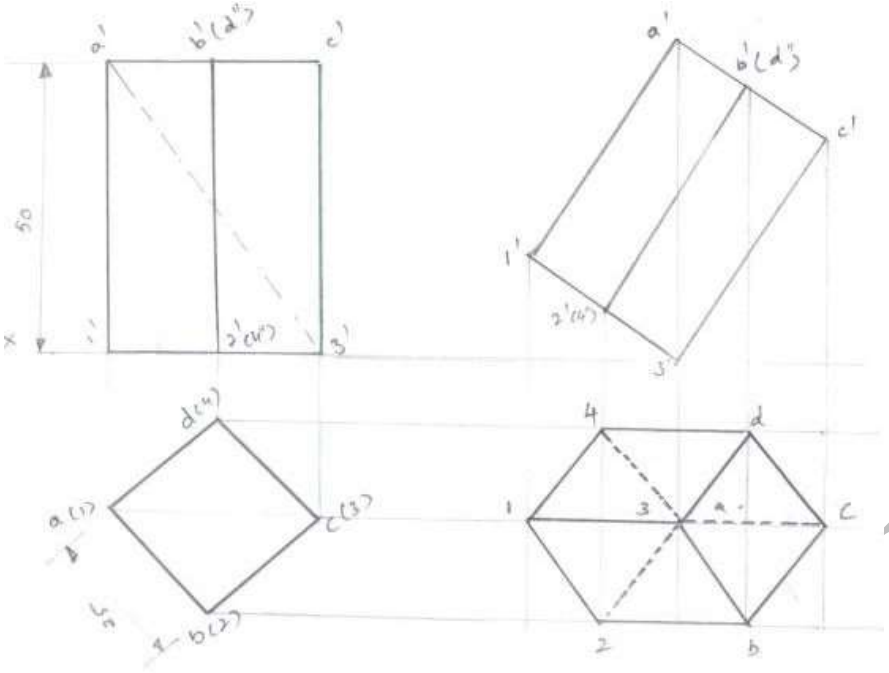
1. A cone of base 40 mm diameter and axis length 65 mm is resting on VP on one of its base point with its axis parallel to HP and inclined at 40 º to VP. Draw its projections.



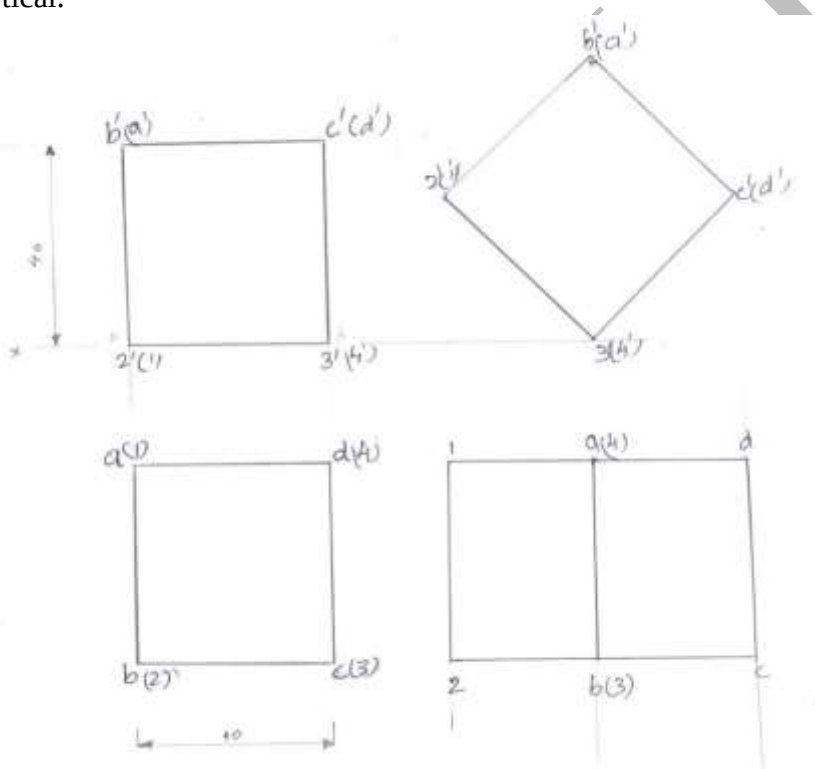
2. A cylinder of diameter 30mm and axis length 50mm is resting on the HP on a point so that its axis is inclined at 45º to HP and parallel to the VP. Draw its top and front view.



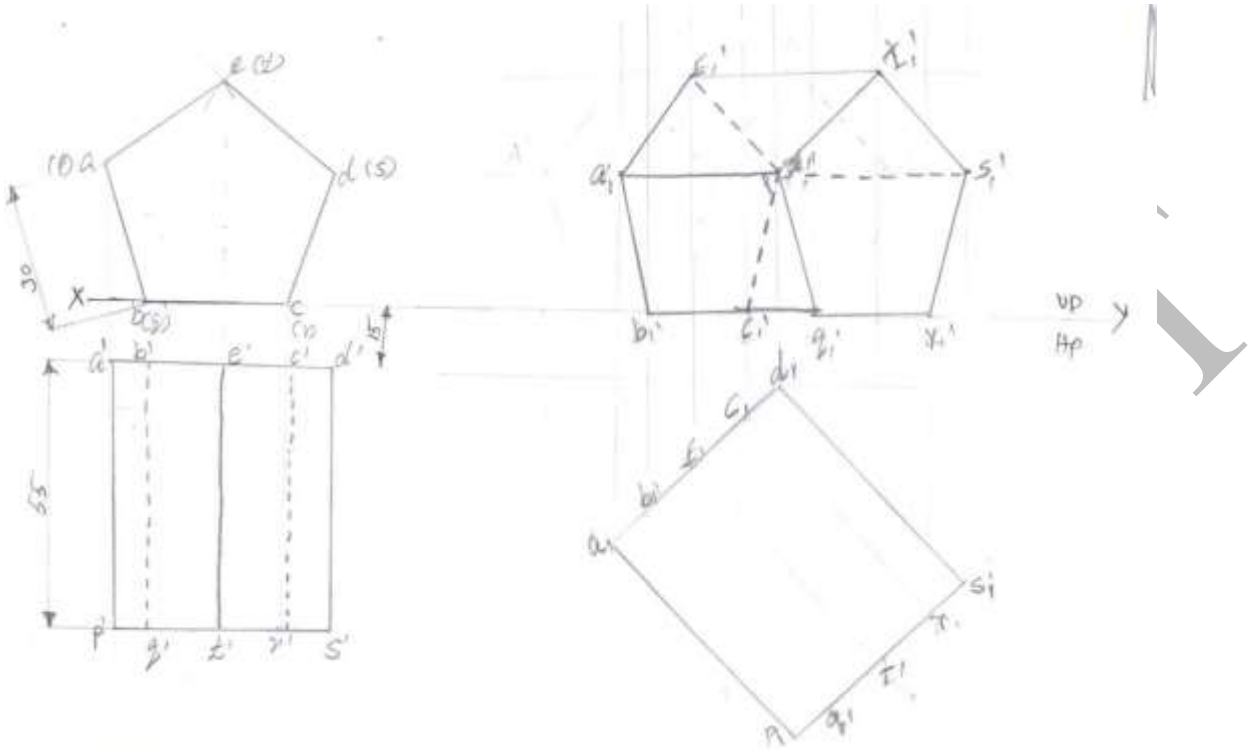
3. Draw the projections of a square prism of size 25 mm x 50 mm, resting on HP on one of its Corners, with a solid diagonal vertical.



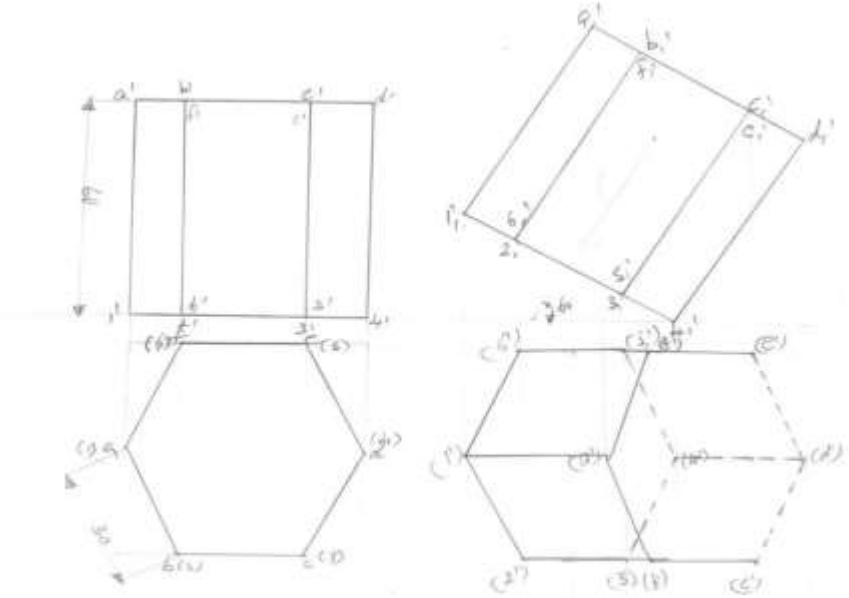
4. Draw the projections of a cube of side 40 mm resting on the HP on one of its side with a solid vertical.



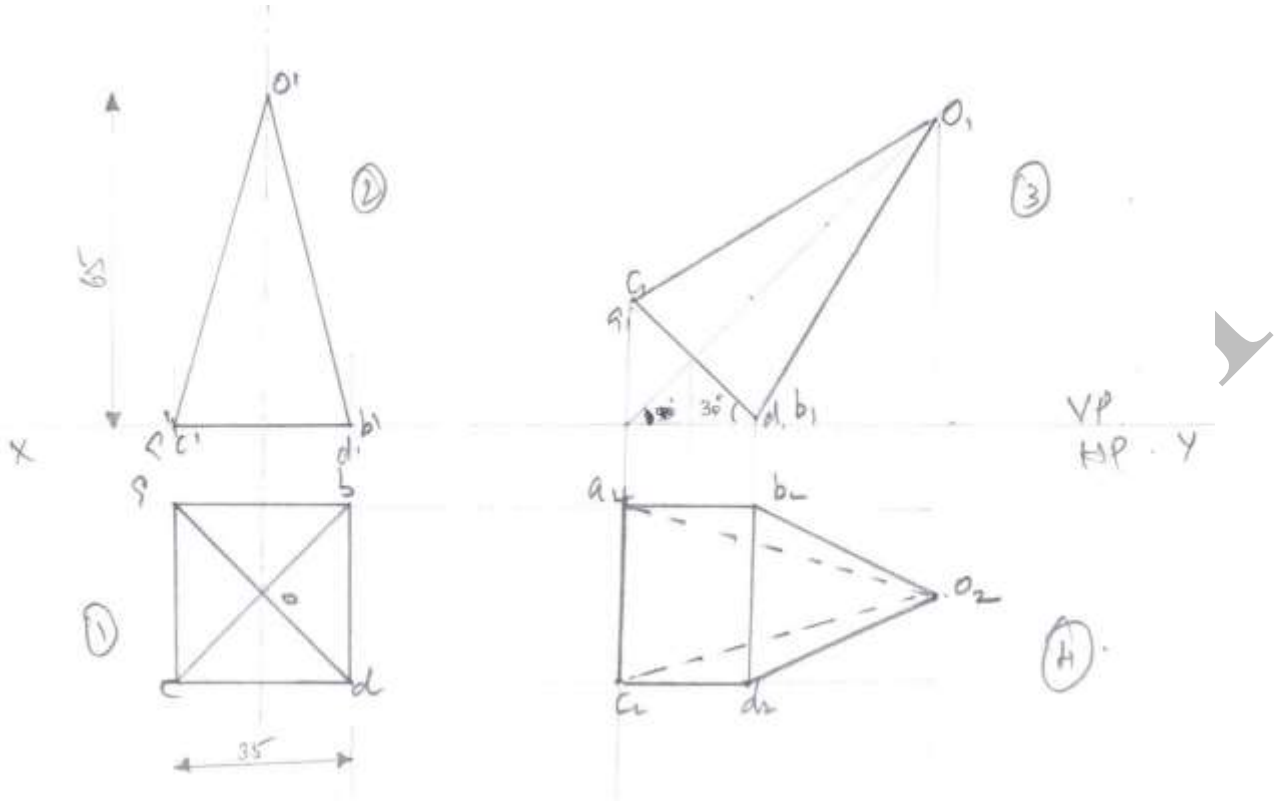
5. A pentagonal prism of base side 30 mm and axis length 55mm is lying on the ground on one of its rectangular faces. Draw its top view, front and left side view when the end nearer to the VP is 15 mm away from it and axis is 40 degree with VP.



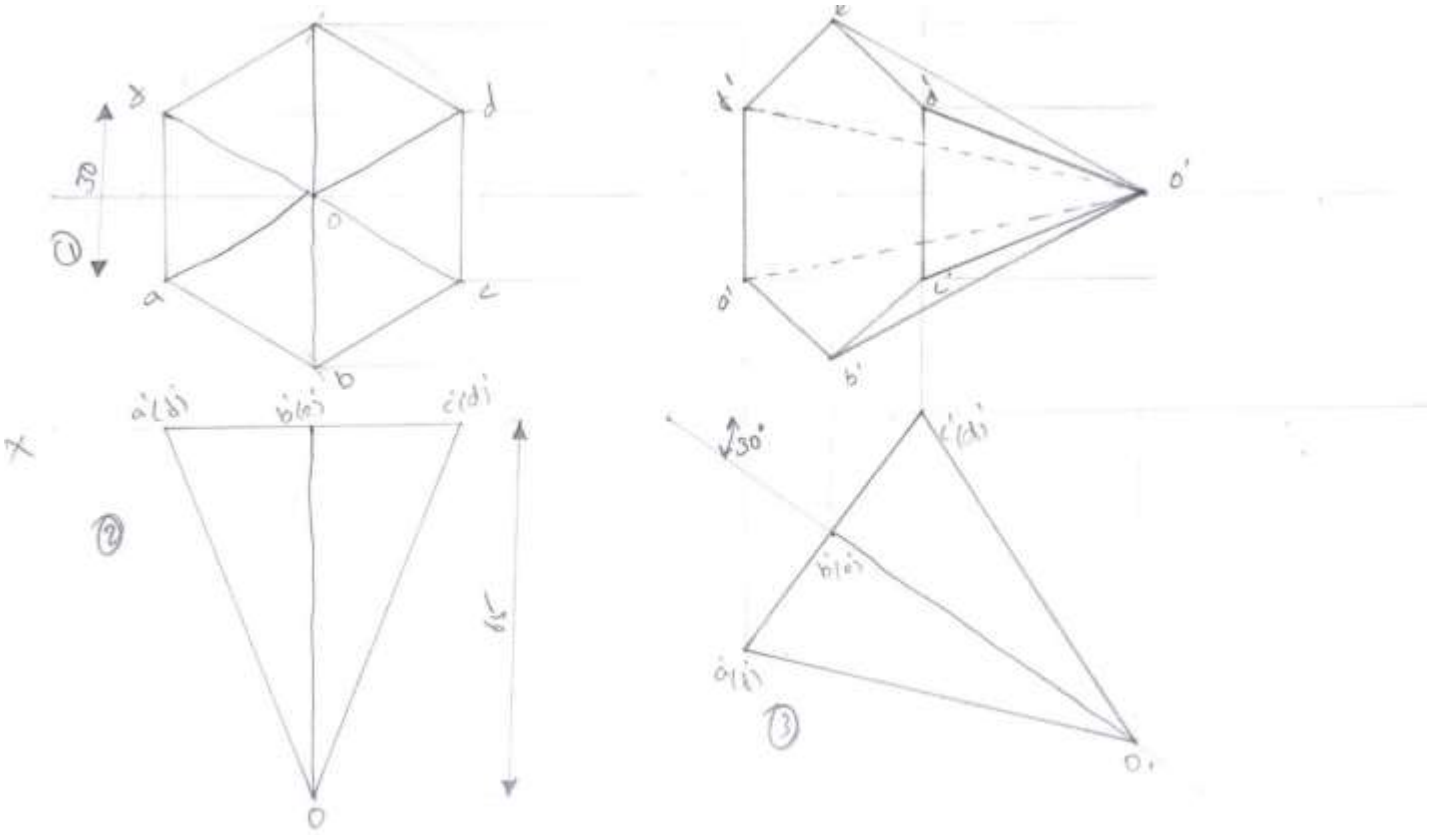
6. A hexagonal prism of base side 30 mm and axis length 60 mm rests on the HP on one of its base edges with its axis inclined at 60° to HP and parallel to the VP. Draw its top and front views.



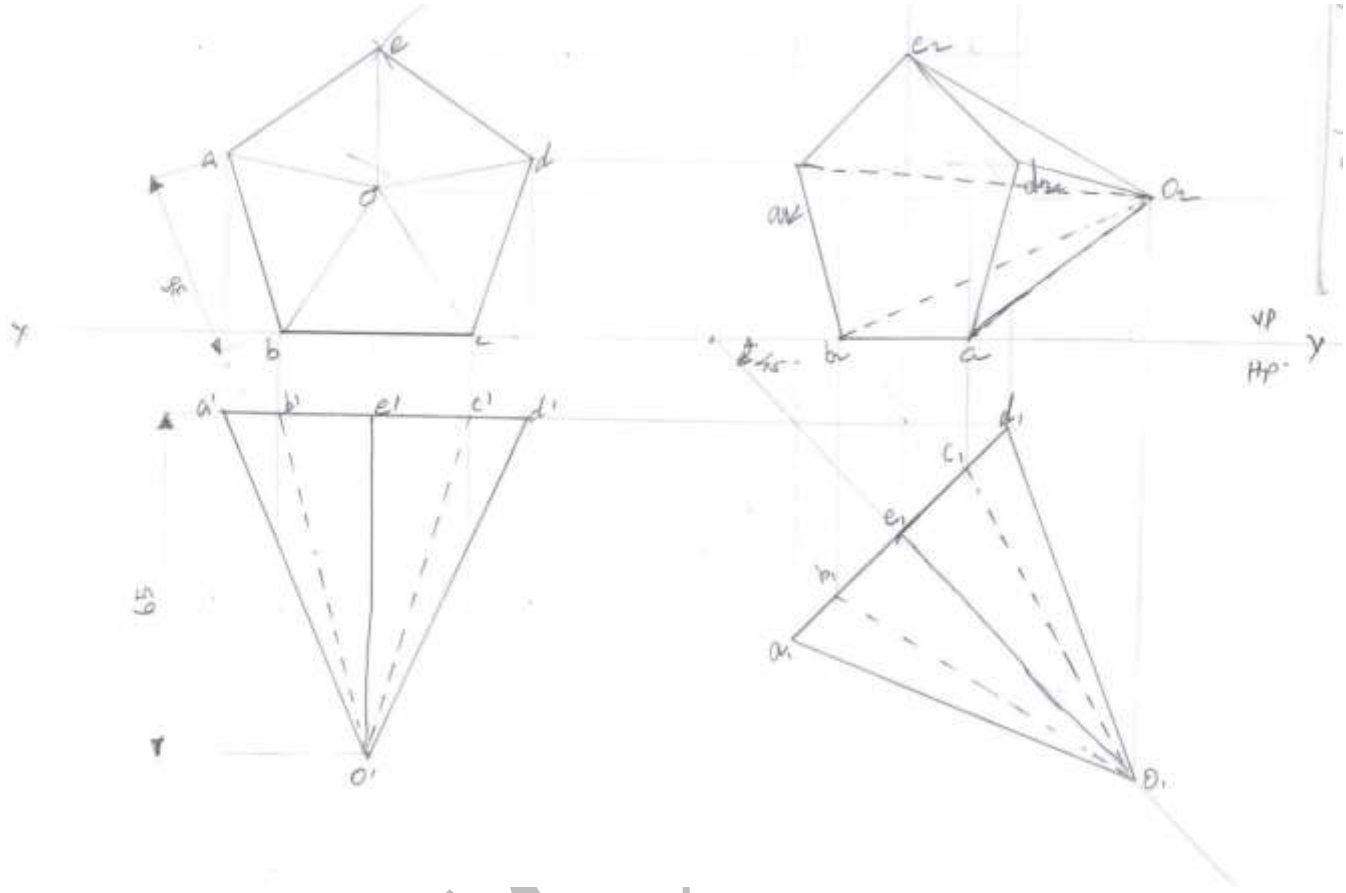
7. A square pyramid of base side 35mm and axis length 65mm is resting on HP on one of its Edge. The base is inclined 30 degree with HP and its axis parallel to VP. Draw its projections.



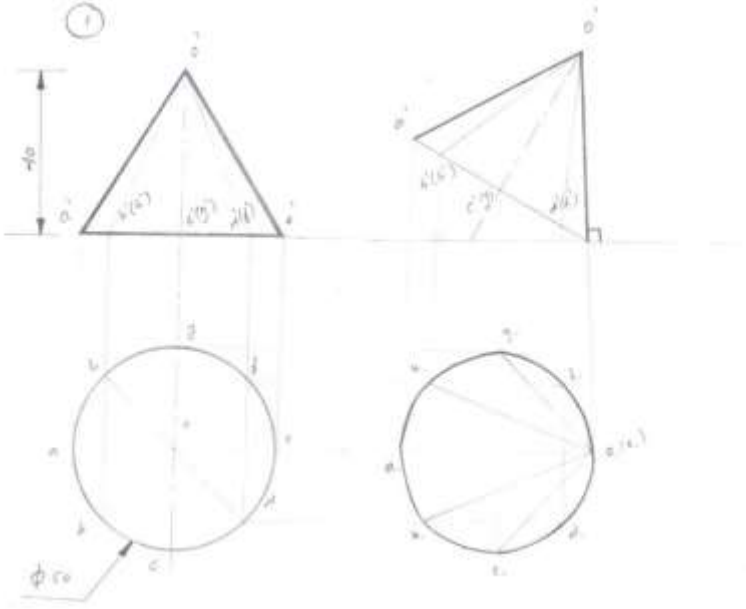
8. A hexagonal pyramid of base side 30 mm and axis length 65 mm is resting on VP on one of its base edges with its axis inclined at 35º to VP and parallel to HP. Draw its projections.



9. A pentagonal pyramid of base side 36 mm and axis length 65 mm is resting on VP on one of its base edge on HP and with its axis parallel to HP. Draw its projections.



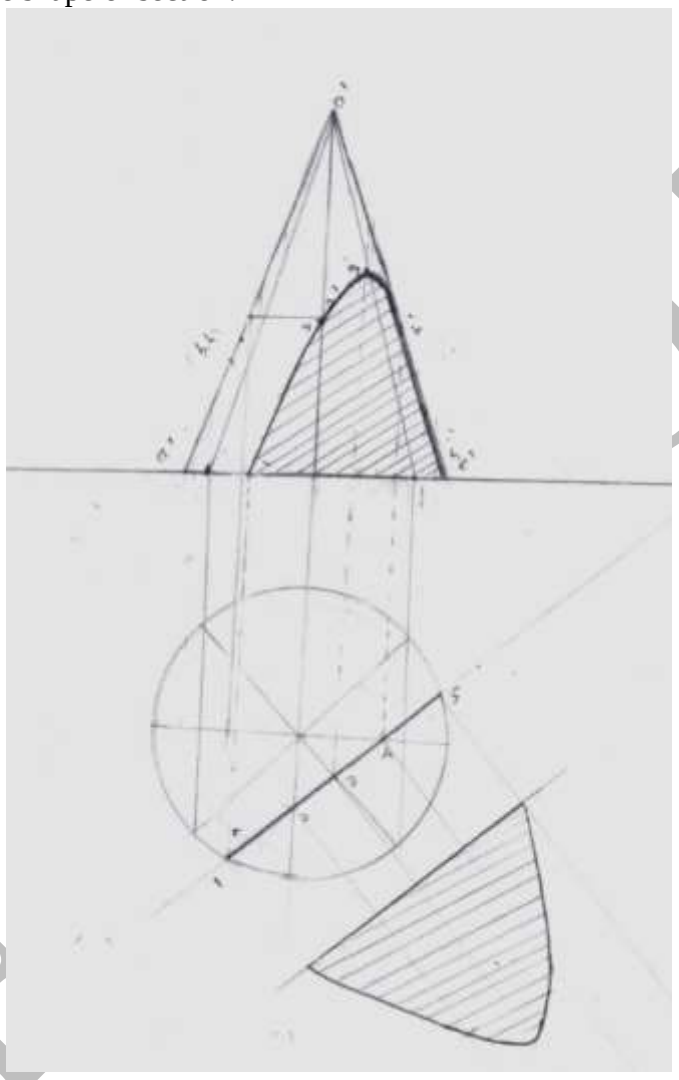
10. Draw the projections of a cone of diameter 50 mm and height 40 mm lying on the ground on one of its base points with a generator perpendicular to HP.



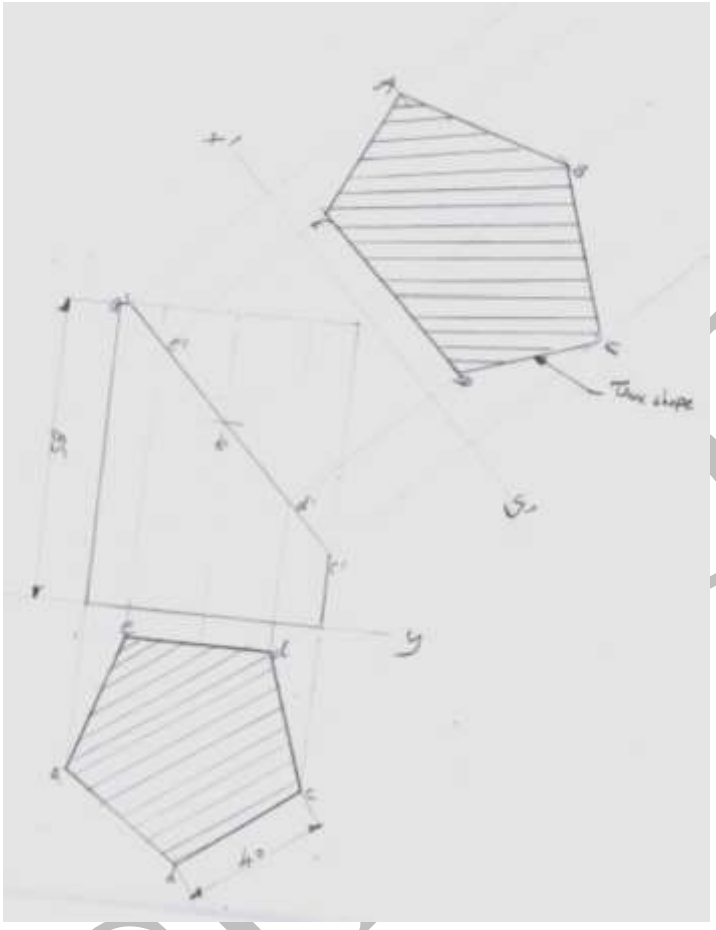
UNIT – IV

Section of solids:

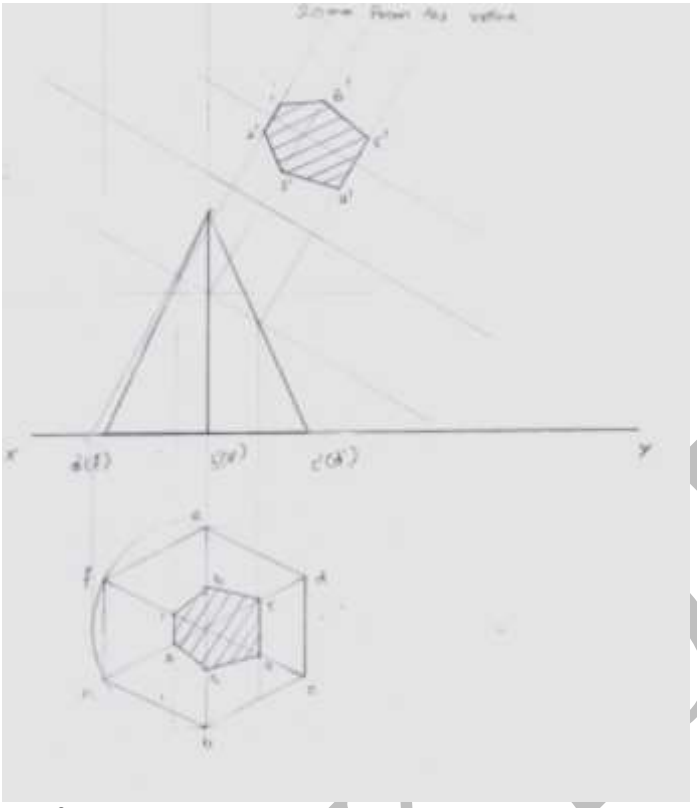
1. A cone of base diameter 50 mm and axis length 70 mm is resting on HP on its base. It is cut by a plane inclined at 45^{o}degree to HP and perpendicular to VP that cuts the cone at a distance of 10 mm from axis and in front of it. Draw the plan, sectional elevation and true shape of section.



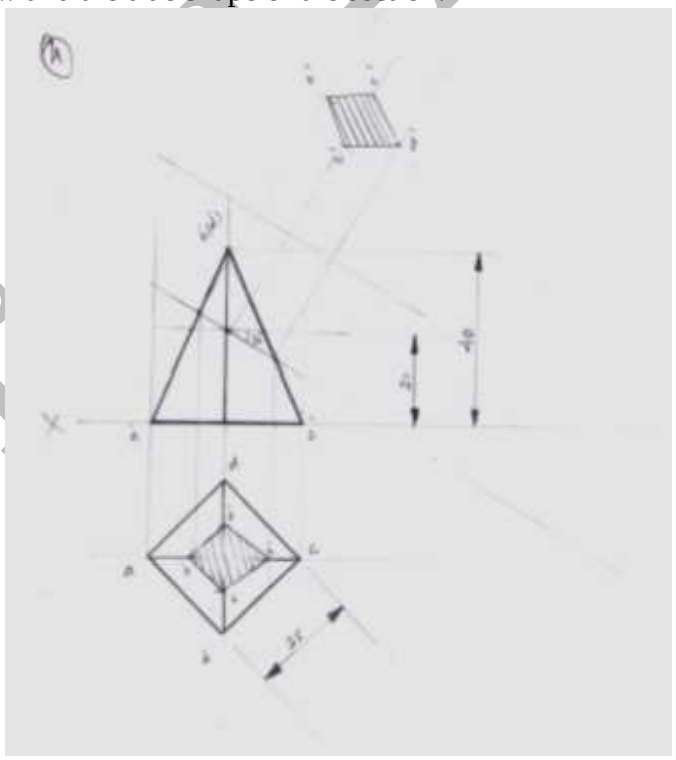
2. A pentagonal prism of base side 40mm and height 85mm rests on the H.P such that two of its base edges are equally inclined to VP. It is cut by a plane perpendicular to the V.P and inclined 45° to the H.P. The cutting plane meets the axis at 30mm from the top. Draw the front view, sectional top view and true shape of the section.



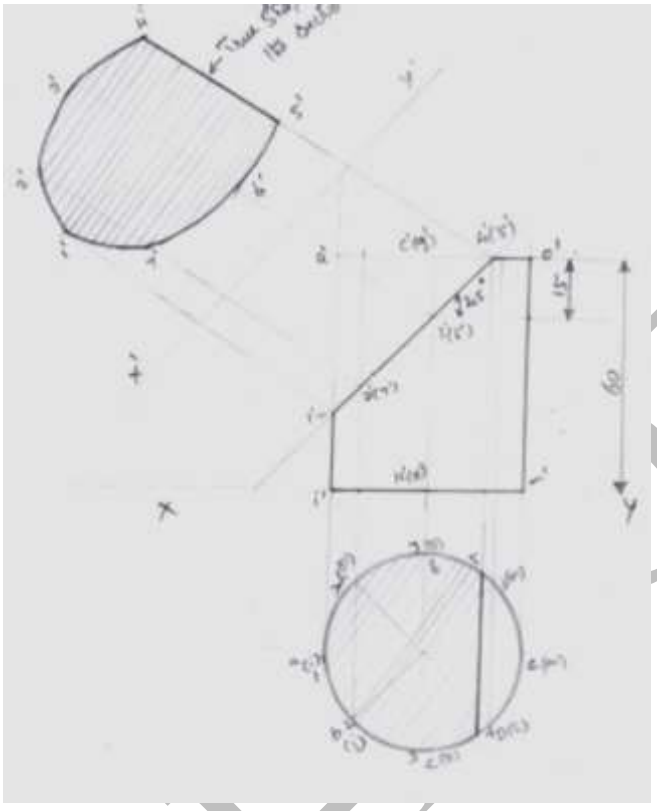
3. A hexagonal pyramid of base side 25mm and axis 55 mm rests on its base on the HP with two base edges perpendicular to VP. It is cut by a plane perpendicular to VP and inclined at 30° to HP, meeting the axis at 20mm from the vertex. Draw its front view, sectional top view and true shape of the section.



4. A square pyramid of base side 25mm and altitude 40mm rests on the HP on its base with the base edges equally inclined to the VP. It is cut by a plane perpendicular to the VP and inclined at 30° to the HP meeting the axis at 21mm above the HP .Draw the sectional top view and the true shape of the section.

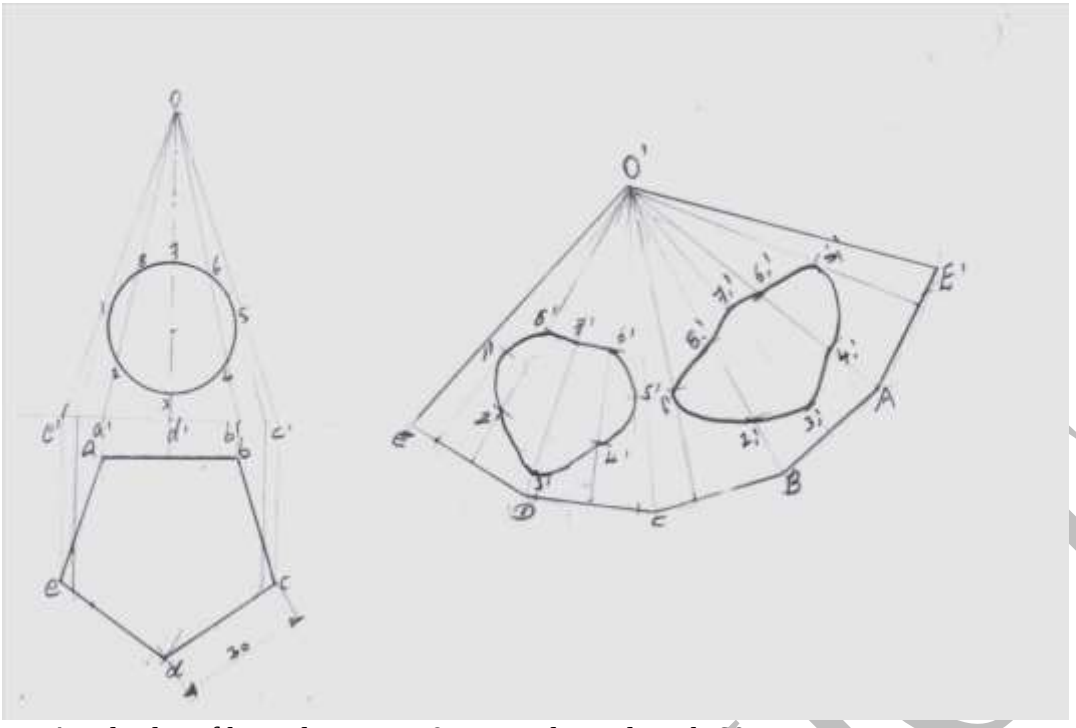


5. A cylinder of base diameter 50 mm and height 60 mm rests on its base on HP. It is cut by a plane perpendicular to VP and inclined at 45 to HP. The cutting plane meets the axis at a distance of 15 mm from the top base. Draw the sectional plan and true shape of section.

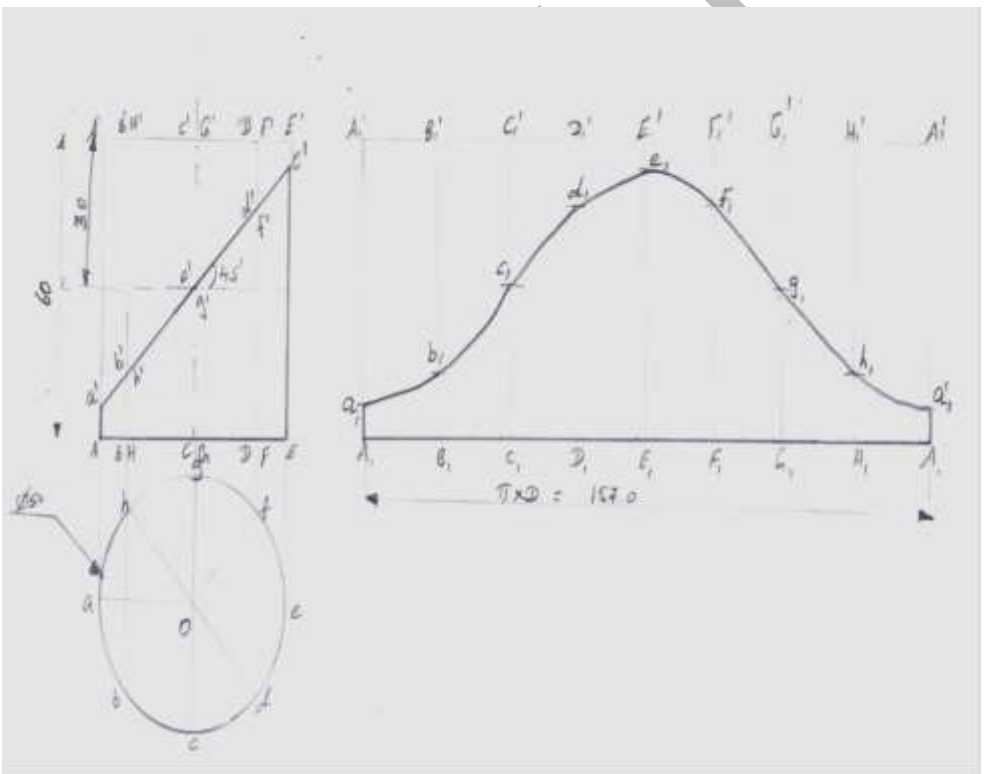


Development of surfaces:

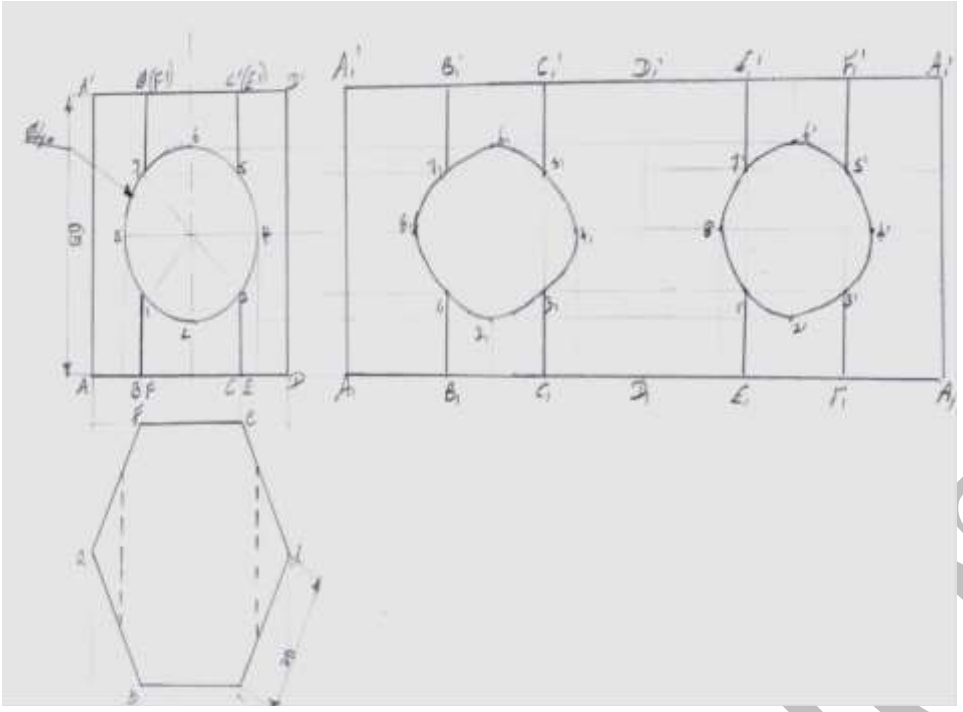
1. A pentagonal pyramid side of base 30 mm and height 70 mm stand with its base on HP. A through circular hole of 30 mm diameter is drilled through the pyramid such that the axis of the hole is perpendicular to VP and intersects the axis of the pyramid 20 mm above the base. Draw the development of the lateral surfaces of the pyramid.



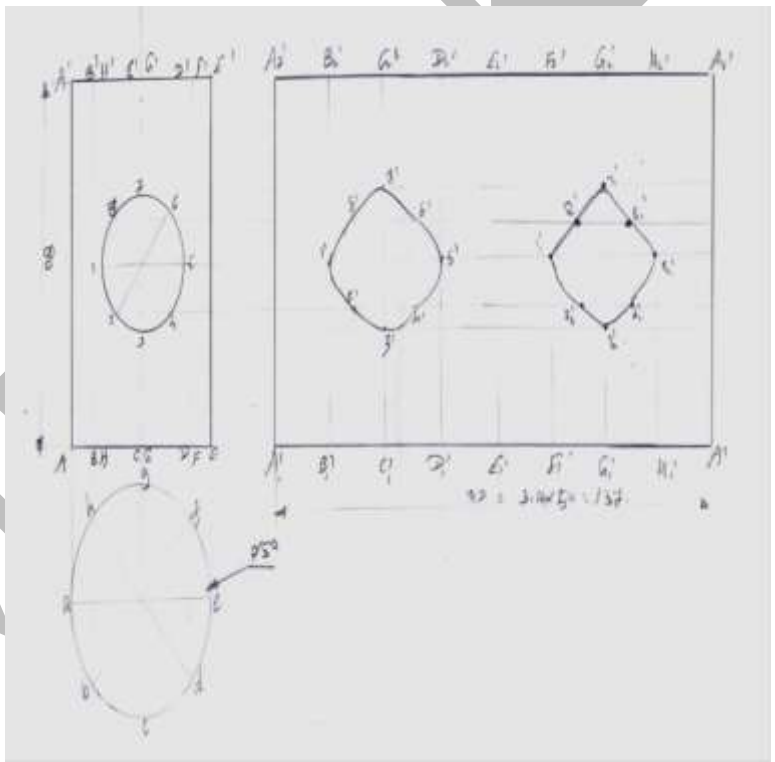
2. A cylinder of base diameter 50 mm and axis length 60 mm is resting on HP on its base, cut by a plane inclined 45degree to HP and perpendicular to VP. The cutting plane is passing through a point on the axis at a distance of 30 mm from the top end. Draw the development of the lateral surface of the remaining portion of the cylinder.



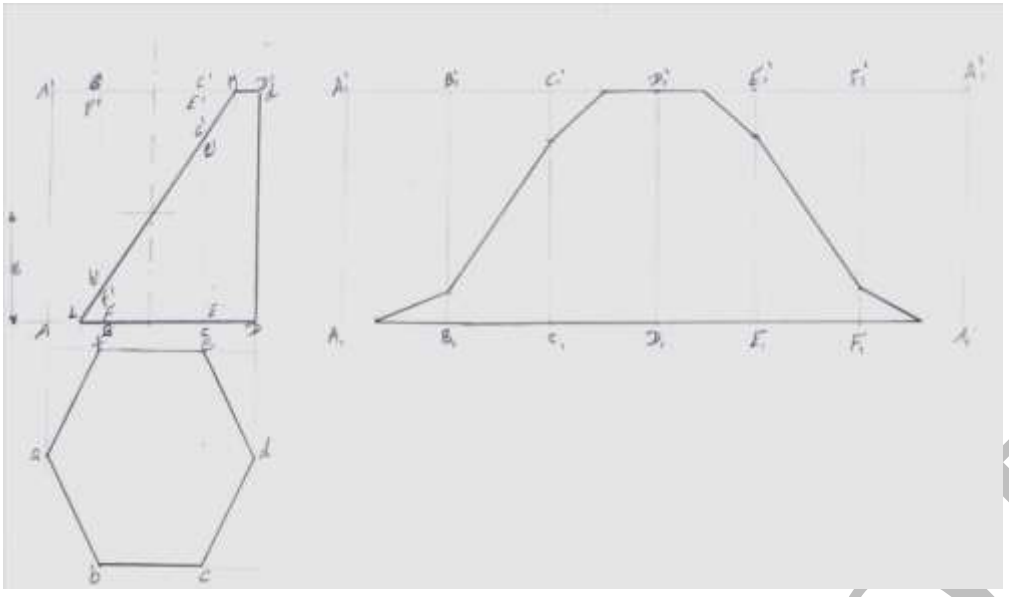
3. A hexagonal prism of side of base 30 mm and axis 65 mm stands on one of its ends in HP with two of its rectangular faces parallel to VP. A circular hole of diameter 40 mm is drilled completely through the prism such that the axis of the hole is perpendicular to VP and bisects the axis of the prism. Draw the development of lateral surface of the prism showing the shape of the holes formed on it.



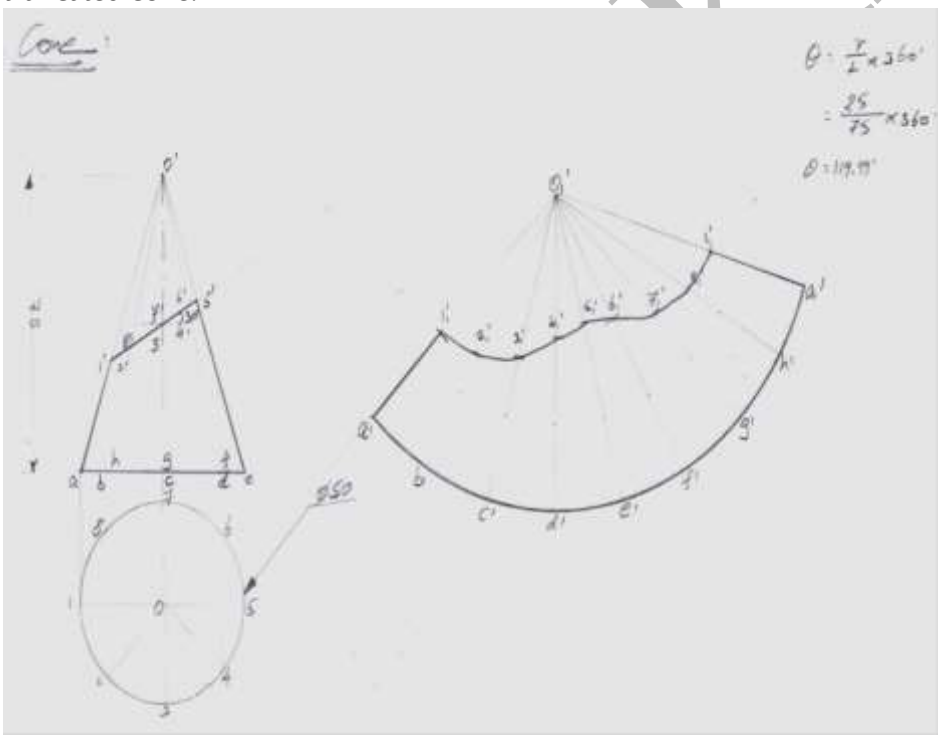
4. A vertical cylinder of diameter 50 mm and height 80 mm is drilled by a hold of diameter 30 mm such that the axis of the hole is perpendicular to VP and parallel to HP. Draw the development of lateral surface of the cylinder with hole.



5.A hexagonal prism of base side 30 mm and height 65 mm rests on its base on the ground with a base edge parallel to VP. It is cut by a plane perpendicular to VP inclined at 55o to HP and meets the axis at 30 mm from the base. Draw the lateral surface development.



6. A right circular cone of base diameter 50 mm and height 75 mm is resting on its base on the ground. It is cut by a plane perpendicular to VP and inclined at 30º to HP. The cutting plane bisects the axis of the cone. Draw the development of the lateral surface of the truncated cone.

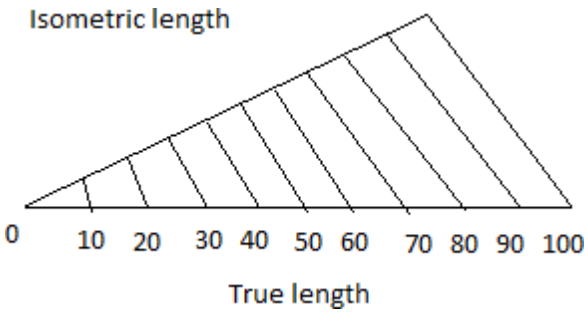


UNIT- V

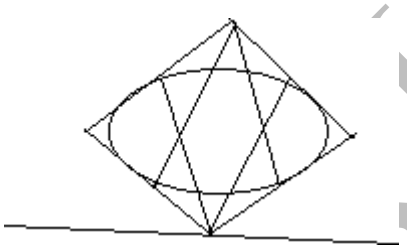
Isometric scale:

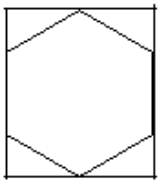
This scale is used in drawing

The isometric length =0.82 x True length

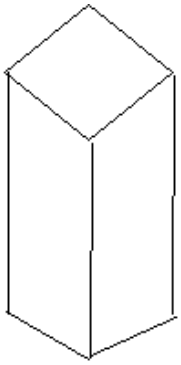


Drawing of circle in isometric view





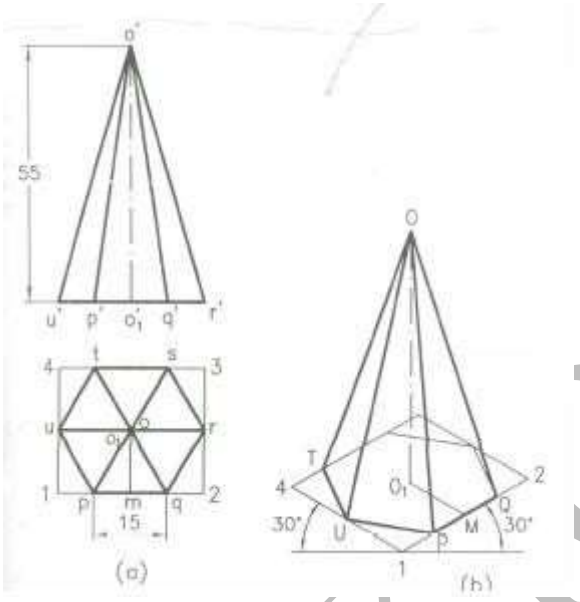
Top view of the hexagoanl prism



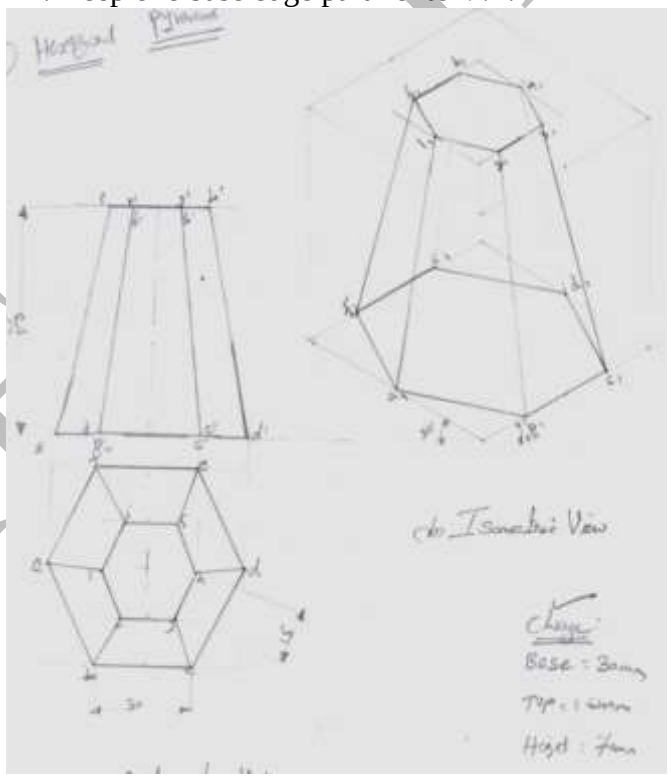
box (object is placed inside this box)

Isometric Projection:

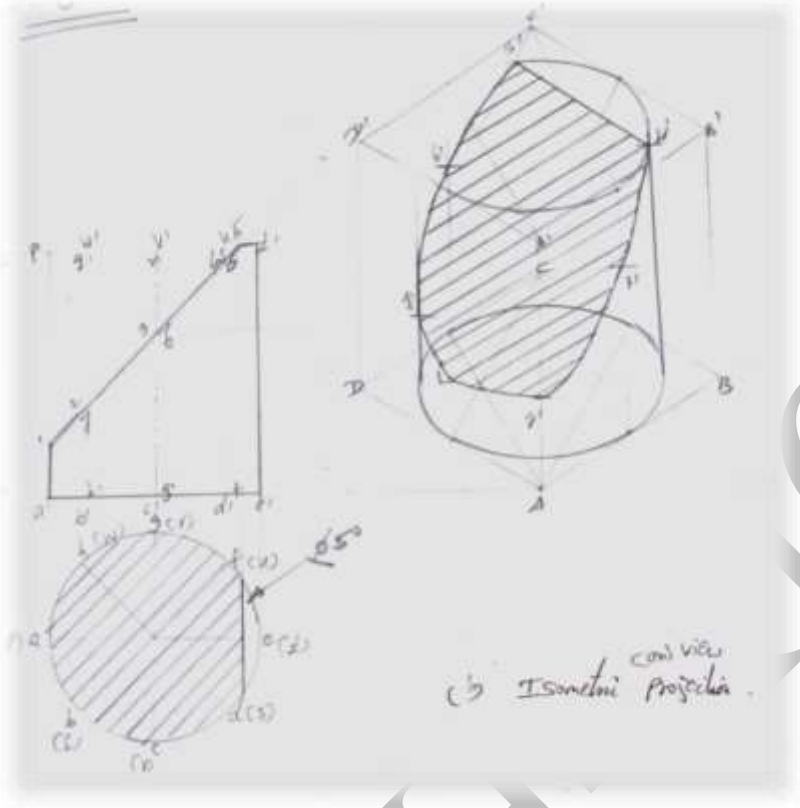
1. Draw the isometric projection of the hexagonal pyramid of base 15mm and axis 55mm resting on its a horizontal plane with sides of the base parallel to VP.



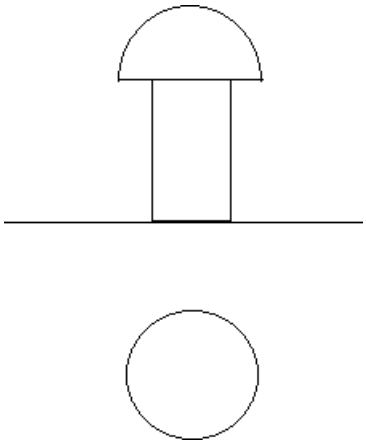
2. Draw the isometric view of a frustum of a hexagonal pyramid of base 30mm; top 15mm side and height 70mm. Keep one base edge parallel to V.P.

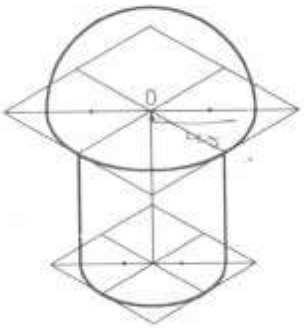


3. A cylinder of height 60 mm and diameter 50 mm resting on one of its end faces on HP. It is cut by a plane perpendicular to VP and inclined 45° to HP. The plane passes through a point on the axis located at 20 mm from the top. Draw the isometric view of the cut cylinder.



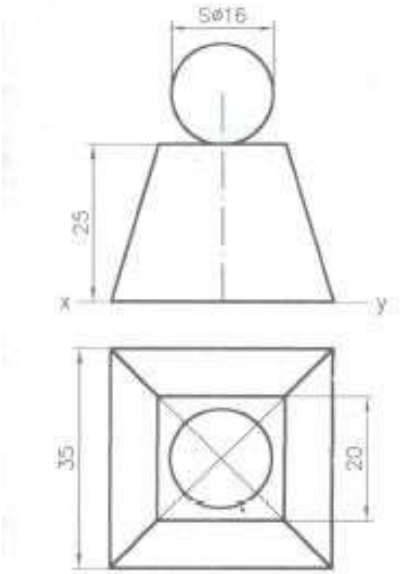
4. A hemispherical piece of metal 90mm in diameter is joined centrally to the end of a cylindrical piece of metal of diameter 60 mm and length 75 mm so as to form a snap headed rivet. Draw the isometric of the rivet when it is held with the hemispherical head at the top

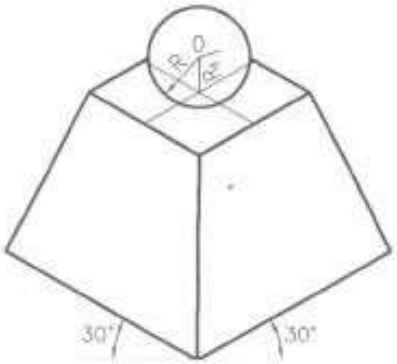




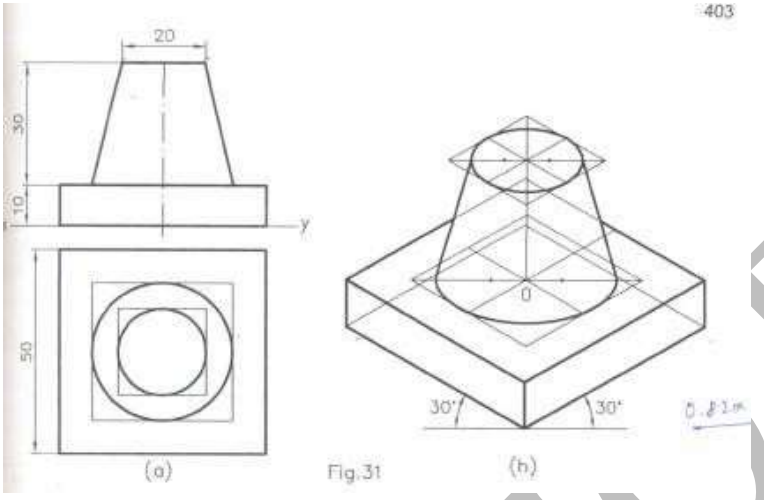
5. Draw the isometric projection of a sphere of diameter 16mm kept centrally over a frustum of a square pyramid of height 25mm. the frustum has a base of side 35mm and top side 20mm.

405



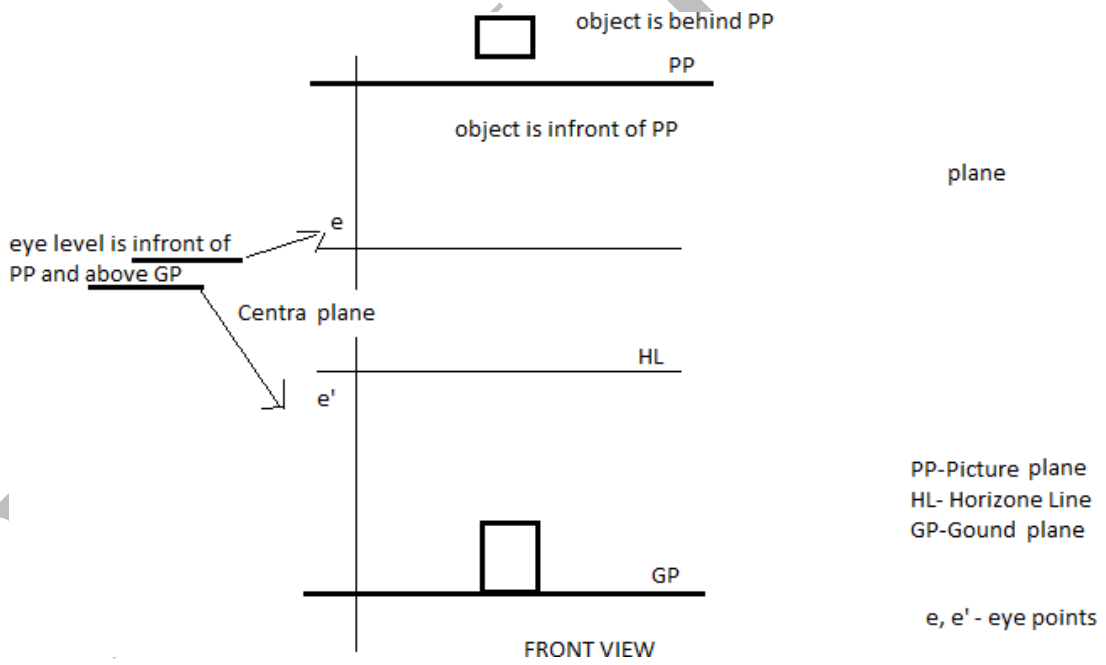


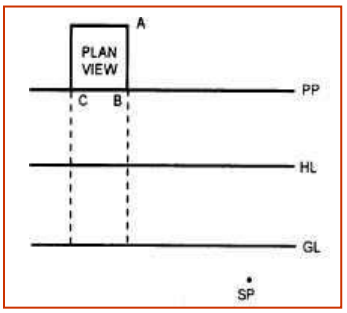
6. Draw the isometric view of a frustum of a cone of height 30mm, base diameter 34mm, top diameter 20mm when it is centrally placed over a square slab of side 50 mm and thickness 10mm.



Perspective Projection:

Planes for Perspective Projection:





Perspective Projection:

1. A regular hexagonal pyramid of base edge 20 mm and height 35mm rests on its base on the ground plane with one of its base edges touching the picture plane. the station point is 30mm above the ground plane and 40mm in front of the PP. The central plane is 30mm to the right of the axis. draw the perspective projections of the pyramid by visual ray method. Use the top view and the front view.

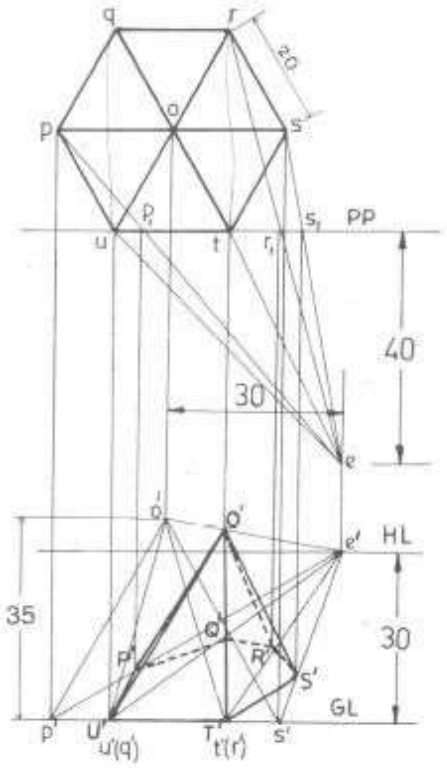
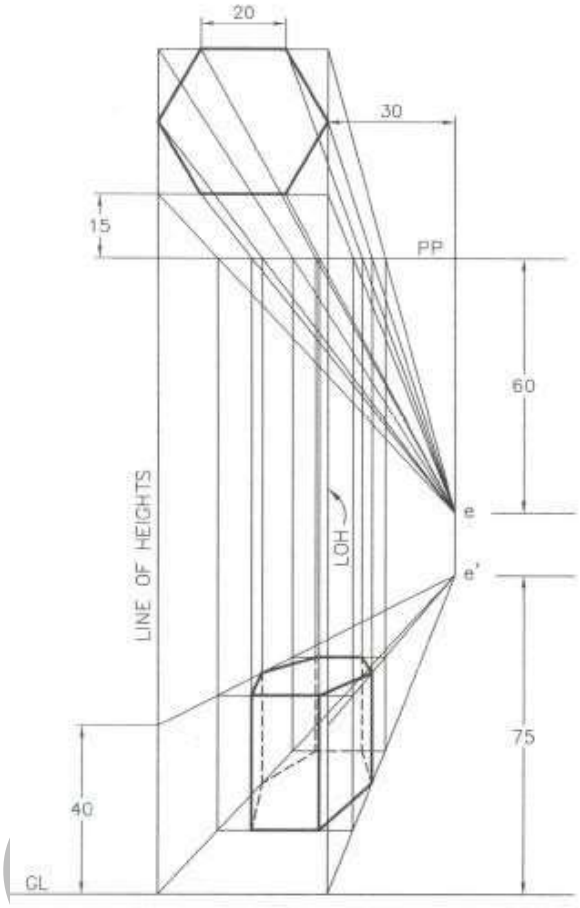


Fig. A

2. Draw the perspective view of a hexagonal prism of base side 20mm and height 40mm when it rests on its base on the ground plane with one of its rectangular faces parallel to and 20mm behind the pictures plane. The station point is 45mm in front of the PP and 60mm above the GP. the observer is 20mm to the left of its axis. Use the top view and the end view to draw the perspective by visual ray method.



3. A square prism of base 25 x 25mm and height 40mm rests on the GP on one of its ends with a rectangular force receding away from the PP towards right making 60º with PP. The corner nearest to the PP is 40mm to the left of the station point and 20mm behind the PP. The station point is 60mm above the GP and 50 mm in front of the PP. Draw the perspective view of the prism by visual ray method. Use the top view and front view.

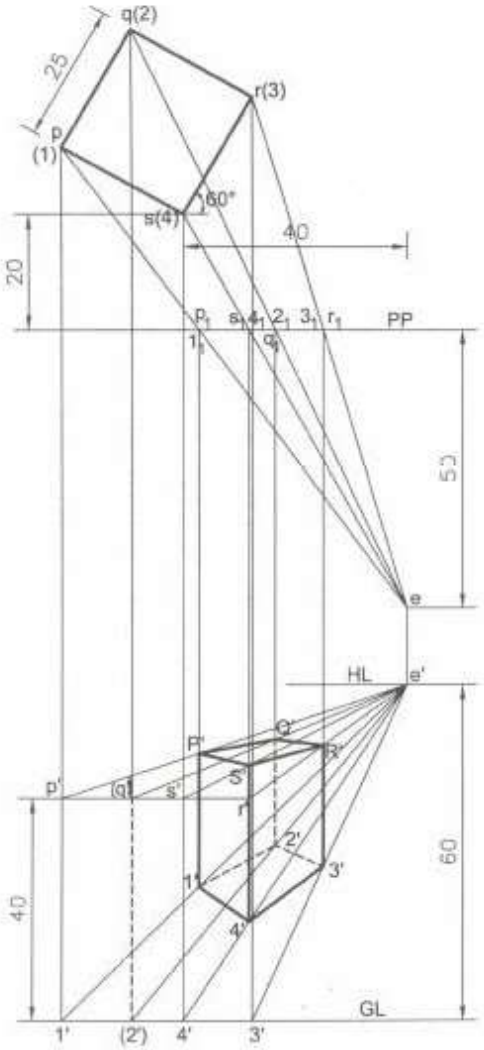
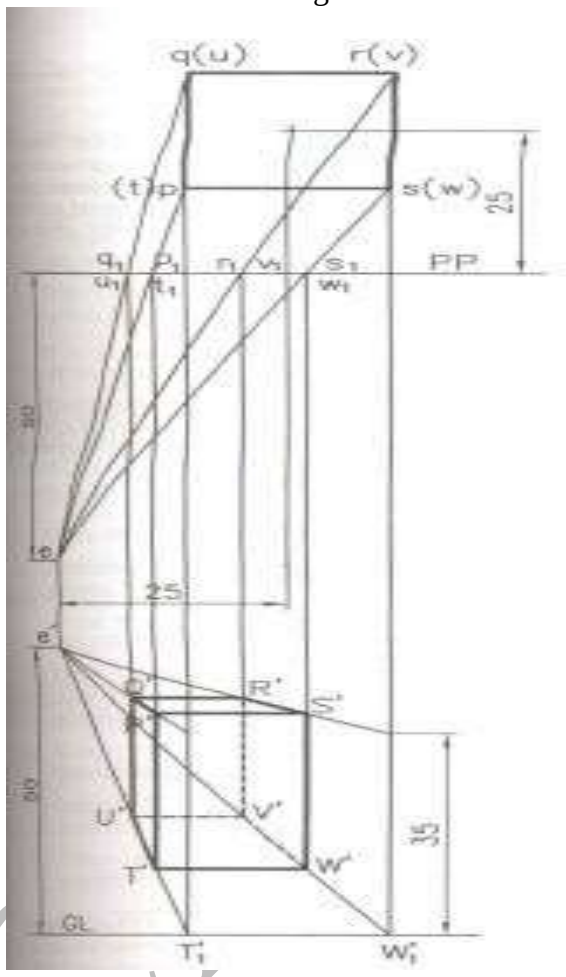
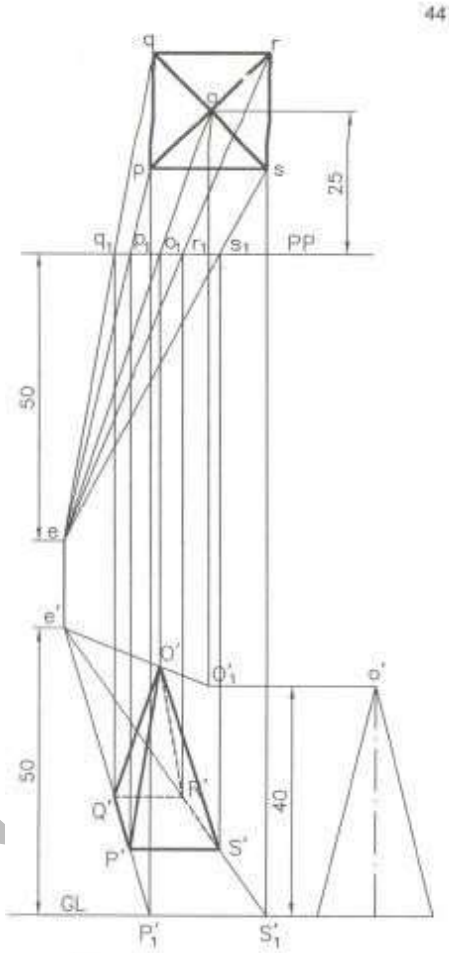


Fig.C

4. Draw the perspective view of a square prism of base 20 mm and height 35 mm resting on an end on the ground with a rectangular face parallel to the picture plane. The axis of the prism is 25 mm behind the PP and 25 mm to the right of the eye. The eye is 50 mm in front of the PP and 50 mm above the ground.



5. A square pyramid of base edge 20 mm and altitude 40 mm rests on its base on the ground with a base parallel to the picture plane. The axis of the pyramid is 25 mm behind the PP and 25 mm to the right of the eye. The eye is 50 mm in front of the PP and 50 mm above the ground. Draw the perspective view of the square pyramid.



6. Steps provided for an LIG house consists of three treads of 250mm each and three rises of 150 mm each. The length of the step is one meter. The steps are parallel to the PP. the nearest face of the steps is 500mm behind the PP. the station point is 2meter in front of the PP and one meter above the ground. The station point lies in in center plane 1250mm to the right of the right extreme face of the steps. Draw the perspective view