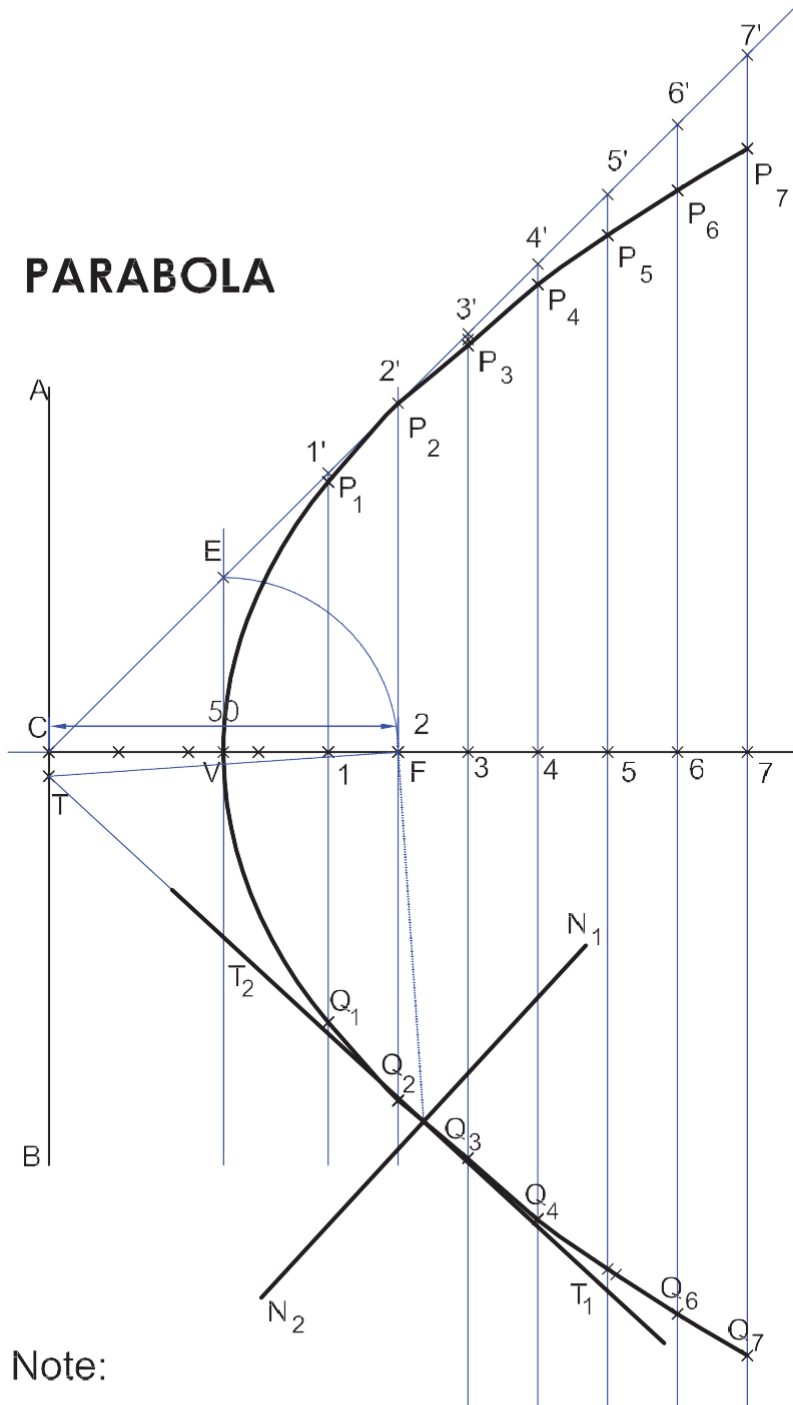


GE3251 Engineering Graphics

Important Questions for University Examination

2. Construct a Parabola when the distance of its focus from its directrix is equal to 50 mm. Also draw a tangent and a normal to the curve.

PARABOLA



Note:

V - Vertex

F - Focus

AB - Directrix

TT - Tangent @ M

NN - Normal @ M

CVF - Axis

CF - 50mm(Given)

VF/VC - 1 (Given)

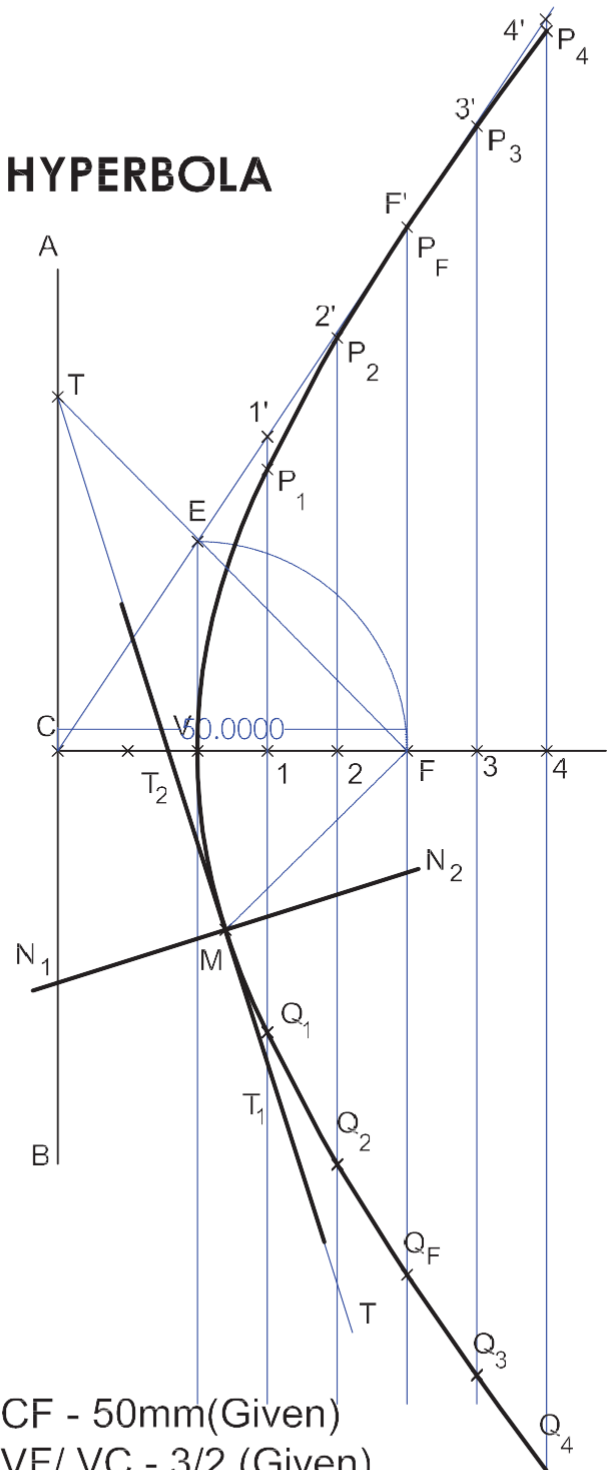
VF = 25 mm

VC = 25 mm

SCALE: 1: 1
ALL DIMENSIONS ARE IN MM

3. Construct a hyperbola, when the distance of its focus from its directrix is equal to 50 mm and eccentricity is $3/2$. Also draw a tangent and a normal to the curve.

HYPERBOLA



CF - 50mm(Given)

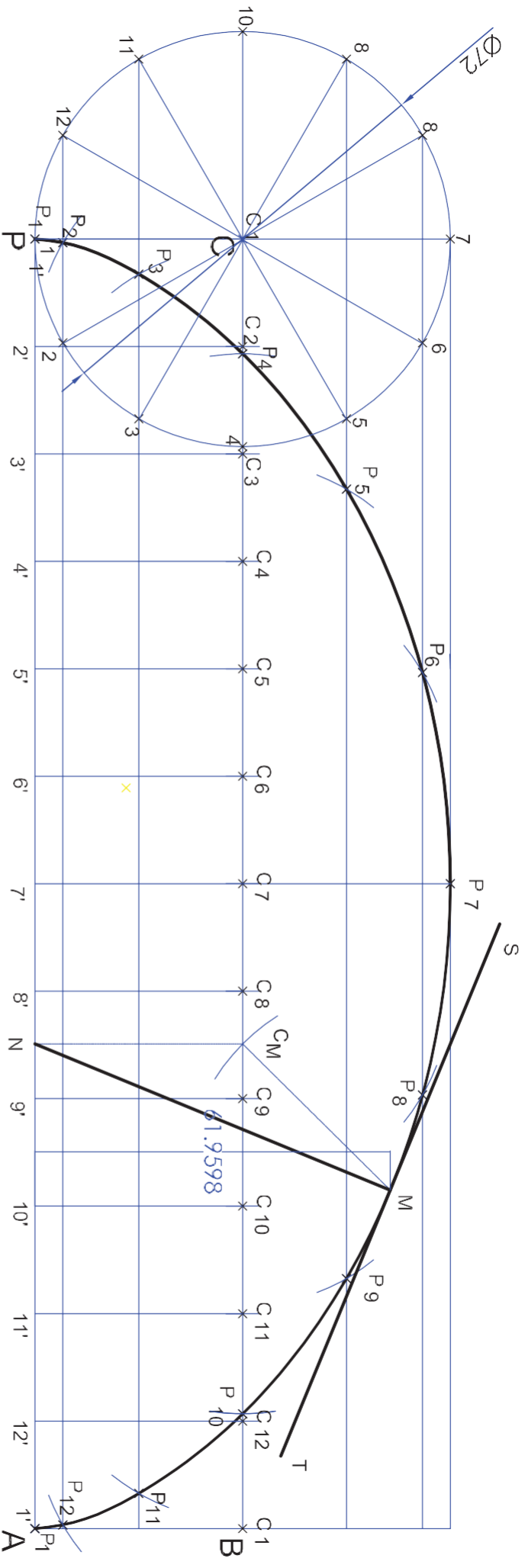
VF/VC - $3/2$ (Given)

VF = 30 mm

VC = 20 mm

SCALE: 1: 1
ALL DIMENSIONS ARE IN MM

4. A circle of 72mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference, for one complete revolution of the circle. Name the curve. Draw a tangent and normal to the curve at a point N on at any point on the curve.



CYCLOID

Steps for construction:

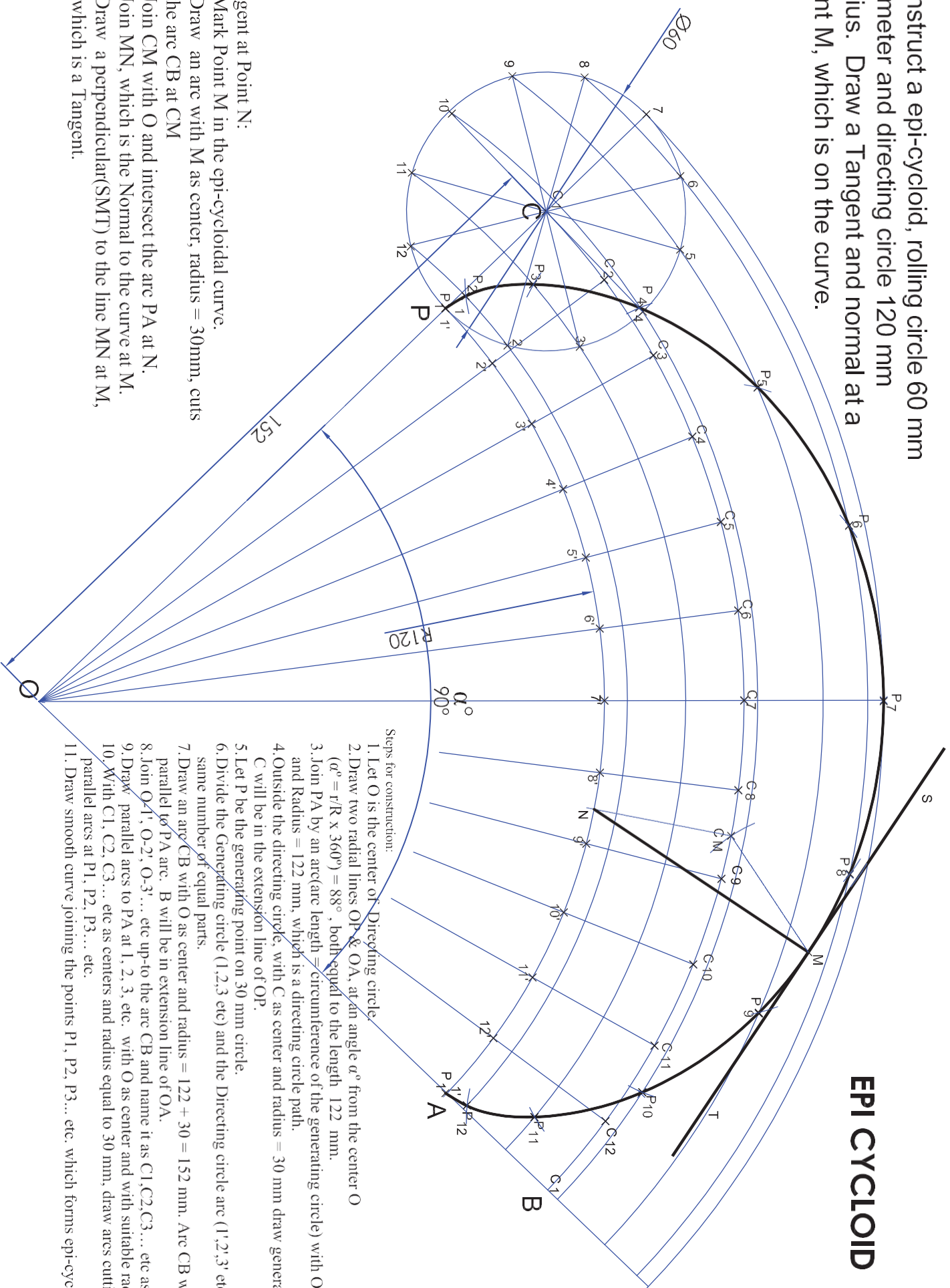
1. With C as centre and given radius 36 mm draw a circle.
2. Let P be the generating point on the rolling circle.
3. Draw a line PA tangential to and equal to the circumference of the circle
4. Divide the circle (1,2,3 etc) and the tangent(1',2',3' etc) into same no. of equal parts
5. Draw a line CB parallel and equal to PA
6. Draw perpendiculars at 1', 2', 3' ... etc upto the line CB and name it C1,C2,C3... etc.
7. Draw horizontal lines parallel to PA at 1, 2, 3, etc.
8. With C1, C2, C3... etc as centers and radius equal to R(36mm), draw arcs cutting the lines 1,2,3...etc. at P1, P2, P3... etc.
9. Draw smooth curve joining the points P1, P2, P3 etc. which forms cycloid curve.

Tangent at Point N:

1. Mark Point M any point (distance 62 mm) from the line PA.
2. Draw an arc with M as center, radius = 36mm, cuts the line CB at
3. Draw a perpendicular at , meets the line PA at N.
4. Join MN, which is the Normal to the curve at M.
5. Draw a perpendicular(SMT) to the line MN at M, which is a Tangent.

5. Construct an epi-cycloid, rolling circle 60 mm diameter and directing circle 120 mm radius. Draw a Tangent and normal at a point M, which is on the curve.

EPI CYCLOID



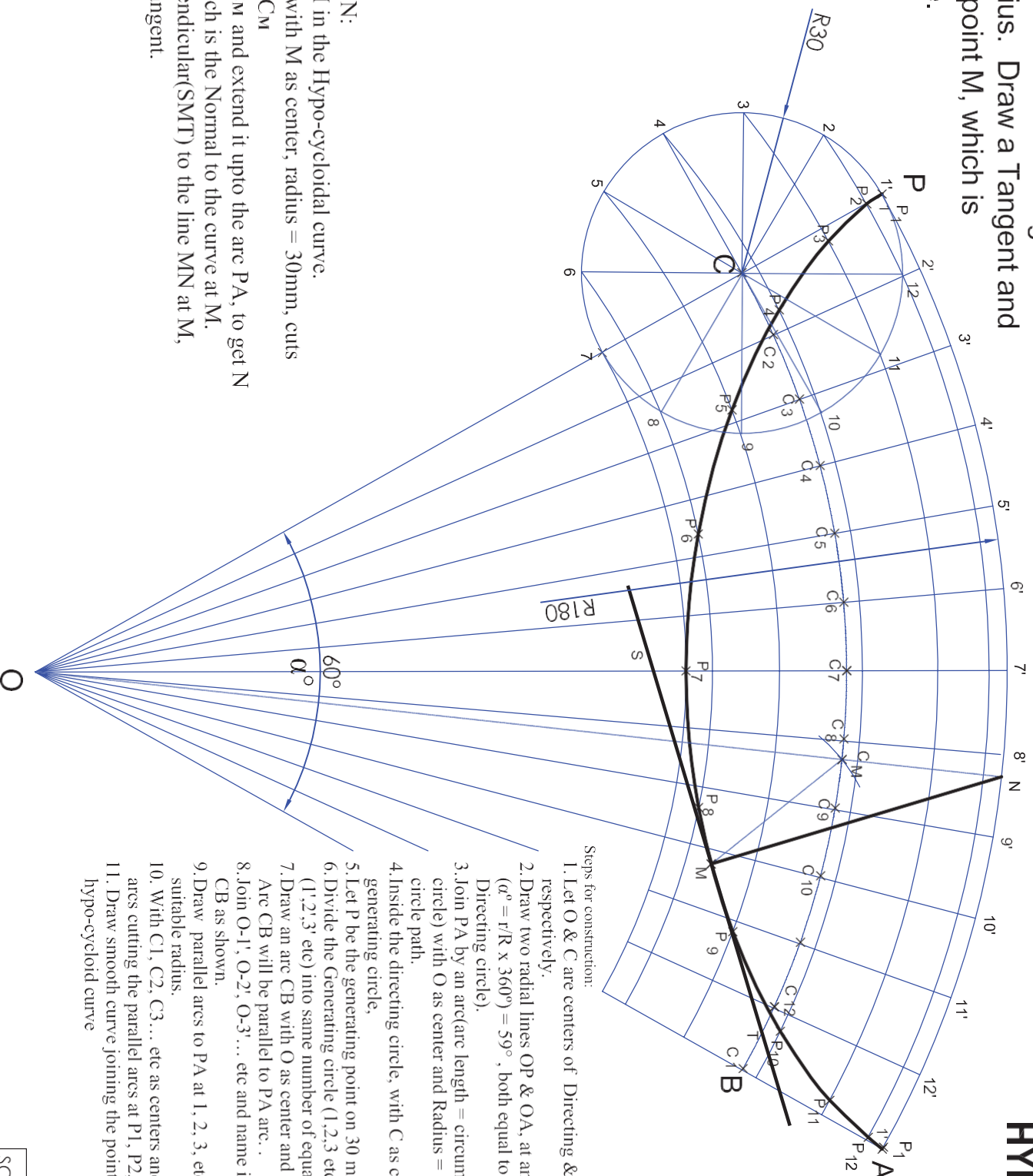
- Tangent at Point N:
1. Mark Point M in the epi-cycloidal curve.
 2. Draw an arc with M as center, radius = 30mm, cuts the arc CB at CM
 3. Join CM with O and intersect the arc PA at N.
 4. Join MN, which is the Normal to the curve at M.
 5. Draw a perpendicular(SMT) to the line MN at M, which is a Tangent.

- Steps for construction:
1. Let O is the center of Directing circle.
 2. Draw two radial lines OP & OA, at an angle α° from the center O ($\alpha^\circ = r/R \times 360^\circ = 88^\circ$, both equal to the length 122 mm.
 3. Join PA by an arc(arc length = circumference of the generating circle) with O as center and Radius = 122 mm, which is a directing circle path.
 4. Outside the directing circle, with C as center and radius = 30 mm draw generating circle. C will be in the extension line of OP.
 5. Let P be the generating point on 30 mm circle.
 6. Divide the Generating circle (1,2,3 etc) and the Directing circle arc (1',2',3' etc) into same number of equal parts.
 7. Draw an arc CB with O as center and radius = $122 + 30 = 152$ mm. Arc CB will be parallel to PA arc. B will be in extension line of OA.
 8. Join O-1', O-2', O-3'... etc up-to the arc CB and name it as C1,C2,C3... etc as shown.
 9. Draw parallel arcs to PA at 1, 2, 3, etc. with O as center and with suitable radius.
 10. With C1, C2, C3... etc as centers and radius equal to 30 mm, draw arcs cutting the parallel arcs at P1, P2, P3... etc.
 11. Draw smooth curve joining the points P1, P2, P3... etc. which forms epi-cycloid curve

SCALE: 1 : 1
ALL DIMENSIONS ARE IN MM

6. Construct a hypo-cycloid, rolling circle 60 mm diameter and directing circle 180 mm radius. Draw a Tangent and normal at a point M, which is on the curve.

HYPYO CYCLOID



Steps for construction:

1. Let O & C are centers of Directing & Generating circles respectively.
2. Draw two radial lines OP & OA, at an angle α° from the center O ($\alpha^\circ = r/R \times 360^\circ = 59^\circ$, both equal to the length 182 mm (radius of Directing circle).
3. Join PA by an arc(arc length = circumference of the generating circle) with O as center and Radius = 182 mm, which is a directing circle path.
4. Inside the directing circle, with C as centre and radius = 30 mm draw generating circle.
5. Let P be the generating point on 30 mm circle.
6. Divide the Generating circle (1,2,3 etc) and the Directing circle arc (1',2',3' etc) into same number of equal parts.
7. Draw an arc CB with O as center and radius = 182 - 30 = 152 mm. Arc CB will be parallel to PA arc..
8. Join O-1', O-2', O-3'... etc and name it as C1,C2,C3... etc in the arc CB as shown.
9. Draw parallel arcs to PA at 1, 2, 3, etc. with O as center and with suitable radius.
10. With C1, C2, C3... etc as centers and radius equal to 30 mm, draw arcs cutting the parallel arcs at P1, P2, P3... etc.
11. Draw smooth curve joining the points P1, P2, P3 etc. which forms hypo-cycloid curve

Tangent at Point N:

1. Mark Point M in the Hypo-cycloidal curve.
2. Draw an arc with M as center, radius = 30mm, cuts the arc CB at C_M
3. Join O with C_M and extend it upto the arc PA, to get N
4. Join MN, which is the Normal to the curve at M.
5. Draw a perpendicular(SMT) to the line MN at M, which is a Tangent.

SCALE: 1 : 1
ALL DIMENSIONS ARE IN MM

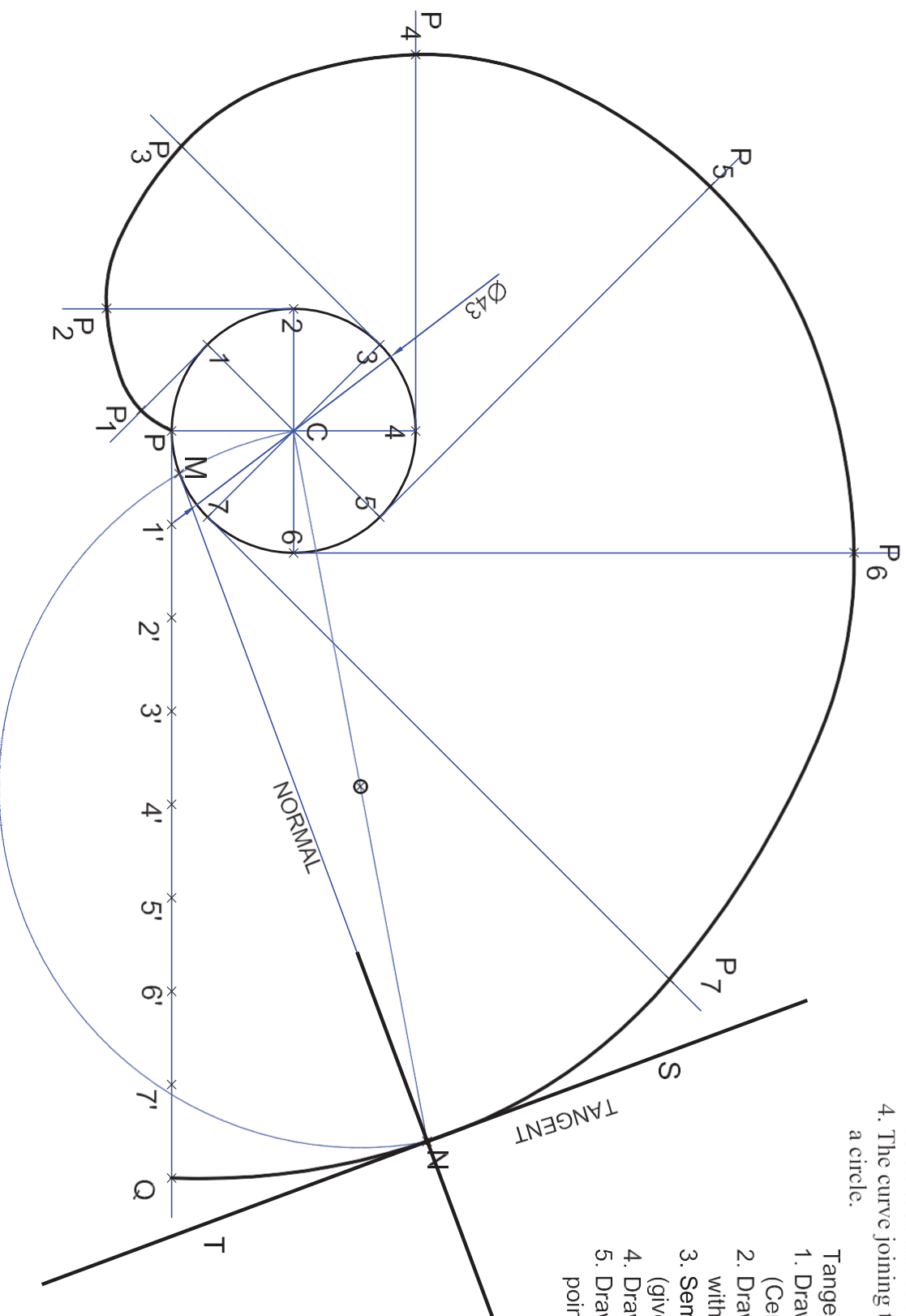
7. A coil is unwound from a drum 43 mm diameter. Draw the locus of the free end of the coil for unwinding through an angle 360°. Draw also a normal and tangent at any point on the curve.

Steps for construction:

1. Draw a line PQ, tangent to the circle and equal to the circumference of the circle
2. Divide the circle (1, 2, 3 etc) and the tangent (1', 2', 3' etc) into same number of equal parts as shown.
3. Draw tangents at 1, 2, 3, etc and mark on them points P₁, P₂, P₃ etc such that 1P₁=P₁'; 2P₂=P₂'; 3P₃=P₃' etc.
4. The curve joining the points P₁, P₂, P₃, etc is involute of a circle.

Tangent at Point N:

1. Draw a line, joining the points N & C (Center of the circle) shown in dotted line.
2. Draw a semi-circle (shown in dotted line) with CN as diameter
3. Semi-circle cutting the 30 mm circle (given) at M
4. Draw a line MN, which is Normal
5. Draw a perpendicular line to NM at the point N, which is a Tangent (SNT).

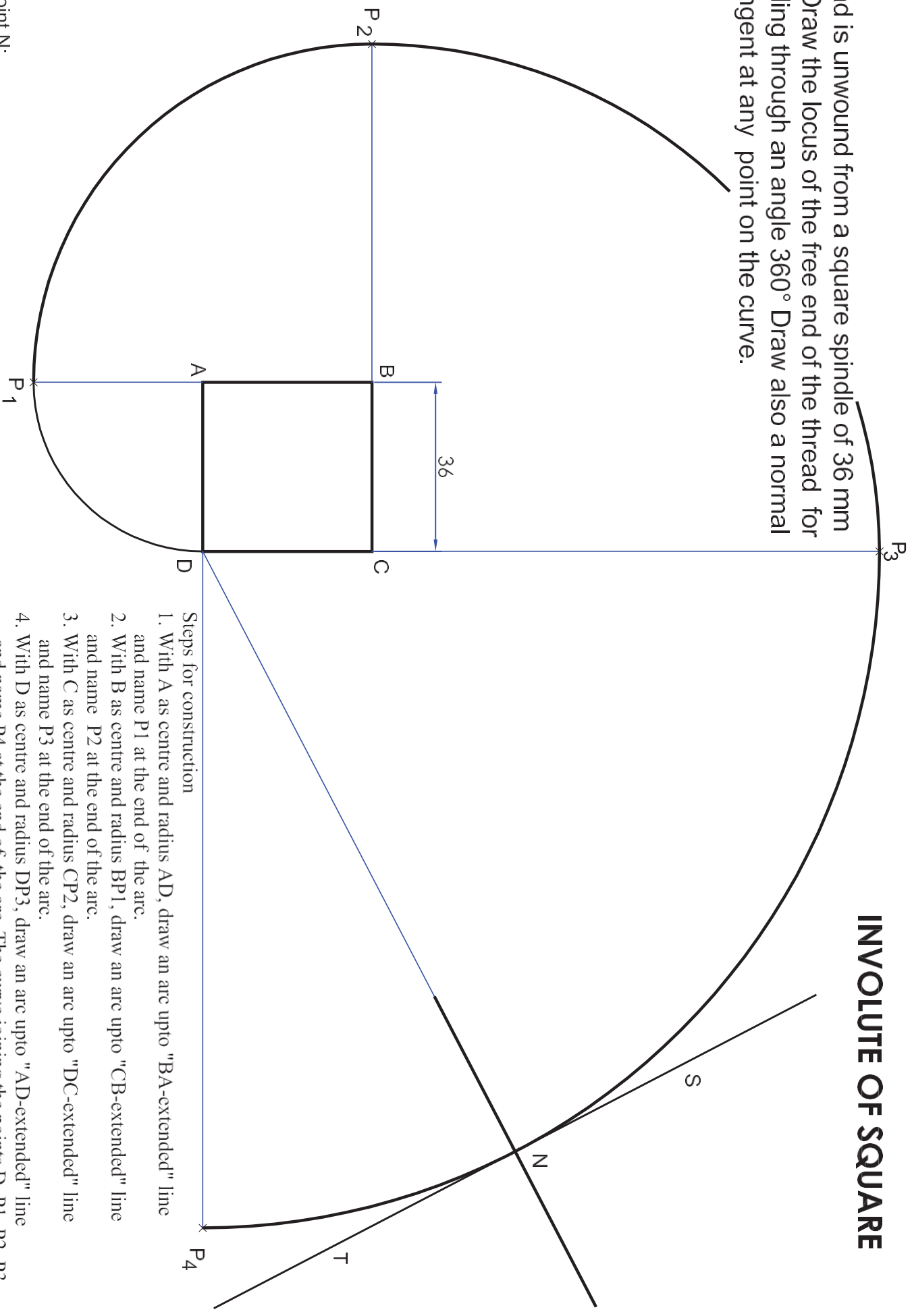


INVOLUTE OF CIRCLE

SCALE: 1:1
ALL DIMENSIONS ARE IN MM

INVOLUTE OF SQUARE

8. A thread is unwound from a square spindle of 36 mm side. Draw the locus of the free end of the thread for unwinding through an angle 360° . Draw also a normal and tangent at any point on the curve.



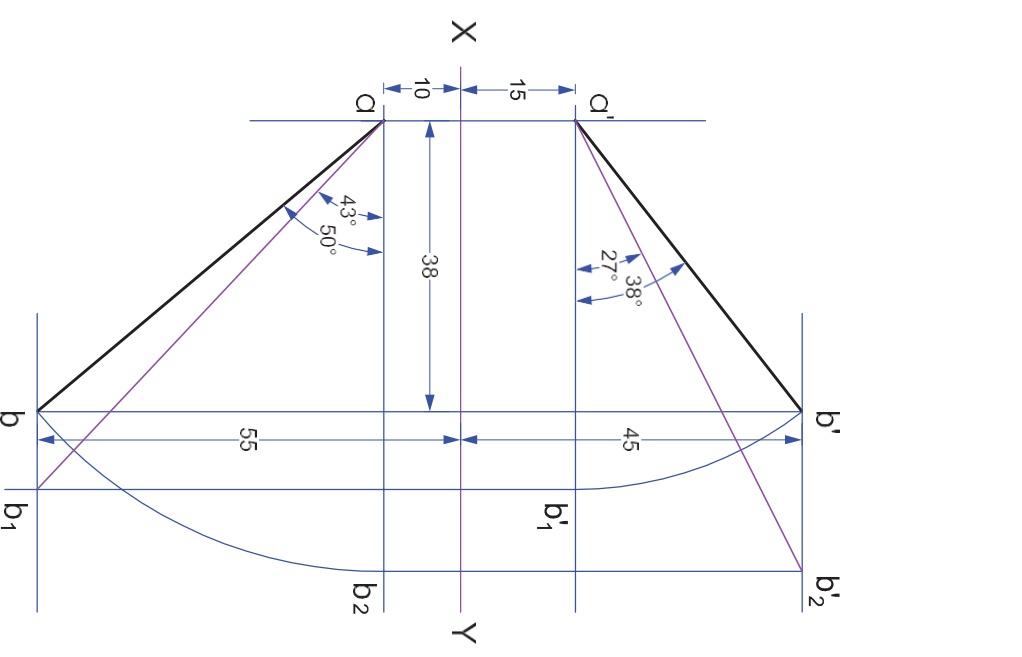
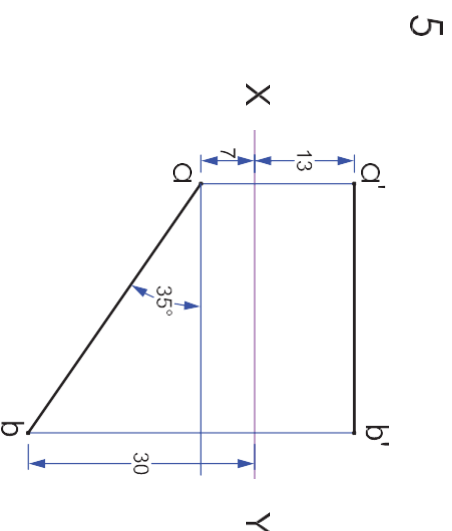
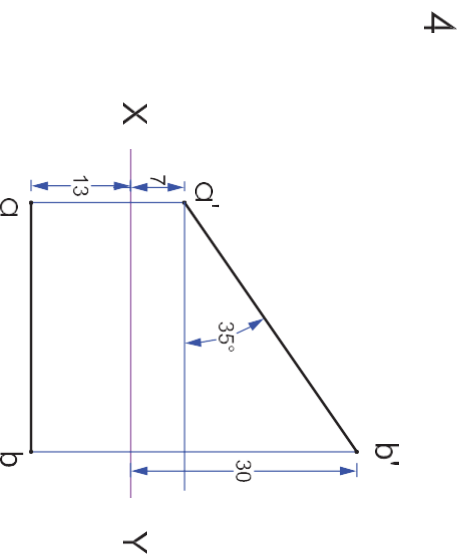
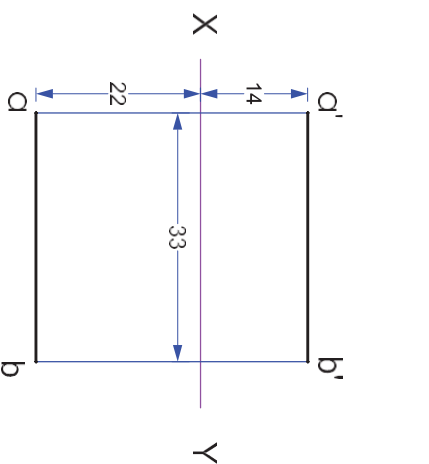
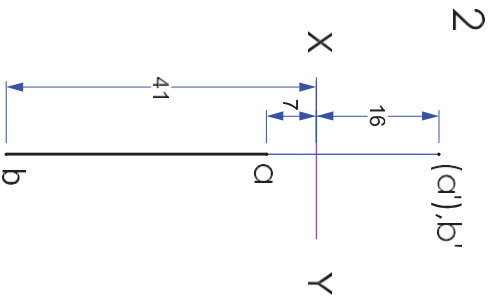
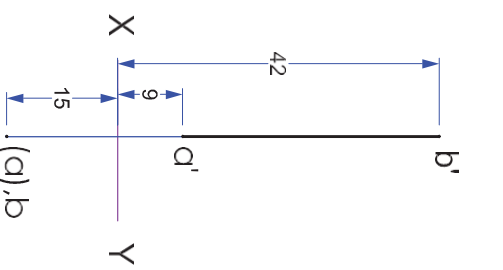
Steps for construction

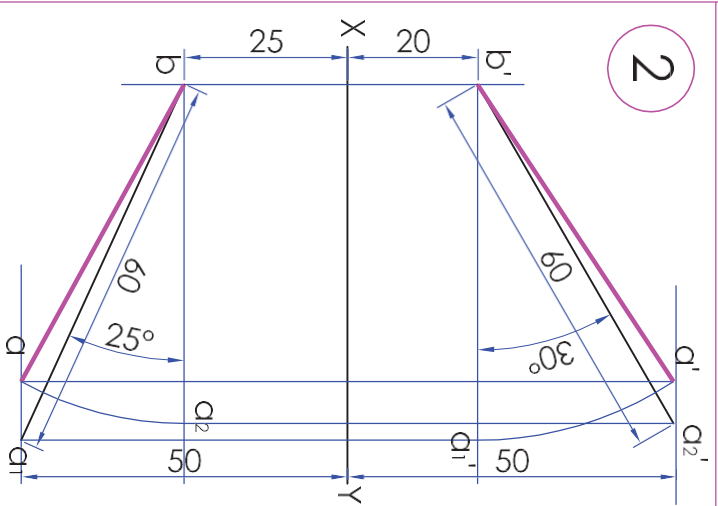
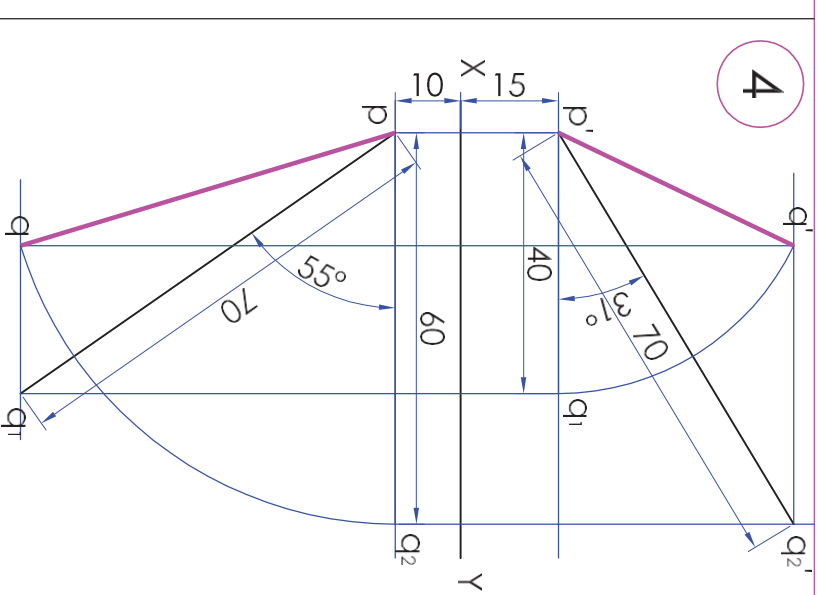
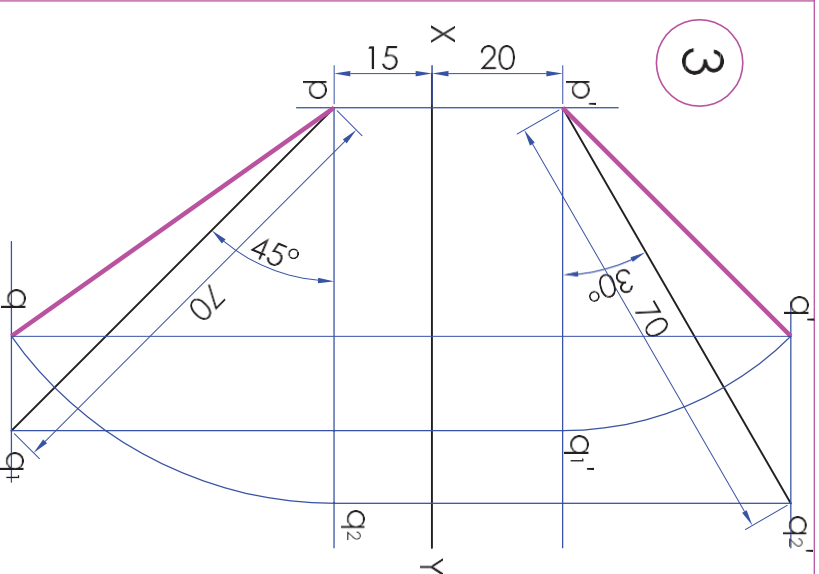
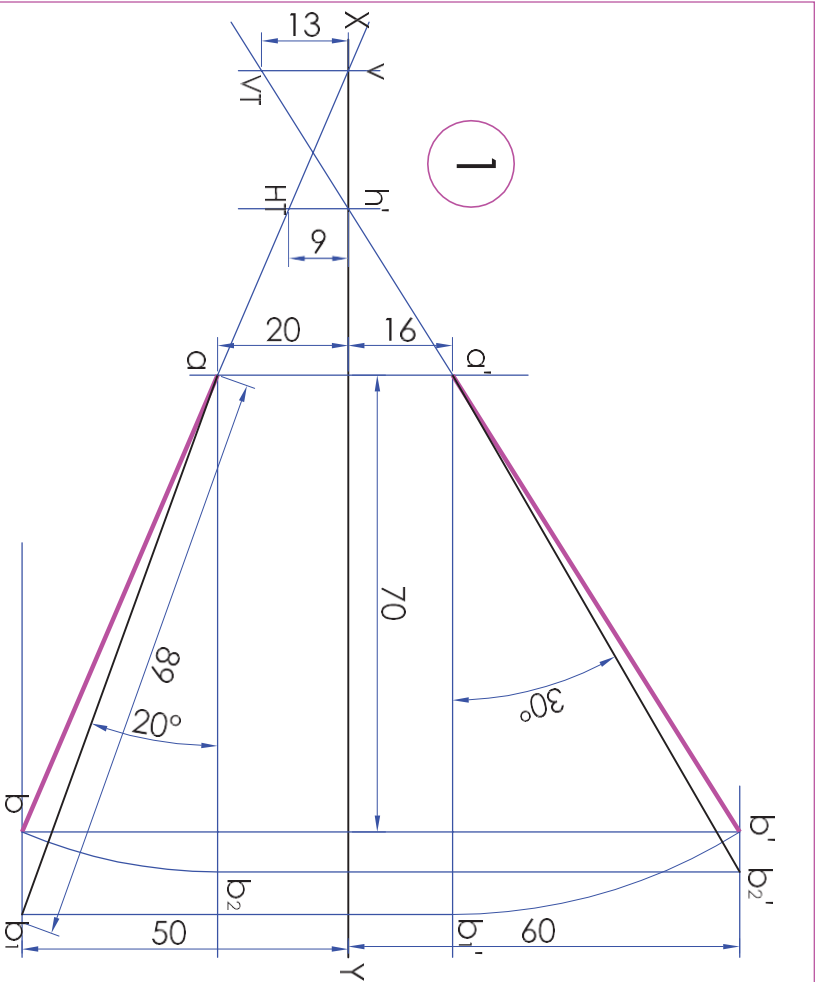
1. With A as centre and radius AD, draw an arc upto "BA-extended" line and name P1 at the end of the arc.
2. With B as centre and radius BP1, draw an arc upto "CB-extended" line and name P2 at the end of the arc.
3. With C as centre and radius CP2, draw an arc upto "DC-extended" line and name P3 at the end of the arc.
4. With D as centre and radius DP3, draw an arc upto "AD-extended" line and name P4 at the end of the arc. The curve joining the points D, P1, P2, P3, and P4 is involute of a square

- Tangent at Point N:
1. Draw a line, joining the points N & D (one corner of a square)
 2. The line, ND is Normal
 3. Draw a perpendicular(SNT) to the line ND at N, which is a Tangent.

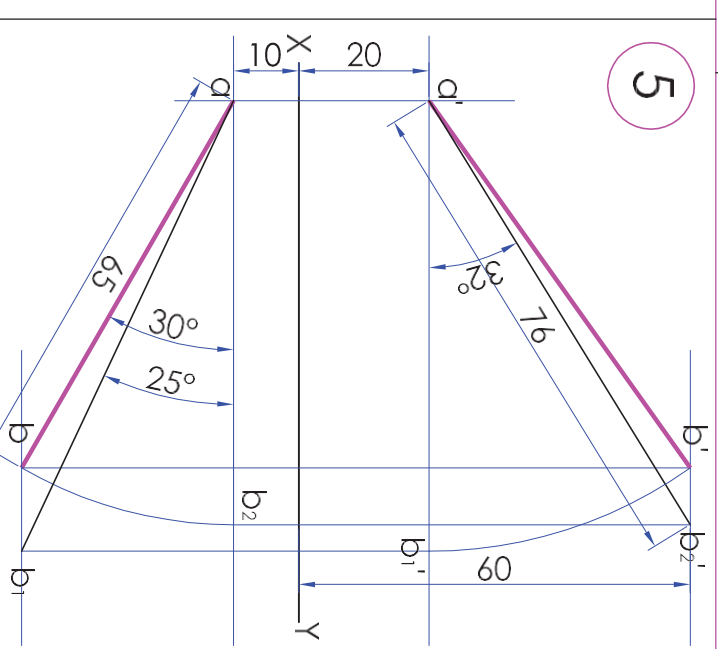
SCALE: 1 : 1
ALL DIMENSIONS ARE IN MM

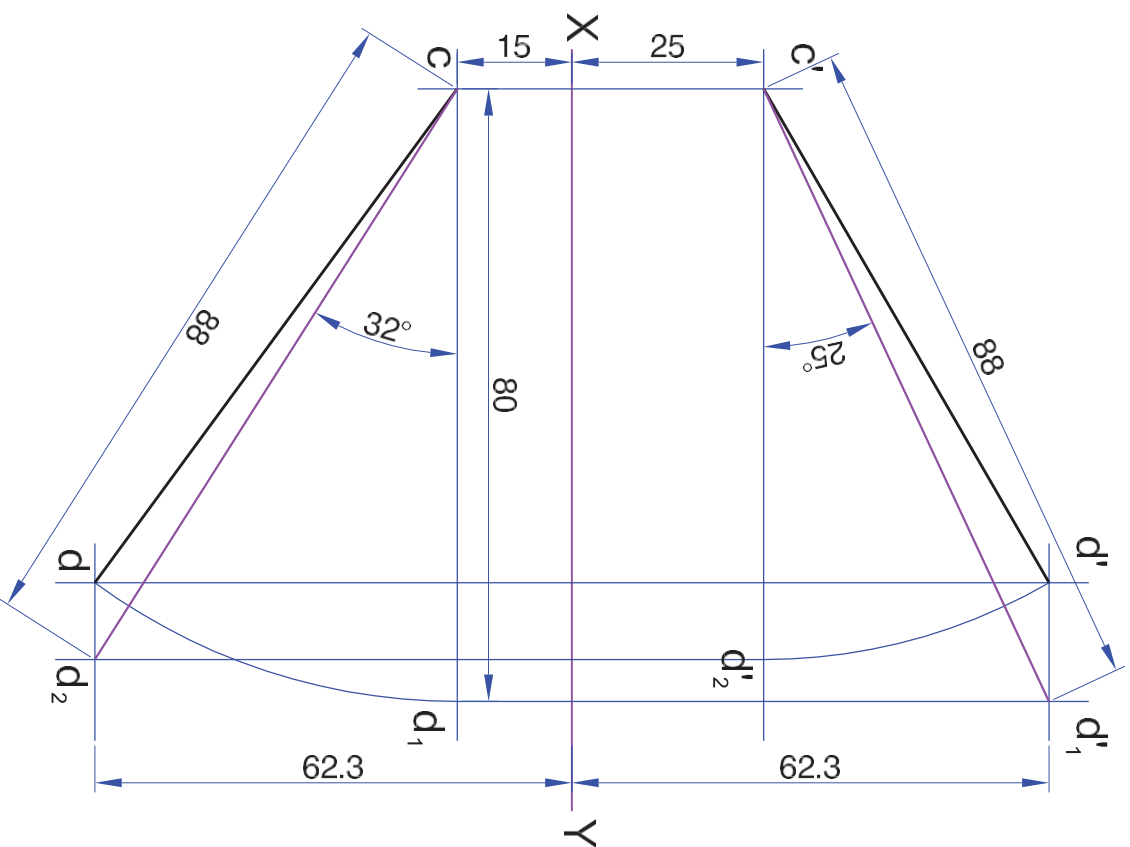
- The end A of a line AB is 9 mm above HP and 15 mm in front of VP. The other end B is 42mm above HP and the line is Perpendicular to HP. Draw the Projection of the line AB
- The end A of a line AB is 16 mm above HP and 7 mm in front of VP. The other end B is 41mm in front of VP and the line is Perpendicular to VP. Draw the Projection of the line AB.
- The end A of a line AB is 14 mm above HP and 22 mm in front of VP. Draw the Projection of the line AB, if the line is parallel to both HP and VP and the distance between the projectors is 33 mm.
- The end A of a line AB is 7 mm above HP and 13 mm in front of VP. The other end B is 30mm above HP. Draw the Projection of the line AB, if the line is Parallel to VP and inclined at 35° to HP
- The end A of a line AB is 13 mm above HP and 7 mm in front of VP. The other end B is 30mm in front of VP. Draw the Projection of the line AB, if the line is Parallel to HP and inclined at 35° to VP.
- The end A of a line AB is 15 mm above HP and 10 mm in front of VP. The other end B is 45mm above HP and 55mm in front of VP. The distance between the projectors is 38mm. Draw the Projection of the Line and find True length, Inclination angle to HP and VP.





1. The end A of a line AB is 16 mm above HP and 20 mm in front of VP, while the end B is 60 mm above HP and 50 mm in front of VP. If the end projectors are at a distance of 70 mm, find the true length and true inclinations of the line. Also draw the traces. (Jan-2011:FN).
2. A line AB 60 mm long has its end B, 20 mm above HP and 25 mm in front of VP. The end A, 50 mm above HP and 50 mm in front of VP. Draw its projections and find its inclinations with HP and VP.
3. A line PQ measuring 70mm is inclined to HP at 30° and to VP at 45° with the end P 20mm above HP and 15mm in front of VP. Draw its projections. (Jan-2012 AN).
4. A line PQ 70 mm long has its end P, 15 mm above HP and 10 mm in front of VP. Its top view and front view measure 60 mm and 40 mm respectively. Draw the projections of the line and determine its inclinations with HP and VP.
5. The top view of a line is 65 mm long and is inclined at 30° to the reference line. One end is 20 mm above the HP and 10 mm in front of VP. The other end is 60 mm above HP and is in front of VP. Draw the projections and find the true length of the line and its inclinations to HP and VP. (Jan-2005:FN)



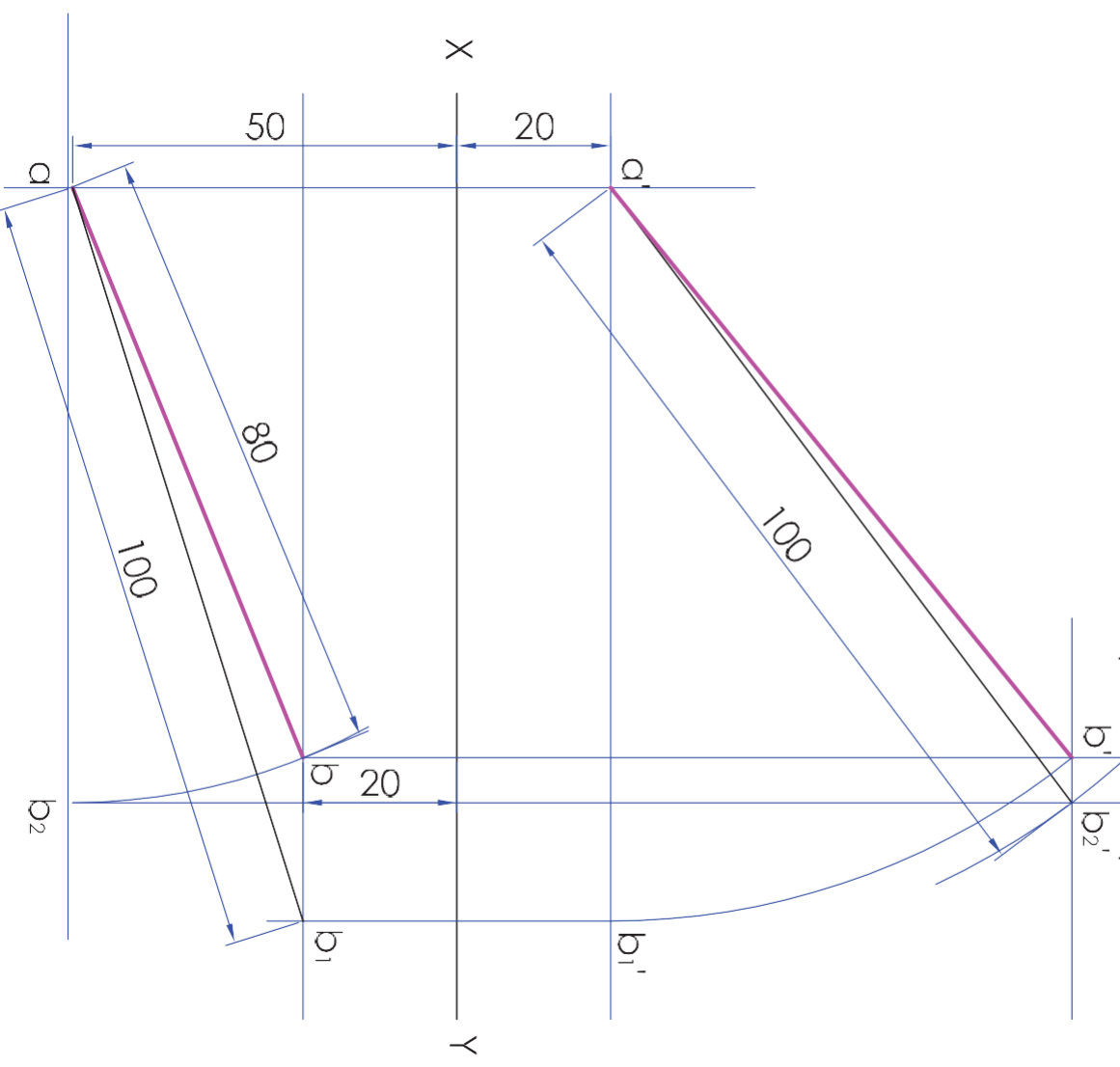


A line CD , inclined at 25° to the HP , measures 80 mm in top view. The end C is in the first quadrant and 25 mm and 15 mm from the HP and the VP respectively. The end D is at equal distances from both the reference planes. Draw the projections. Find true length and true inclination with the VP .

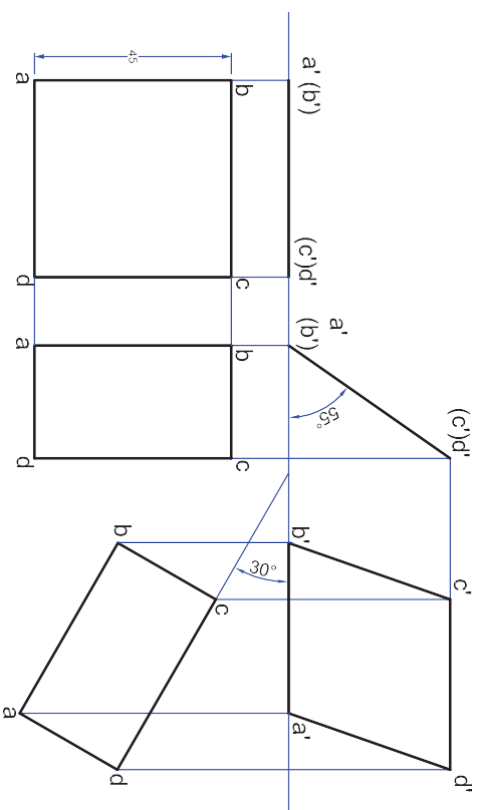
Steps:

1. Draw line reference line XY .
2. Draw the Projector- C and mark c' & c (25mm , 15mm).
3. Draw the locus line and 25° line at c' .
4. Draw locus line at c and mark d_1 (80mm given).
5. Draw the projector at d_1 , mark d'_1 in the 25° line.
6. Measure the distance d'_1 from XY line (62.3mm).
7. Draw locus line at d'_1 to find d'
8. Draw the locus line below the XY line @ 62.3mm .
9. Draw the arc from d_1 with center as c and mark d .
10. Draw the projector at d and mark d' .
11. Mark d'_2 and d_2 by drawing arc and projector.
12. Measure true Length and Inclination angle with VP .
(Ans: True Length 88mm and angle is 32° inclined to VP)

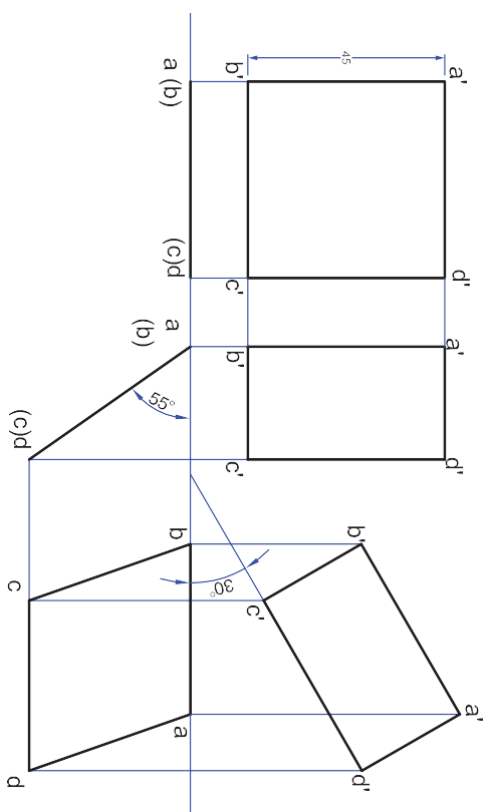
7. A line 100 mm long has one of its ends 50 mm in front of VP and 20 mm above HP. The other end is 20 mm in front of VP and above HP. The length of the top view of the line measures 80mm. Draw the projections and find the inclinations of the line to HP and VP. (Jan-2005;AN)



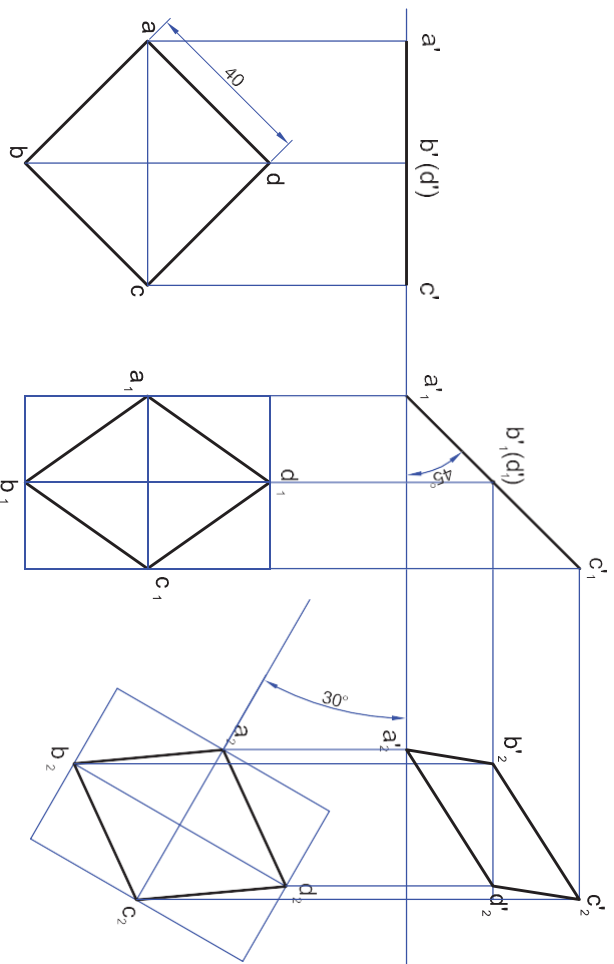
1. Draw the projection of a square lamina of side 45 mm having one of its sides in H.P. and is inclined at 30° to V.P. The surface is inclined at 55° to H.P.



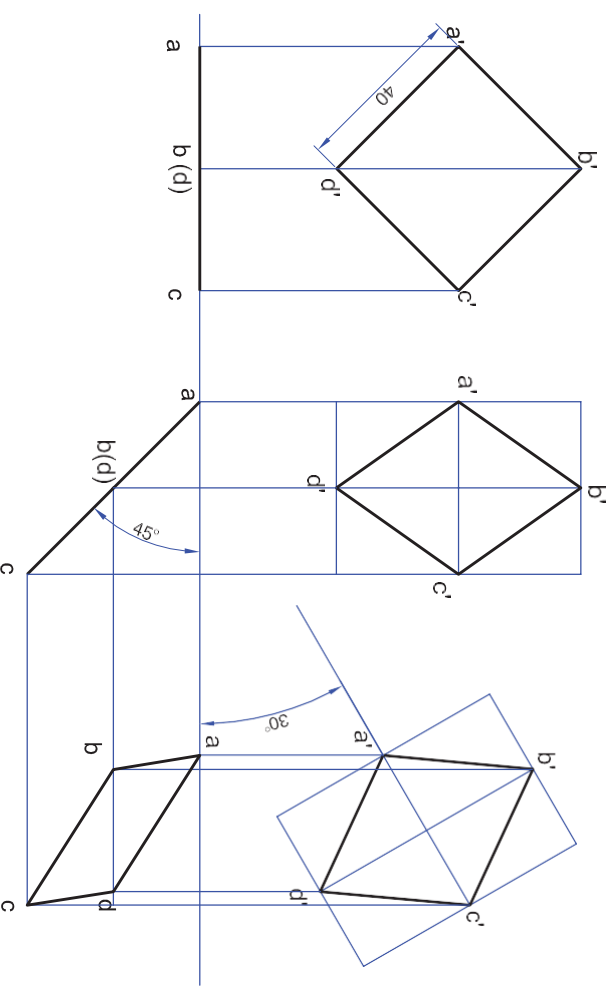
2. Draw the projection of a square lamina of side 45 mm having one of its sides in V.P. and is inclined at 30° to H.P. The surface is inclined at 55° to V.P.



3. Jun 2005 : Que 2. (b)
A square lamina ABCD of side 40 mm rests on the ground on its corner A in such a way that the diagonal AC is inclined at 45° to the H.P. and apparently inclined at 30° to the V.P. Draw its projections.

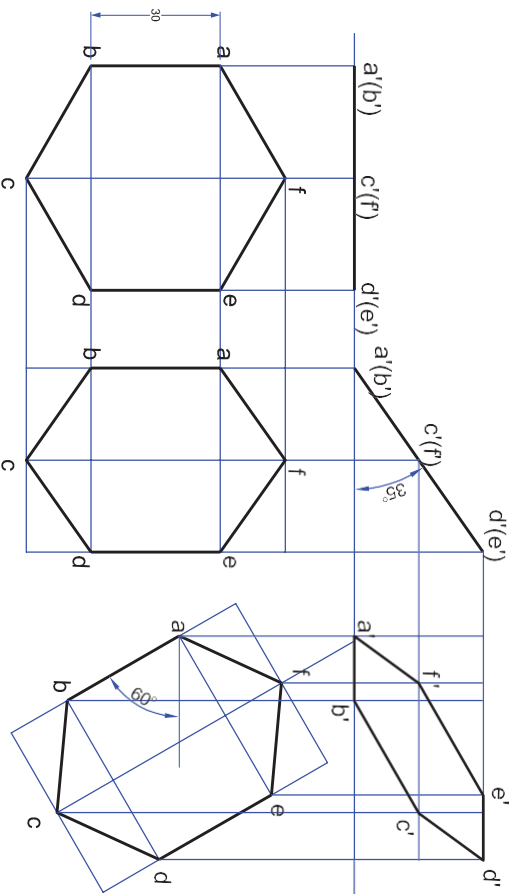


4. A square lamina ABCD of side 40 mm rests on the V.P. on its corner A in such a way that the diagonal AC is inclined at 45° to the V.P. and apparently inclined at 30° to the H.P. Draw its projections.

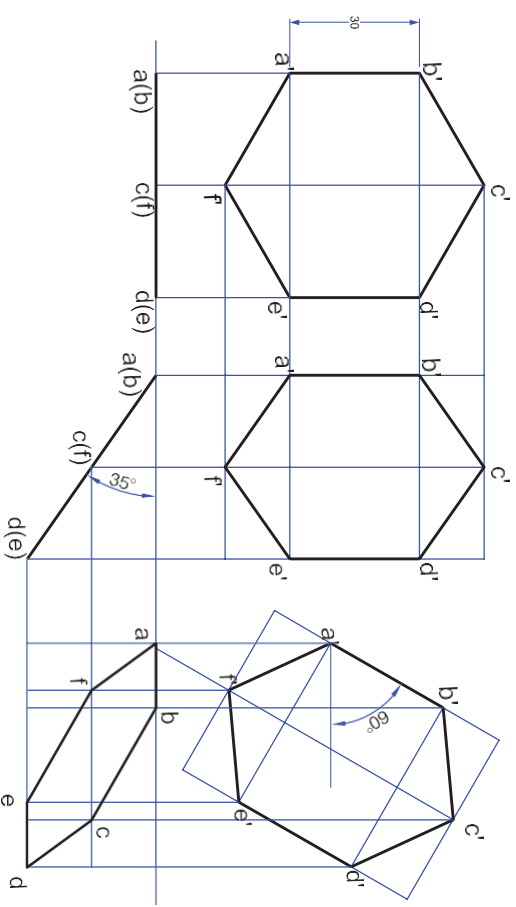


5. Jan 2005 : 2.(b)

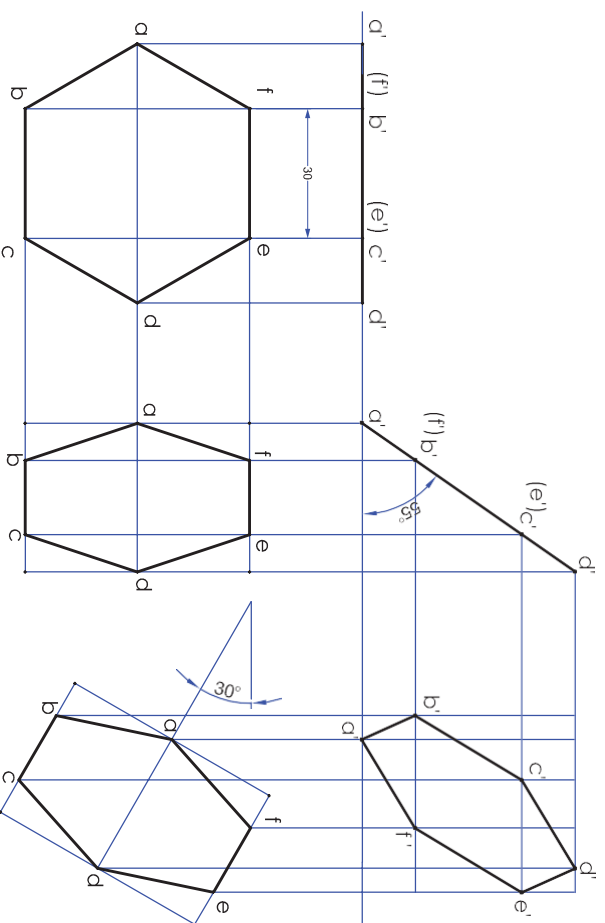
Draw the projection of a hexagon of side 30 mm having one of its sides in H.P. and inclined at 60° to V.P. The surface is inclined at 35° to H.P.



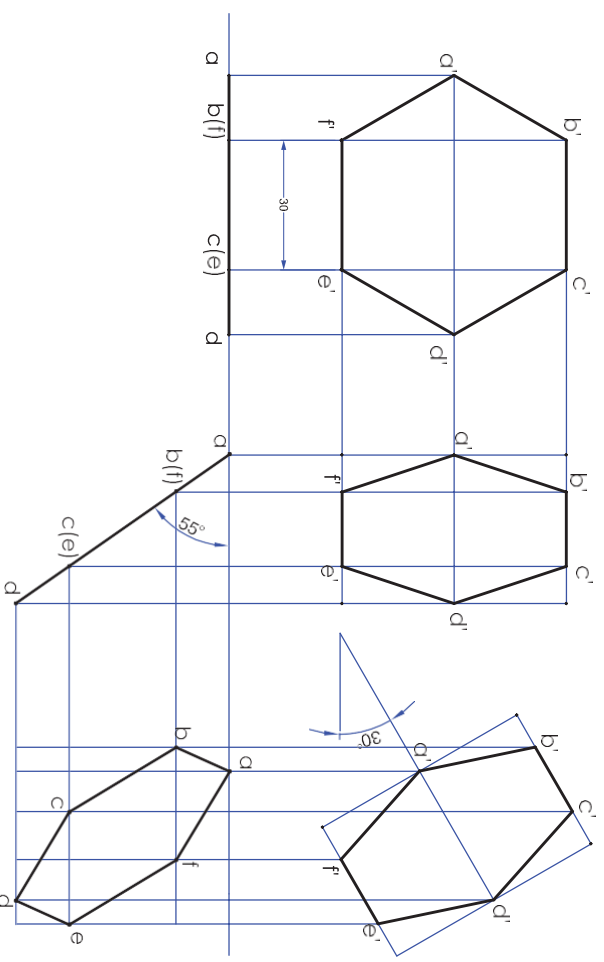
6. Draw the projection of a hexagon of side 30 mm having one of its sides in V.P. and inclined at 60° to H.P. The surface is inclined at 35° to V.P.



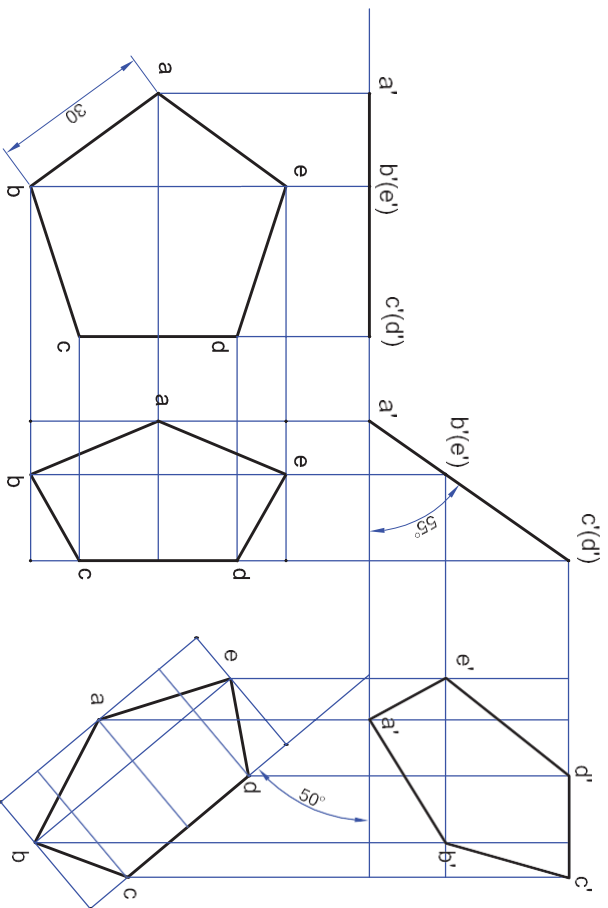
7. A Hexagonal Lamina of side 30 mm rests with one of its corner in H.P. and the surface is inclined at 55° to H.P. Draw the Projection of the Lamina, if the plan of the diagonal passing through the resting corner is inclined at 30° to V.P.



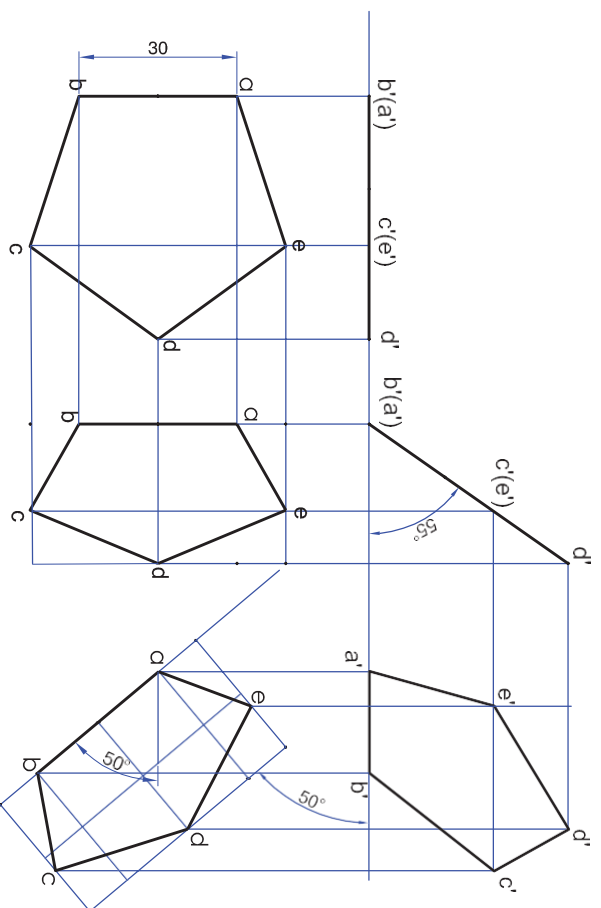
8. A Hexagonal Lamina of side 30 mm rests with one of its corner in V.P. and the surface is inclined at 55° to V.P. Draw the Projection of the Lamina, if the plan of the diagonal passing through the resting corner is inclined at 30° to H.P.



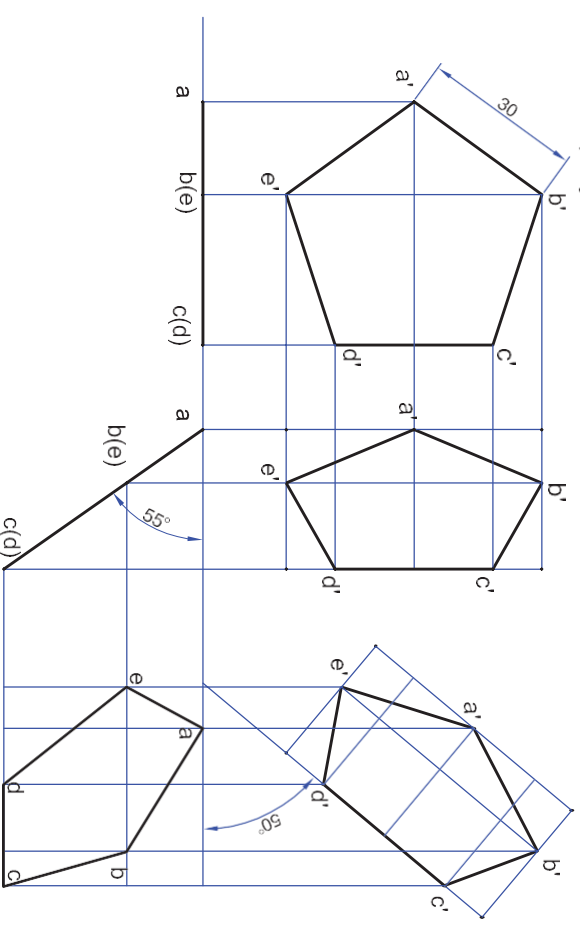
9. A pentagonal lamina of side 30 mm rests on the H.P. on its corner in such a way that the opposite side is inclined at 50° to the V.P. and the surface is inclined at 55° to the H.P. Draw its projections.



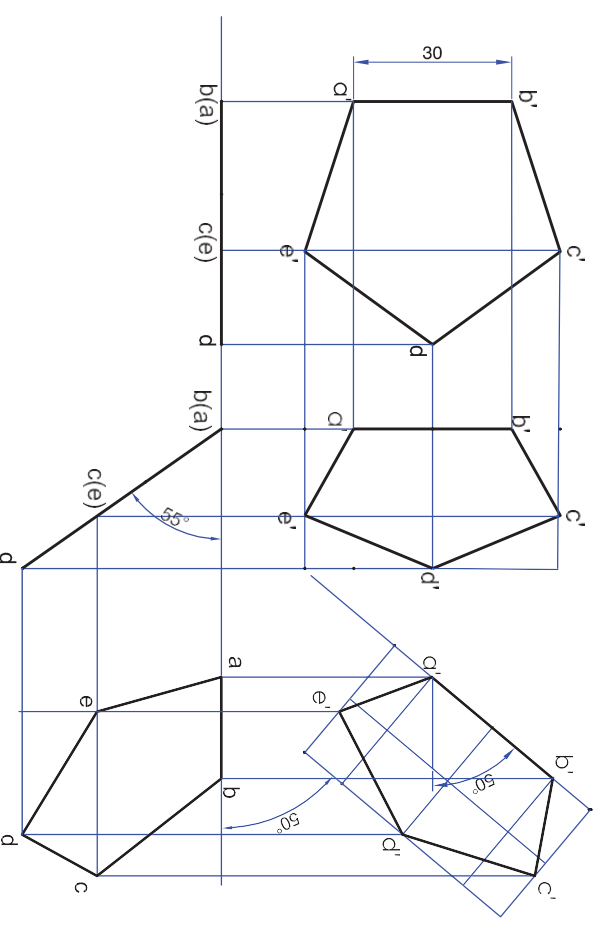
11. A pentagonal lamina of side 30 mm rests on the ground on its sides in such a way that the resting side is inclined at 50° to the V.P. and the surface is inclined at 55° to the H.P. Draw its projections.



10. A pentagonal lamina of side 30 mm rests on the V.P. on its corner in such a way that the opposite side is inclined at 50° to the H.P. and the surface is inclined at 55° to the V.P. Draw its projections.

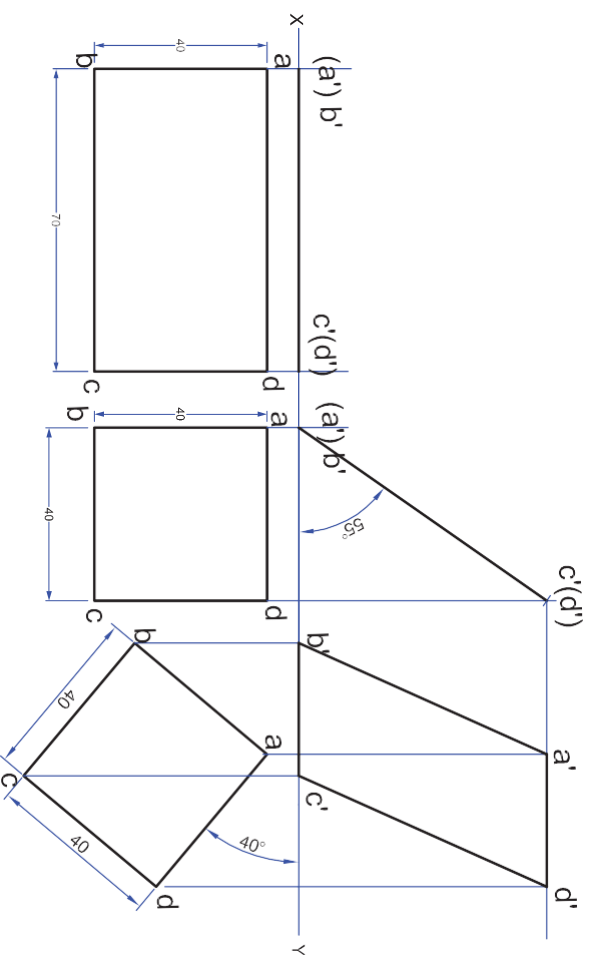


12. A pentagonal lamina of side 30 mm rests on the V.P. on its sides in such a way that the resting side is inclined at 50° to the H.P. and the surface is inclined at 55° to the V.P. Draw its projections.

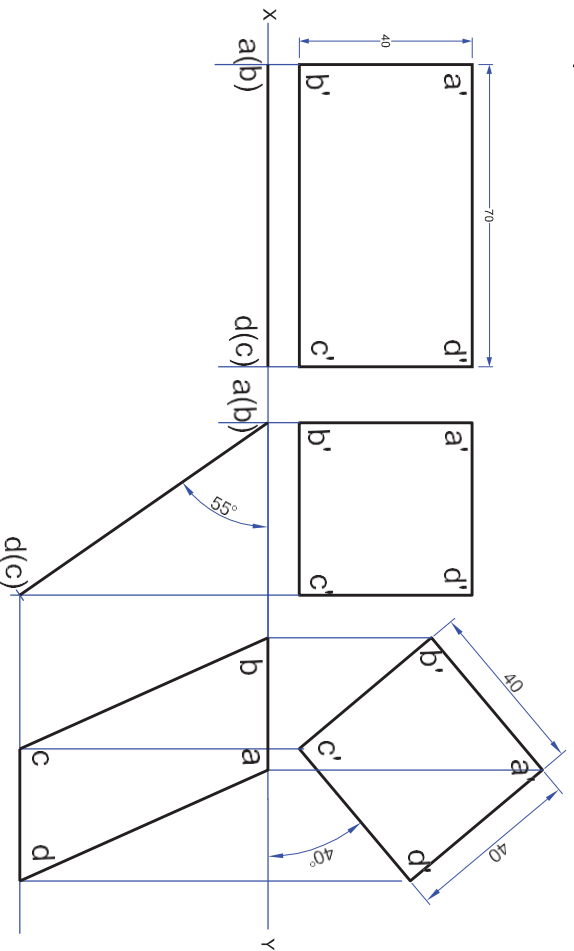


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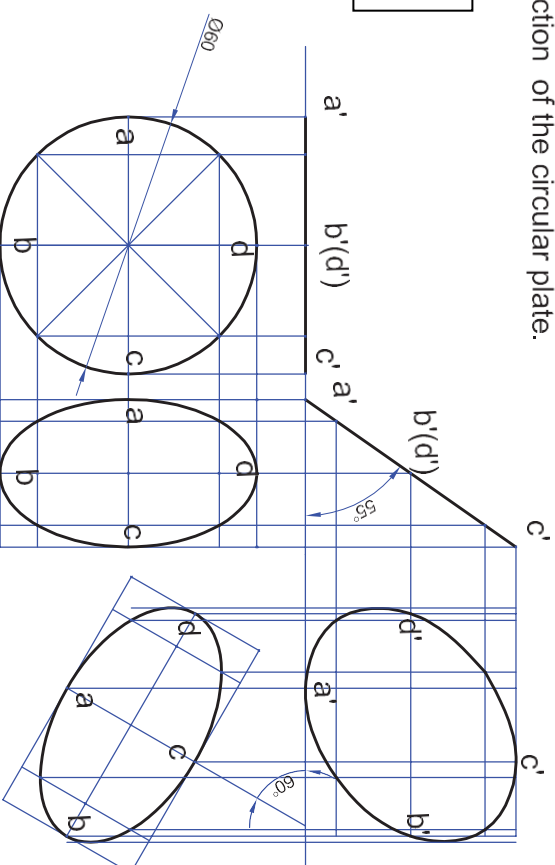
A rectangular Plate 70 x 40 mm has one of its shorter edges in the H.P., inclined at 40° to the V.P. Draw its top view, if its TOP view is a square of side 40 mm.

**14**

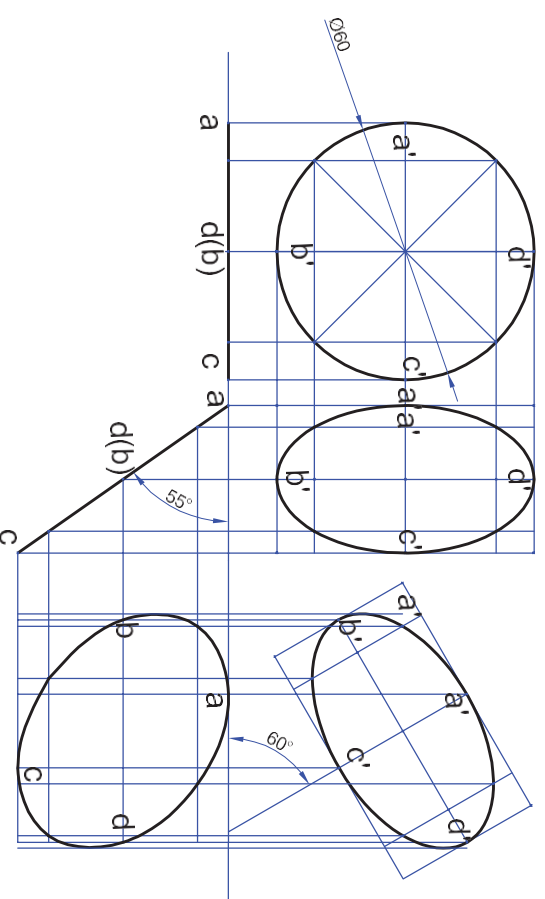
A rectangular Plate 70 x 40 mm has one of its shorter edges in the V.P., inclined at 40° to the H.P. Draw its top view, if its front view is a square of side 40 mm.



A circular plate of diameter 60 mm resting with a point on the circumference in H.P. and the surface is inclined at 55° to H.P. The diagonal plane passing through the resting point is inclined at 60° to V.P. Draw the projection of the circular plate.

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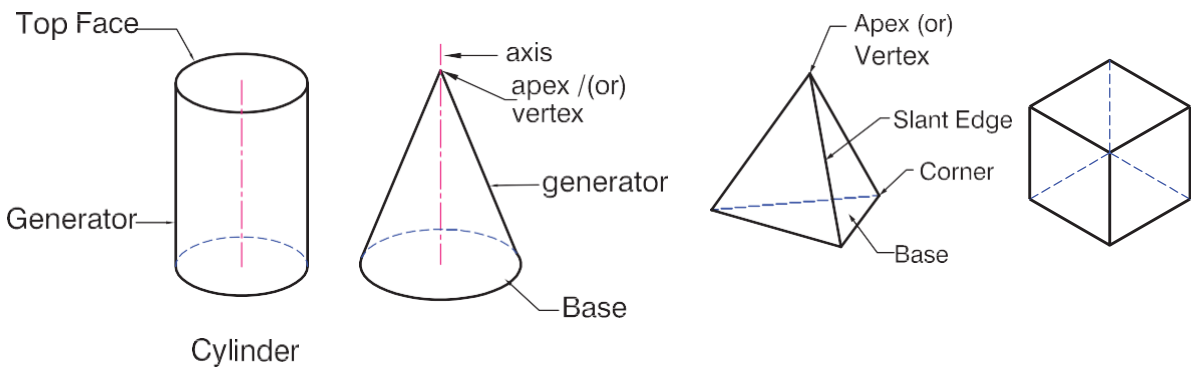
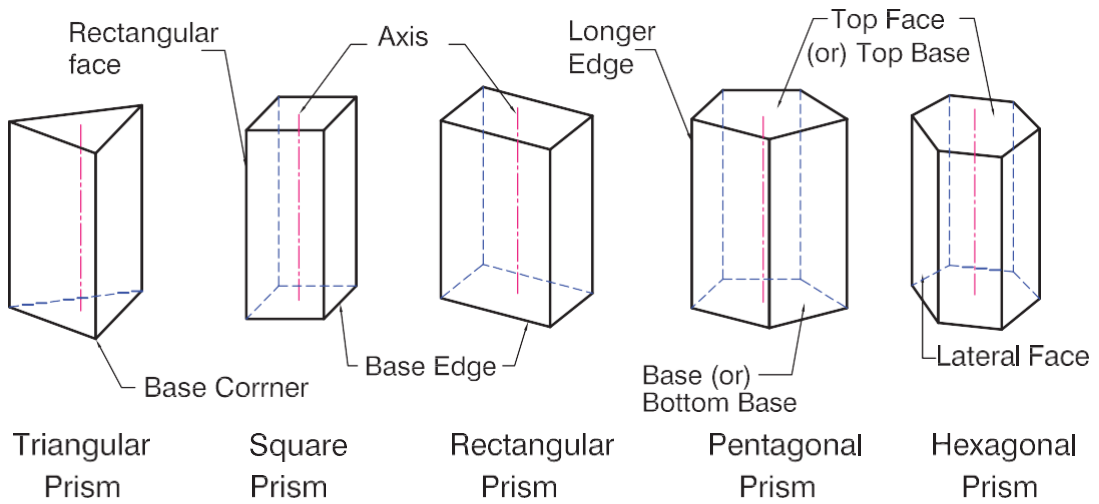
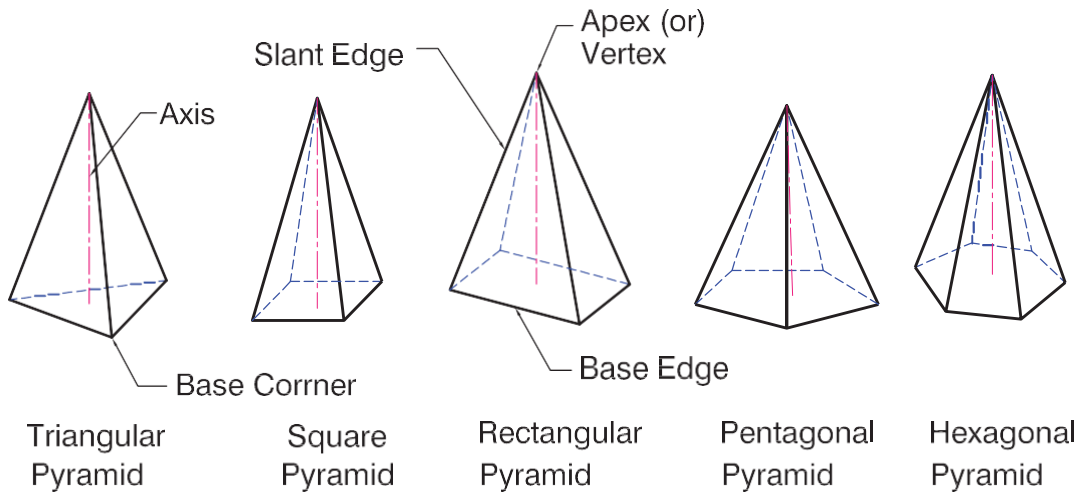
A circular plate of diameter 60 mm resting with a point on the circumference in V.P. and the surface is inclined at 55° to V.P. The diagonal plane passing through the resting point is inclined at 60° to H.P. Draw the projection of the circular plate.



UNIT III PROJECTION OF SOLIDS :

Projection of simple solids like prisms, pyramids, cylinder, cone and **truncated solids** when the axis is inclined to one of the principal planes and parallel to the other, by rotating object method.

1. (Triangular Prism and Pyramid)
2. (Square & Rectangular Prism and Pyramid)
3. (Pentagonal Prism and Pyramid)
4. (Hexagonal Prism and Pyramid)
5. (Cylinder, Cone, Cube and tetrahedron)



A. Axis of the Solids Parallel to Both HP and VP

Projection of Prism & Cylinder

Projection of Pyramid & Cone

Axis of the Solids Inclined to HP and Parallel to VP (Angle will be given-Draw above the XY Line)

Projection of Cube, Prism & Cylinder

Projection of Pyramid & Cone

B. Axis of the Solids Inclined to VP and Parallel to HP(Angle will be given-Draw below the XY Line)

Projection of Cube, Prism & Cylinder

Projection of Pyramid & Cone

C. Resting on HP conditions with Axis of the Solids Inclined to HP and Parallel to VP

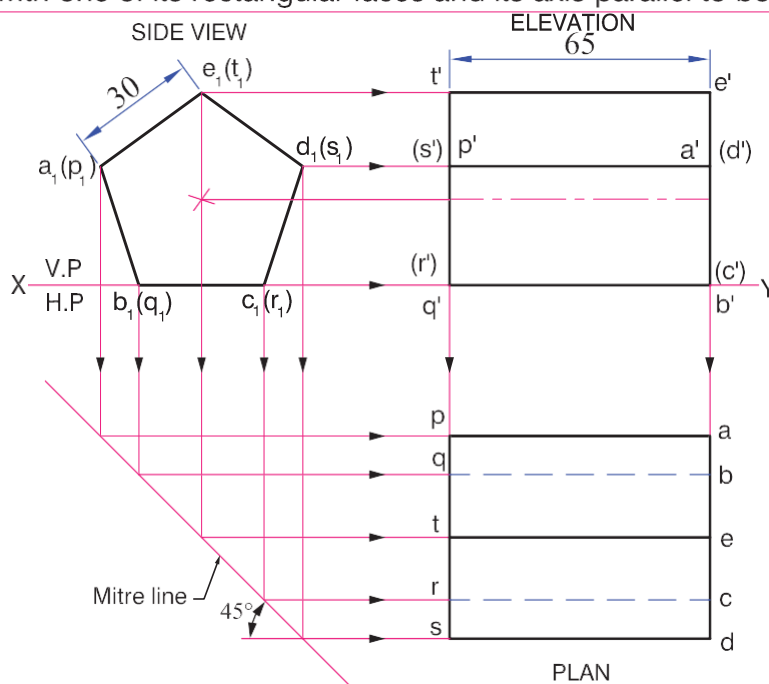
Projection of Pyramid & Cone (Inclination angles will not be given)

D. Resting on VP conditions with Axis of the Solids Inclined to VP and Parallel to HP

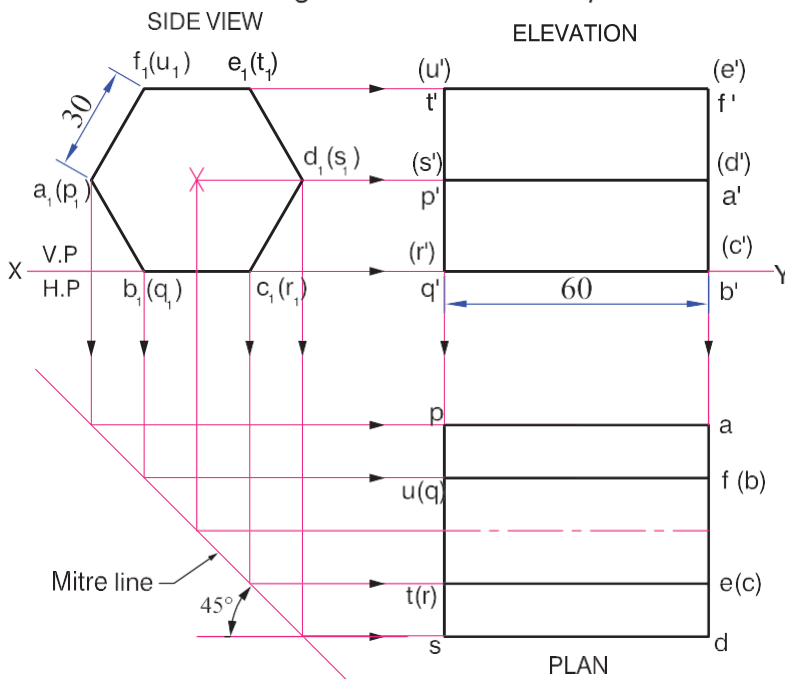
Projection of Pyramid & Cone(Inclination angles will not be given)

E. Freely suspended solids & Truncated solids(Inclination angles will not be given)

1. Draw the projections of a pentagonal prism of base side 30 mm and axis 65 mm long resting on the ground with one of its rectangular faces and its axis parallel to both planes.



2. Draw the projections of a hexagonal prism of base side 30 mm and axis 60 mm long. It is lying on the ground on one of its rectangular faces. Its axis is parallel to both vertical and horizontal planes.



3. A Pentagonal prism side of base 25 mm and axis 50 mm long, rests with one of its edges on HP, such that, the base containing the edge makes an angle of 30° to HP and its axis is Parallel to VP. Draw its Projections.

(hint: Axis will be inclined at 60° to HP)

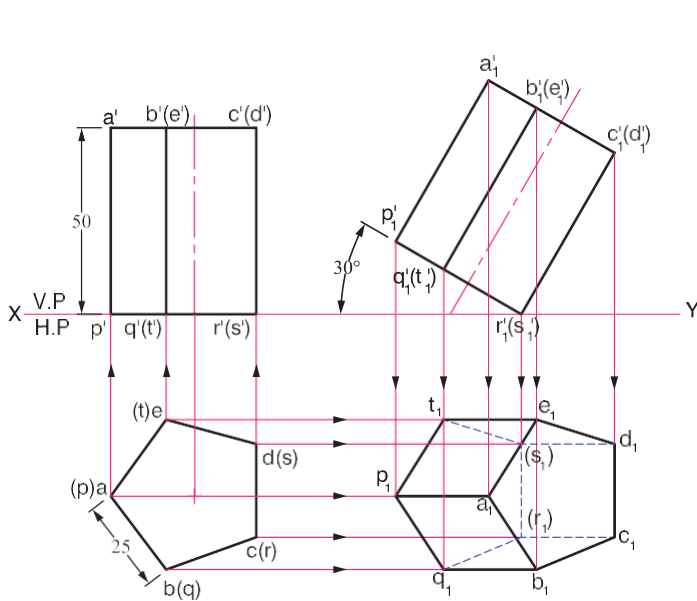
4. A Pentagonal Prism of base side 35 mm and axis length 65 mm is resting on HP on one of its base corner with its axis is inclined at 40° to HP and parallel to VP. Draw its Projections.

5. A Pentagonal prism side of base 25 mm and axis 50 mm long, rests with one of its edges on VP, such that, the base containing the edge makes an angle of 30° to VP and its axis is Parallel to HP. Draw its Projections.

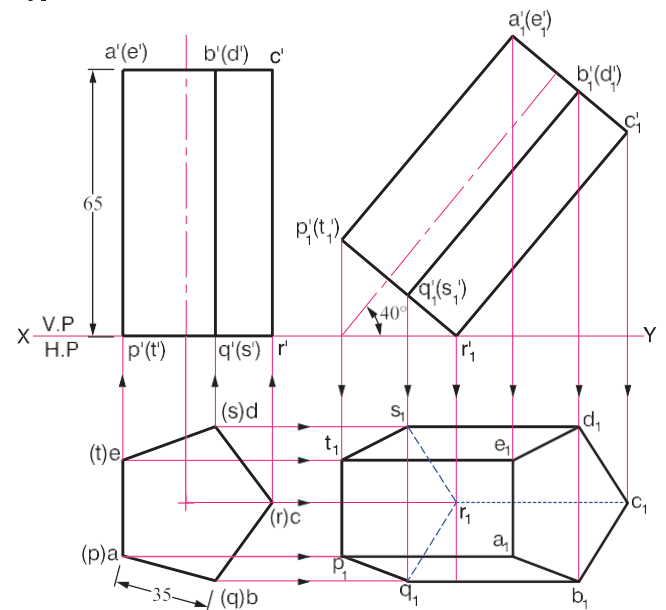
(hint: Axis will be inclined at 60° to VP)

6. A Pentagonal Prism of base side 35 mm and axis length 65 mm is resting on VP on one of its base corner with its axis is inclined at 40° to VP and parallel to HP. Draw its Projections.

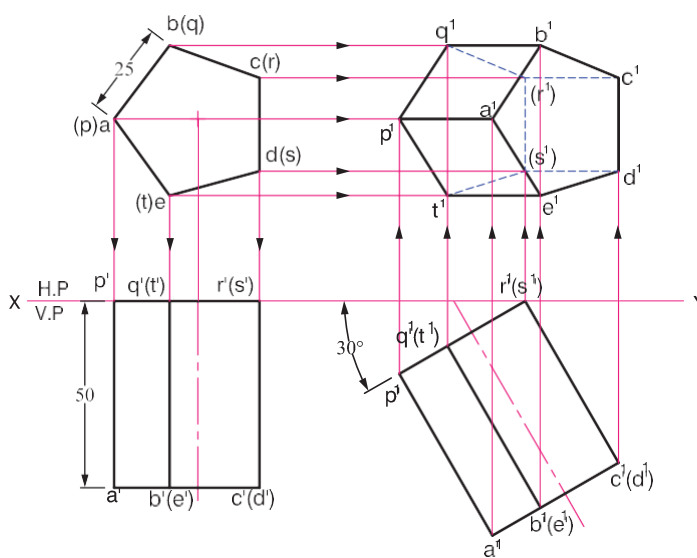
3.



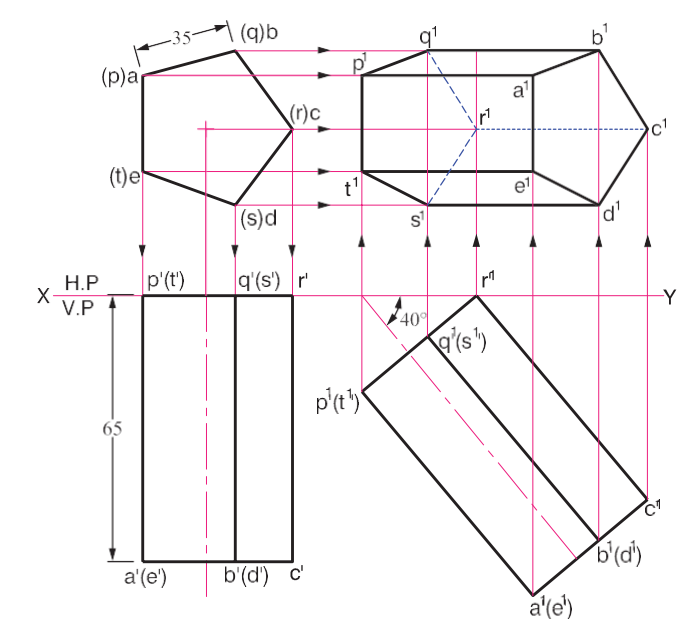
4.



6.



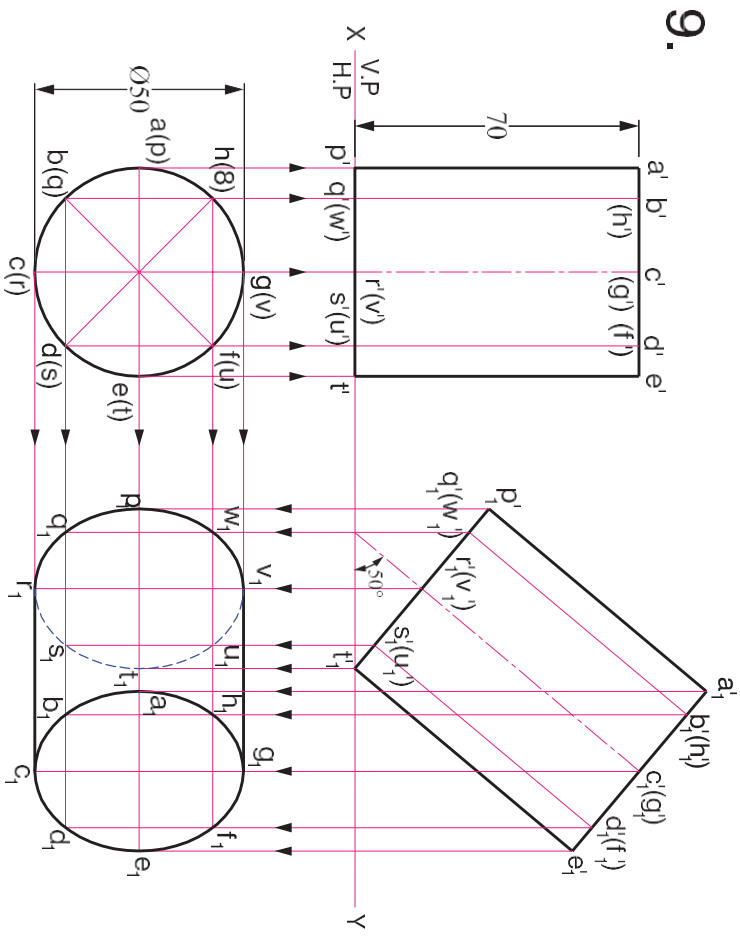
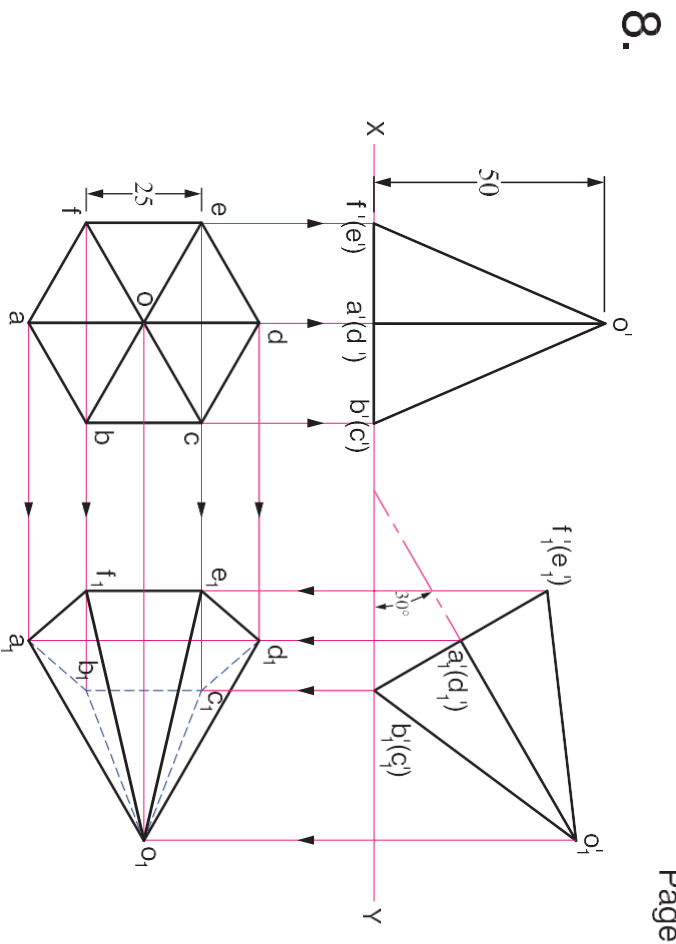
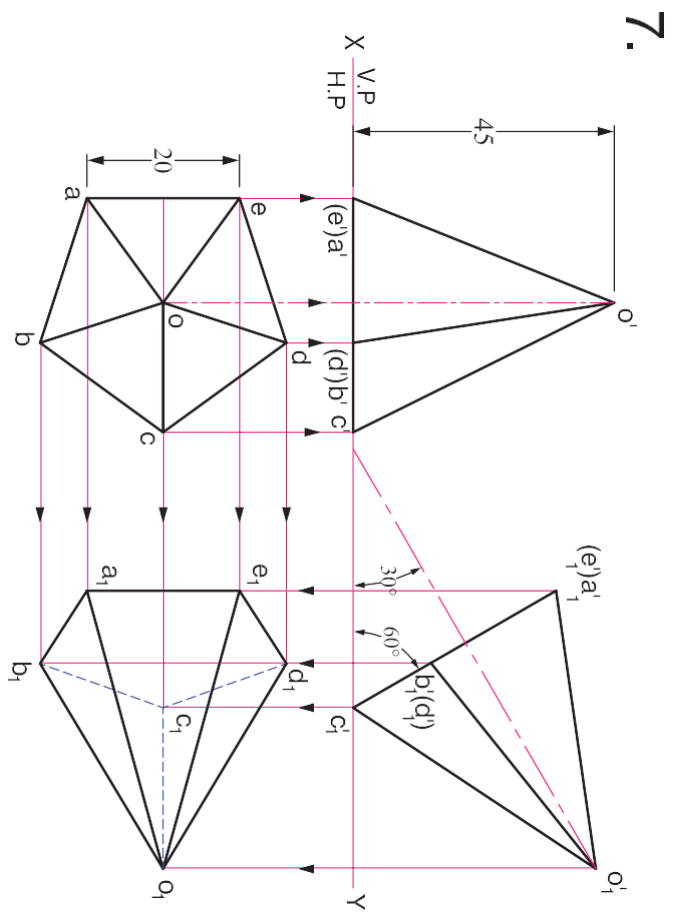
6.



7. A Pentagonal Pyramid side of base 20 mm and axis 45 mm long rests with one of its corners on HP. such that the base is inclined at an angle of 60° to HP (Axis will be inclined at 30° to HP) and the opposite base side of the resting corner is perpendicular to VP. Draw its projections.

8. A hexagonal Pyramid side of base 25 mm and axis 50 mm long, rests with one of the edges of its base on the HP and its axis is inclined at 30° to HP Parallel to VP. Draw its Projections.

9. A cylinder of base diameter 50 mm and 70 mm height resting on the ground with its axis making an angle of 50° with HP. Its axis Parallel to VP. Draw the Projections.

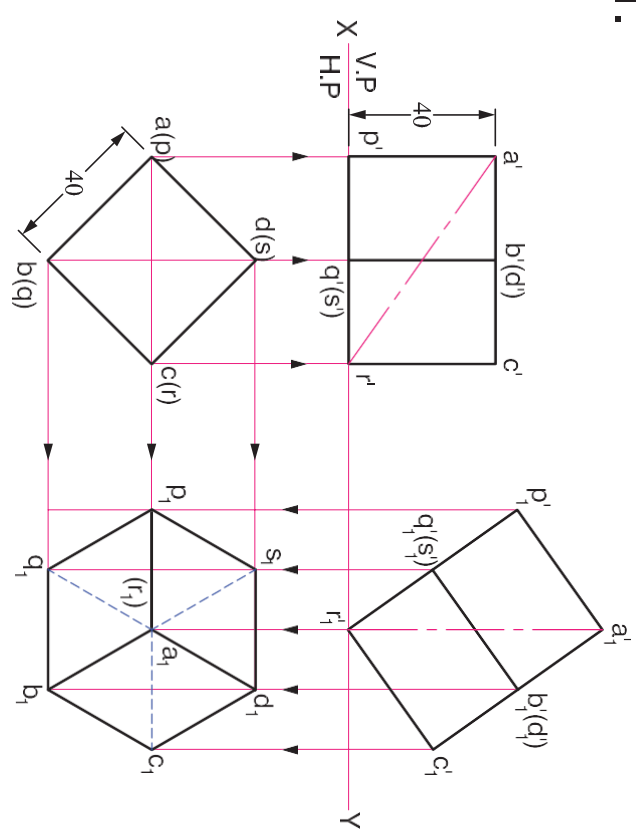


8.

9.

7.

11.

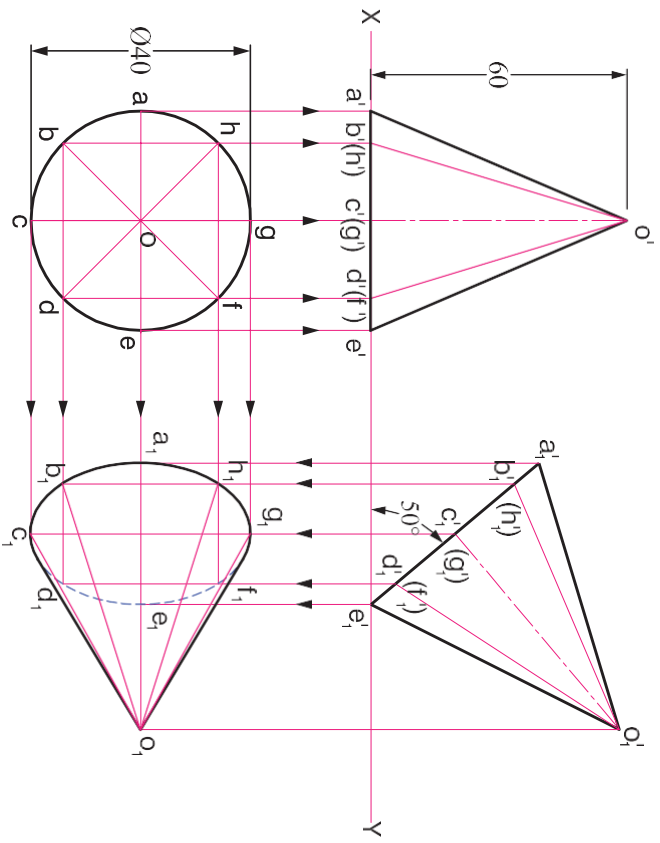


10. A cone of base diameter 45mm and axis length 65 mm is resting on HP on a point on the circumference of the base. Its base is inclined at 50° to HP and axis parallel to VP. Draw its Projections.

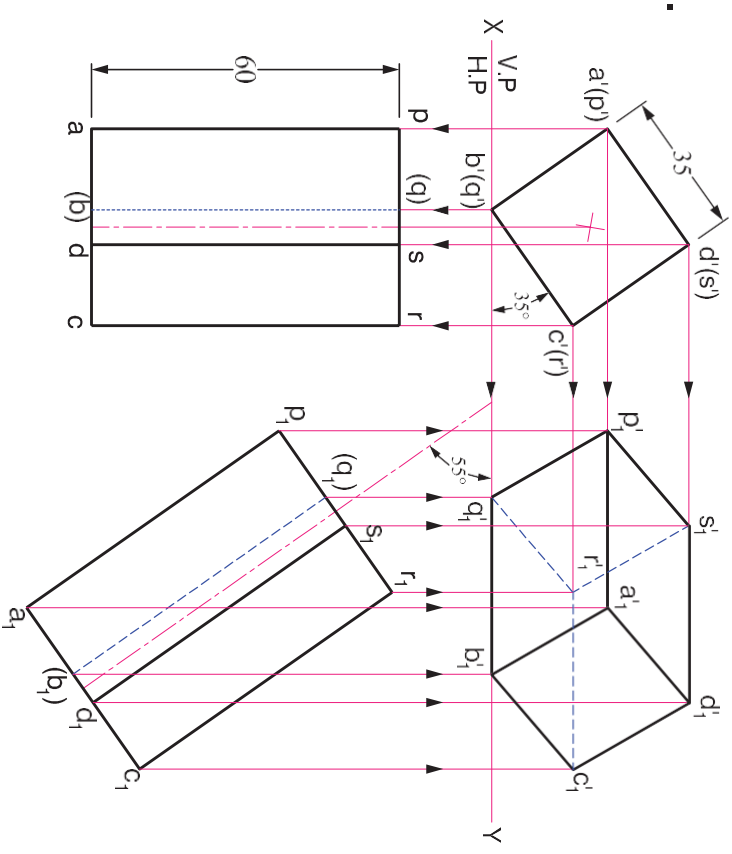
11. Draw the projections of a cube of 40 mm edge resting on the HP on one of its corners with a solid diagonal vertical.

12. A square prism of a base side 35 mm and axis length 60 mm is resting on HP on one of its longer edges with its axis inclined 55° to VP. One of the faces containing resting edge inclined at 35° to HP. Draw the Projections.

10.



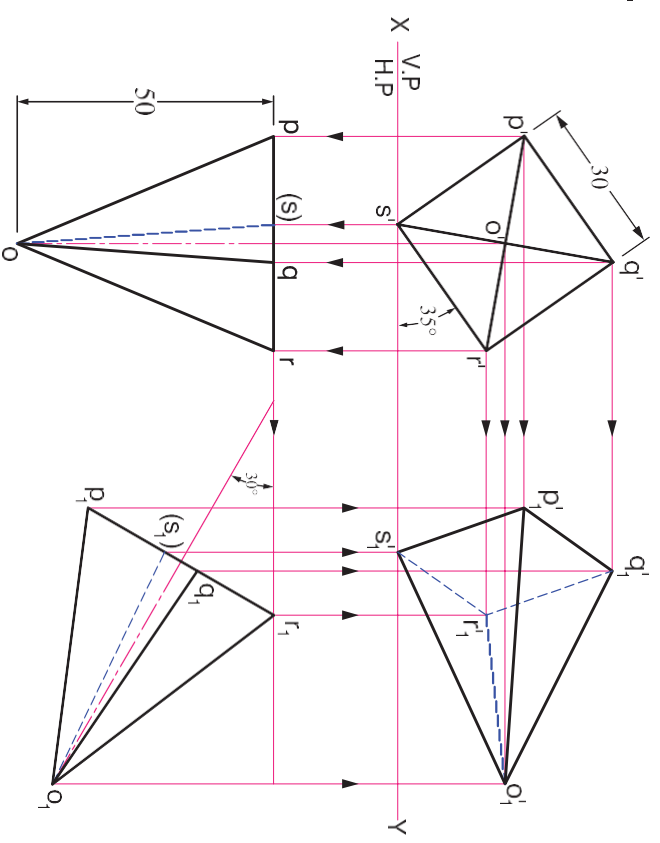
12.



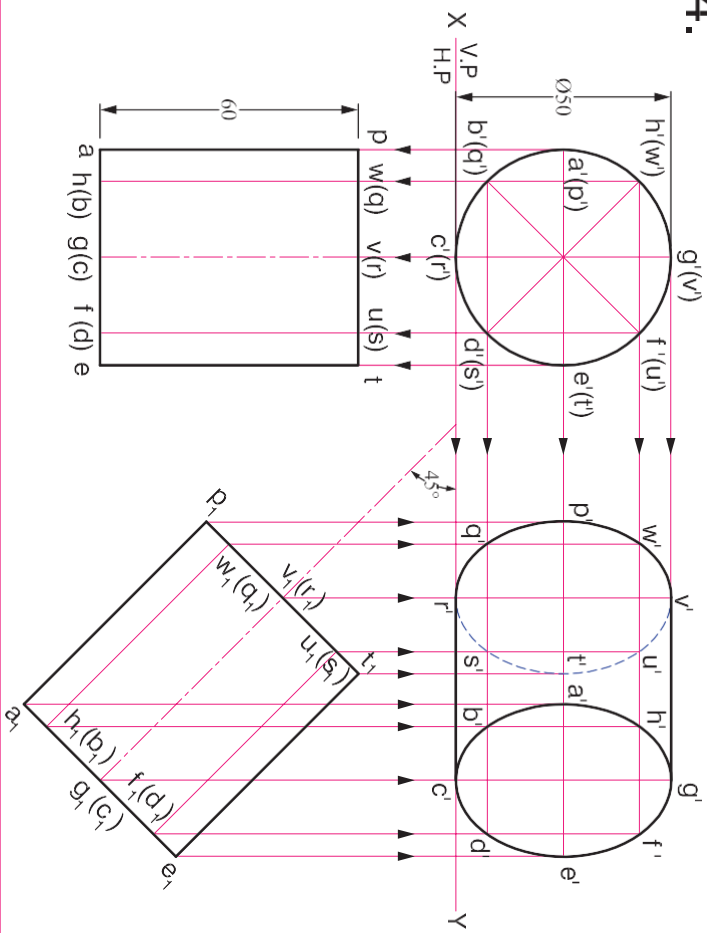
13. Draw the projections of a square pyramid of base side 30 mm and axis 50 mm when it is resting on the HP on one of its base corners with a base side containing the corner making 35° with the HP. The axis is inclined at 30° to the VP and is parallel to the HP and the vertex is away from the VP.

14. A cylinder of a base diameter 50 mm and axis length 60 mm resting on one of its generator on HP with its axis inclined at 45° to VP. Draw its projection.

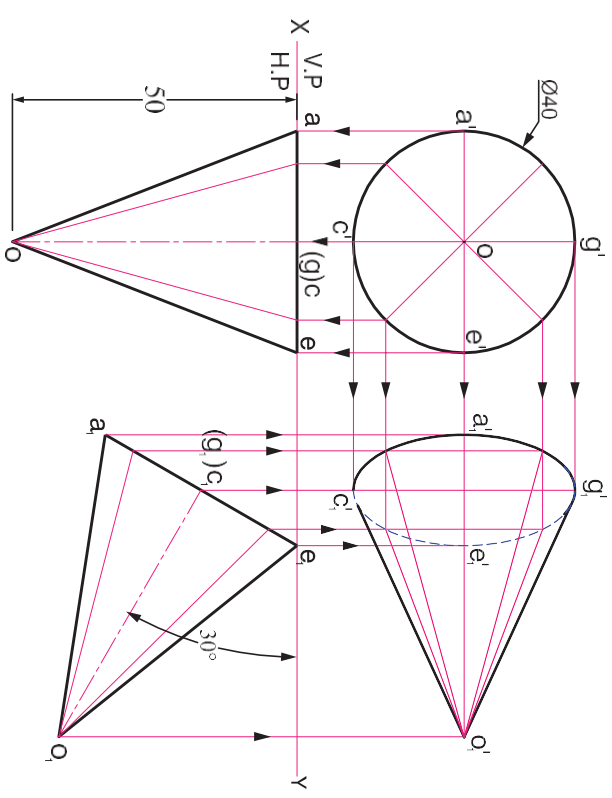
15. A cone of base 40 mm and axis 50 mm long touches the VP on a point of its base circle. Its axis is inclined at 30° to VP and parallel to HP. Draw its projections.



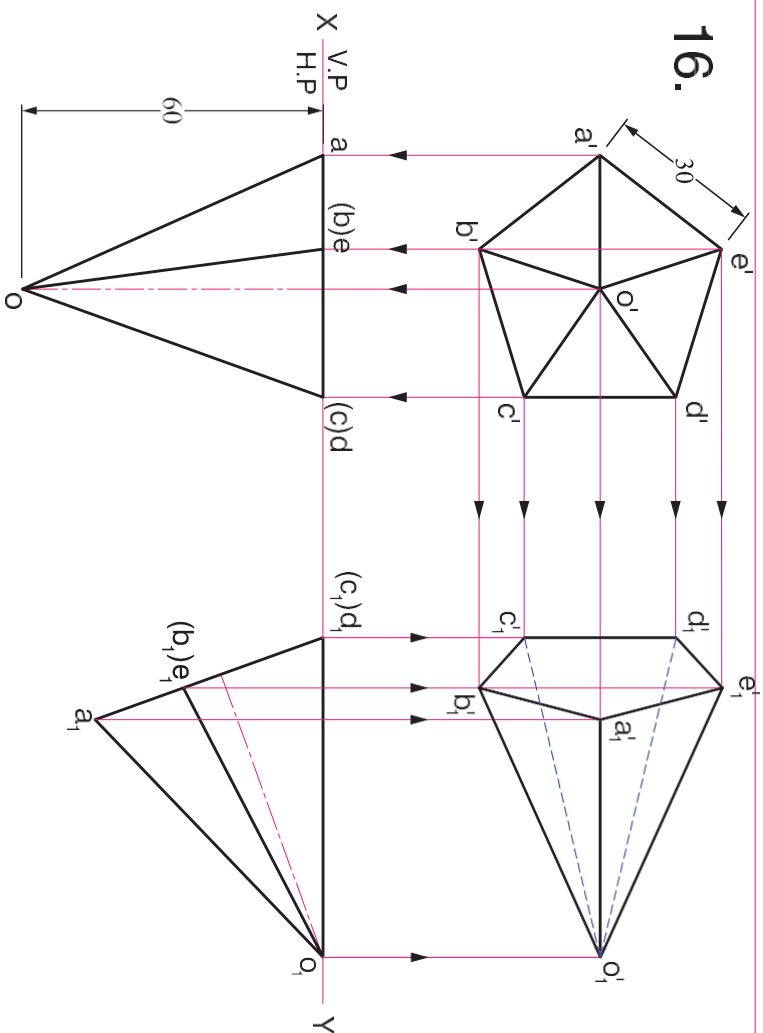
14.



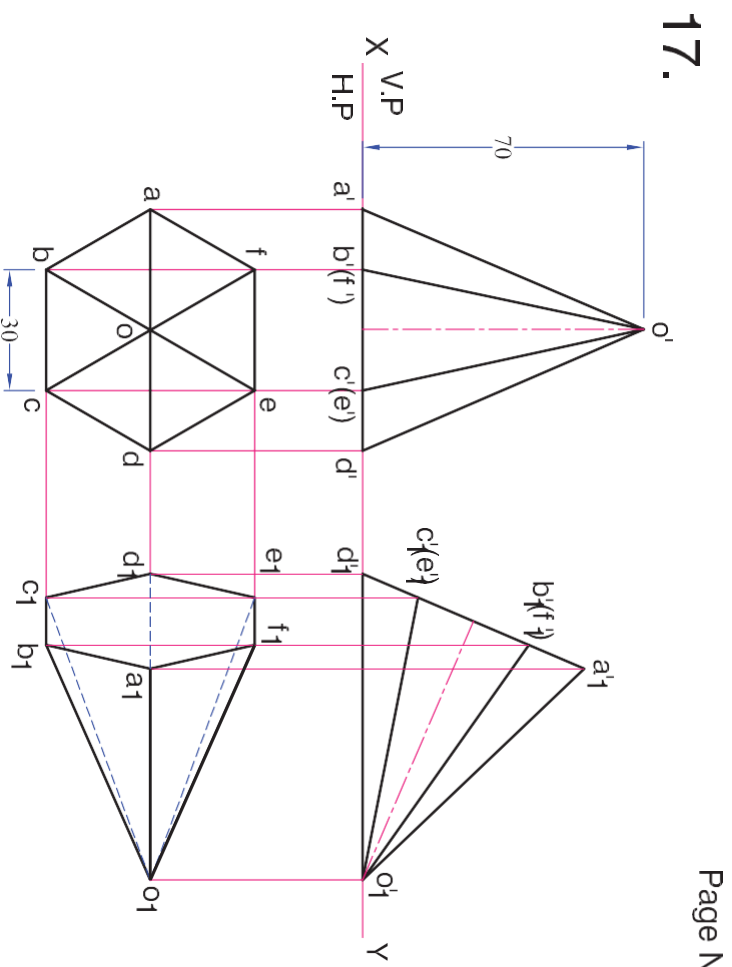
15.



16. Draw the projection of a pentagonal pyramid of side 30 mm and axis length 60 mm, which is resting on the VP on one of its triangular faces.

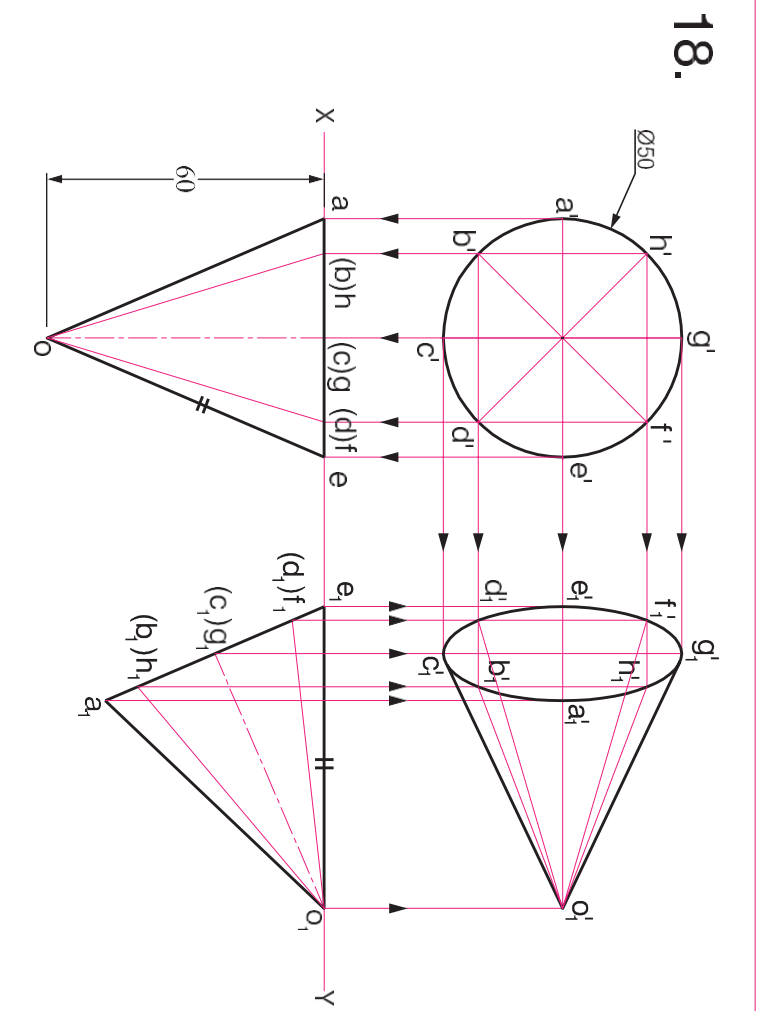


17. A hexagonal pyramid with 30 mm base side and 70 mm long axis is lying on a slant edge on the ground such that the axis is parallel to the V.P. Draw its projections.



17.

18. A cone of base diameter 50 mm and axis length 60 mm is resting on VP on one of its generators with its axis parallel to HP. Draw its projections.



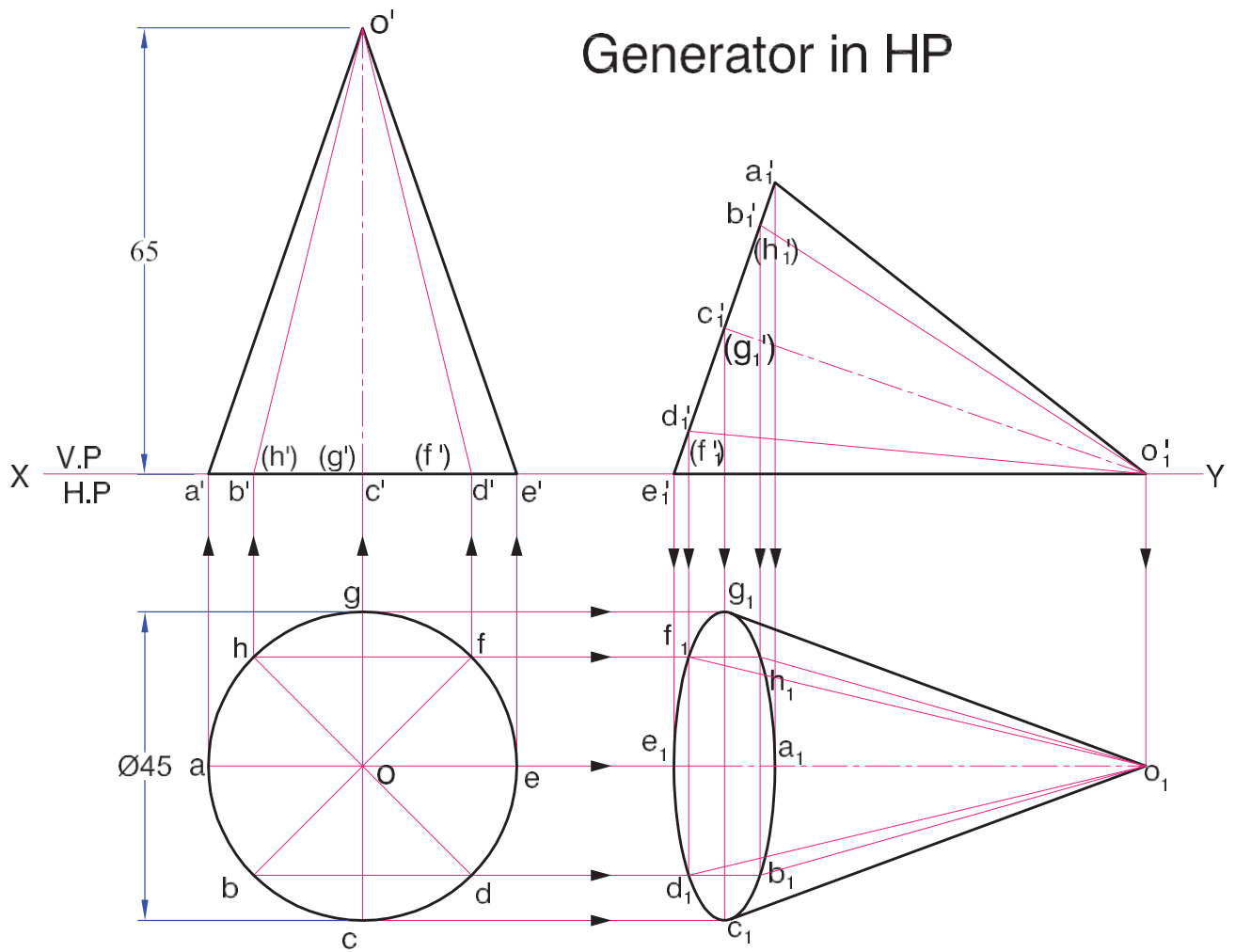
18.

19. A cone of base diameter 45 mm and axis length 65 mm is resting on HP on one of its generators with axis parallel to VP. Draw the projections of the cone.

20. A cone of base diameter 40 mm and height 56 mm is freely suspended from one of its base points such that its axis is parallel to the VP. Draw its projections.

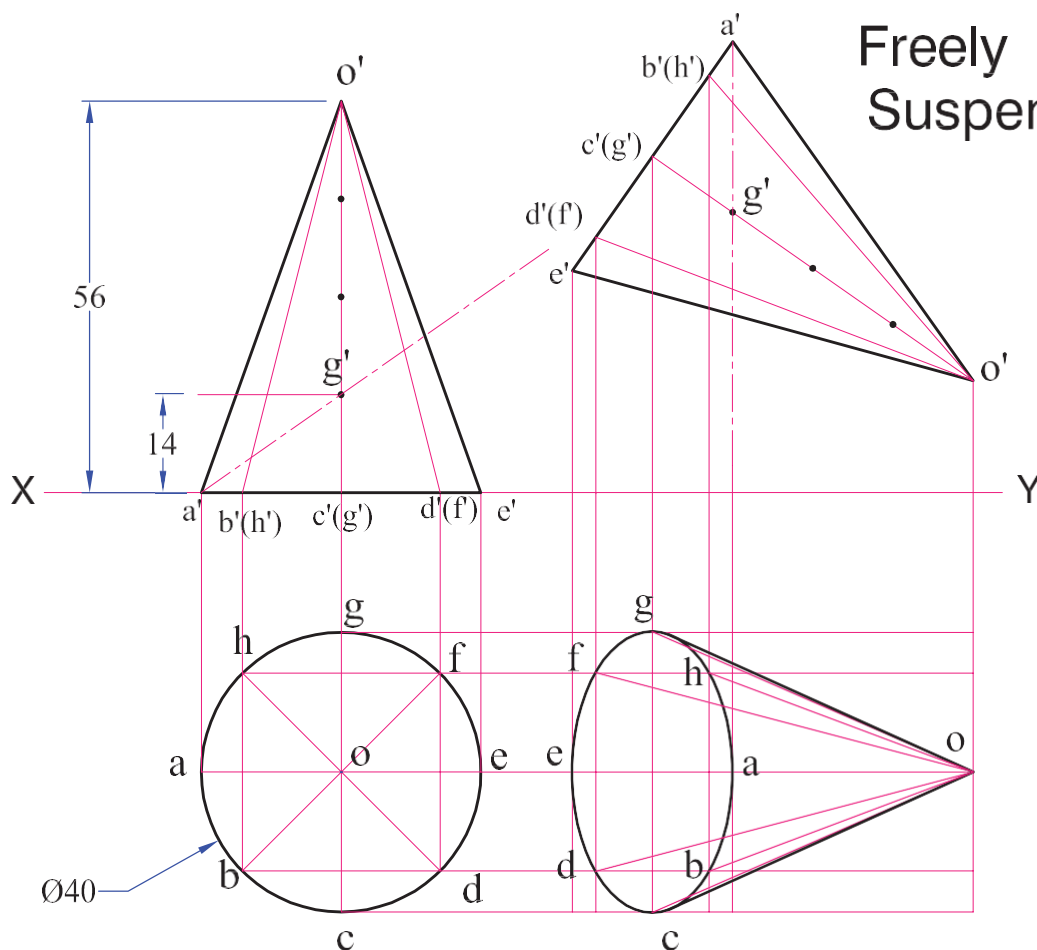
19.

Generator in HP

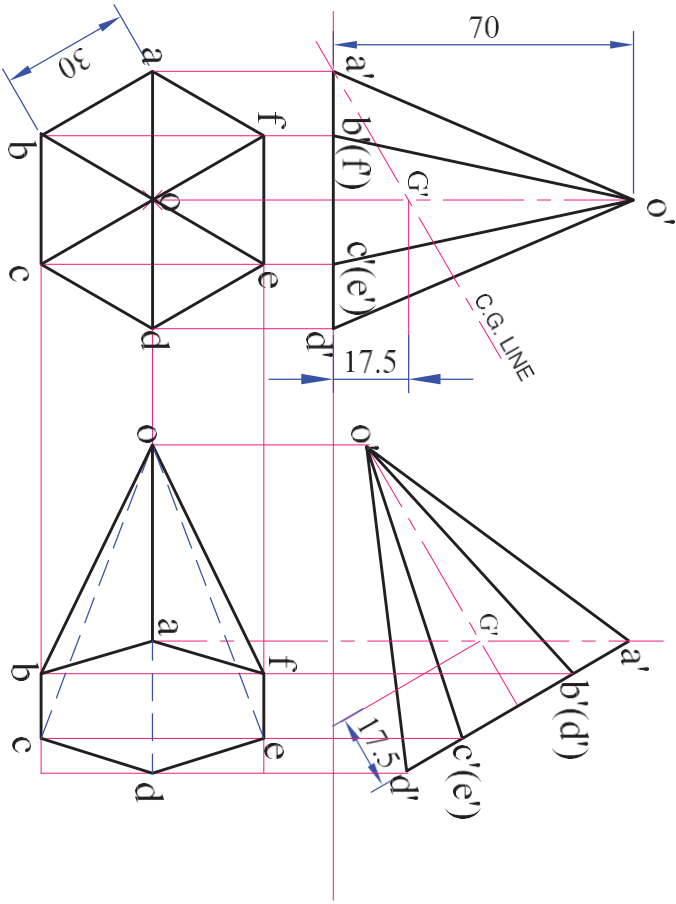


20.

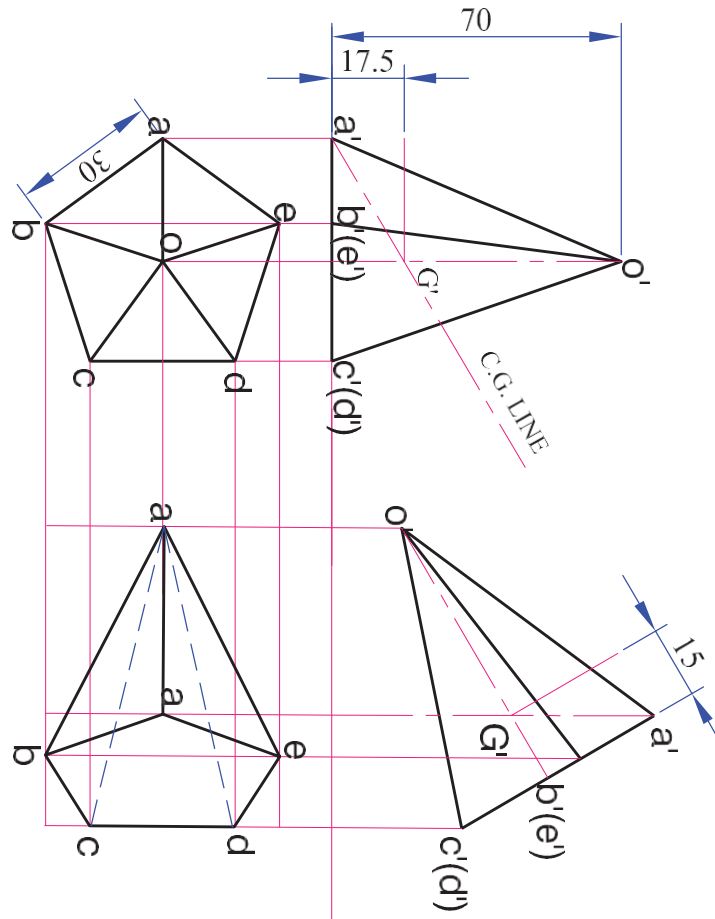
Freely Suspended



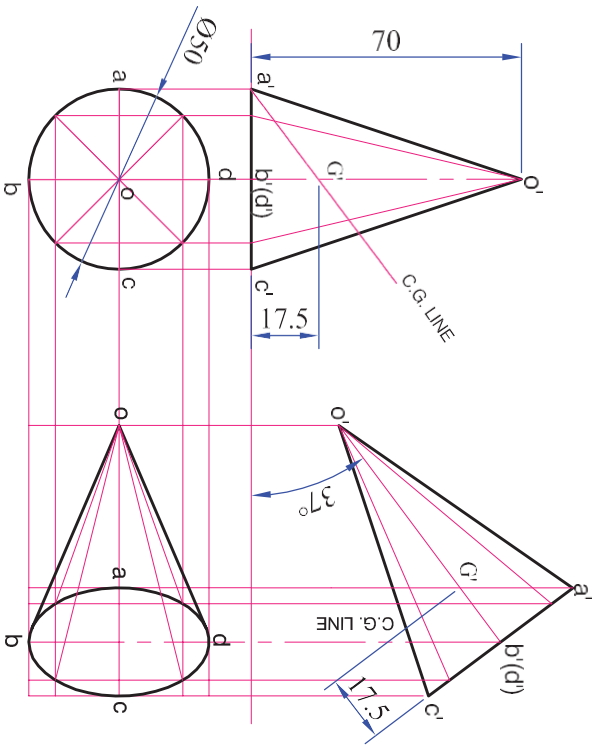
3. FREELY SUSPENDED Hexagonal Pyramid



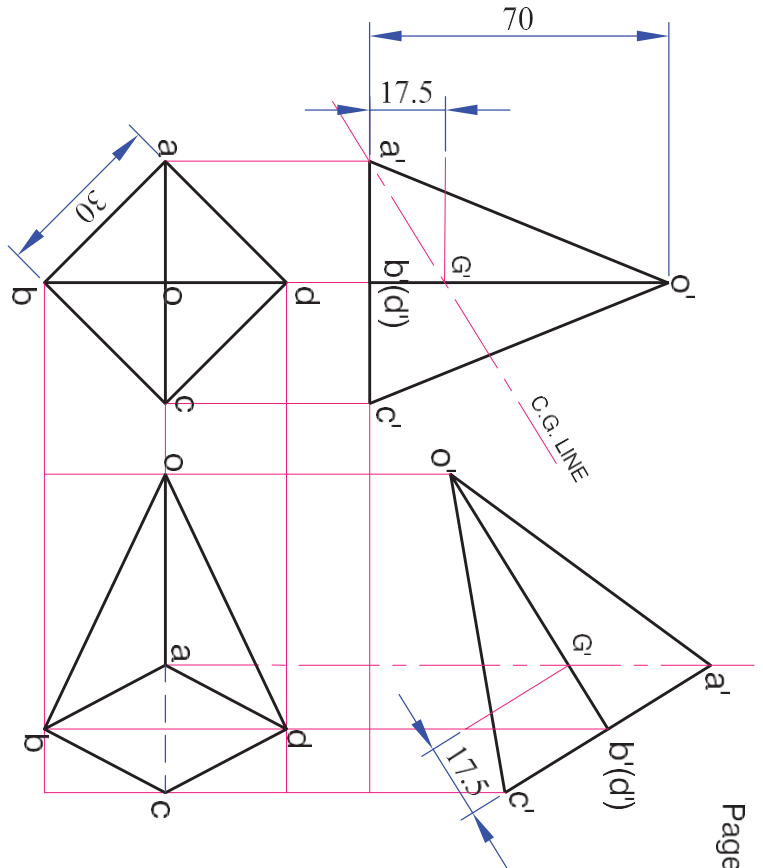
1. FREELY SUSPENDED Pentagonal Pyramid



4. FREELY SUSPENDED Cone



2. FREELY SUSPENDED Square Pyramid



1. Pentagonal , 2. Square, 3. Hexagonal Pyramid of side 30 mm and height 70 mm is suspended freely from one of its corners of the base and the Axis is Parallel to VP. Draw the projection of the Pyramid. 4. A cone of Diameter 50 mm and height 70 mm is suspended freely from one of its base points. Draw the Projection of the solid, if the axis plane is parallel to VP

21(a) A pentagonal prism of base side 30 mm and axis length 60 mm is resting on HP on one of its rectangular faces with its axis inclined at 40° to VP. Draw its projections. (b) A hexagonal Prism, side of base 25 mm and axis 60 mm long lies with one of its rectangular faces on the HP. Such that the axis is inclined at 45° to the VP. Draw its Projections.

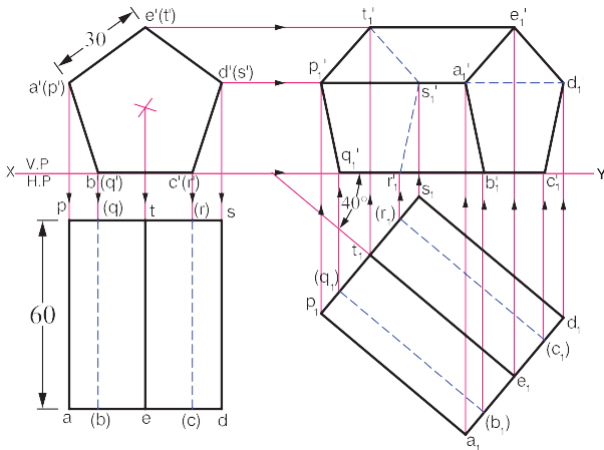
22. Draw the projections of a pentagonal prism of 30 mm side of base and 65 mm long lying on one of its longer edges on the HP with one rectangular face perpendicular to the HP such that the axis makes 60° with VP.

23. A hexagonal pyramid of base side 30 mm and axis length 60 mm is resting on HP on one of its base edges with the face containing the resting edge perpendicular to both HP and VP. Draw its Projections.

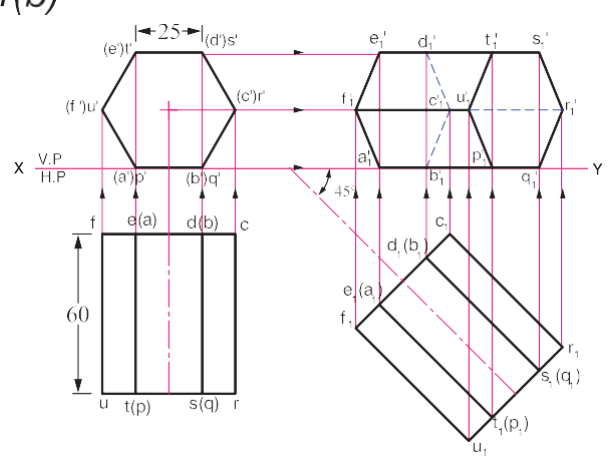
24. A pentagonal pyramid of base side 30 mm and axis length 65 mm is resting on HP one of its base corners with its axis parallel to VP. Draw the projections when the slant edge containing the resting corners vertical.

25. Draw the projections of a cone of diameter 40 mm and height 65 mm lying on the ground on one of its base points with a generator perpendicular to HP.

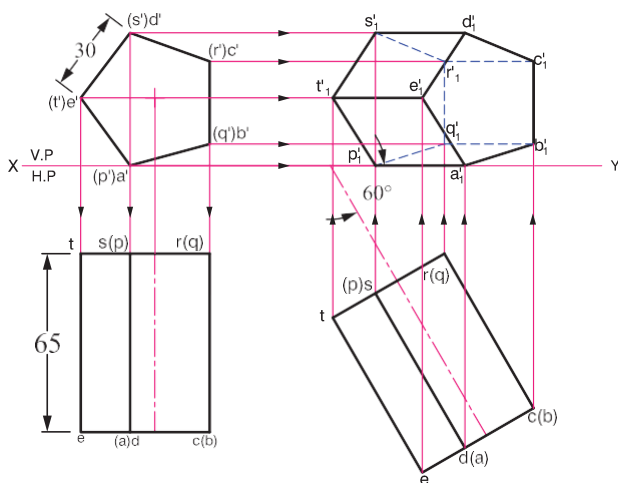
21.



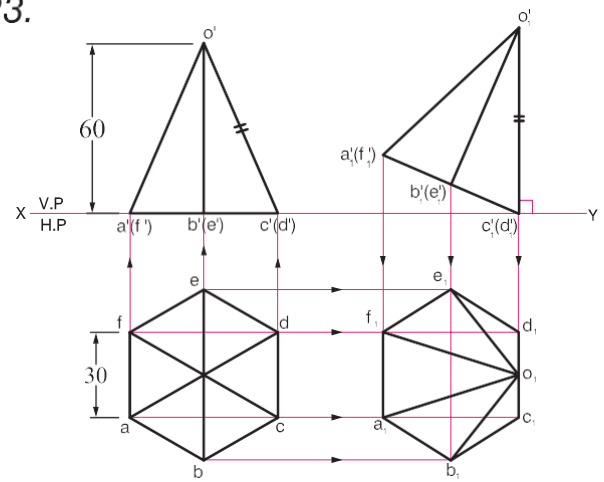
21(b)



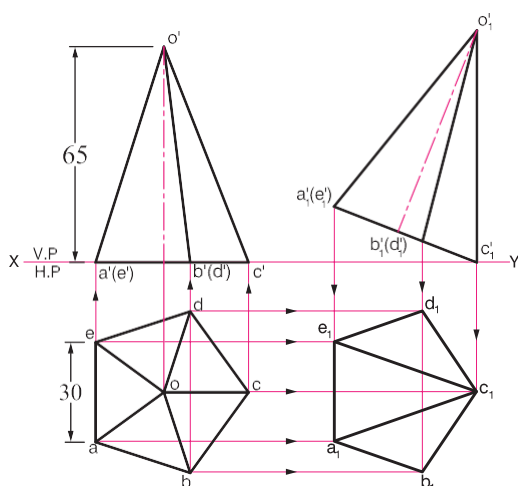
22.



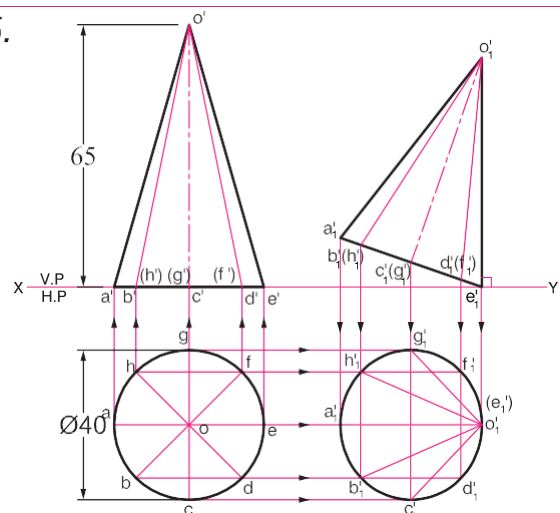
23.



24.



25.



26. A Pentagonal Prism of base side 35 mm and axis length 65 mm is resting on VP on one of its base corner with its axis is inclined at 50° to VP and parallel to HP. Draw its Projections.

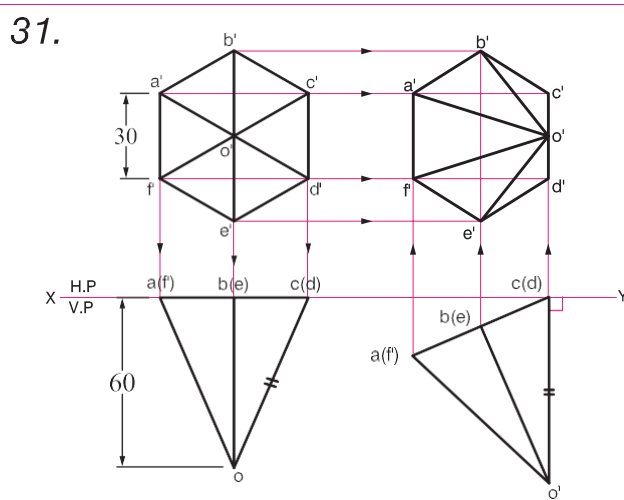
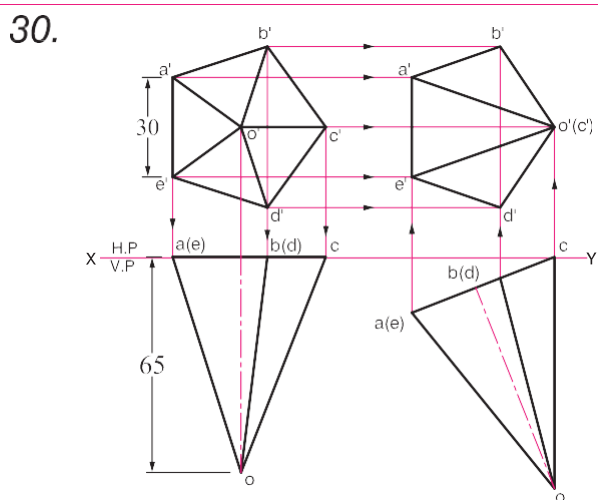
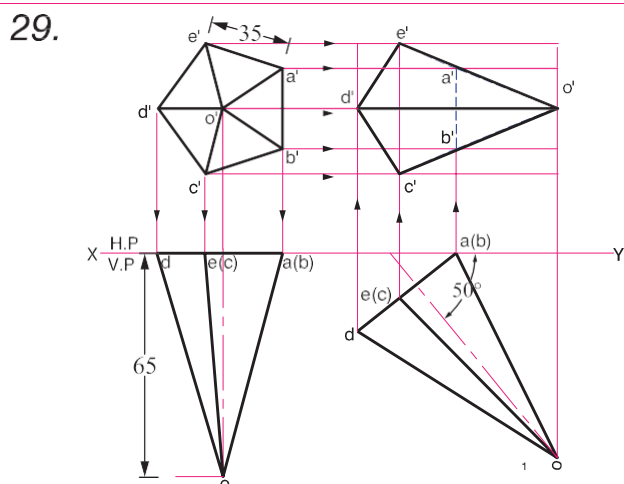
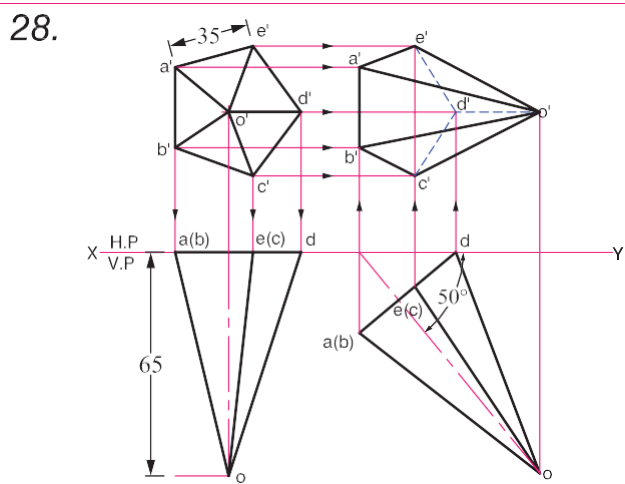
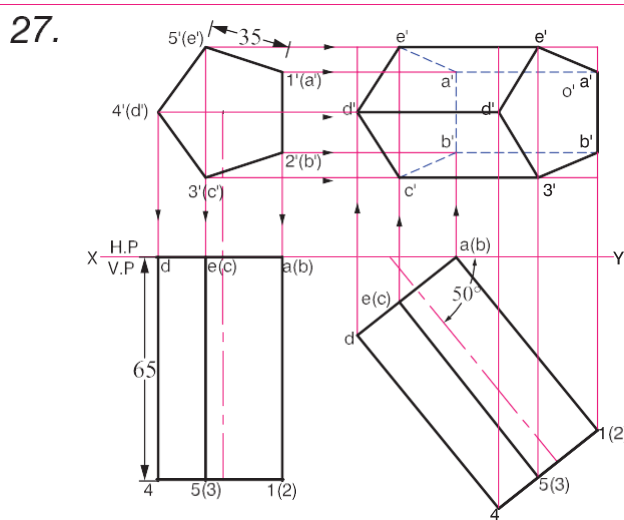
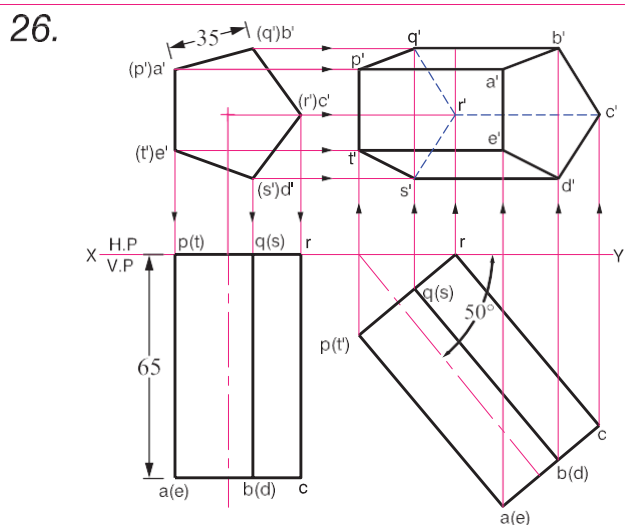
27. A Pentagonal Prism of base side 35 mm and axis length 65 mm is resting on VP on one of its base edges with its axis is inclined at 50° to VP and parallel to HP. Draw its Projections.

28. A Pentagonal Pyramid of base side 35 mm and axis length 65 mm is resting on VP on one of its base corner with its axis is inclined at 50° to VP and parallel to HP. Draw its Projections.

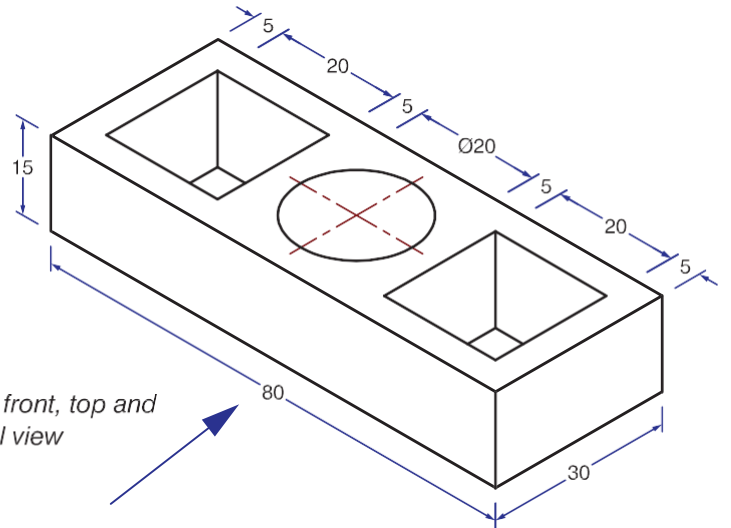
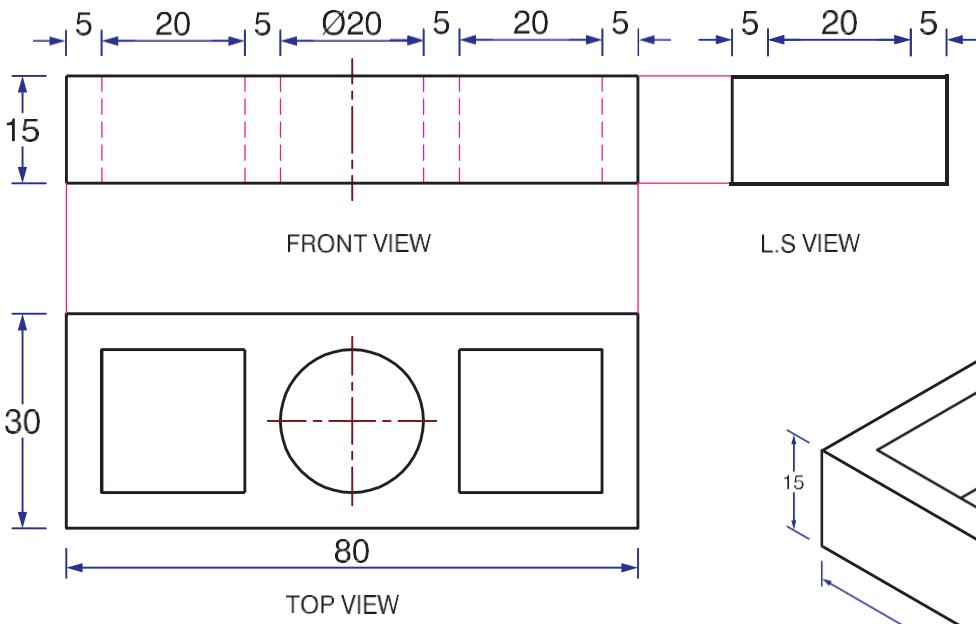
29. A Pentagonal Pyramid of base side 35 mm and axis length 65 mm is resting on VP on one of its base edges with its axis is inclined at 50° to VP and parallel to HP. Draw its Projections.

30. A pentagonal pyramid of base side 30 mm and axis length 65 mm is resting on VP with one of its base corners. Draw the projections when the slant edge containing the resting corner is vertical.

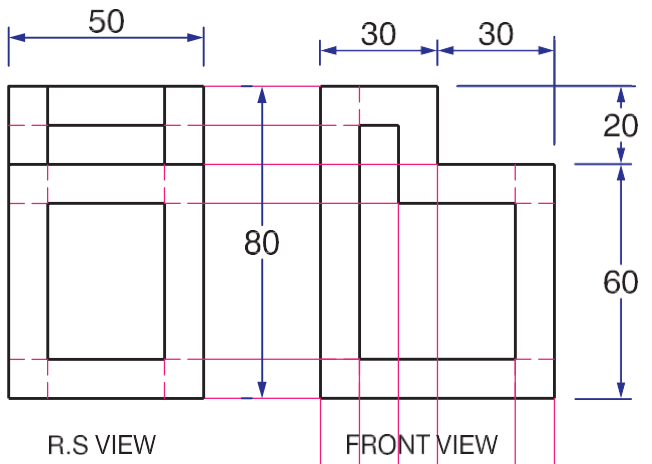
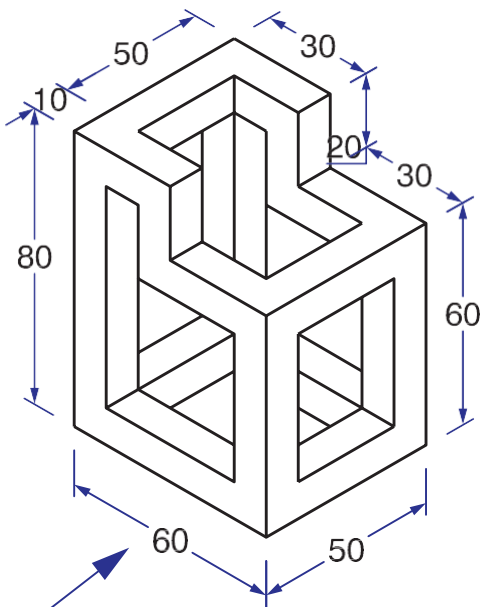
31. A hexagonal pyramid of base side 30 mm and axis length 60 mm is resting on VP on one of its base edges with the face containing the resting edge perpendicular to both HP and VP. Draw it Projections.



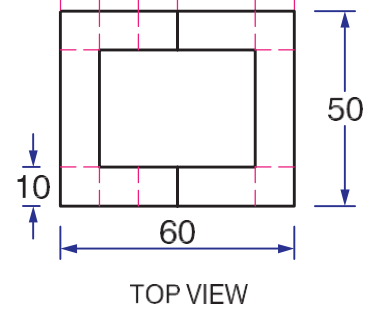
Solution:



1. Make free-hand sketches of front, top and left side views of the pictorial view shown in Fig.

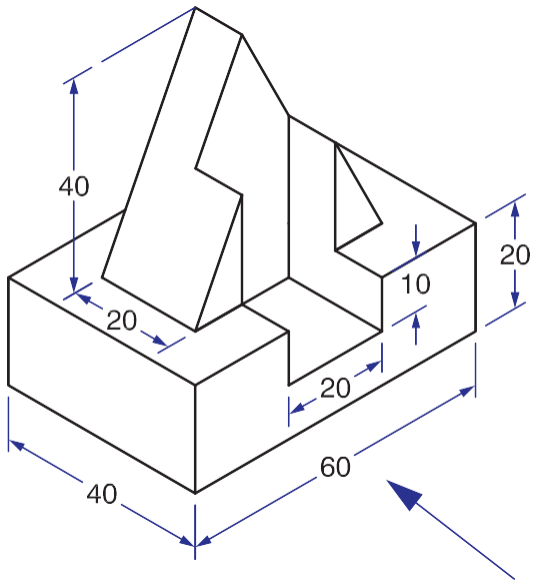


Solution:

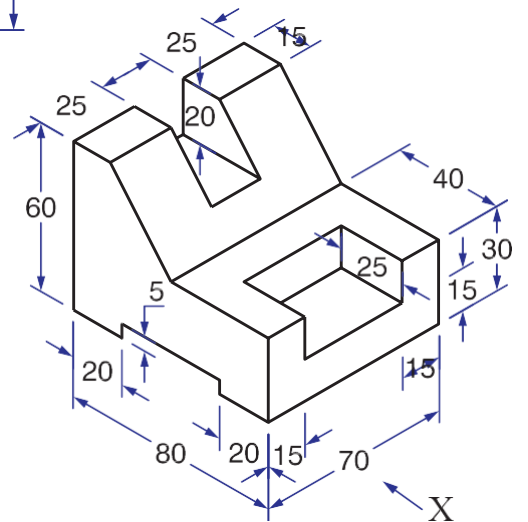
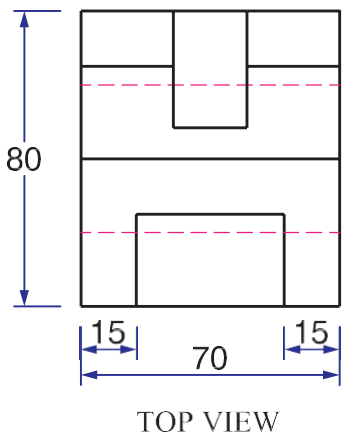
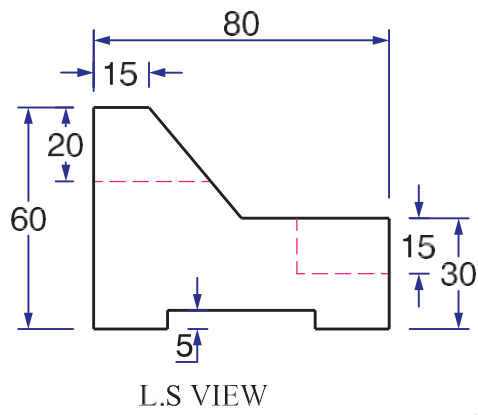
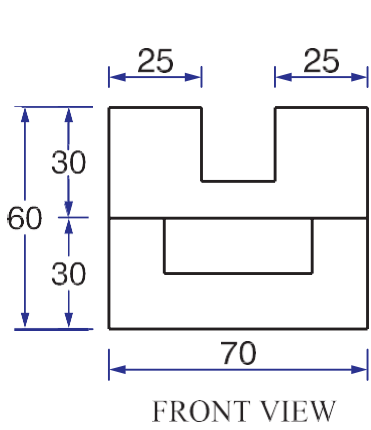
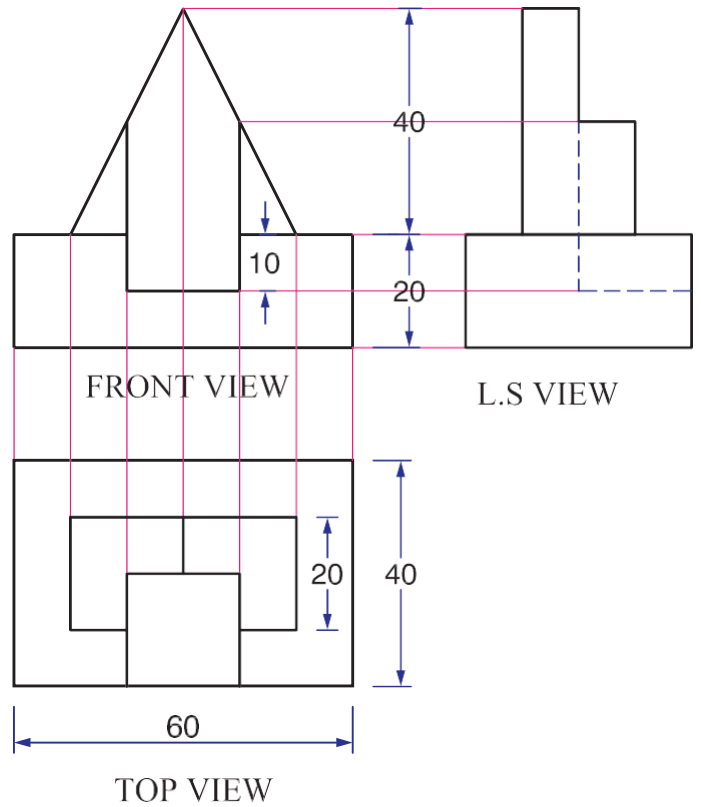


2. Make free-hand sketches of front, top and right side views of the pictorial view shown in Fig.

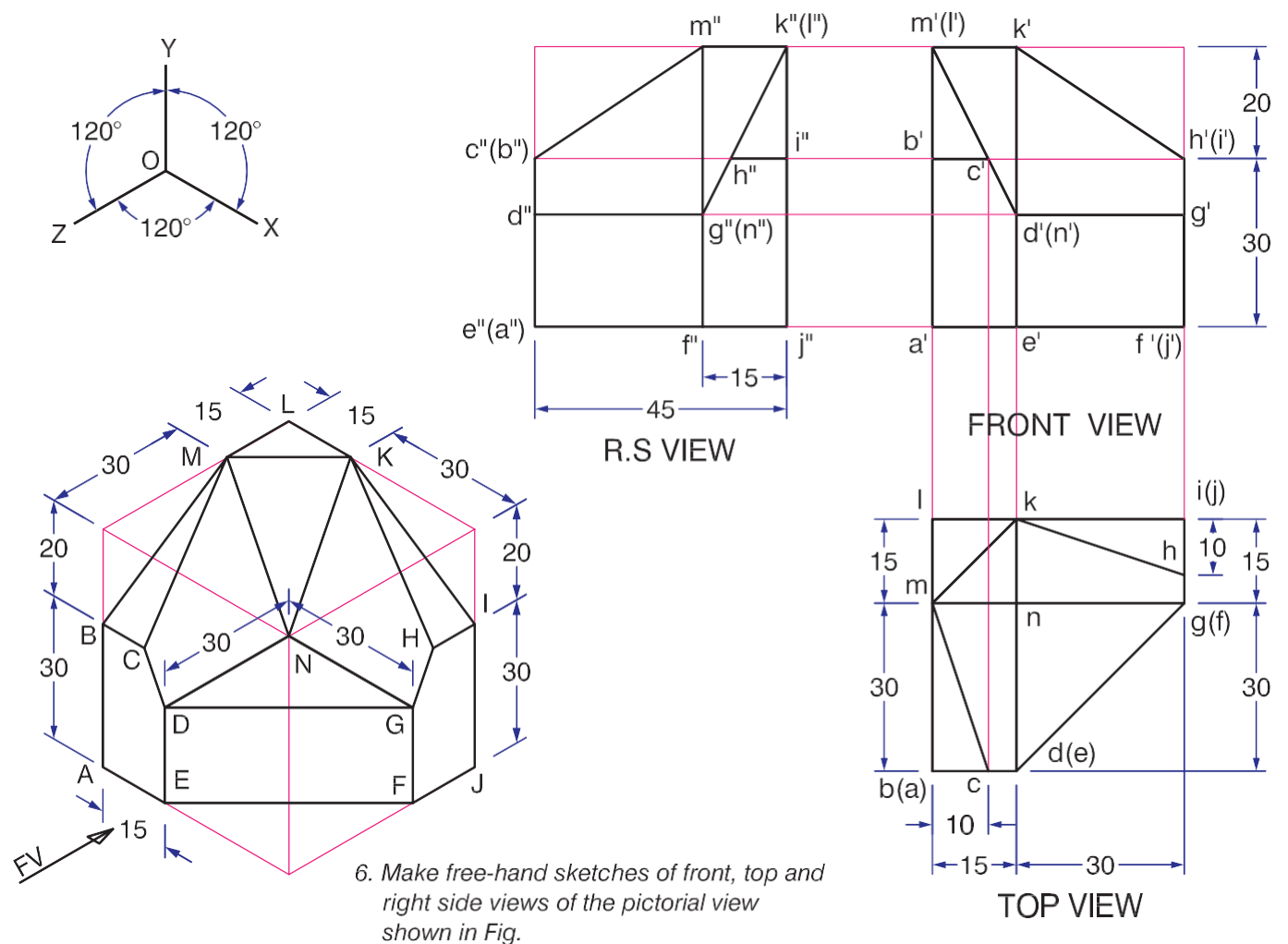
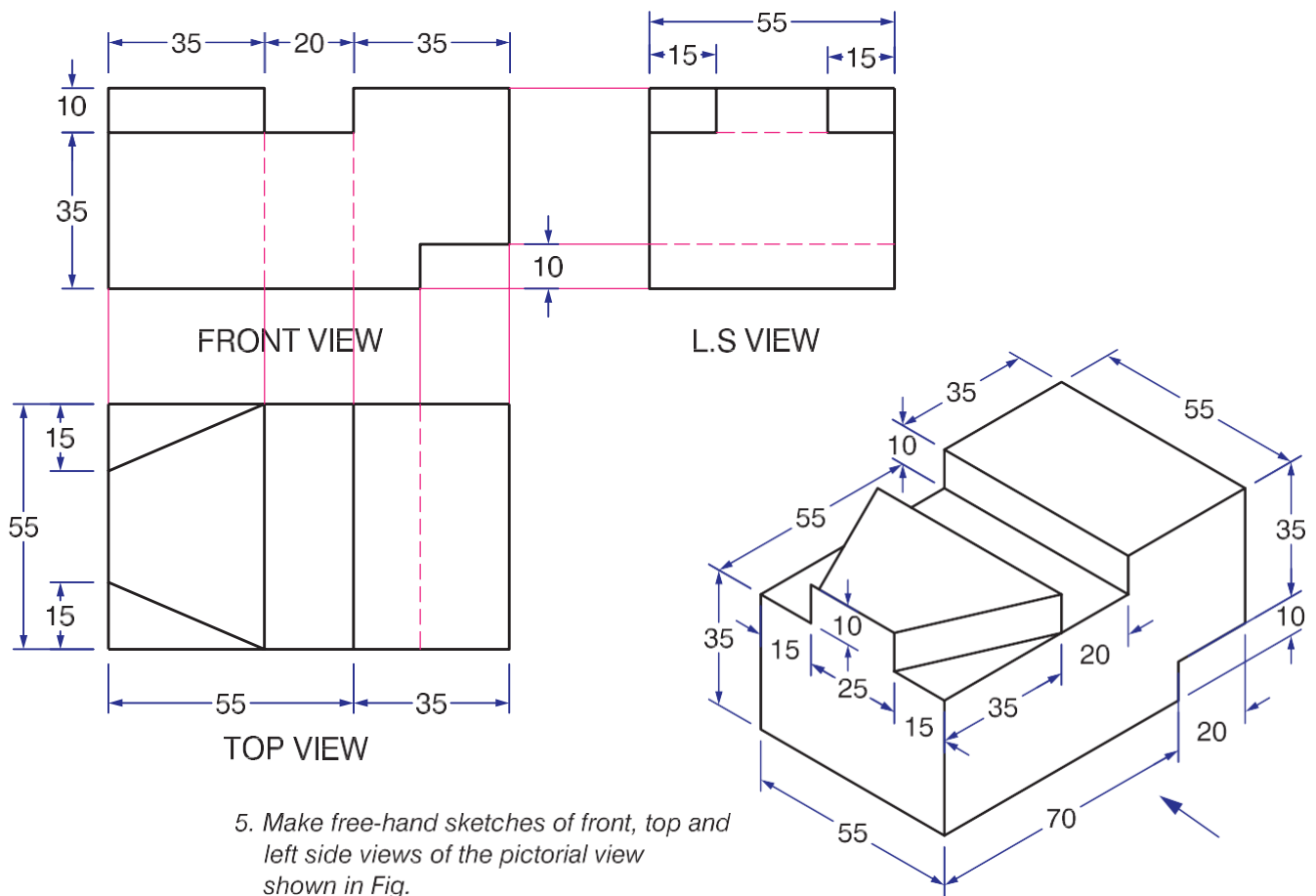
Solution :



3. Make free-hand sketches of front, top and left side views of the pictorial view shown in Fig.



4. Make free-hand sketches of front, top and left side views of the pictorial view shown in Fig.

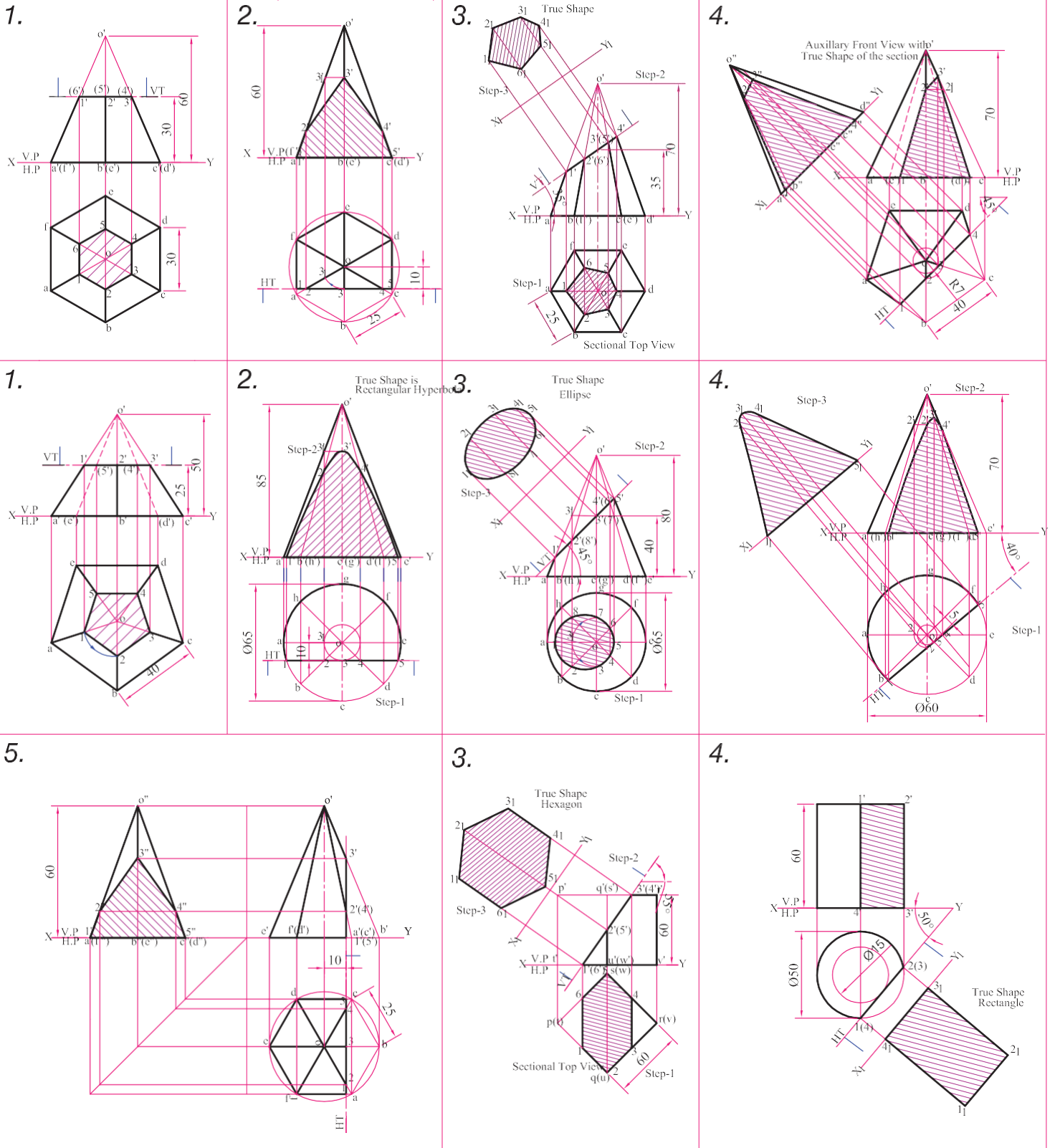


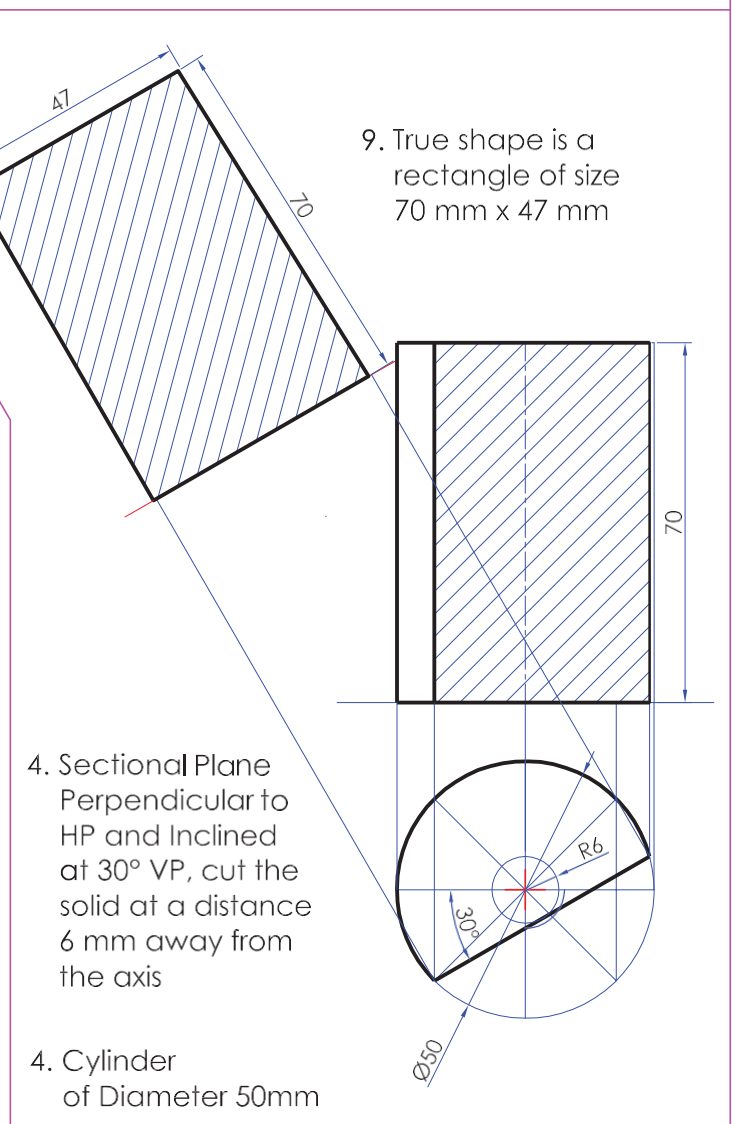
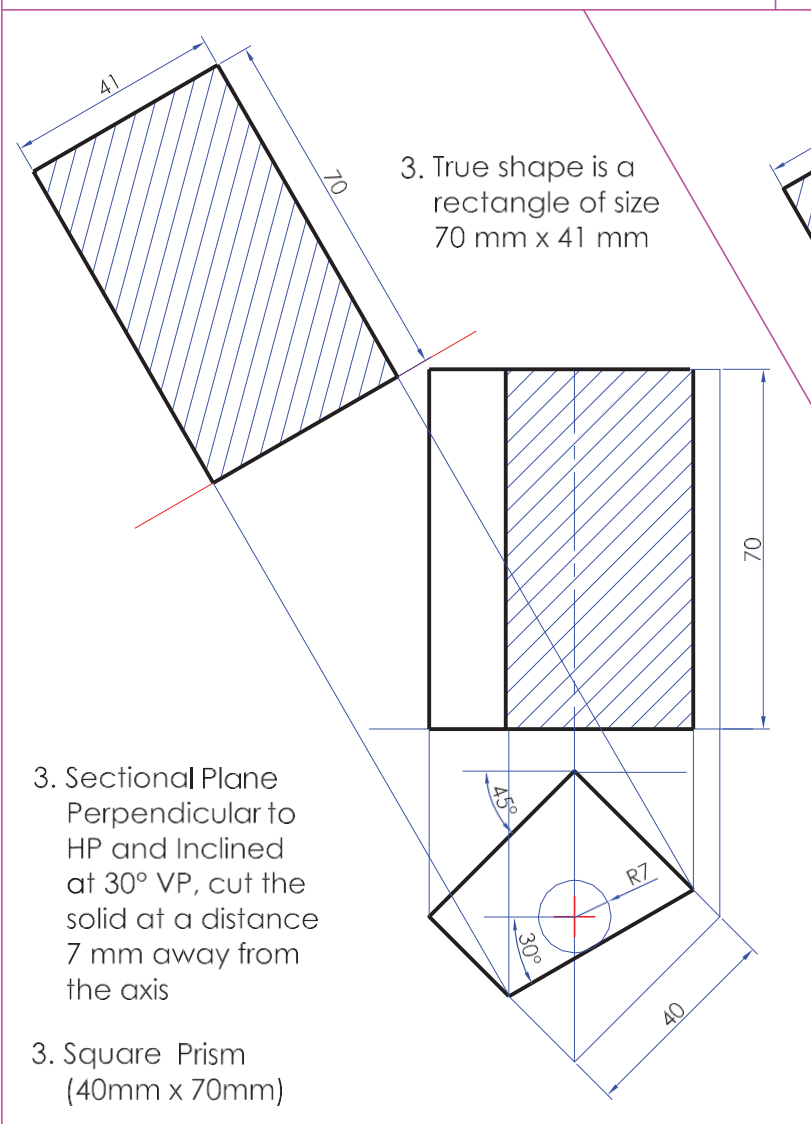
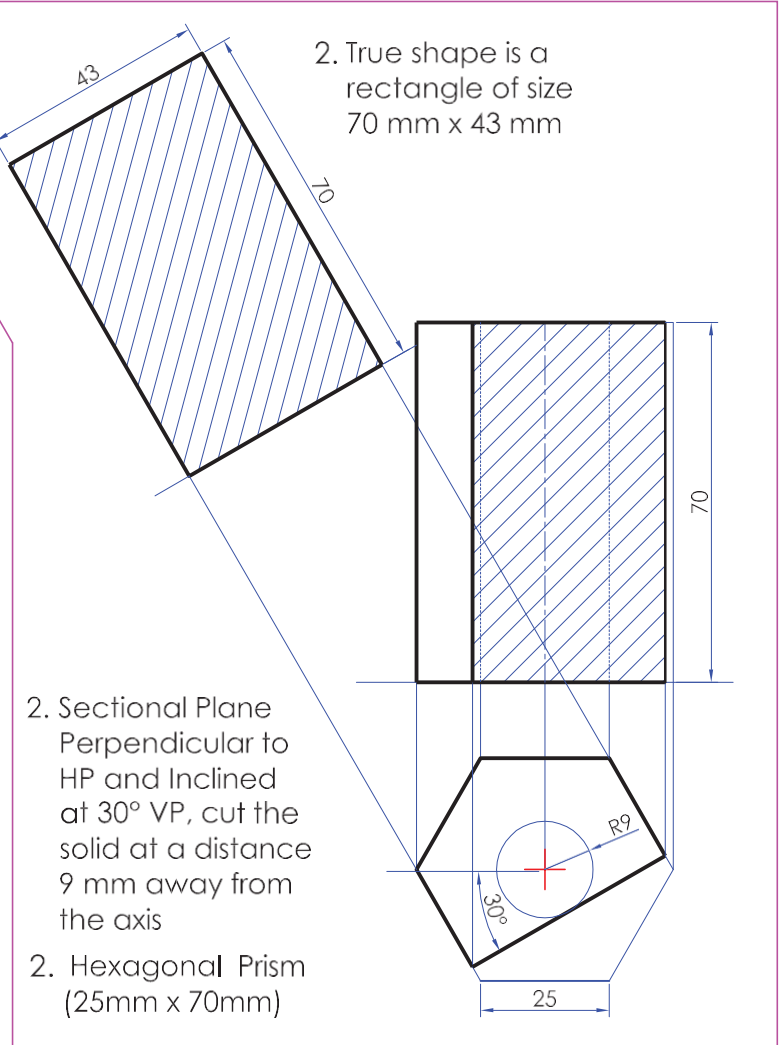
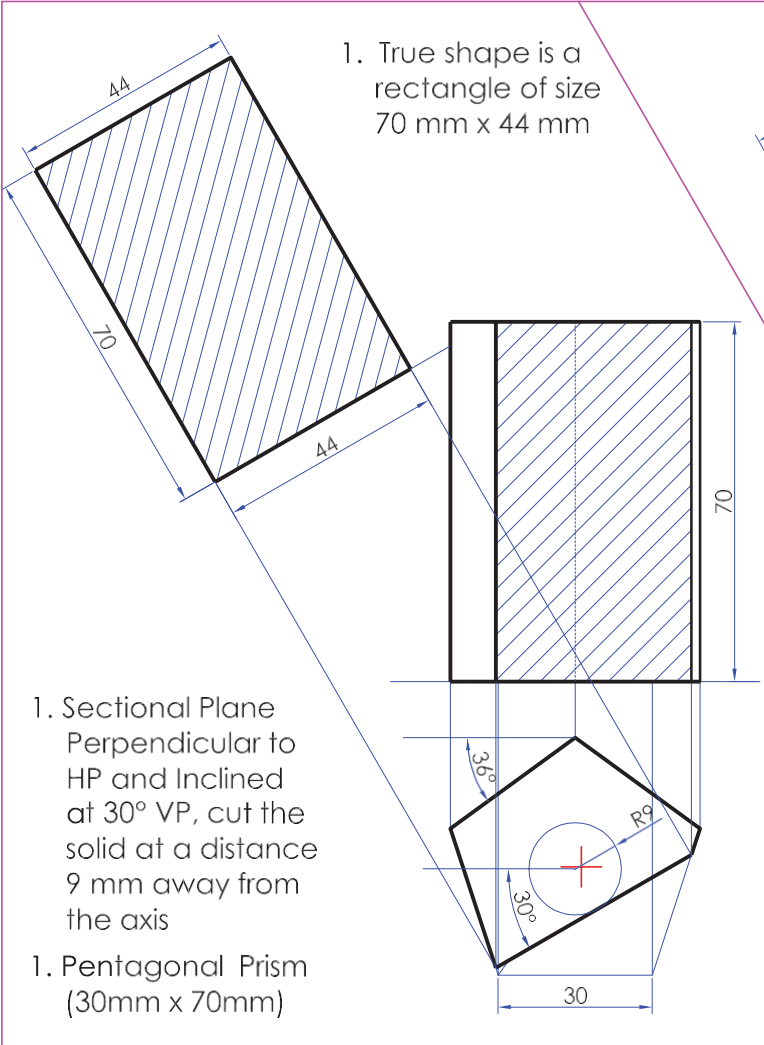
UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES :

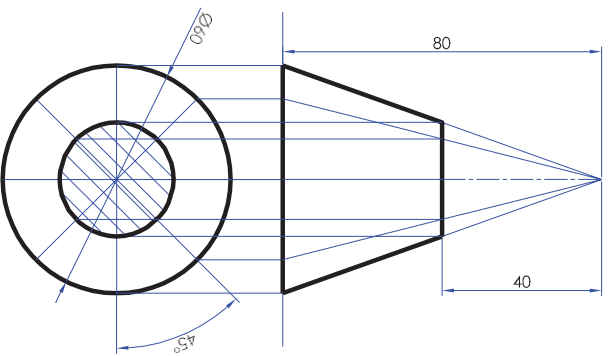
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

Different Positions of Cutting Plane:

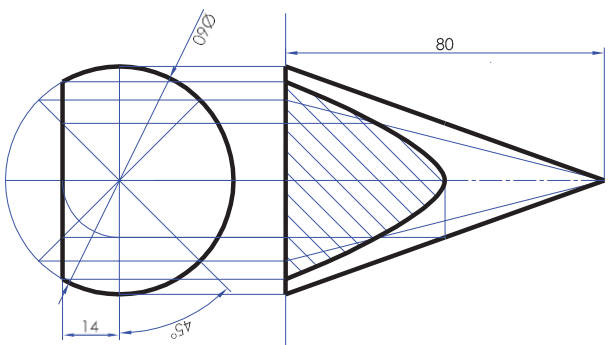
1. Cutting Plane Perpendicular to VP and Parallel to HP. (Top View is True shape of the section)
2. Cutting Plane Perpendicular to HP and Parallel to VP. (Front View is True shape of the Section)
3. Cutting Plane Perpendicular to VP and Inclined to HP. (True shape is perpendicular to the given to θ°)
4. Cutting Plane Perpendicular to HP and Inclined to VP. (True shape is perpendicular to the given to ϕ°)
5. Cutting Plane Perpendicular to both HP and VP. (Side View is True shape of the section)



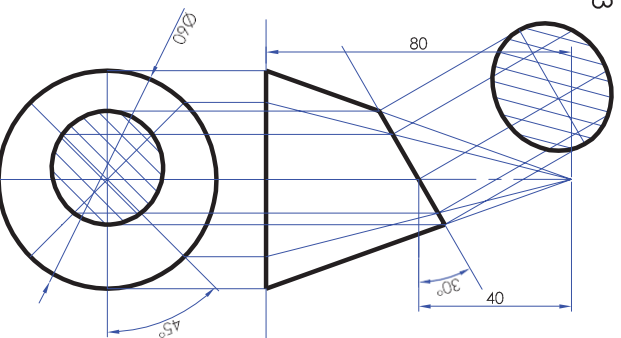




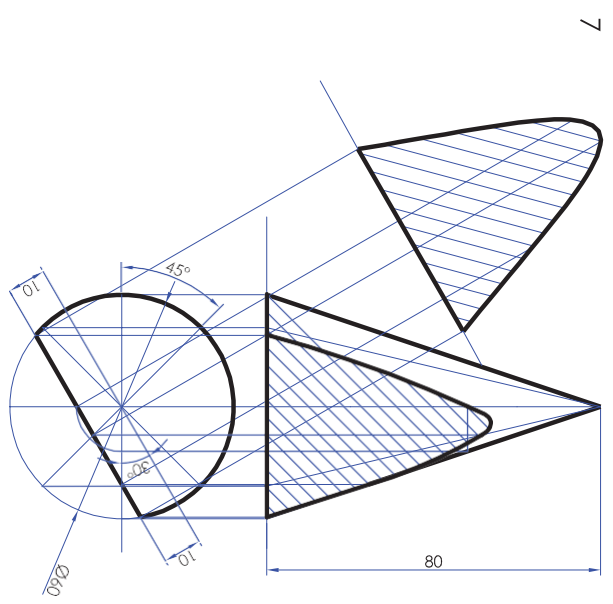
1. A cone of base diameter 60 mm axis 80 mm lies on HP with its base and a Section Plane Parallel to HP and perpendicular to VP, cuts the Axis at a Distance 40 mm from the Vertex / Base.



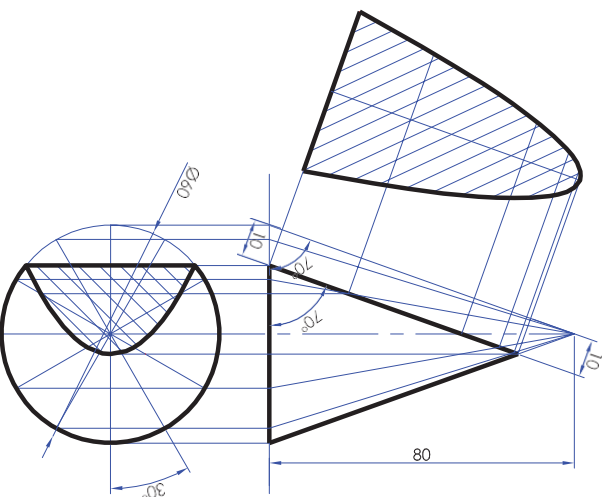
2. A cone of base diameter 60 mm axis 80 mm lies on HP with its base and a Section Plane Parallel to VP and perpendicular to HP, cuts the solid at a Distance 14 mm away from the Axis.



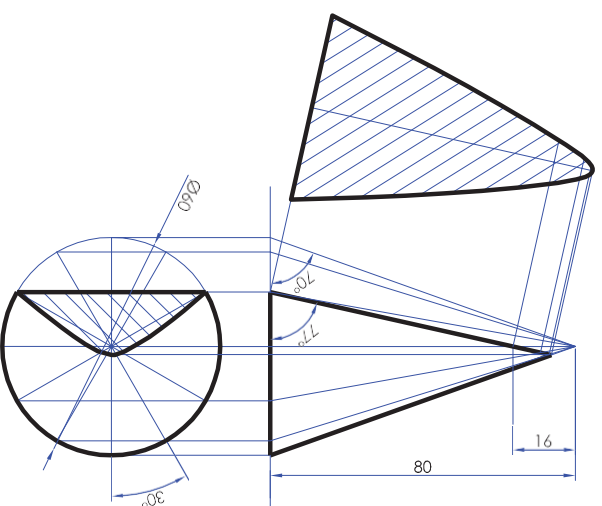
3. A cone of base diameter 60 mm, axis 80 mm lies on HP with its base and a Section Plane inclined at 30° to HP and perpendicular to VP, cuts the axis at a Distance 40 mm from the Vertex.



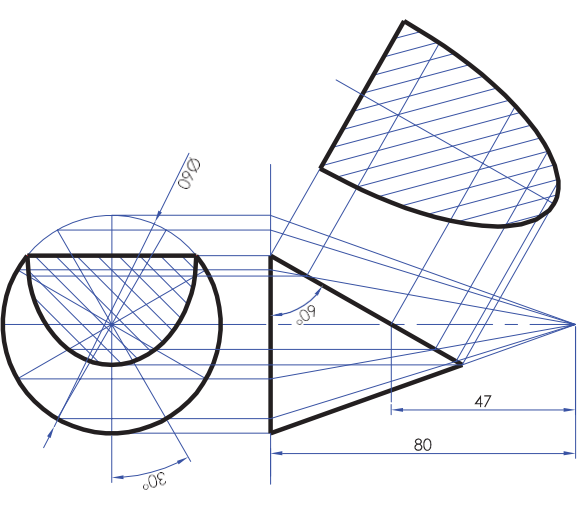
7. A cone of base diameter 60 mm axis 80 mm lies on HP with its base and a Section Plane inclined at 30° to VP and perpendicular to HP, cuts the solid at a Distance 10 mm away from the Axis. Draw the Top View, Sectional Front view and true shape of the section.



4. A cone of Base diameter 60mm axis 80 mm lies on HP with its base and it is cut by a Section Plane parallel to the extreme generator at a distance 10 mm away from it. Draw the Sectional top view, front view and true shape of the section.

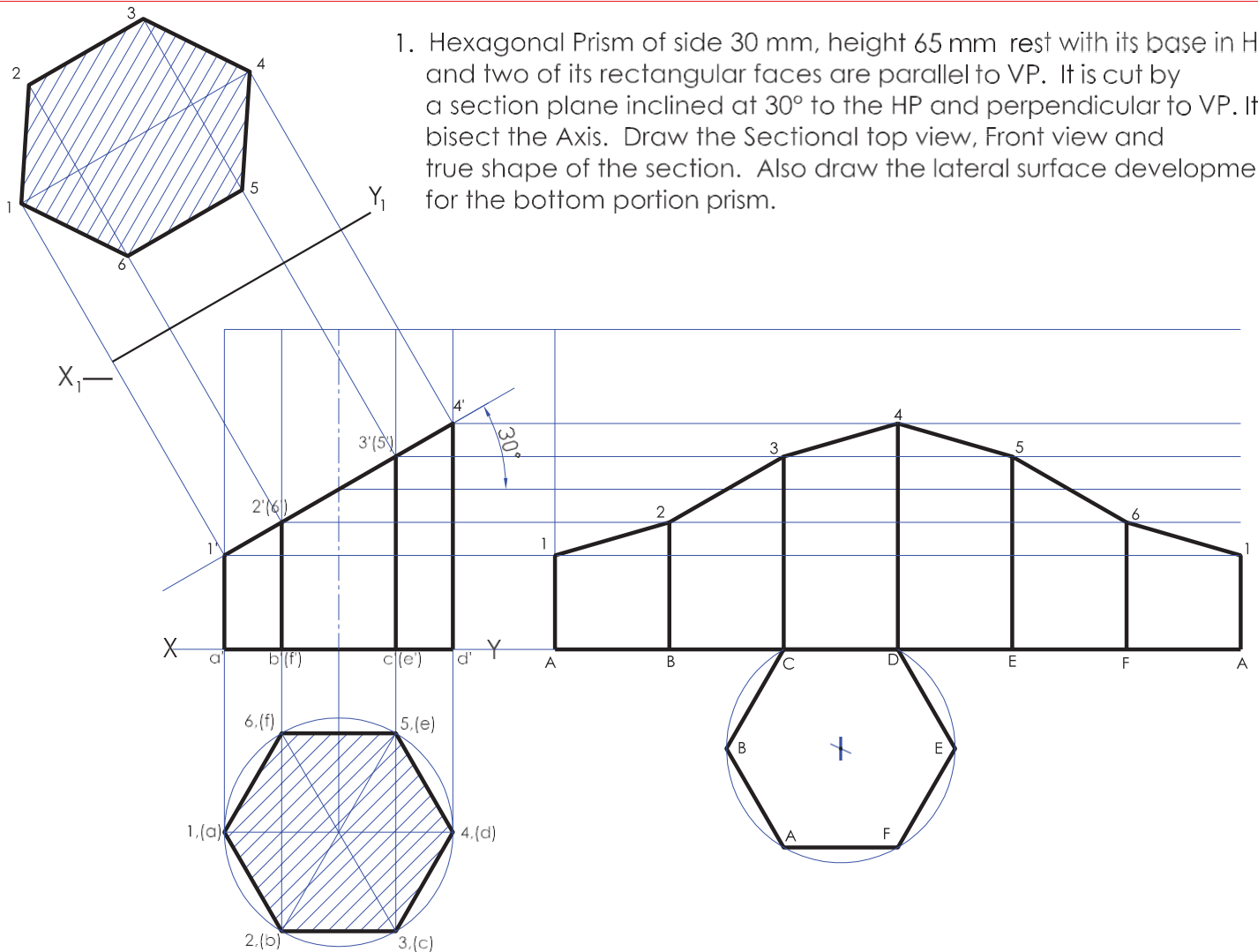


5. A cone of base diameter 60 mm axis 80 mm lies on HP with its base and a section plane inclined at 77° to HP and perpendicular to VP, cuts the axis at a Distance 16 mm from the Vertex. Draw the sectional top view, front view and true shape of the section.

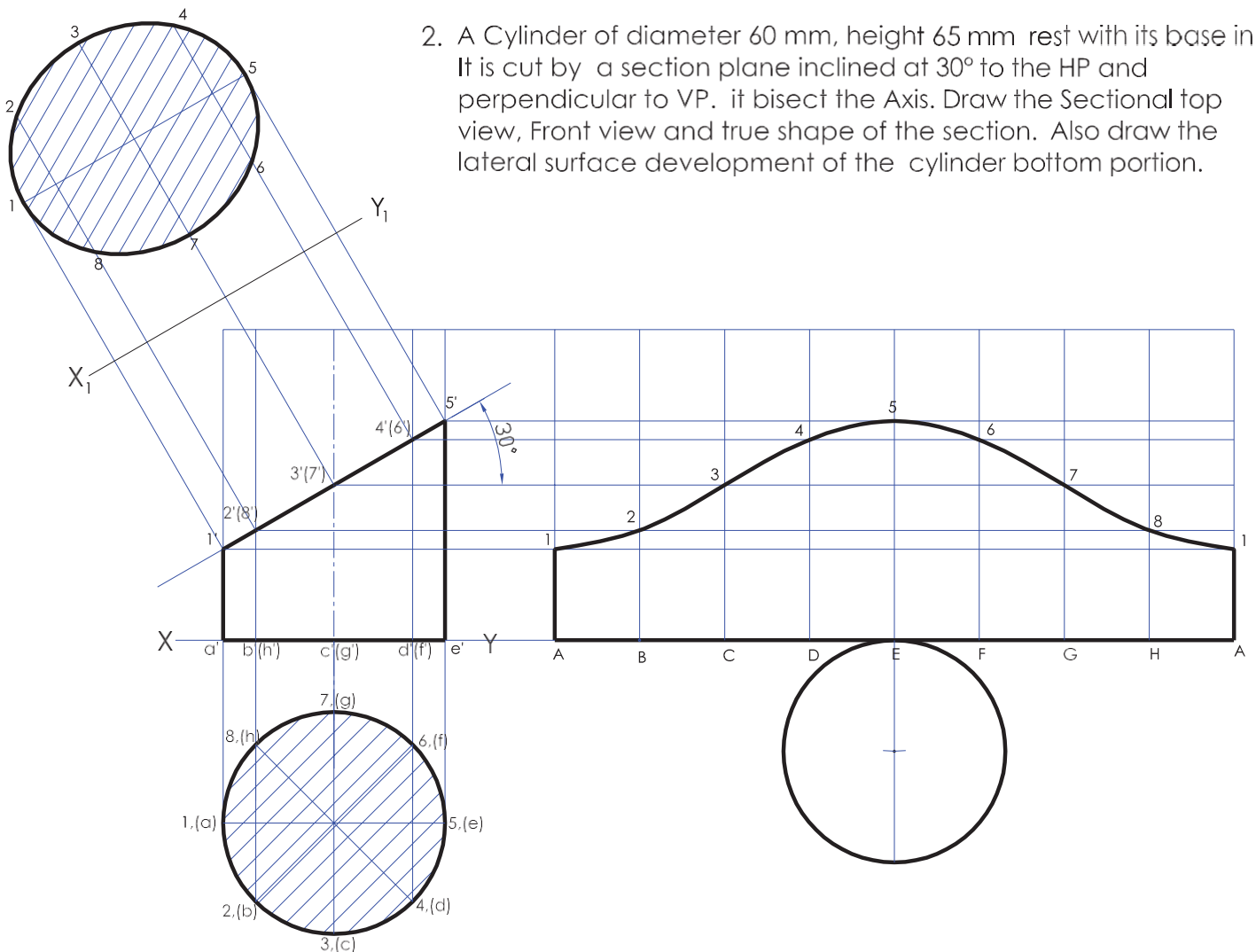


6. A cone of base diameter 60 mm axis 80 mm lies on HP with its base and a section plane inclined at 60° to HP and perpendicular to VP, cuts the axis at a Distance 47 mm from the Vertex. Draw the sectional top view, front view and true shape of the section.

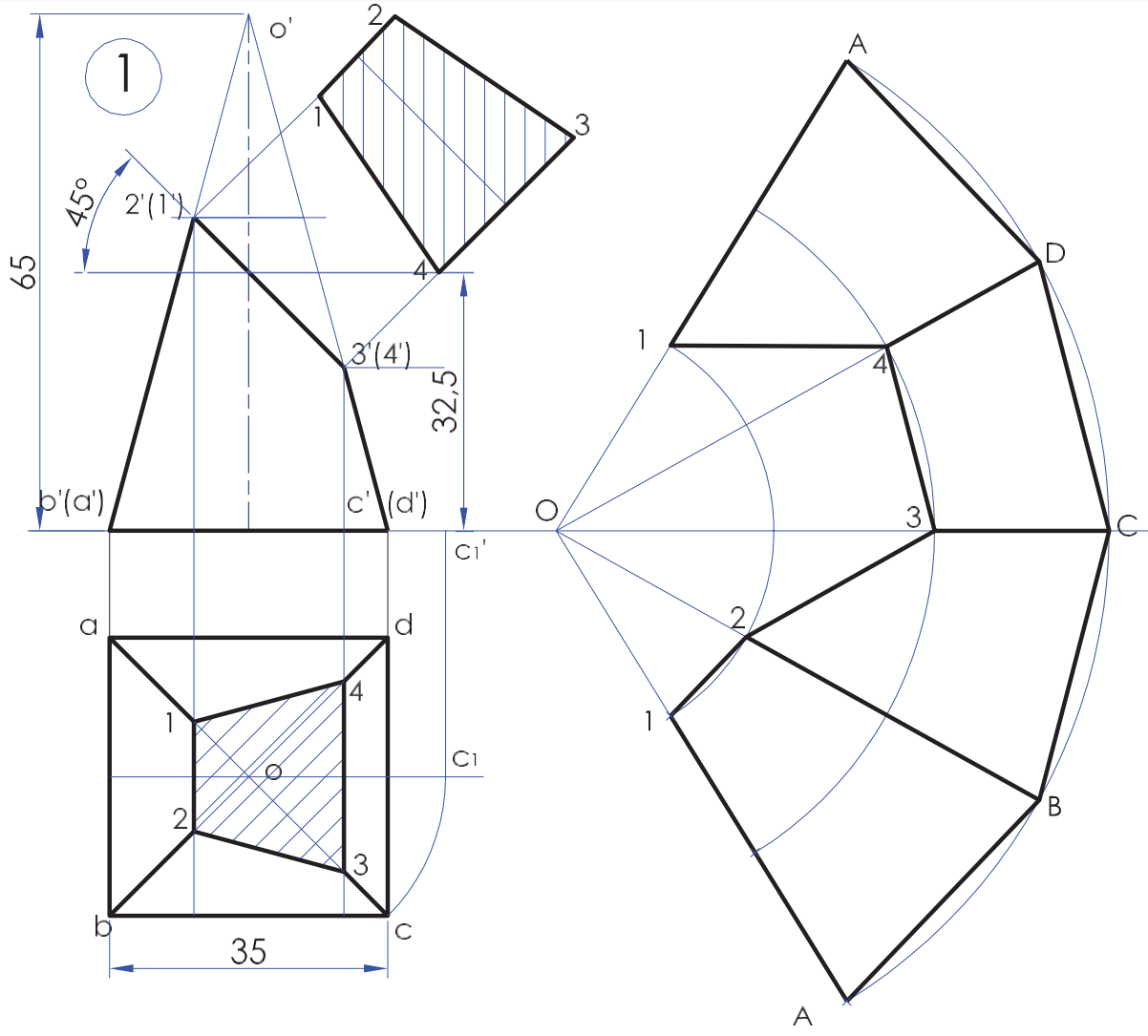
1. Hexagonal Prism of side 30 mm, height 65 mm rest with its base in HP and two of its rectangular faces are parallel to VP. It is cut by a section plane inclined at 30° to the HP and perpendicular to VP. It bisect the Axis. Draw the Sectional top view, Front view and true shape of the section. Also draw the lateral surface development for the bottom portion prism.



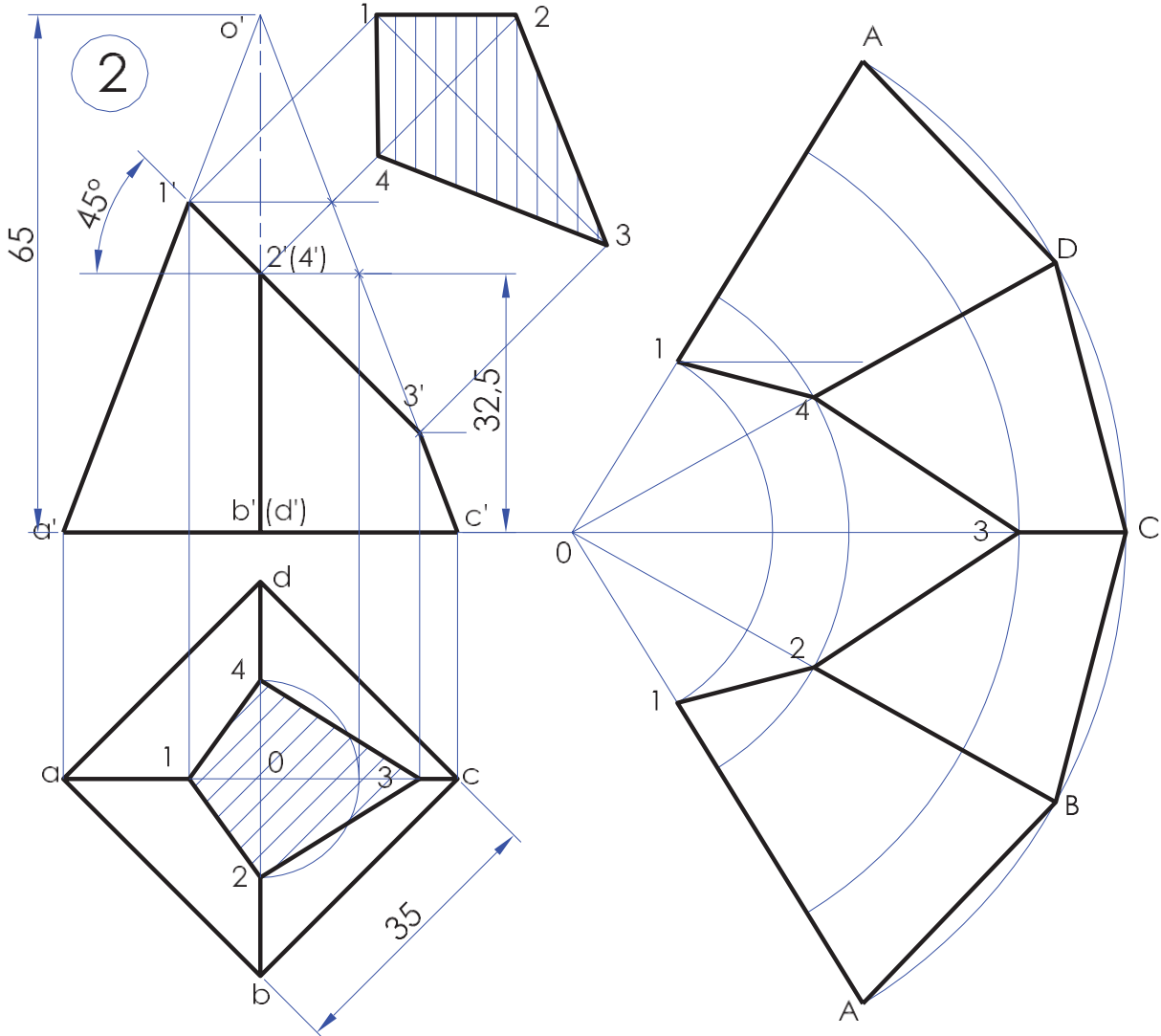
2. A Cylinder of diameter 60 mm, height 65 mm rest with its base in HP. It is cut by a section plane inclined at 30° to the HP and perpendicular to VP. it bisect the Axis. Draw the Sectional top view, Front view and true shape of the section. Also draw the lateral surface development of the cylinder bottom portion.



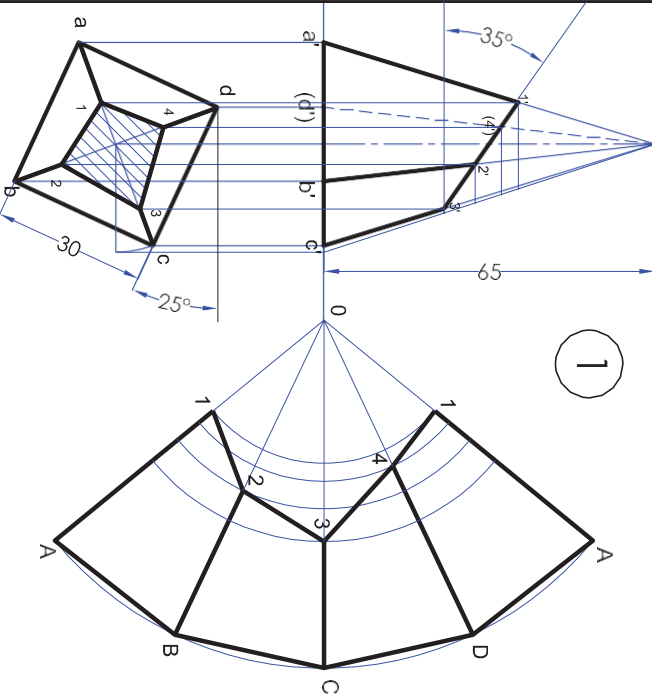
1. A square Pyramid of side 35 mm height 65 mm rests on HP with its base and one of its base edge is parallel to VP. It is cut by a sectional plane inclined at 45° to HP and perpendicular to VP, cut the solid axis at a distance 32.5 mm from the base. Draw the sectional top view, front view and lateral surface development.



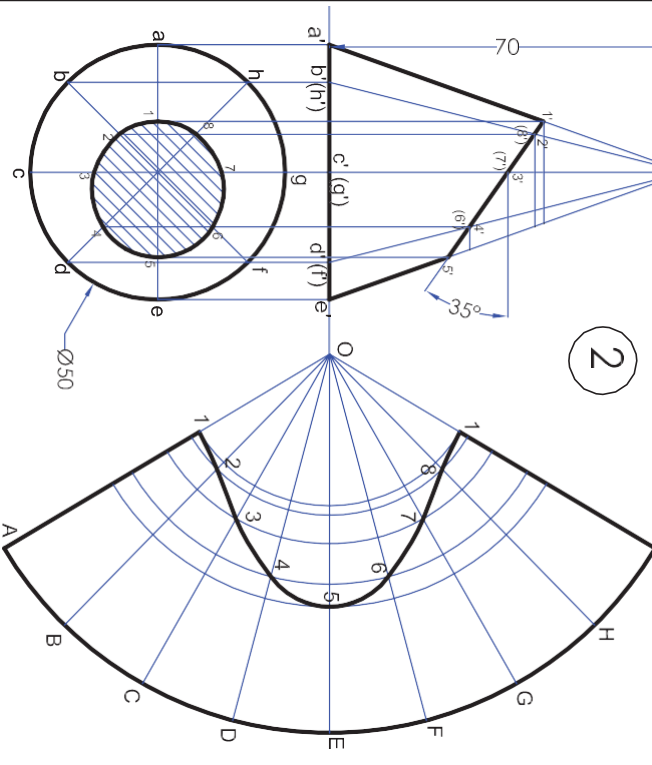
2. A square Pyramid of side 35 mm height 65 mm rests on HP with its base and two of its base edges are equally inclined to VP. It is cut by a sectional plane inclined at 45° to HP and perpendicular to VP, cut the solid axis at a distance 32.5 mm from the base. Draw the sectional top view, front view and lateral surface development.



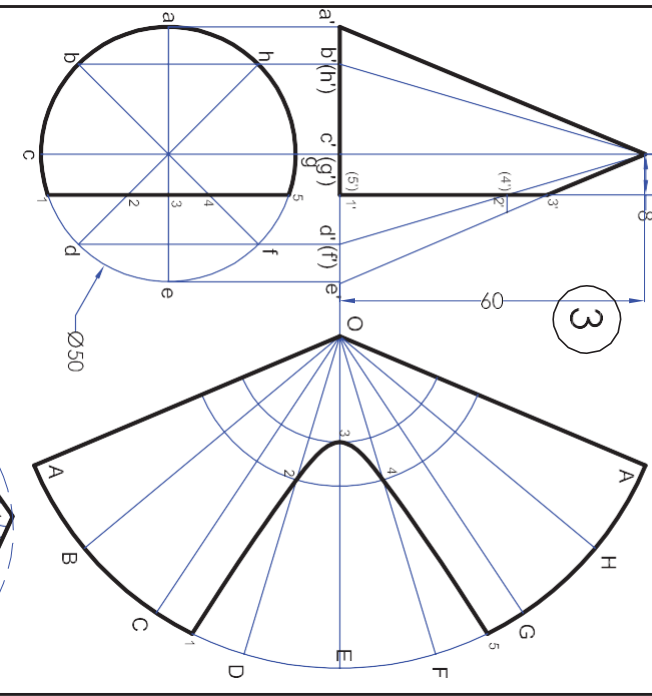
May/June 2007: A square Pyramid of base side 30 mm and altitude 65 mm is resting on HP on its base with a side of base inclined at 25° to VP. It is cut by a plane inclined at 35° to HP and perpendicular to VP and bisects the axis. Draw the development of the lower portion.



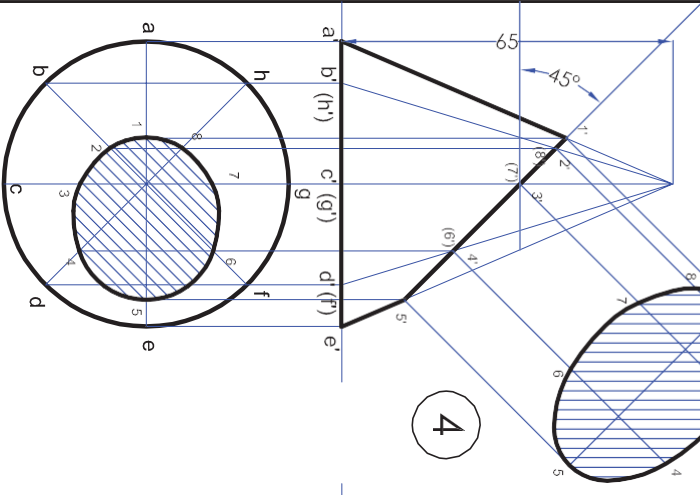
May/June 2007: A cone of base 50 mm and axis length 70 mm rests with its base on HP. A section plane perpendicular to VP and inclined at 35° to HP bisects the axis of the cone. Draw the development of the truncated cone.



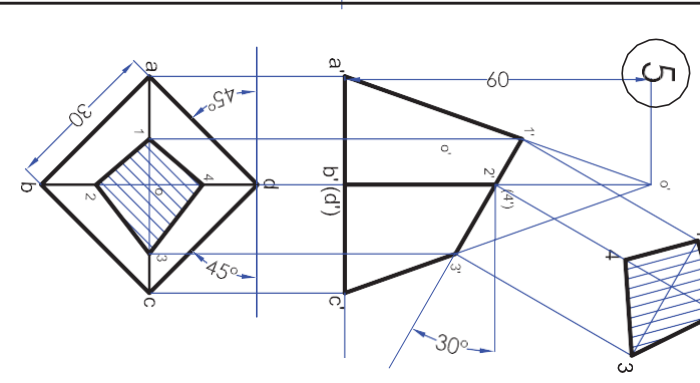
Jan 2005: A cone diameter 50 mm and axis 60 mm is resting on the HP on its base. It is cut by a section plane perpendicular to both HP and VP, 8 mm away from the axis. Draw the development of the lateral surface of the larger portion of the cone.



May/June 2007:



Jan 2005:

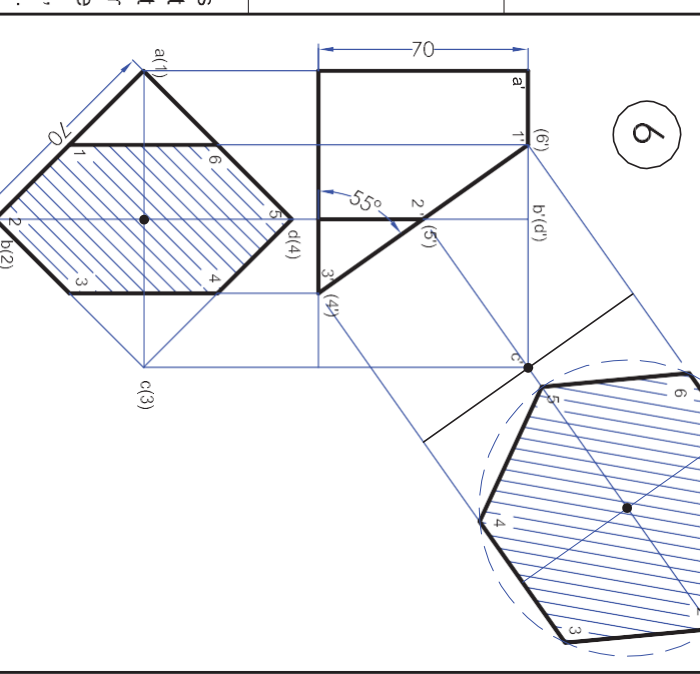


4. May/June 2007: A right circular cone diameter of base 56 mm and height 65 mm, rest on its base on HP. A section plane perpendicular to VP and inclined to HP at 45° cuts the cone meeting its axis at a distance of 36 mm from its base. Draw its front view, sectional top view and true shape of the section.

5. Jan 2005: A square Pyramid of base side 30 mm and axis 60 mm long is standing on the HP with its base edges equally inclined to VP. It is cut by a section plane perpendicular to the VP and inclined at 30° to HP, bisects the axis. Draw the sectional top view and true shape of the section, if the upper portion is removed.

6. JAN-2009 : A cube of 70 mm long edges has its vertical faces equally inclined to VP. It is cut by an auxiliary inclined plane in such a way that the true shape of the cut part is a regular hexagon. Determine the inclination of the cutting plane with the HP. Draw front view, sectional top view and true shape of the section.

Jan 2009:



UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

Isometric axes : The three lines meeting at the point and making 120° angles with each other is called isometric axes.

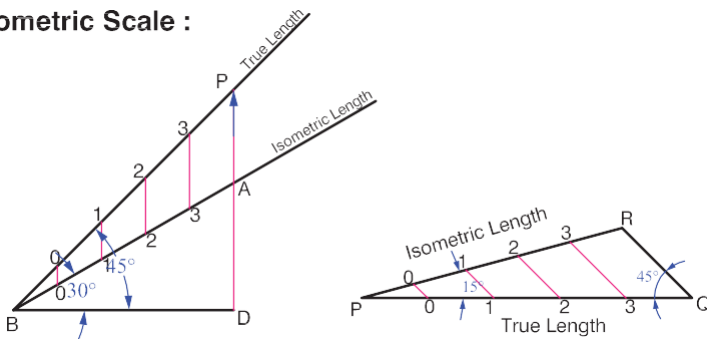
Isometric lines : All lines parallel to these axes are called isometric lines.

Isometric planes: The planes formed by isometric axes and the parallel planes are called isometric planes.

Isometric Scale : A correct isometric projection is drawn with the use of a special isometric scale. The conversion of true length into isometric length is called isometric scale.

Ratio of Isometric length to True length : $\text{Isometric length} / \text{True length} = 0.82$

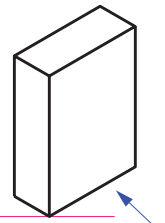
Isometric Scale :



Orthographic Projections (a)

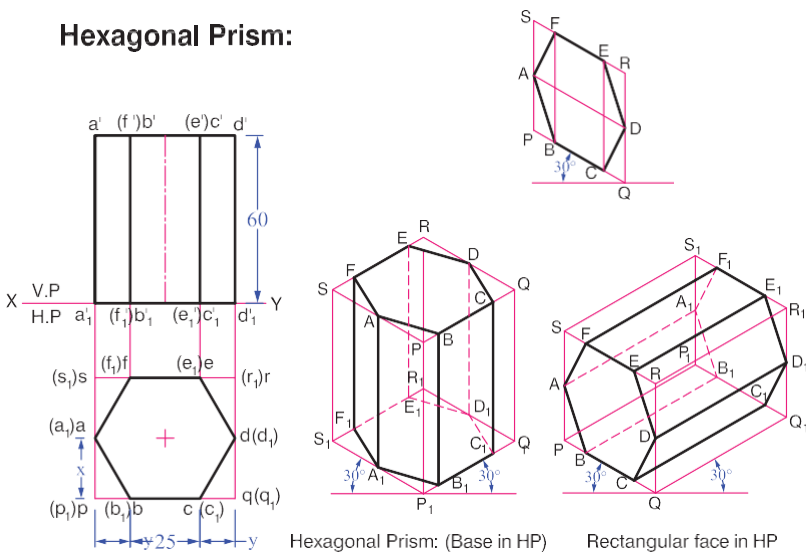


Isometric Projections (b)

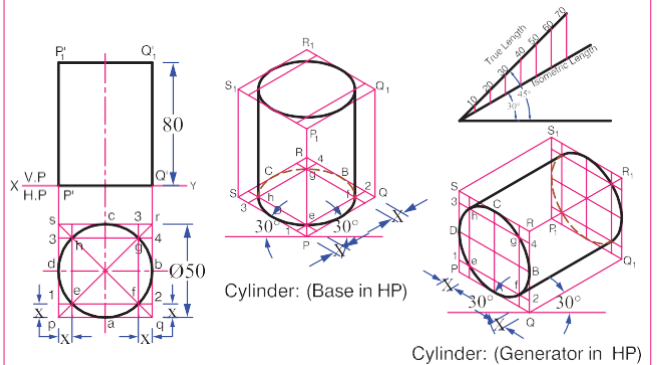


Isometric View (c)

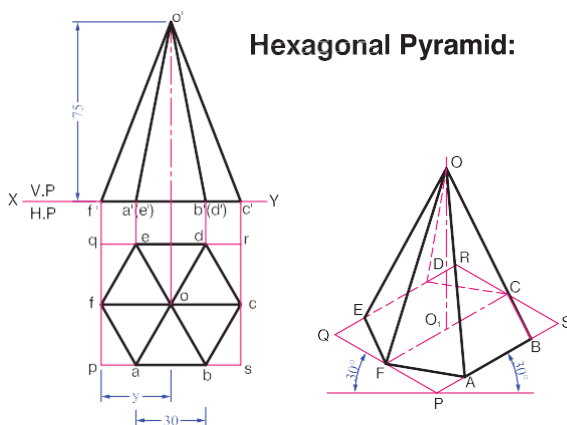
Hexagonal Prism:



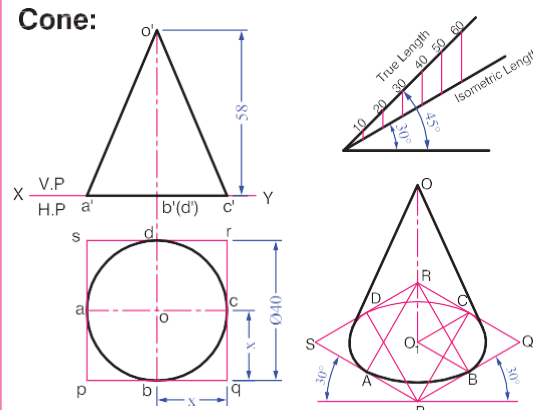
Cylinder :



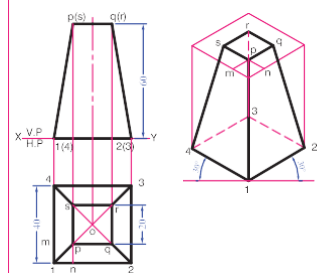
Hexagonal Pyramid:

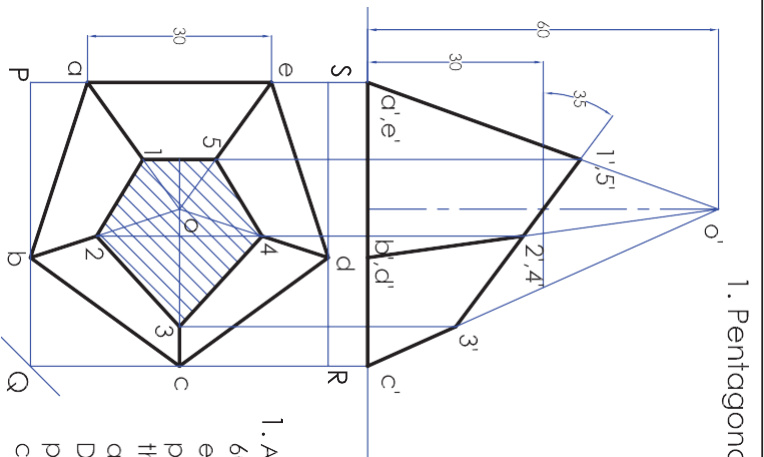


Cone:



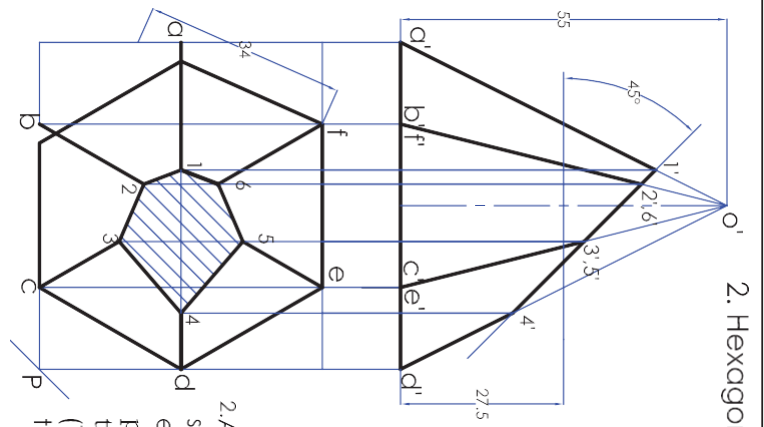
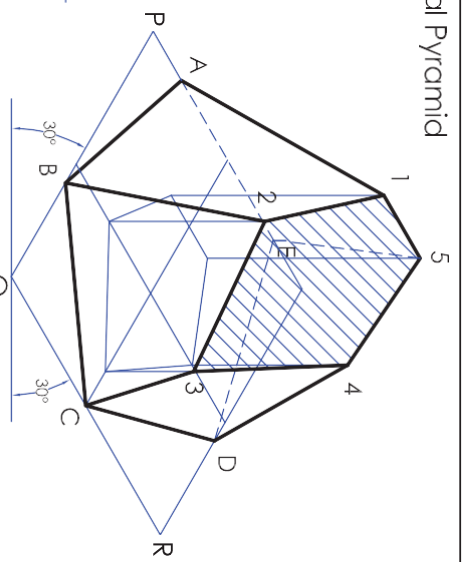
Frustum of a Square Pyramid:





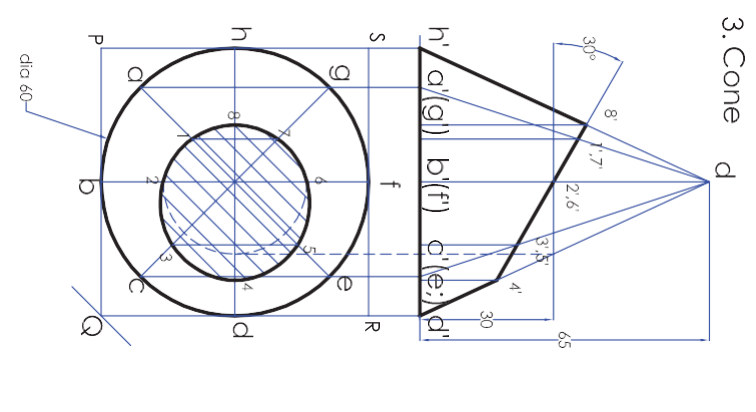
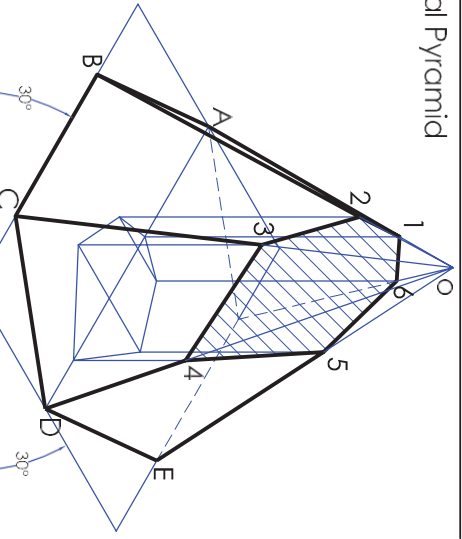
1. Pentagonal Pyramid

1. A Pentagonal pyramid of side 30mm height 60mm stands on H.P with its base and left base edge is perpendicular to VP. A section plane perpendicular to V.P., inclined at 35° to H.P., cuts the pyramid and passes through a point on the axis at a height of 30 mm above the base. Draw the isometric view of the truncated portion of the pyramid when the cut surface is clearly visible to the observer.



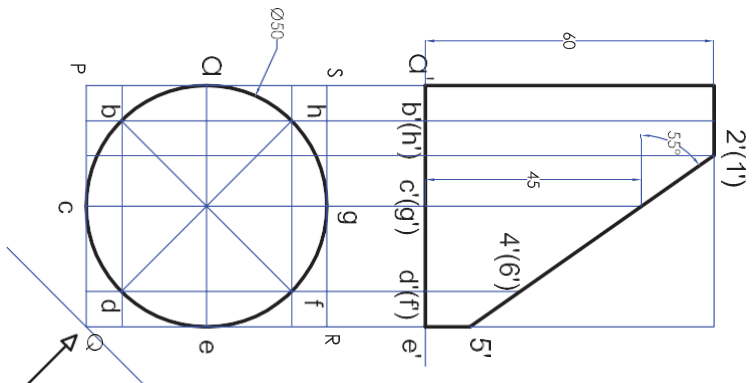
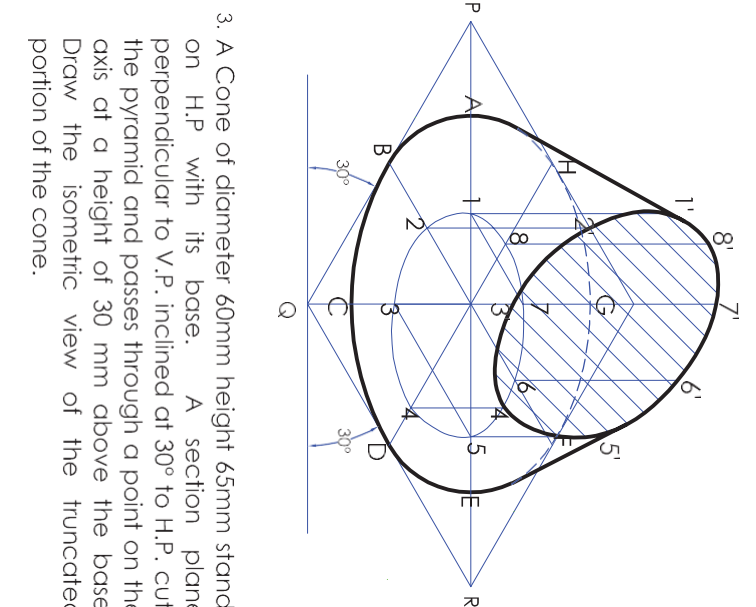
2. Hexagonal Pyramid

2. A Hexagonal pyramid of side 28mm height 55mm stands on H.P with its base and two of its base edges are parallel to VP. It is cut by a sectional plane inclined at 45° to HP and perpendicular to V.P., and meeting the axis at the midpoint (bisecting the axis). Draw the isometric view of the truncated portion of the pyramid.



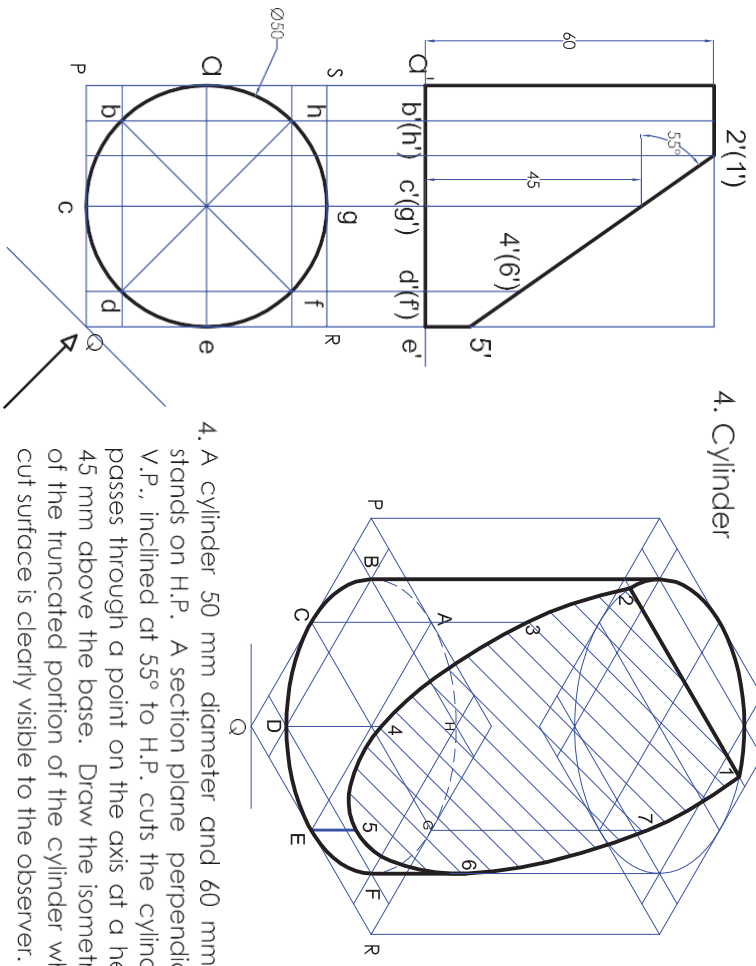
3. Cone

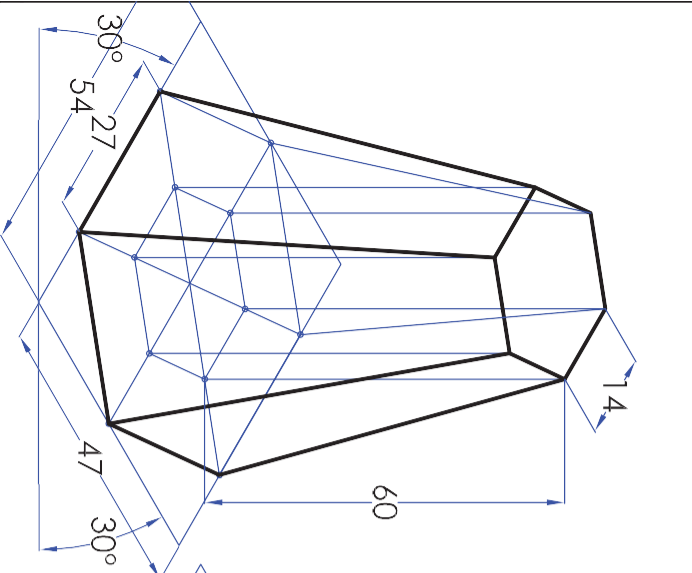
3. A Cone of diameter 60mm height 65mm stands on H.P with its base. A section plane perpendicular to V.P., inclined at 30° to H.P., cuts the pyramid and passes through a point on the axis at a height of 30 mm above the base. Draw the isometric view of the truncated portion of the cone.



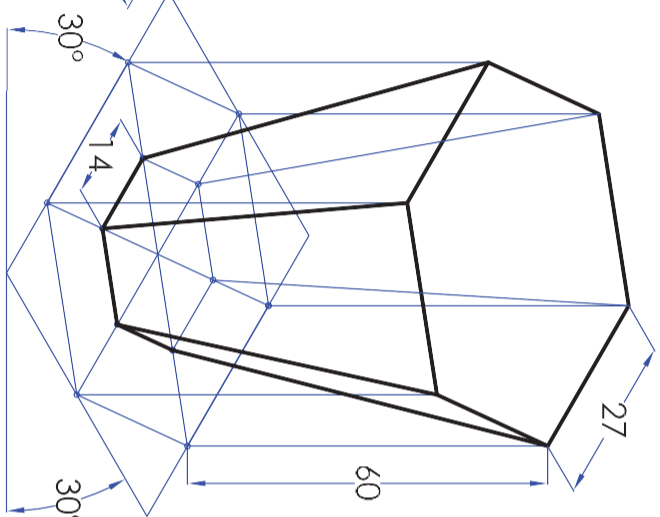
4. Cylinder

4. A cylinder 50 mm diameter and 60 mm height stands on H.P. A section plane perpendicular to V.P., inclined at 55° to H.P., cuts the cylinder and passes through a point on the axis at a height of 45 mm above the base. Draw the isometric view of the truncated portion of the cylinder when the cut surface is clearly visible to the observer.

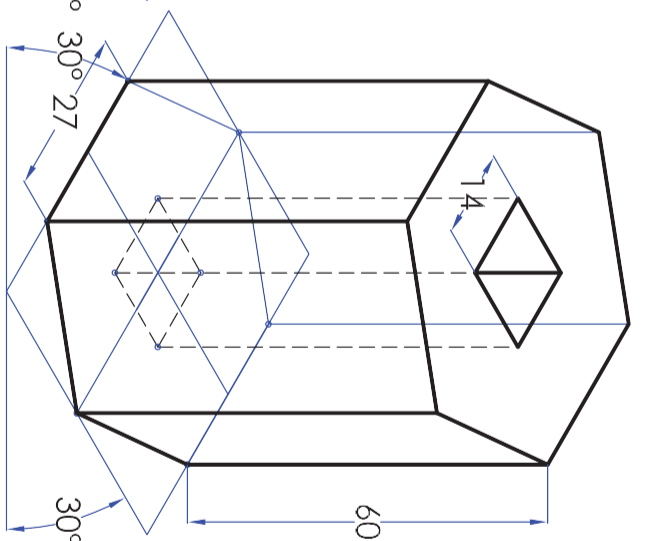




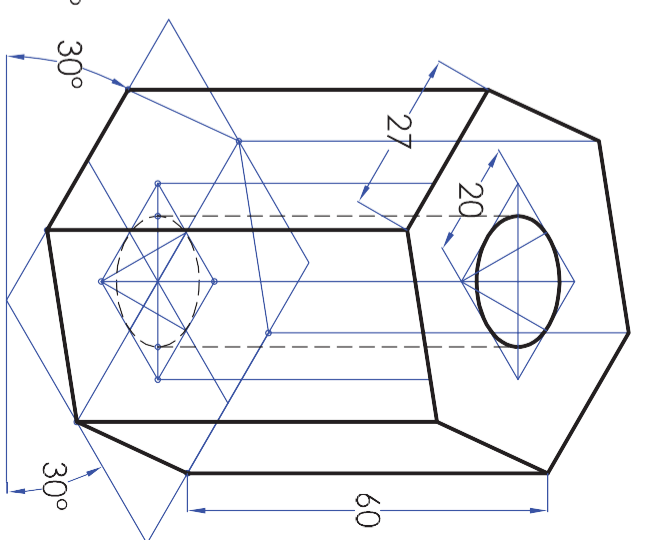
1 FRUSTUM of a hexagonal Pyramid



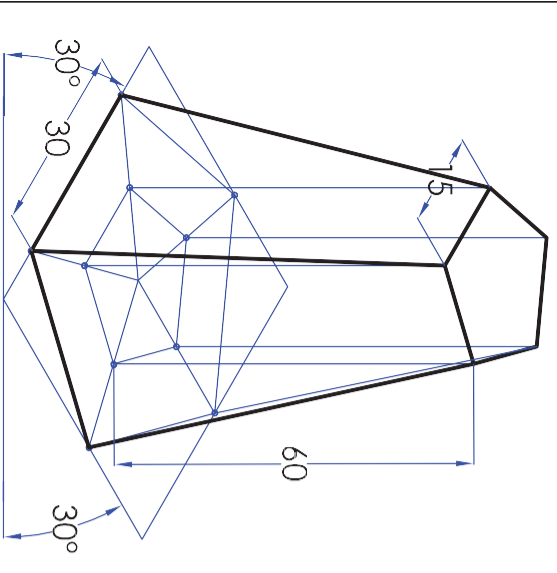
2 INVERTED FRUSTUM



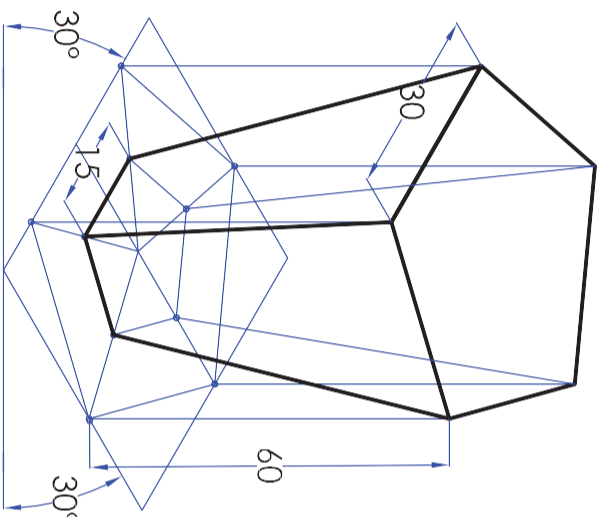
3 PRISM WITH SQUIRE AXIAL HOLE



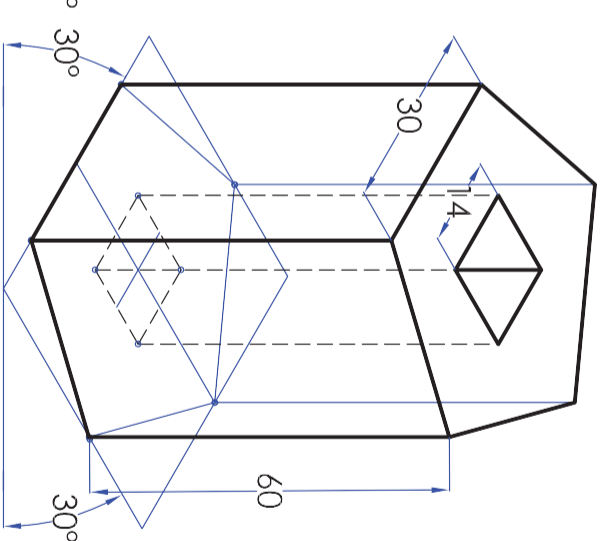
4 PRISM WITH CIRCULAR AXIAL HOLE



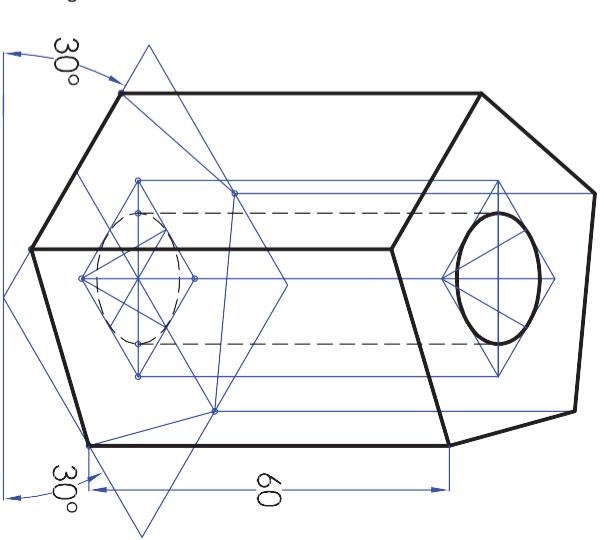
5 FRUSTUM of a pentagonal Pyramid



6 inverted FRUSTUM



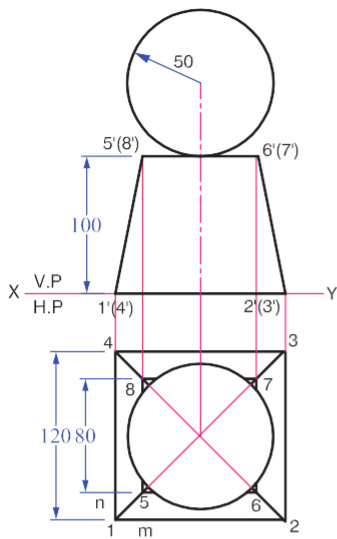
7 Prism with a square axial hole



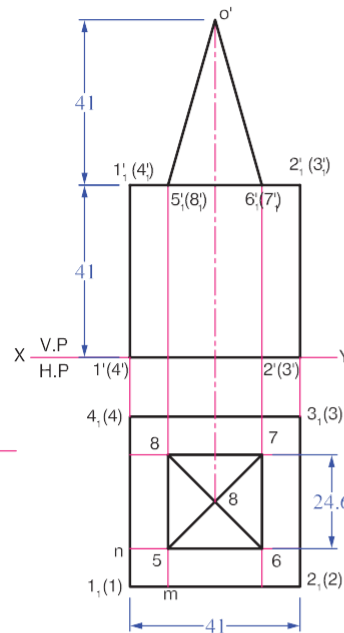
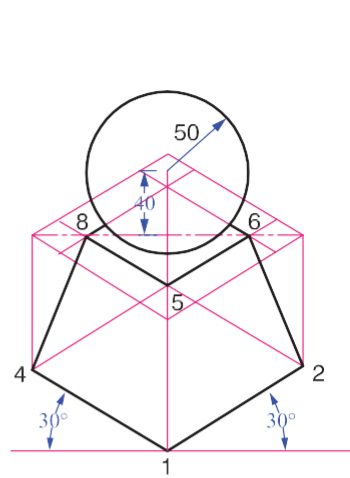
8 with Axial Circular hole

08 - A sphere of radius 50 mm is kept centrally over a frustum of a square pyramid of side 120 mm at the bottom, 80 mm at the top and having a height of 100 mm. Draw the isometric projection of the solid.

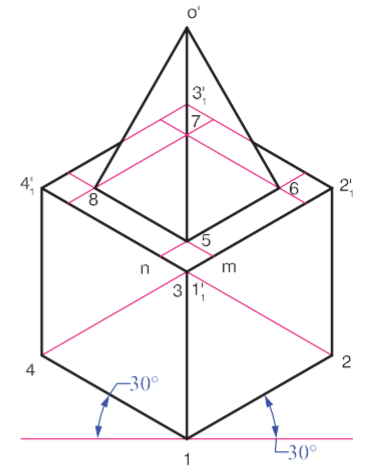
09 - A square pyramid of side 30 mm, axis length 50 mm is centrally placed on the top of a cube of side 50 mm. Draw the isometric projection of solids.



Problem-08 : Solution

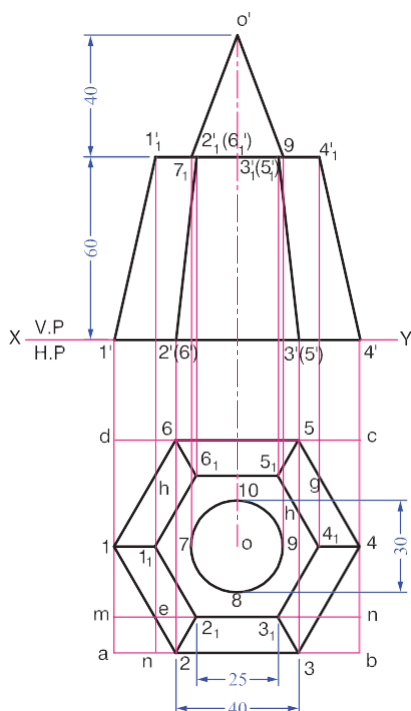


Problem-09 : Solution

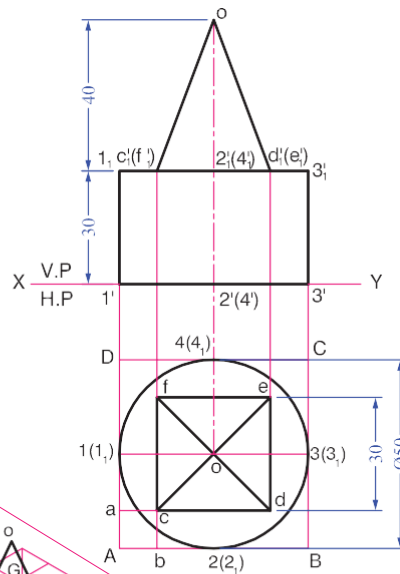
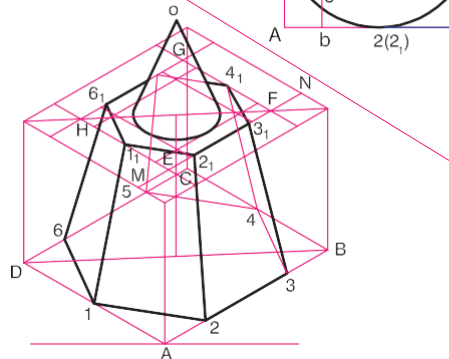


10 - A cone of base diameter 30 mm and height 40 mm rests centrally over a frustum of a hexagonal pyramid of base side 40 mm, top base 25 mm and 60 mm height. Draw the isometric projection of the solids.

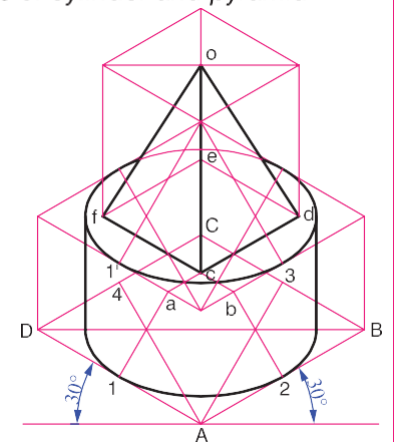
11 - A cylindrical slab of thickness 30 mm and diameter 50 mm is surmounted by a square pyramid of side 30 mm and height 40 mm. Draw the isometric view of the combination if the axis of cylinder and pyramid coincide with each other



Problem-10 : Solution



Problem-11 : Solution



Perspective projection is a method of pictorial projection, where the three dimensional object is drawn more realistically than isometric drawings. The perspective drawings show three – dimensional objects as they appear to the eye or as they are seen in a photograph.

Following are the certain terminologies that are used, while drawing a perspective view:

Ground Plane (GP): It is a horizontal plane on which the object is assumed to be situated.

Picture Plane (PP): It is a transparent plane situated between the observer and the object, through which the object is viewed. The perspective view is formed on this picture plane.

Ground Line (GL): The line of intersection of the picture plane with the ground plane is called the ground line.

Station Point (SP): Location of the eye of the observer while viewing the object, measured from the ground plane and from the picture plane.

Horizon Plane (HP): This imaginary plane is at the level of the eye, i.e. the station point. It is a plane parallel to the ground plane.

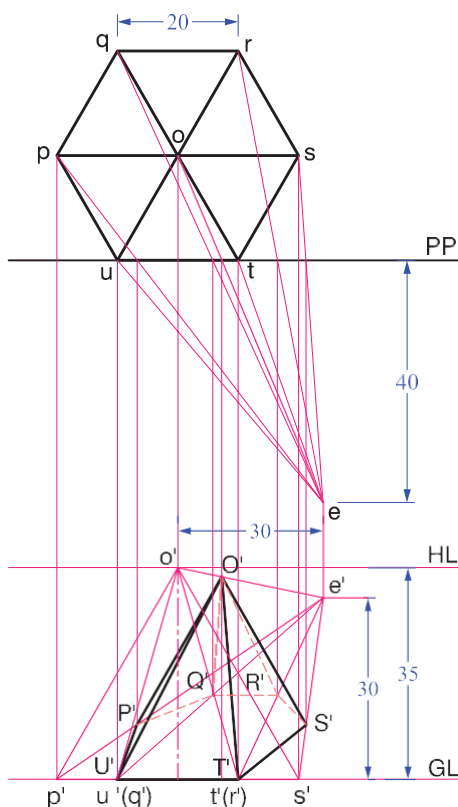
Horizon Line (HL): It is a line which the horizon plane intersects the picture plane. It is parallel to the ground line.

Central Plane (CP): It is an imaginary plane passing through the station point (SP) and perpendicular to both the Picture Plane (PP) and Ground Plane (GP).

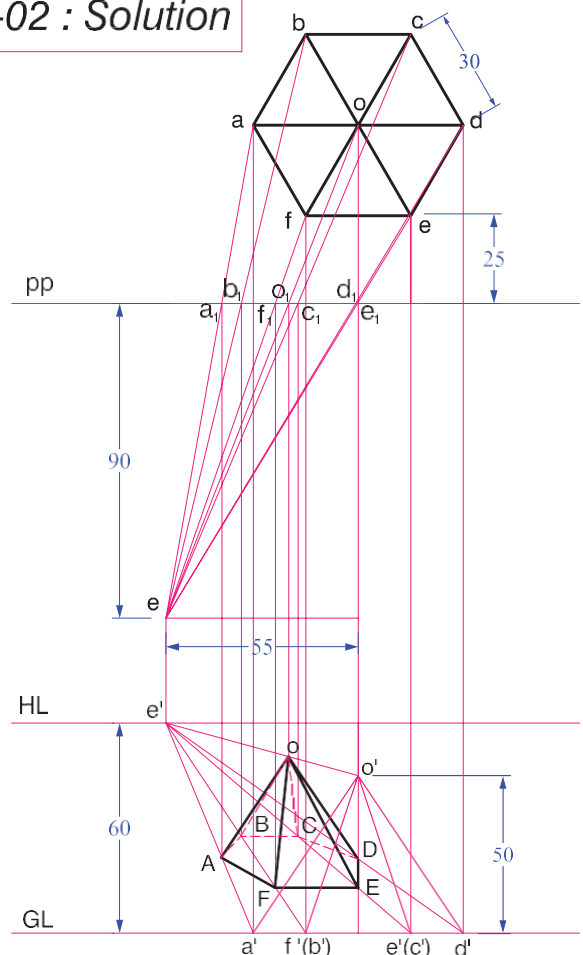
01 -A regular hexagonal pyramid of base edge 20 mm and height 35 mm rests on its base on the ground plane with one of its base edges touching the picture plane. The station point is 30 mm above the ground plane and 40 mm in front of the PP. The central plane is 30 mm to the right of the axis. Draw the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

02 -A hexagonal pyramid of base side 30 mm and axis height 50 mm is resting on GP on its base with a side of base parallel to and 25 mm behind the PP. The station point is 60 mm above GP, 90 mm in front of PP and lies in a central plane which is 55 mm to the left of the axis of the pyramid. Draw the perspective view of the pyramid by visual ray method.

Problem-01 : Solution

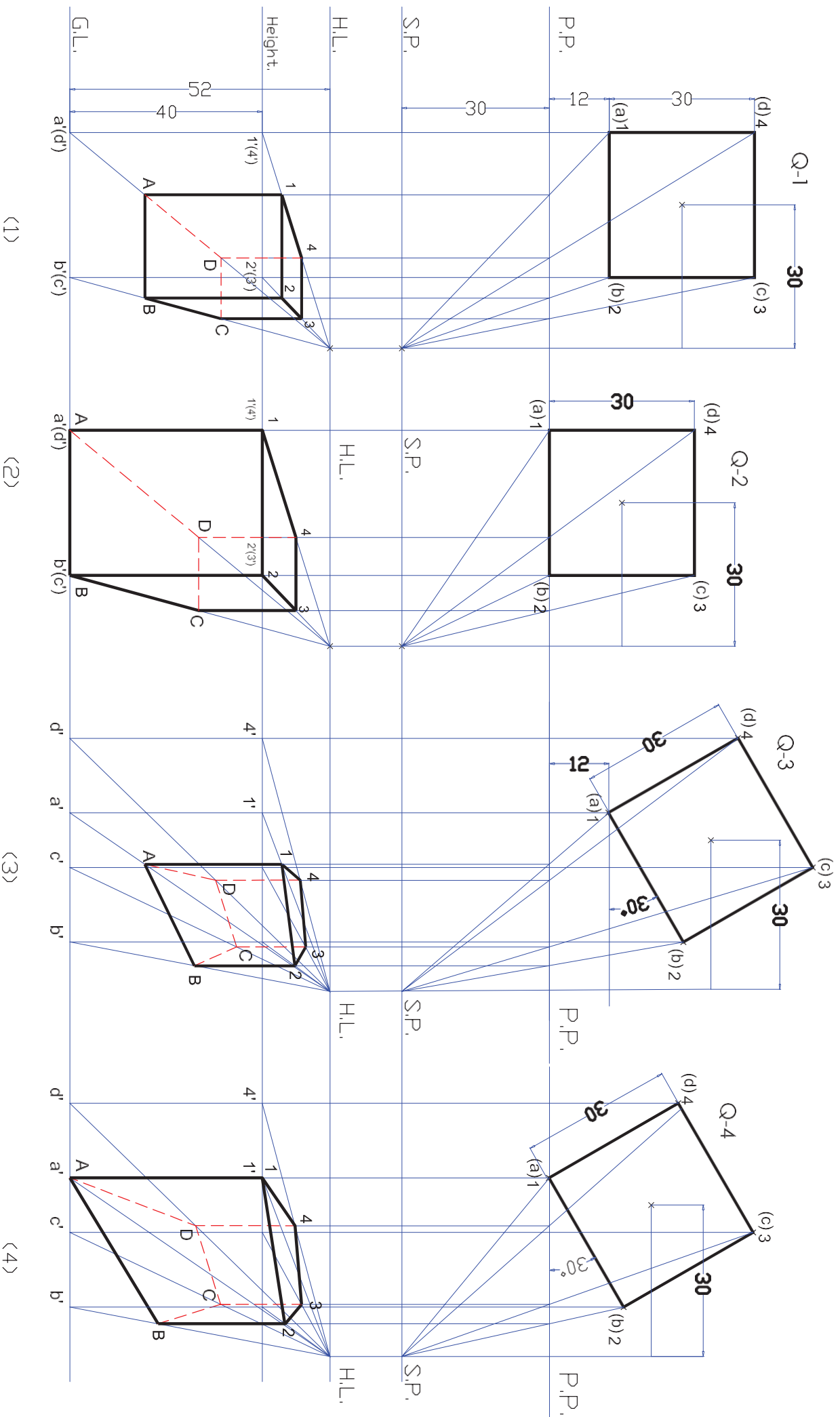


Problem-02 : Solution



A square prism of 30 mm side of base and height 40 mm rests with it's base on ground in the following FOUR conditions.

- (1) One of the rectangular faces is parallel and 12 mm behind Picture Plane.
 - (2) One of the rectangular faces is inclined at 30° to the picture plane and nearest vertical edge is 12 mm behind the picture plane.
 - (3) One of the rectangular faces is inclined at 30° to the picture plane and nearest vertical edge touches the picture plane.
 - (4) The station point is 30 mm in front of the picture plane, 52 mm above the ground and 30 mm right to the axis of the prism.
- Draw the perspective view of the prisms for the above three conditions separately.



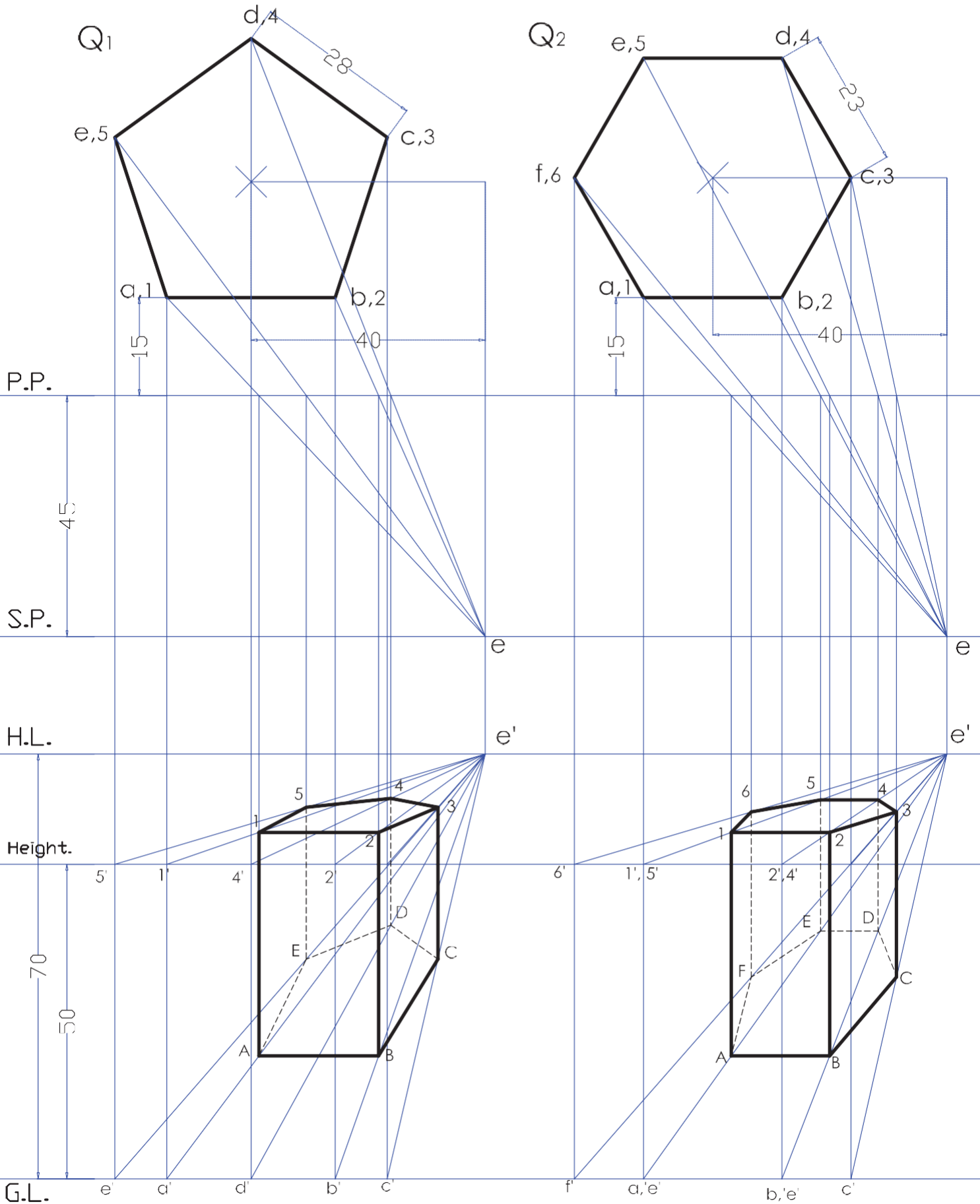
(1)

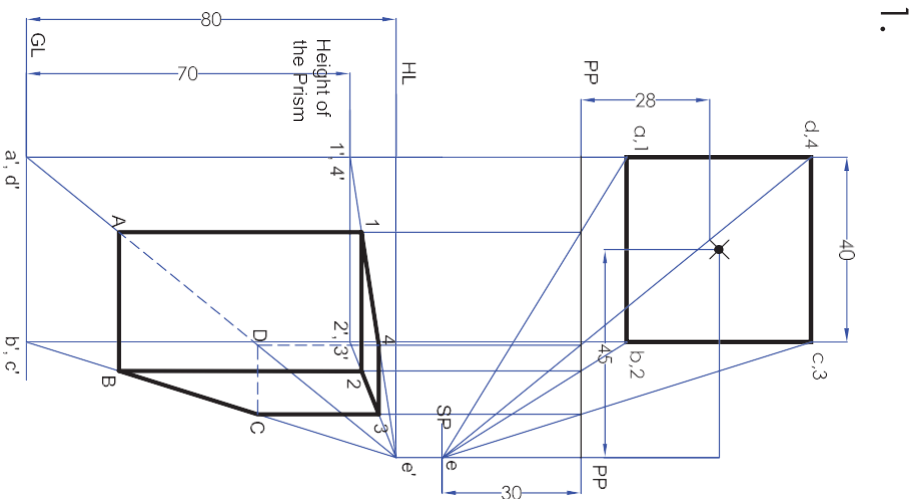
(2)

(3)

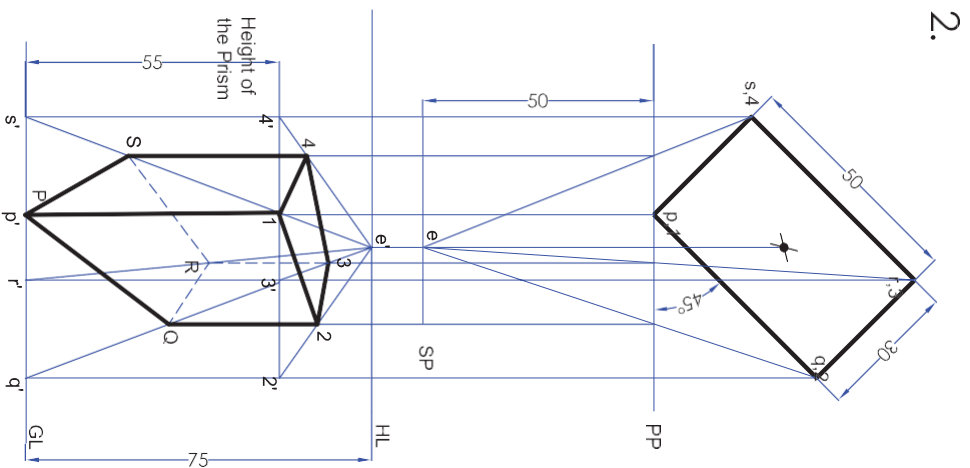
(4)

Q1, Q2 : A Pentagonal (or-Hexagonal) Prism of side 28 / 23 mm and Height 70 mm rests with its base in the ground and one of its rectangular faces is Parallel and 15 mm behind the Picture Plane(PP). The station Point is 45 mm in front of PP, 70 mm above the Ground and 40 mm Right to the Axis of the Prism. Draw the Perspective view of the Prism.

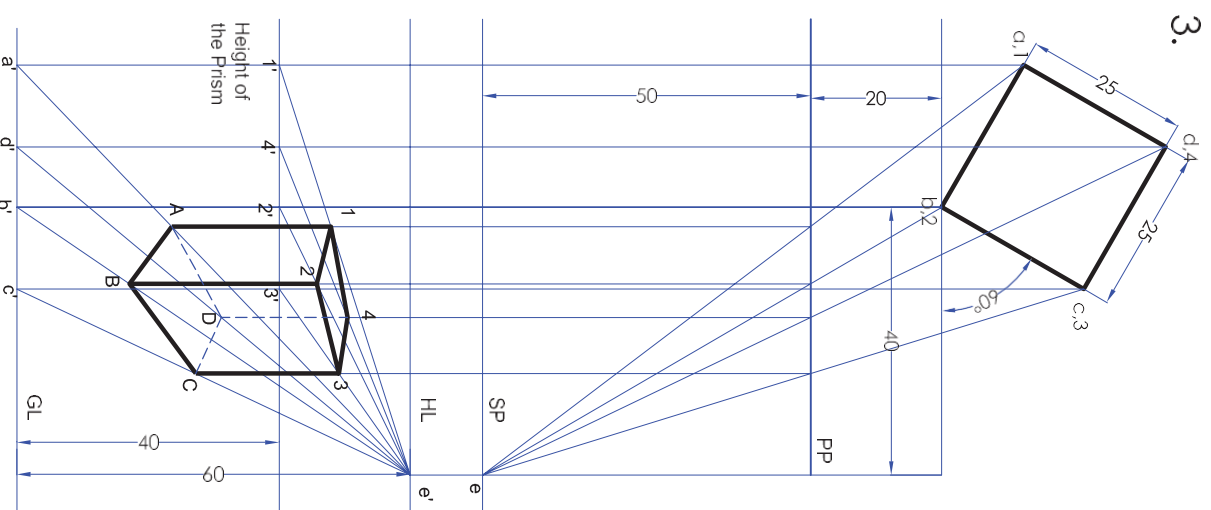




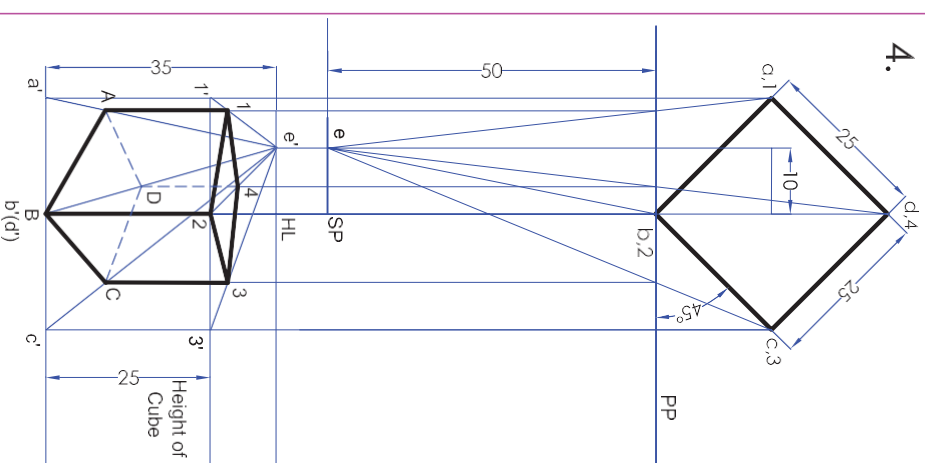
1. Square Prism of side 40mm and height 70mm lies on the ground with its base and one of its rectangular face is parallel and 10 mm height picture plane. The Station Point is 45 mm Right to axis, 30 mm in front of the picture plane and 80 mm above the Ground. Draw the perspective Projection of the solid



2. A rectangular prism, sides of base 50 mm x 30 mm and height 55 mm rests with its base on the ground plane. A vertical edge is in the picture plane and one of the longer edges of its base is inclined at 45° to PP and behind it. The station point is 50 mm in front of PP, 75 mm above the ground plane and lies in a central plane which passes through the center of the prism. Draw the perspective projection of the rectangular prism.



3. Square Prism of side 25mm and height 40mm lies on the ground with its base and one of its rectangular face is inclined at an angle 60° to PP. The nearest vertical edge is 20 mm behind the picture plane. The Station Point is 40 mm Right to the nearest vertical edge, 50 mm in front of the picture plane and 60 mm above the Ground. Draw the perspective Projection of the solid



4. A cube of side 25 mm lies on the ground with one of its faces and other two faces are equally inclined to PP. The nearest vertical edge is touching the PP. The Station Point is 10 mm left to the nearest vertical edge, 50 mm in front of the picture plane and 35 mm above the Ground. Draw the perspective Projection of the solid