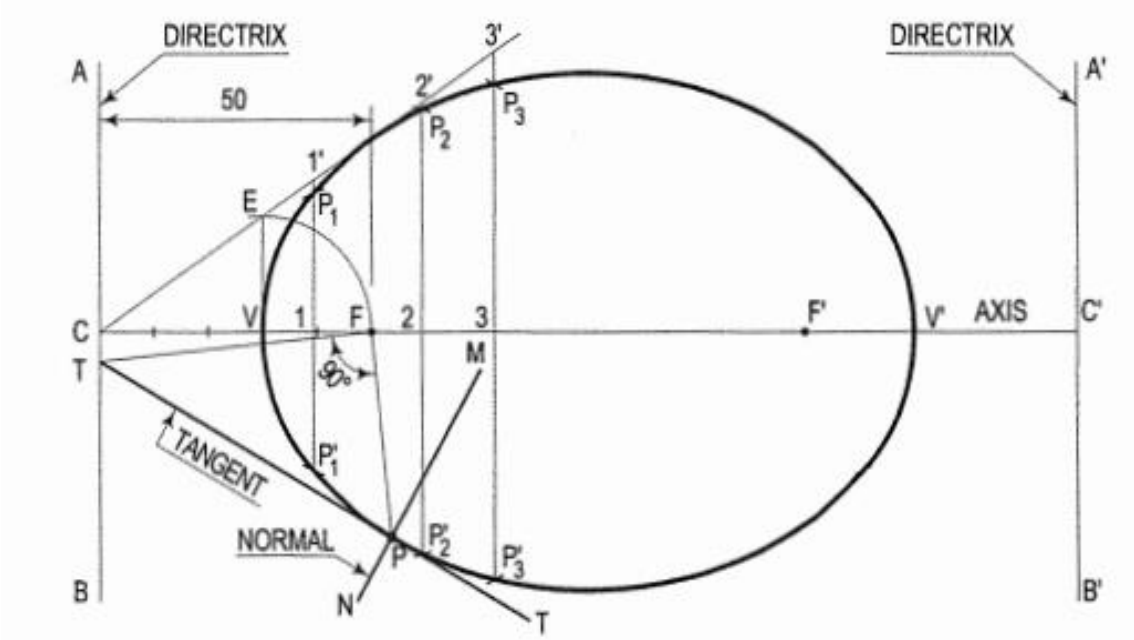
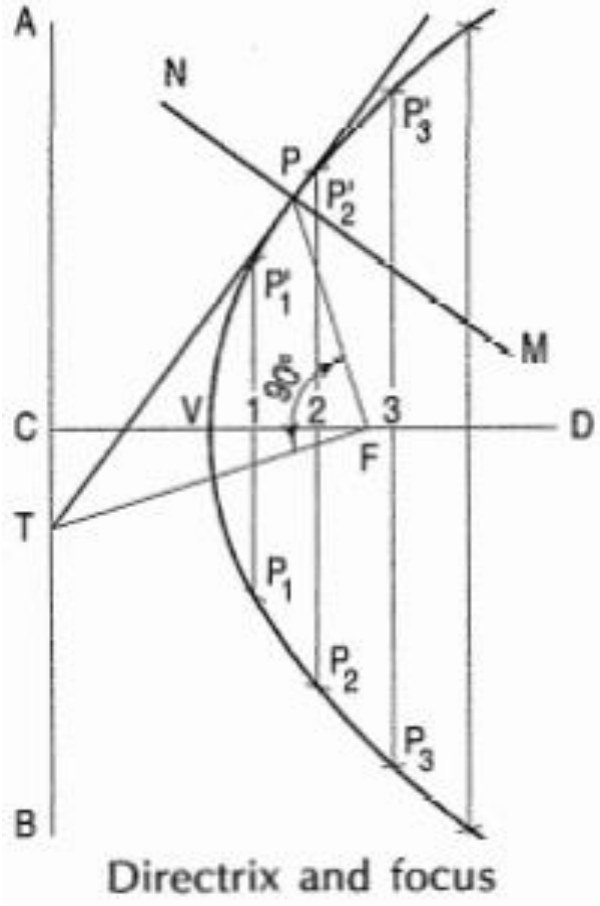
Unit – 1 - ENGINEERING CURVES AND SCALES

Assignment – I

1. Infer the construction of a curve, when the distance between the focus and directrix is 50 mm and eccentricity is 2/3. Also draw the tangent and normal to any point on the curve.

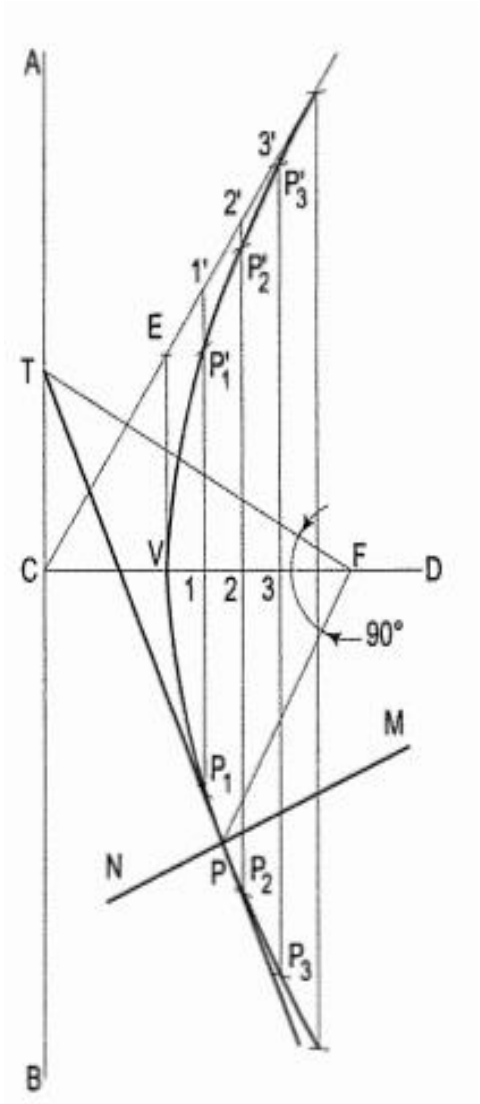


2. Infer the construction of a curve when the distance between the focus and directrix is 40 mm. The curve intersecting on axis is equidistance from fixed line and fixed point. Name the curve and draw the tangent and normal to any point on the curve.

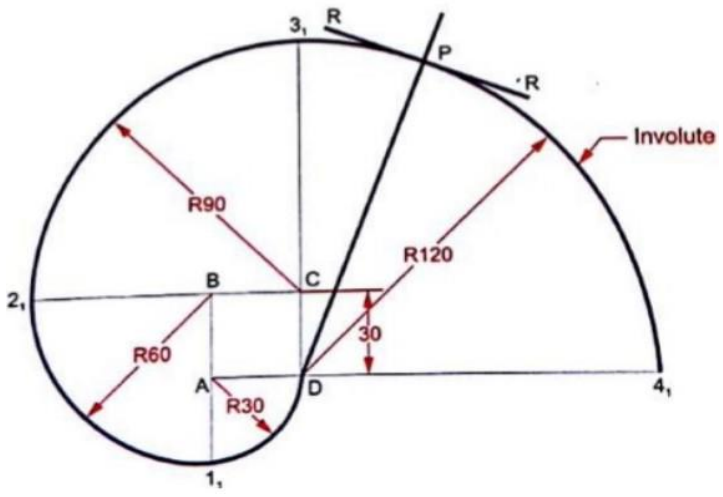


Directrix and focus

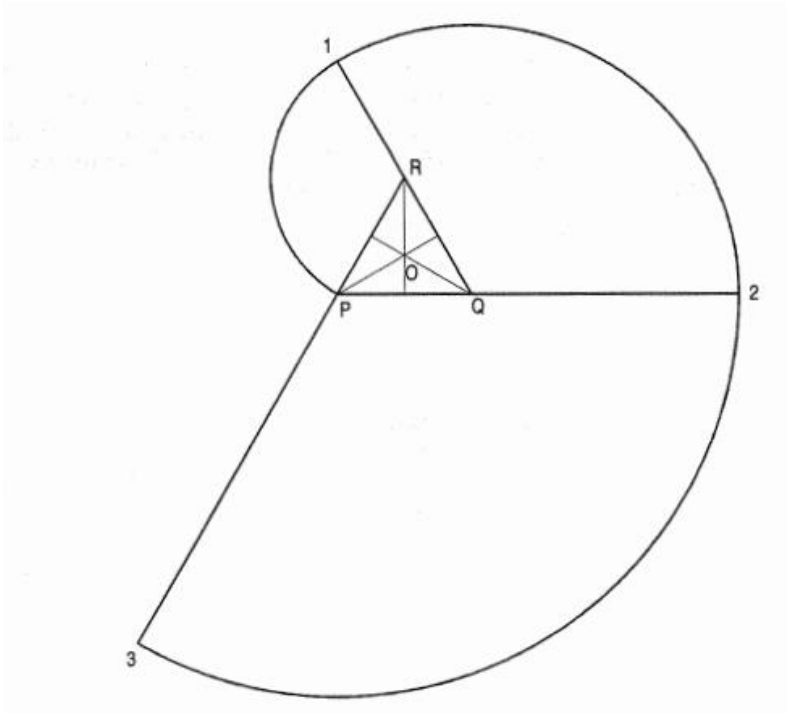
3. Infer the construction of a curve, when the distance between the focus and directrix is 50 mm and eccentricity is 3/2. Also draw the tangent and normal to any point on the curve.



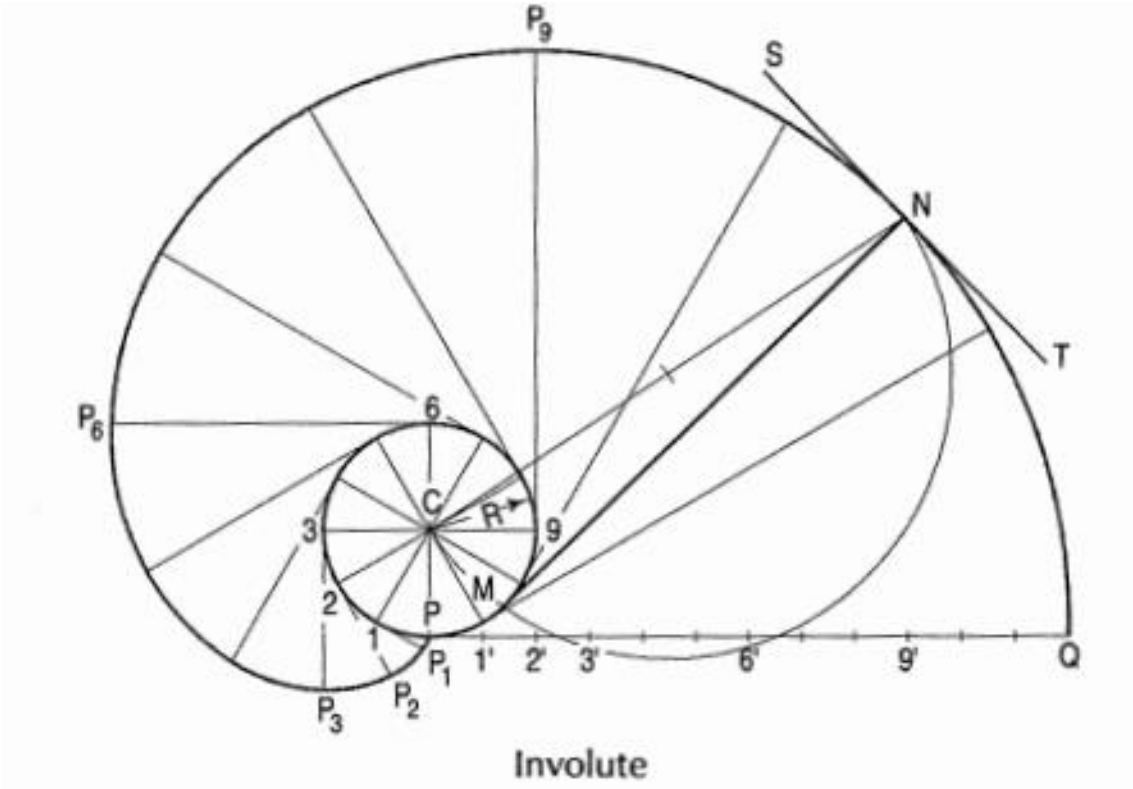
4. a) Draw an involute of a square of base side 30 mm. Also draw the tangent and normal to any point on the curve.



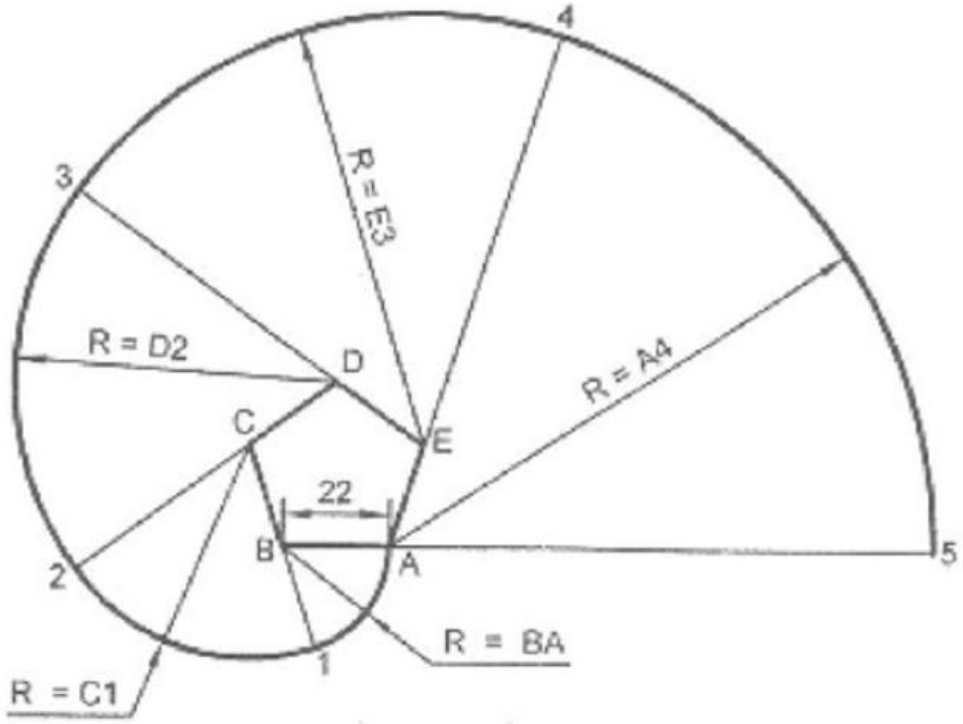
b) Draw an involute of a triangle of base side 30 mm. Also draw the tangent and normal to any point on the curve.



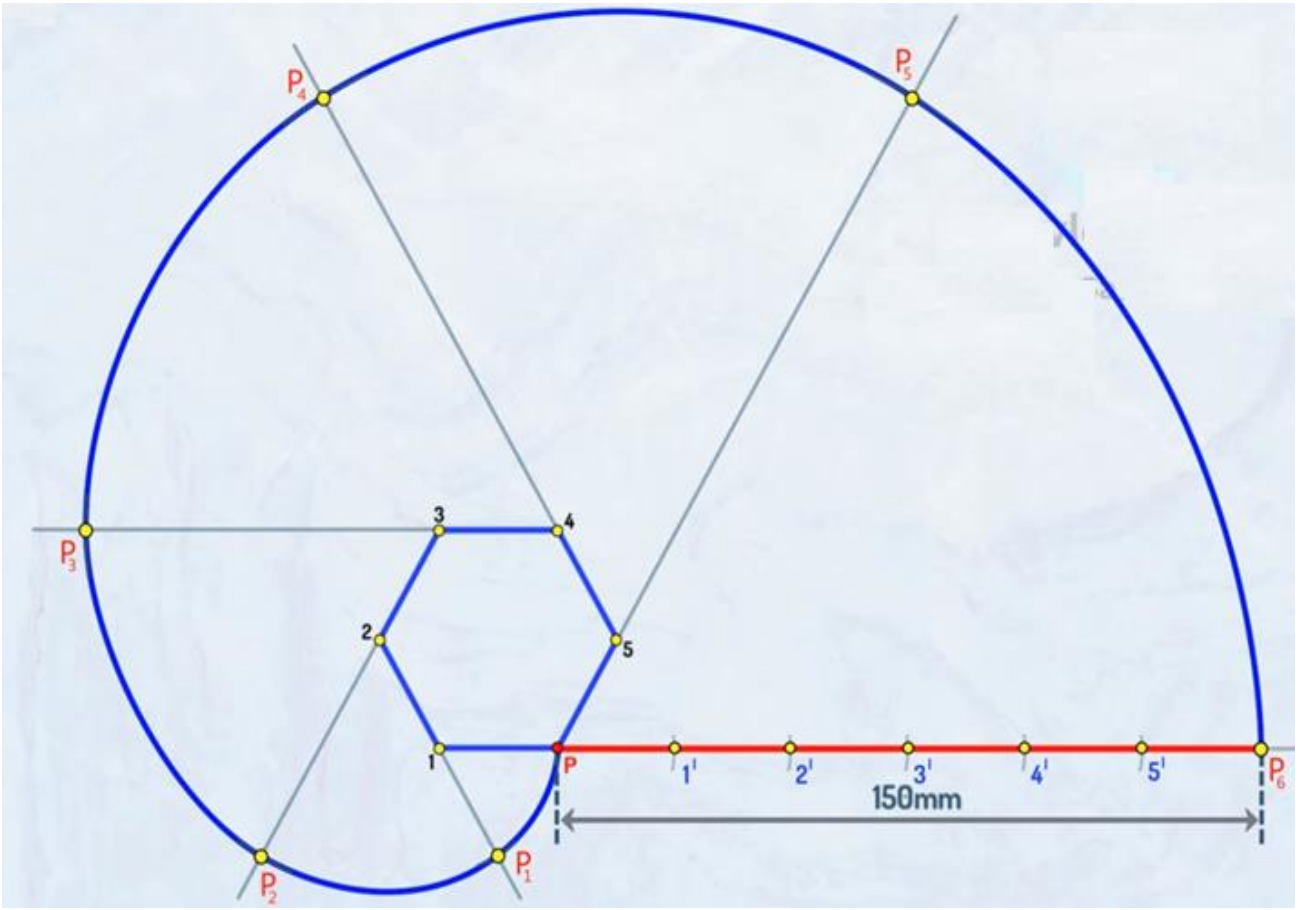
5. Draw an involute of a circle of diameter 40 mm, also draw a tangent and normal to the curve at a point 100 mm from the center of the circle.



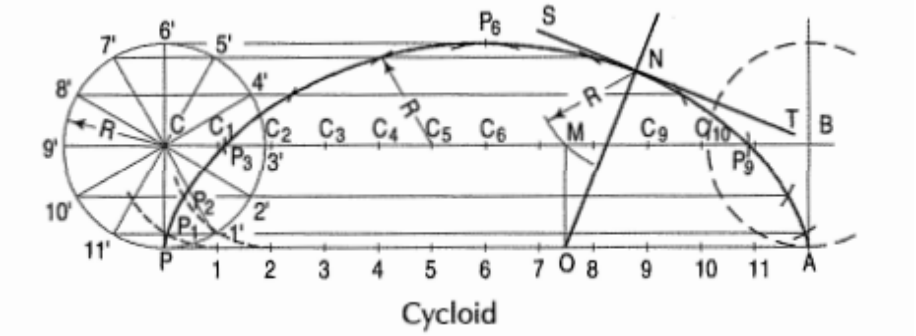
6. Draw an involute of a pentagon of base side 22 mm. Also draw the tangent and normal to any point on the curve.



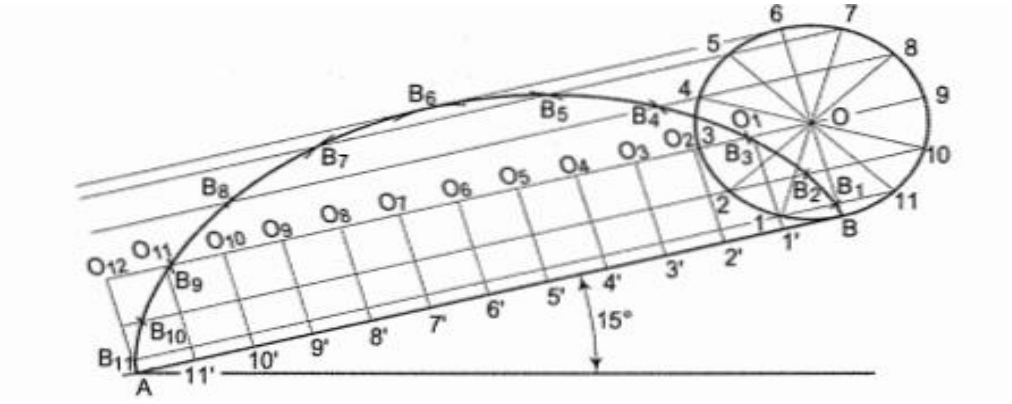
7. Draw an involute of a hexagon of base side 25 mm. Also draw the tangent and normal to any point on the curve.



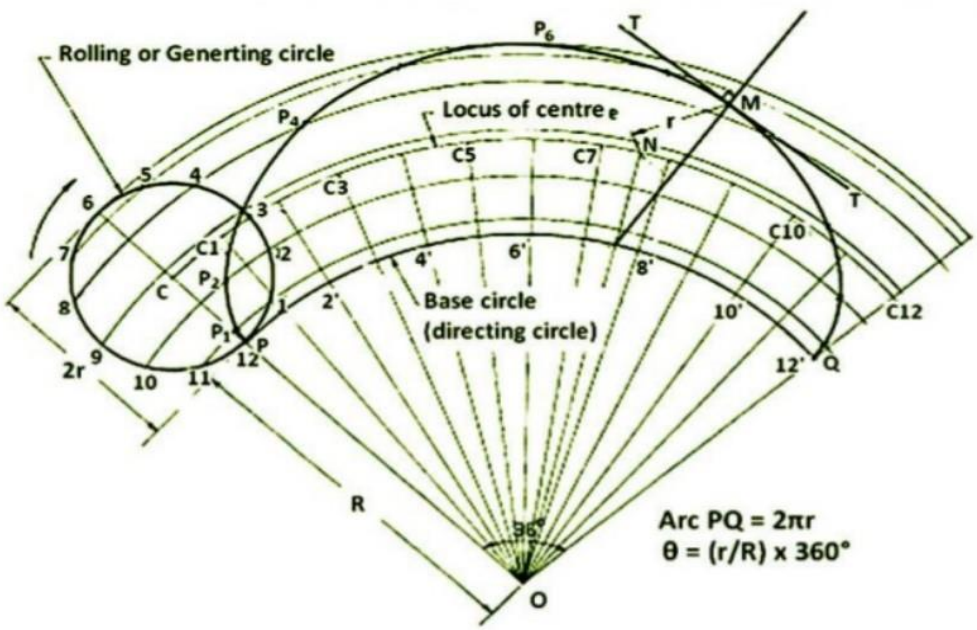
8. A coin of 40 mm diameter rolls over a horizontal table without slipping. A point on the circumference of the coin is in contact with the table surface in the beginning and after one complete revolution. Draw the path traced by the point. Also draw the tangent and normal to any point on the curve.



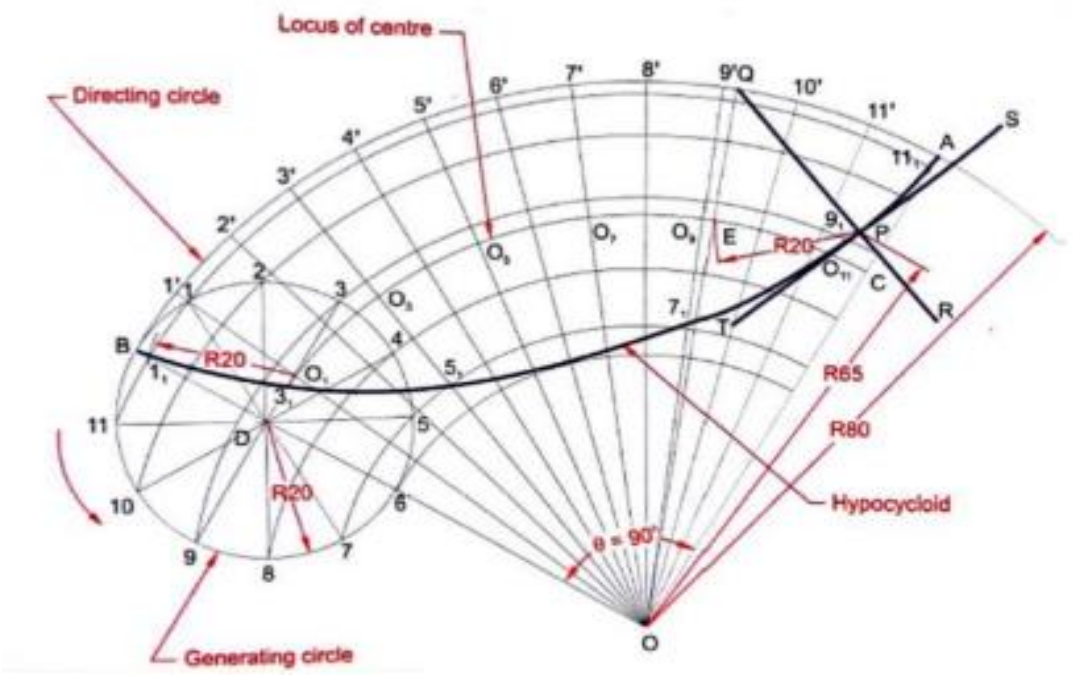
9. A thin circular disc of 50 mm diameter is allowed to roll without slipping from upper edge of sloping plank which is inclined at 15° with the horizontal plane Draw the curve traced by the point on the circumference of the disc.



10. A ball of diameter 50 mm rolls on the outside of another ball of diameter 180 mm for one revolution. Draw the path traced by a point on the smaller ball.



11. Construct the path traced by a point on a circular disc of radius 20 mm rolls inside a circular path of radius 80 mm.



12. In a map a 36 km distance is shown by a line 45 cm long. Calculate the R.F. and construct a plain scale to read kilometers and hectometers, for max. 12 km. Show a distance of 8.3 km on it.

CONSTRUCTION:-

PLAIN SCALE

a) Calculate R.F.

R.F.= 45 cm/ 36 km = 45/ 36 . 1000 . 100 = 1/ 80,000

Length of scale = R.F. × max. distance

= 1/ 80000 × 12 km

= 15 cm

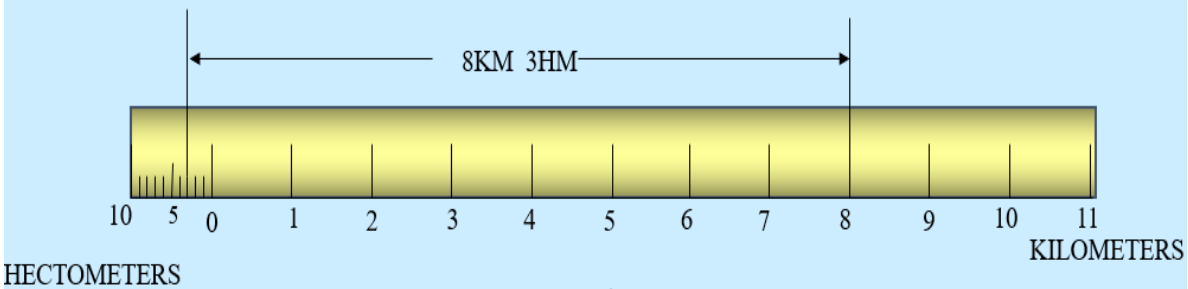
b) Draw a line 15 cm long and divide it in 12 equal parts. Each part will represent larger division unit.

c) Sub divide the first part which will represent second unit or fraction of first unit.

d) Place (0) at the end of first unit. Number the units on right side of Zero and subdivisions on left-hand side of Zero. Take height of scale 5 to 10 mm for getting a look of scale.

e) After construction of scale mention it's RF and name of scale as shown.

f) Show the distance 8.3 km on it as shown.



R.F. = 1/80,000

PLANE SCALE SHOWING KILOMETERS AND HECTOMETERS

13. The distance between two stations is 210 km. A passenger train covers this distance in 7 hours. Construct a plain scale to measure time up to a single minute. RF is 1/200,000 Indicate the distance traveled by train in 29 minutes.

PLAIN SCALE

CONSTRUCTION:-

a) 210 km in 7 hours. Means speed of the train is 30 km per hour (60 minutes)

Length of scale = R.F. × max. distance per hour
= 1/ 2,00,000 × 30km
= 15 cm

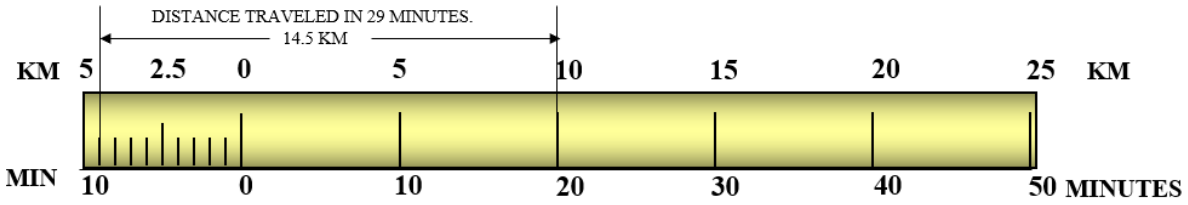
b) 15 cm length will represent 30 km and 1 hour i.e. 60 minutes.
Draw a line 15 cm long and divide it in 6 equal parts. Each part will represent 5 km and 10 minutes.

c) Sub divide the first part in 10 equal parts,which will represent second unit or fraction of first unit.
Each smaller part will represent distance traveled in one minute.

d) Place (0) at the end of first unit. Number the units on right side of Zero and subdivisions on left-hand side of Zero. Take height of scale 5 to 10 mm for getting a proper look of scale.

e) Show km on upper side and time in minutes on lower side of the scale as shown.
After construction of scale mention it's RF and name of scale as shown.

f) Show the distance traveled in 29 minutes, which is 14.5 km, on it as shown.



R.F. = 1/100

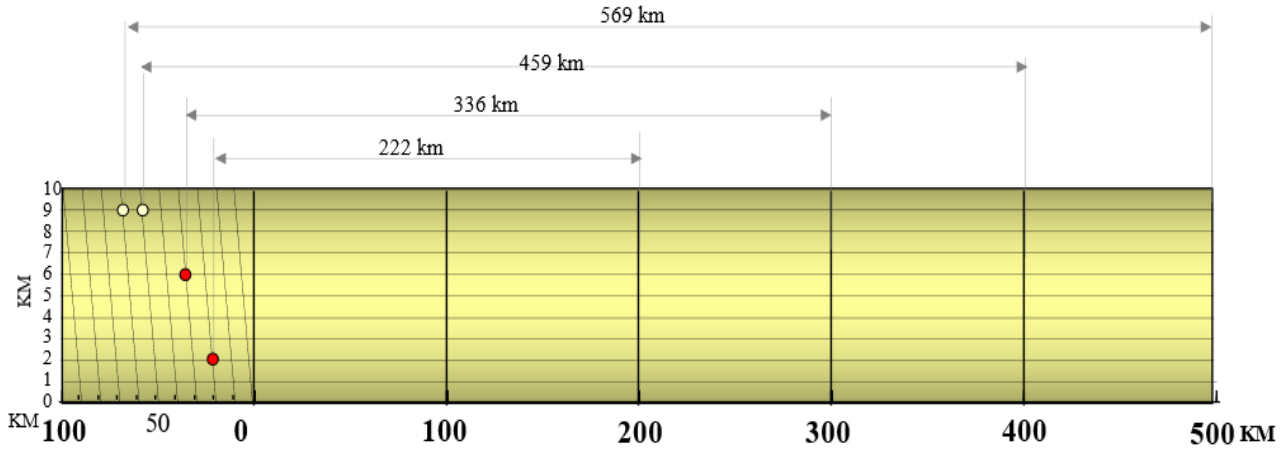
PLANE SCALE SHOWING METERS AND DECIMETERS.

14. The distance between Delhi and Agra is 200 km. In a railway map it is represented by a line 5 cm long. Find it's R.F. Draw a diagonal scale to show single km. And maximum 600 km. Indicate on it following distances. 1) 222 km 2) 336 km 3) 459 km 4) 569 km

SOLUTION STEPS: RF = 5 cm / 200 km = 1 / 40, 00, 000

Length of scale = 1 / 40, 00, 000 X 600 X 10 ^{5} = 15 cm

Draw a line 15 cm long. It will represent 600 km.Divide it in six equal parts.(each will represent 100 km.) **Divid**e first division in ten equal parts.Each will represent 10 km. **Draw** a line upward from left end and mark 10 parts on it of any distance. **Name** those parts 0 to 10 as shown.Join 9 th sub-division of horizontal scale with 10th division of the vertical divisions. **Then** draw parallel lines to this line from remaining sub divisions and complete diagonal scale.



R.F. = 1 / 40,00,000

DIAGONAL SCALE SHOWING KILOMETERS.

Unit – 2 – PROJECTION OF POINTS, LINES AND PLANES

Assignment – II

1. Draw the projections of the following points on a common reference line by keeping the projections 25mm apart.

    i) Point A, 30 mm above HP and 20 mm in front of VP

    ii) Point B, 30 mm above HP and in VP

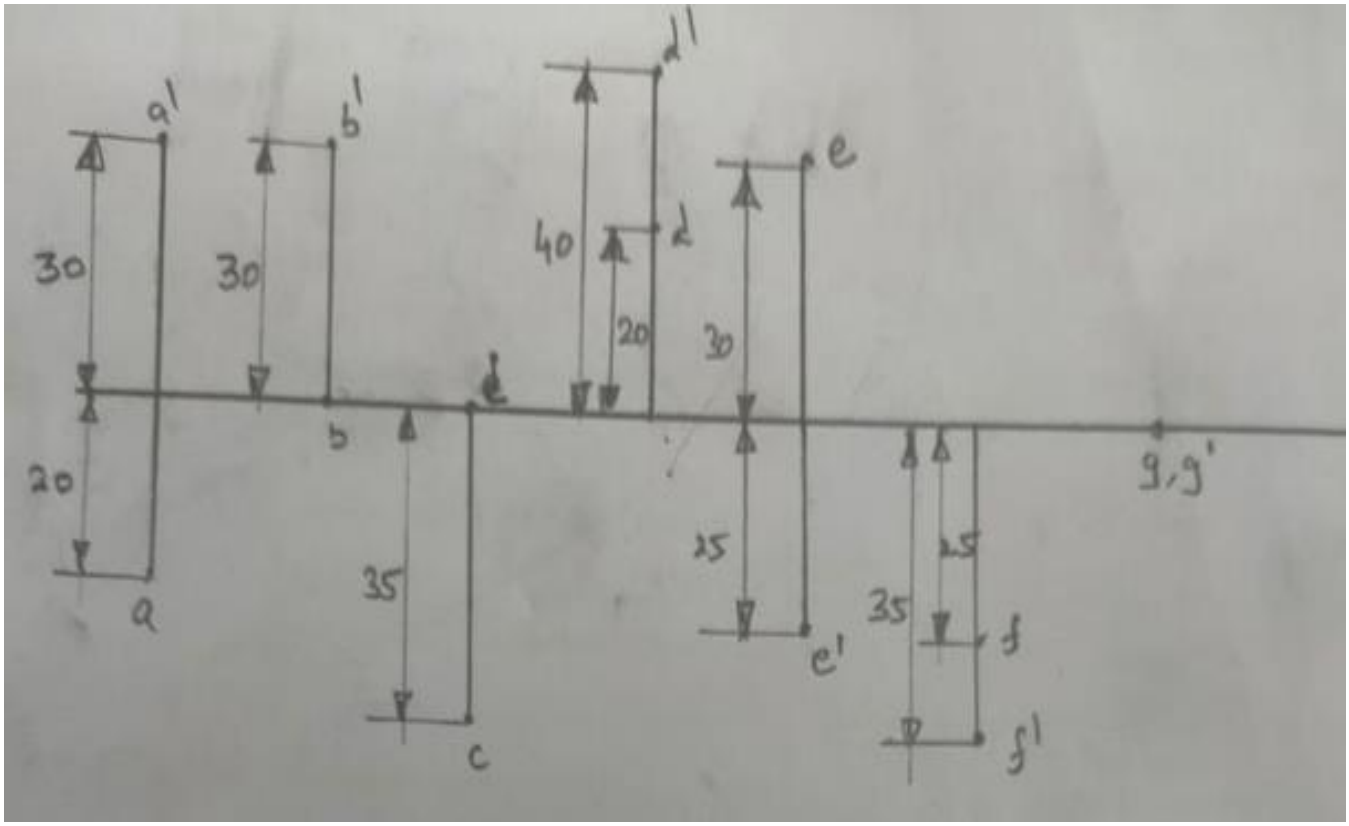
    iii) Point C, 35 mm in front of VP and in HP

    iv) Point D, 40 mm above HP and 20 mm behind VP

    v) Point E, 25 mm below HP and 30 mm behind VP

    vi) Point F, 35 mm below HP and 25 mm in front of VP

    vii) Point G is lying on both HP and VP.



2. Draw the projections of the following points on a common reference line by keeping the projections 25mm apart.

    i) Point A, 35 mm above HP and 25 mm in front of VP

    ii) Point B, 40 mm below HP and 15 mm behind VP

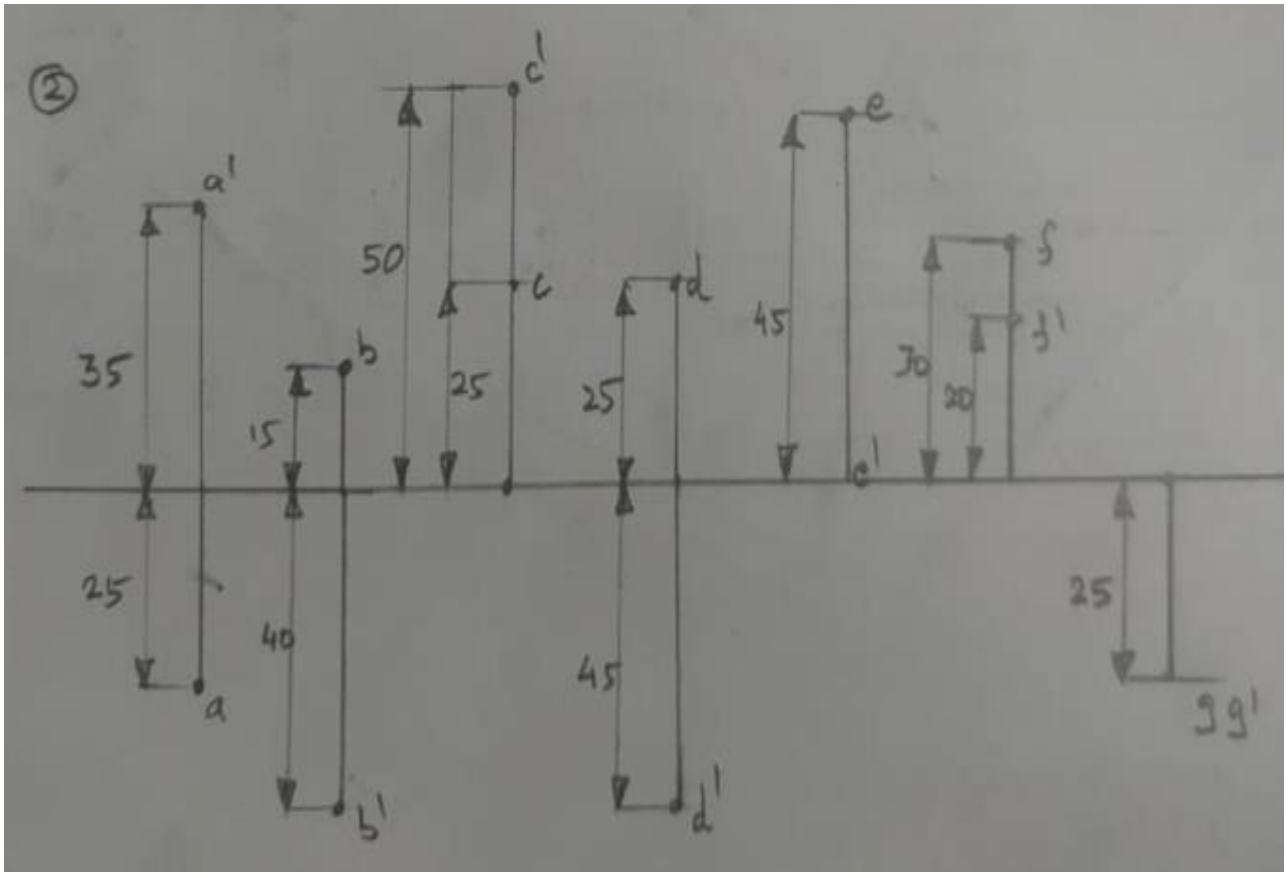
    iii) Point C, 50 mm above HP and 25 mm behind VP

    iv) Point D, 45 mm below HP and 25 mm behind VP

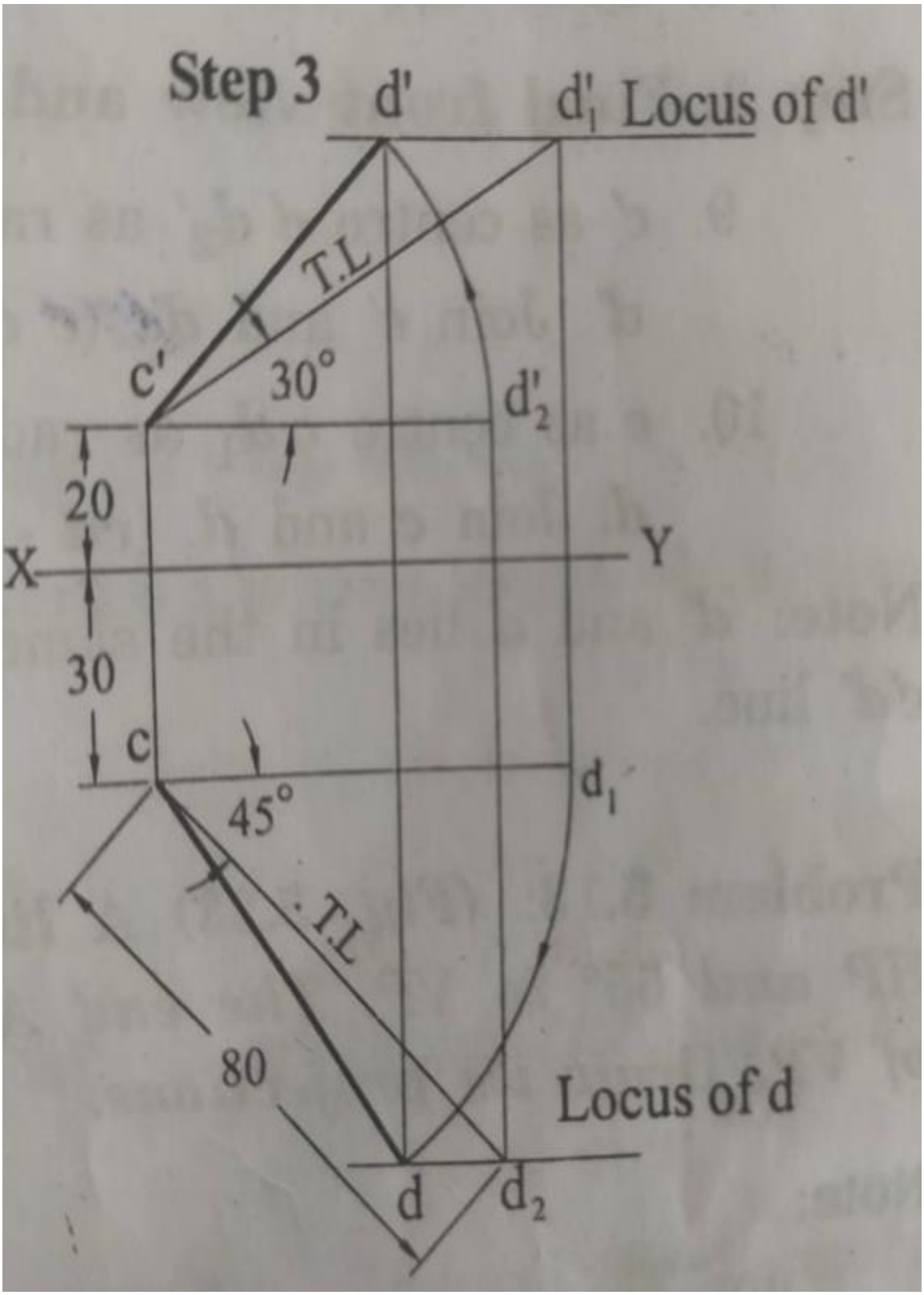
    v) Point E, 45 mm behind VP and on the HP

    vi) Point F, 30 mm above HP and 20 mm behind VP

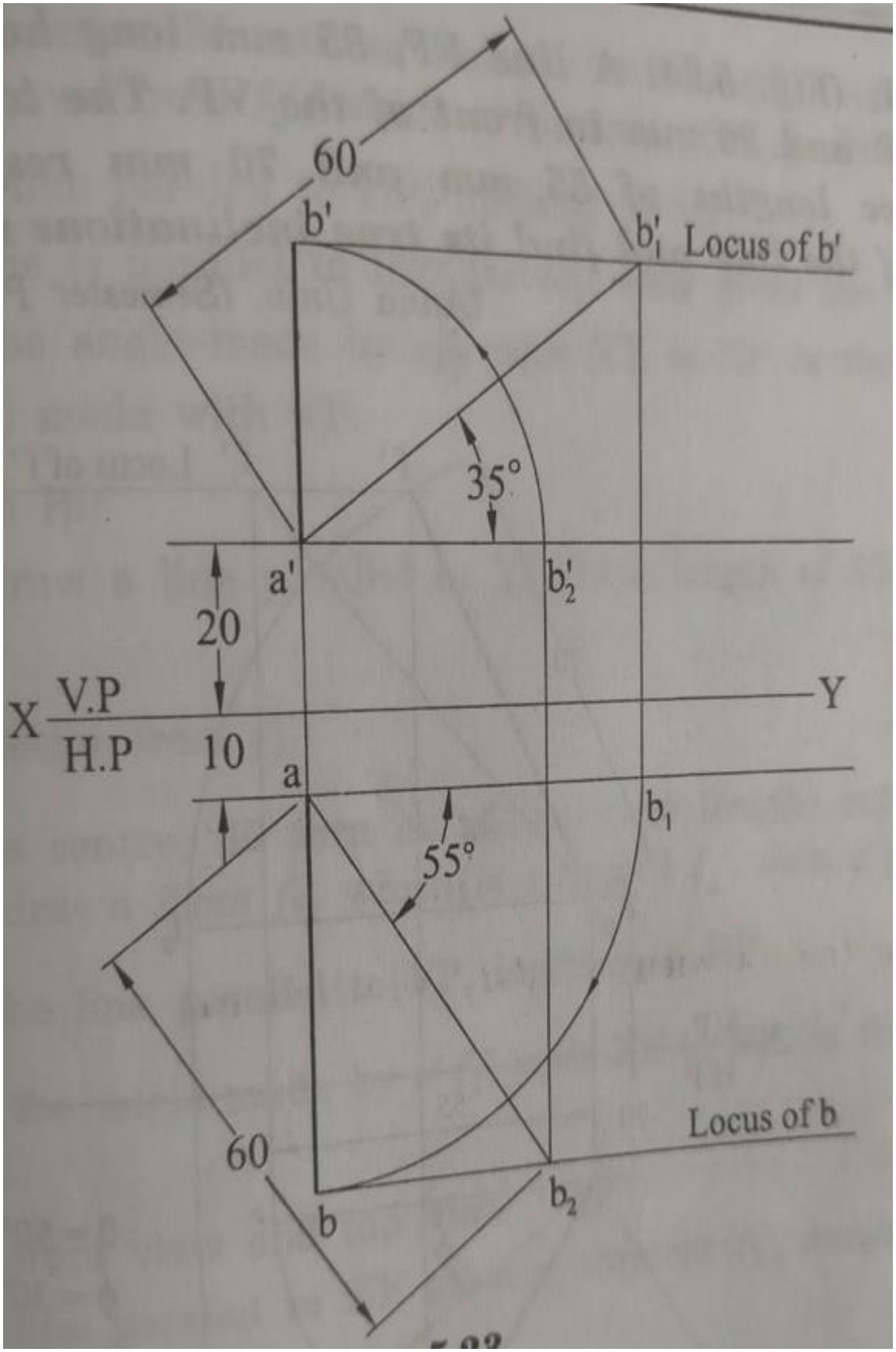
    vii) Point G 25 mm below HP and 25 mm in front of VP.



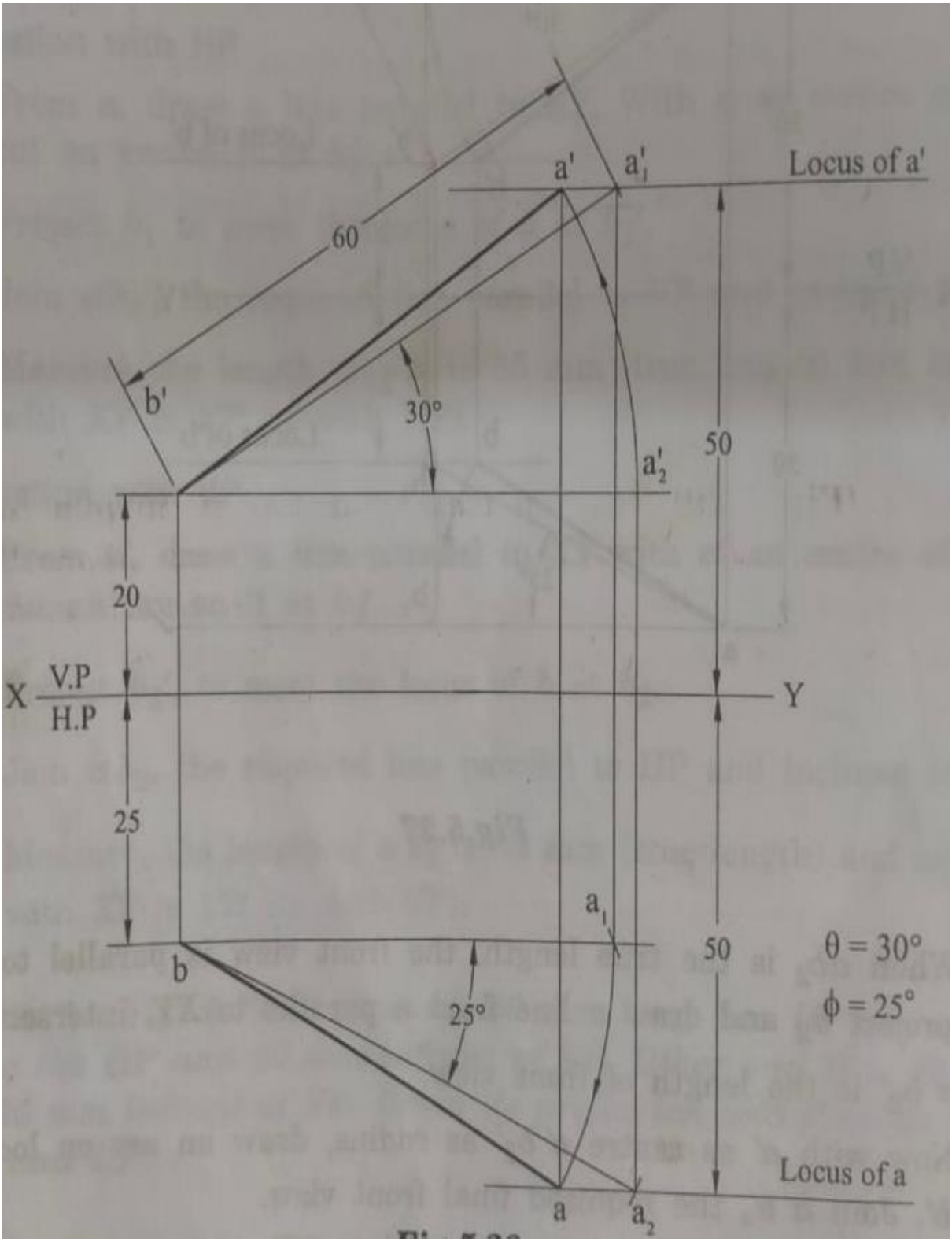
3. A line CD measuring 80 mm is inclined at an angle of 30° to HP and 45° to VP. The point C is 20 mm above HP and 30 mm in front of VP. Draw the projection of straight-line?



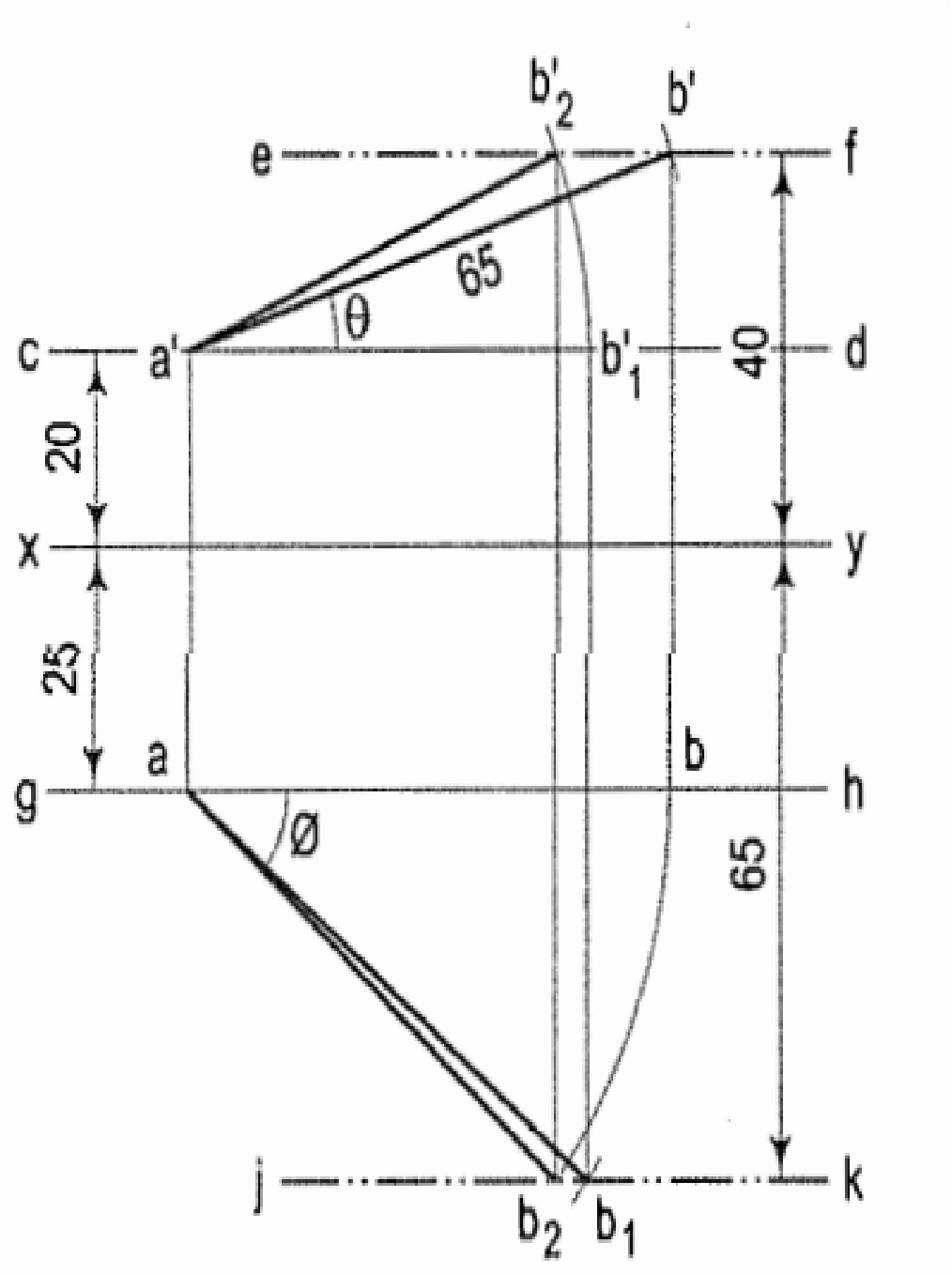
4. A line AB 60 mm long and inclined at 35° to HP and 55° to VP. The end A is 20 mm above HP and 10 mm in front of VP. Draw its projections.



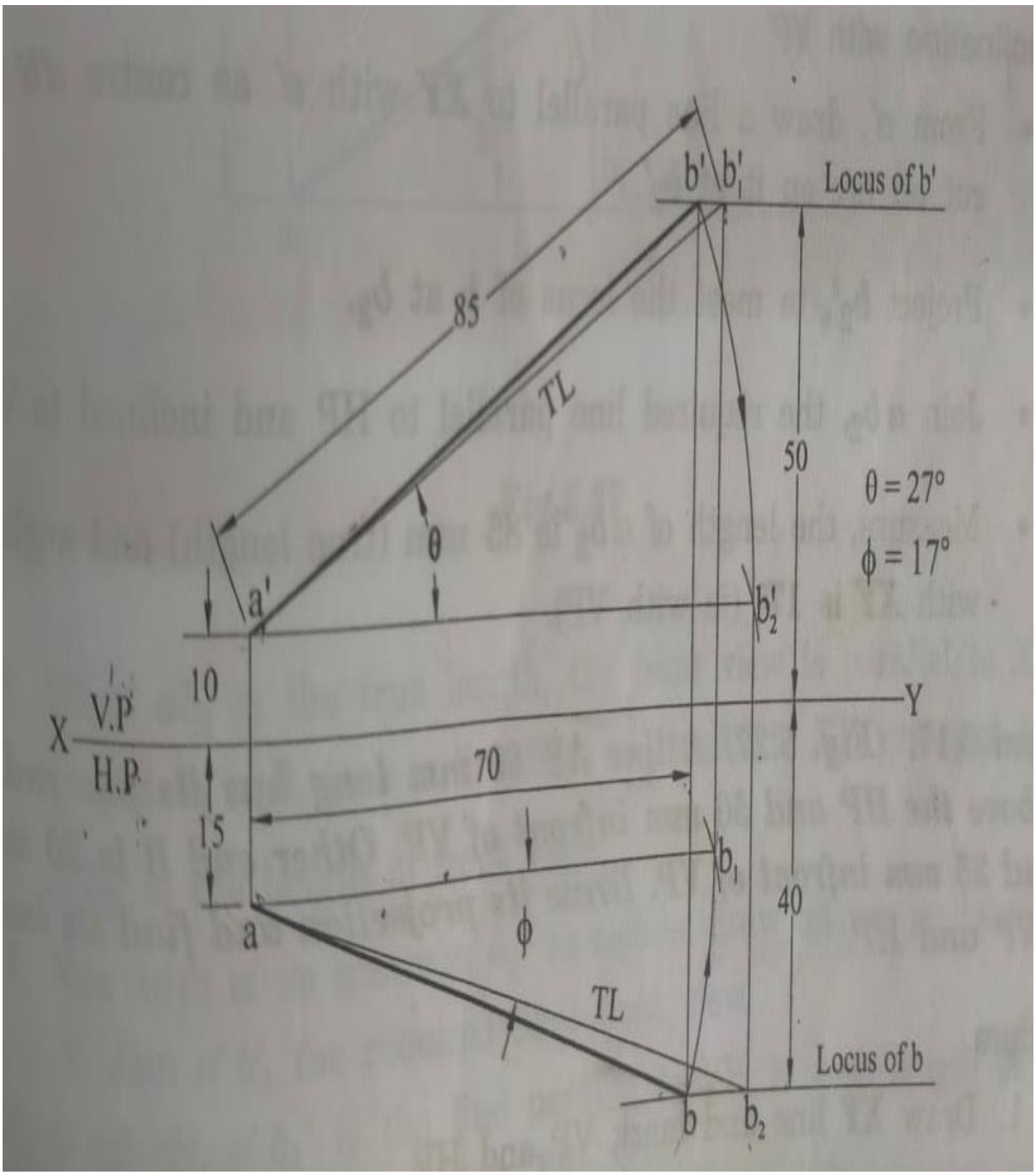
5. A line AB 60 mm long has its end B 20 mm above HP and 25 mm infront of VP. The end A is 50 mm above HP and 50 mm infront of VP. Draw its projections and find its inclinations with VP and HP.



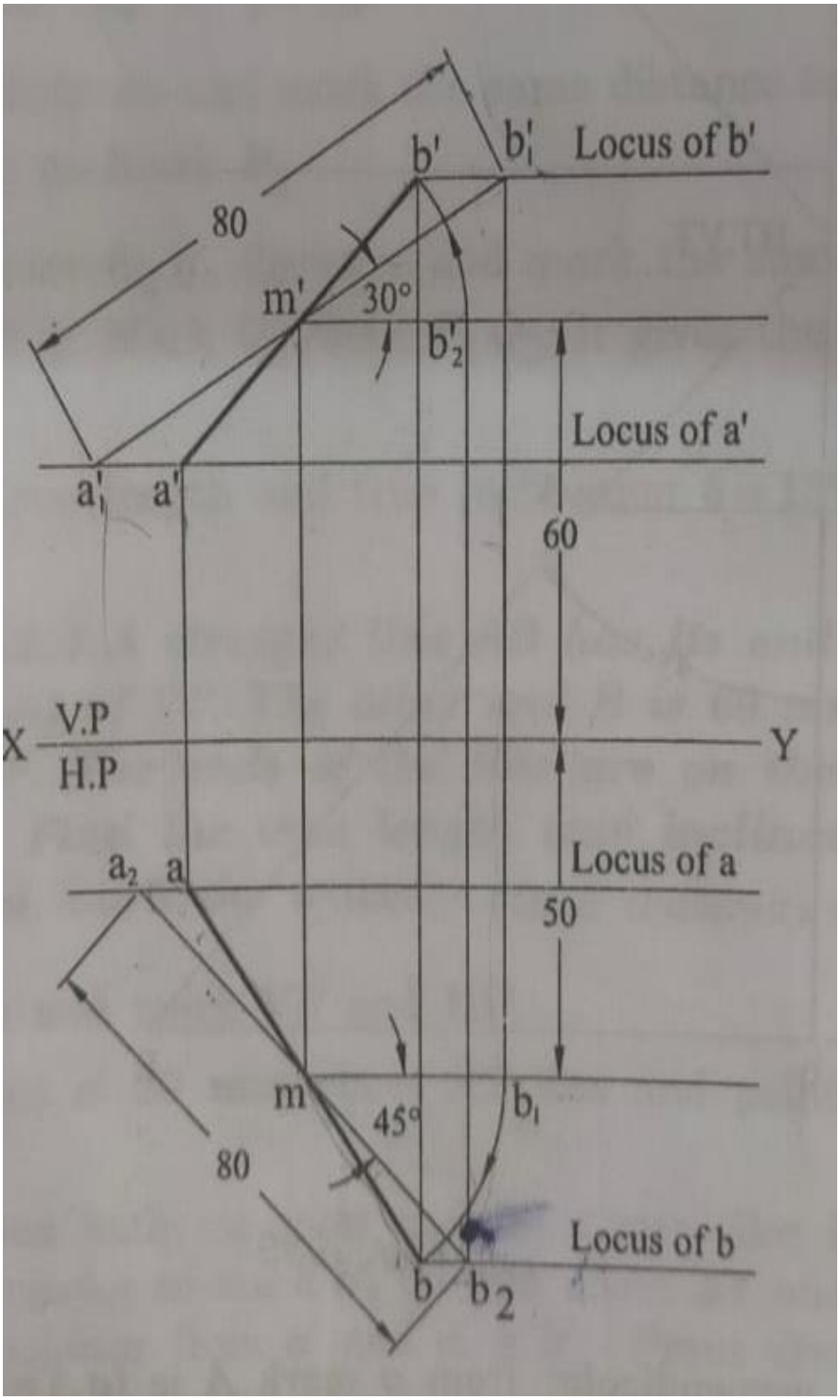
6. A line AB 65 mm long has its end A 20 mm above HP and 25 mm infront of VP. The end B is 40 mm above HP and 65 mm infront of VP. Draw its projections and find its inclinations with VP and HP.



7. The distance between the projectors of two end point A and B is 70 mm. The end A is 10 mm above HP and 15 mm in front of VP. The other end B is 50 mm above HP and 40 mm in front of VP. Find the true length and true inclination using rotating line method.



8. The mid-point of a straight-line AB is 60 mm above HP and 50 mm in front of VP. The line measures 80 mm long and inclined at an angle of 30° to HP and 45° to VP. Draw its projections.



9. The distance between the projectors of two points P and Q is 60 mm. Point P is 20 mm above HP and 15 mm infront of VP. The point Q is 45 mm above HP and 35 mm infront of VP. Find the shortest distance between the P and Q by using the Trapezoidal method. Also, find the true inclination of the line PQ with HP and VP and rotate its traces.

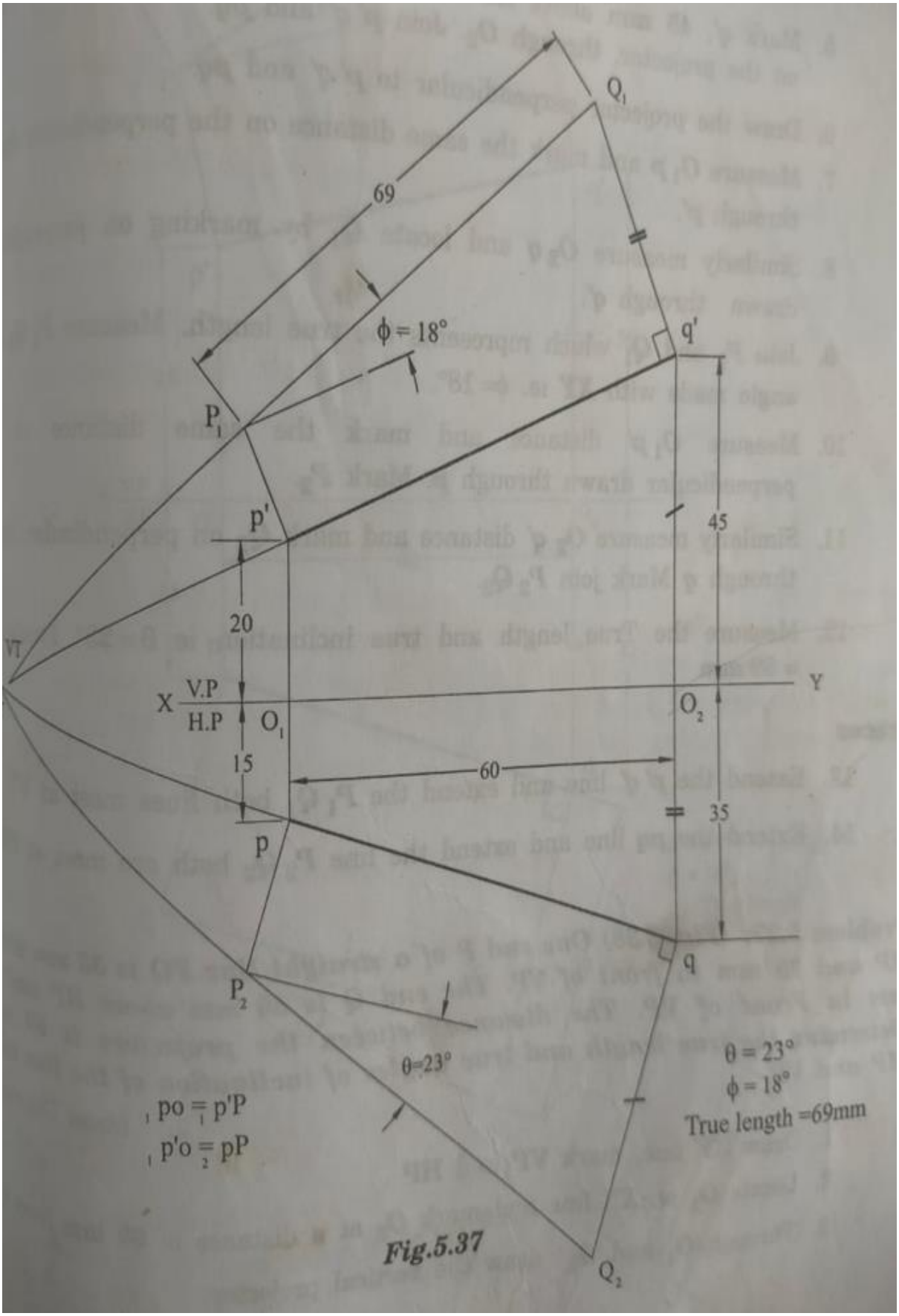
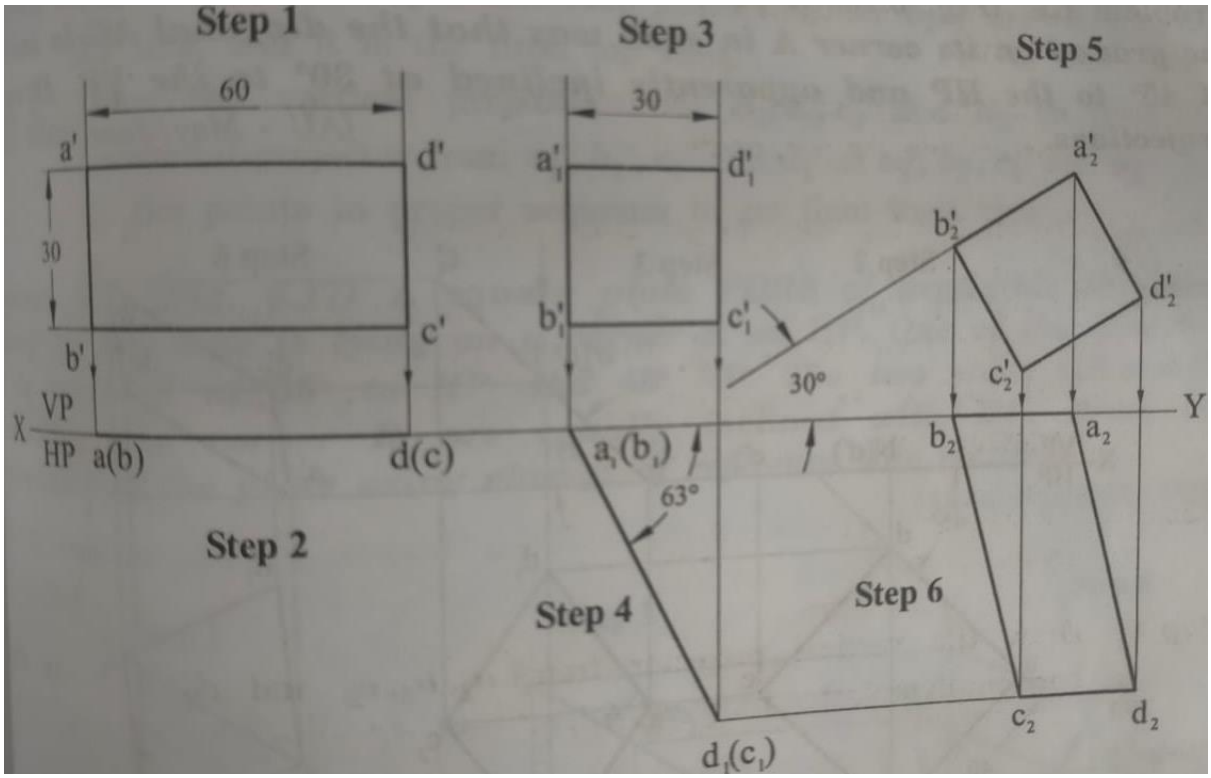
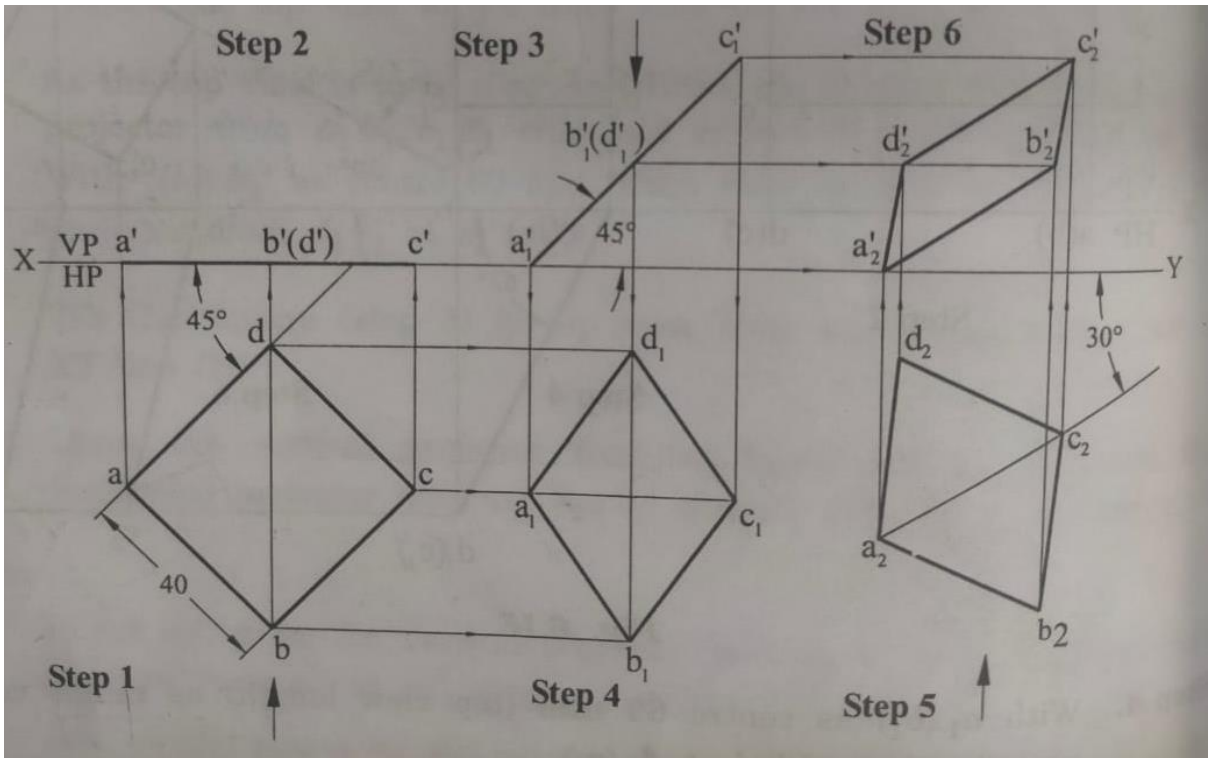


Fig.5.37

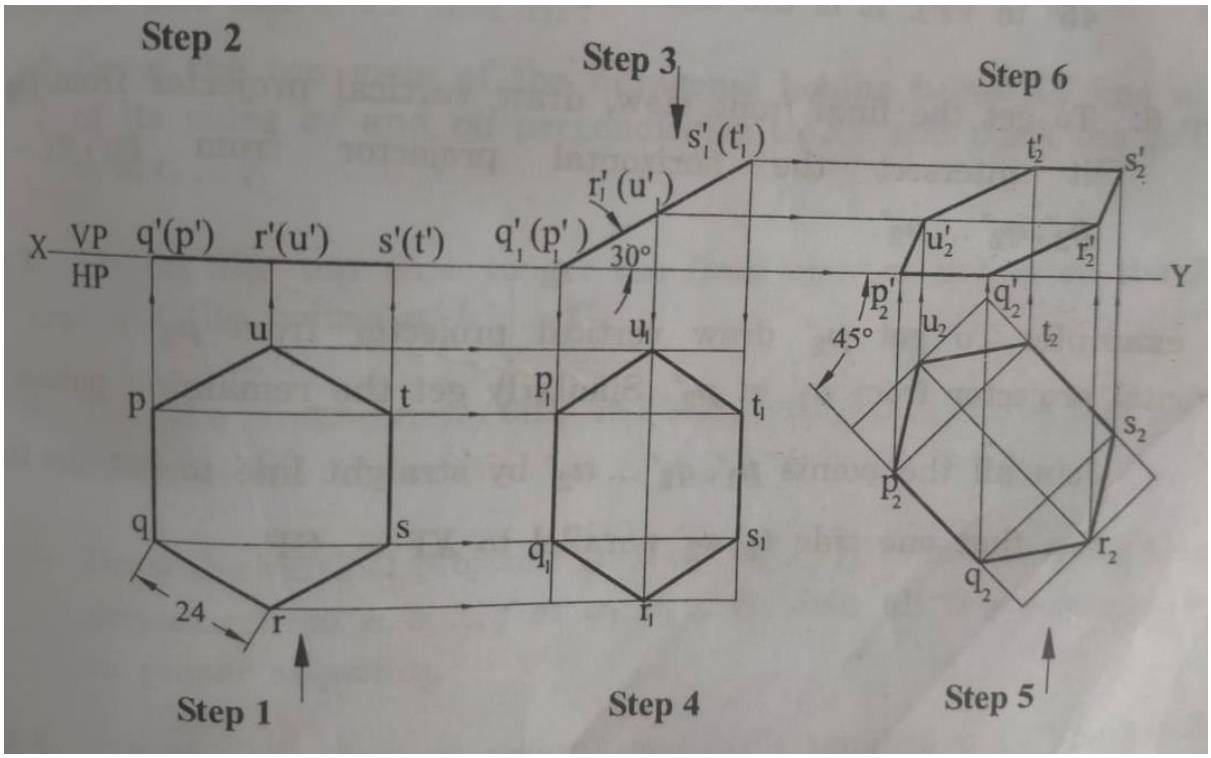
10. A thin rectangular plate of sides 60 mm x 30 mm has its shorter side in the VP and inclined at 30° to the HP. Project its top view if its front view is a square of 30 mm long sides.



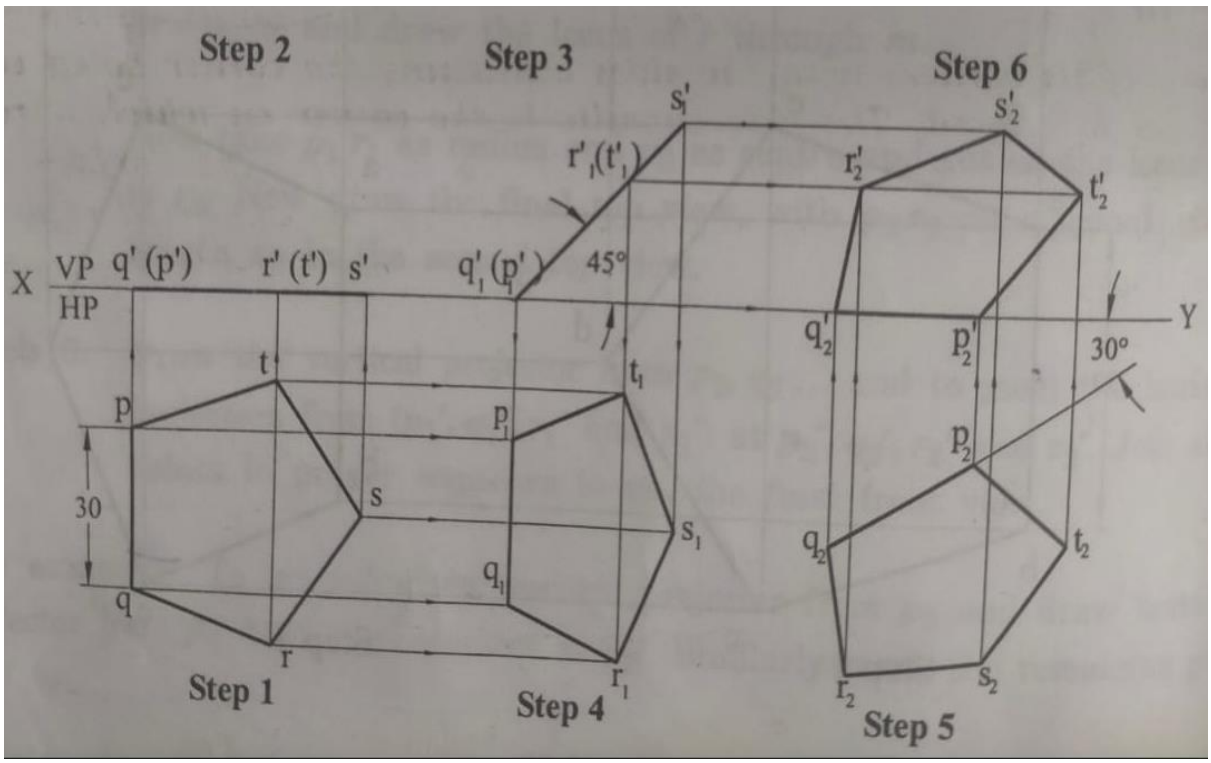
11. A square lamina ABCD of side 40 mm rests on the ground on its corner 'A' in such a way that the diagonal PR is inclined at 45° to the HP and apparently inclined at 30° to the VP. Draw its projections.



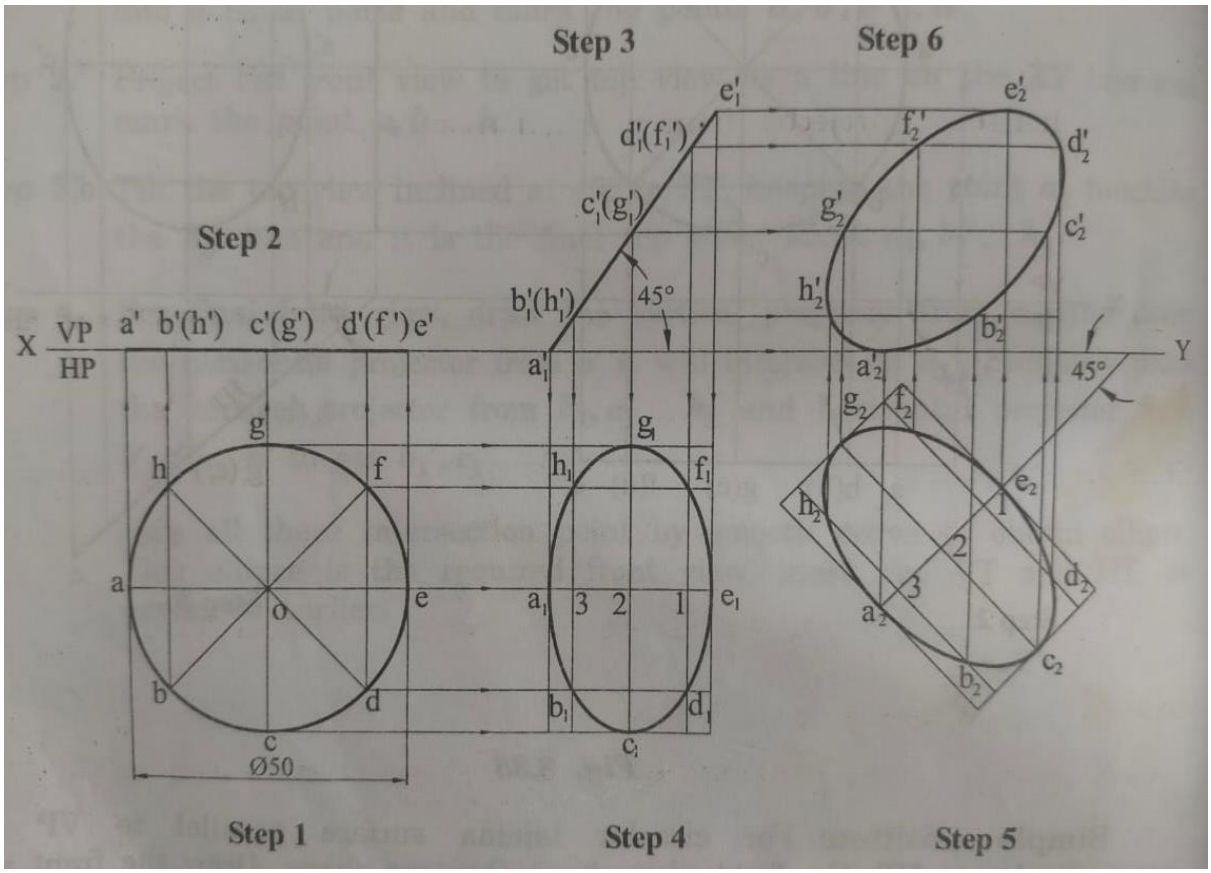
12. A hexagonal lamina of 24 mm side has its surface inclined at 30° to HP. Its one side is parallel to HP and inclined at 45° to VP. Draw its projections.



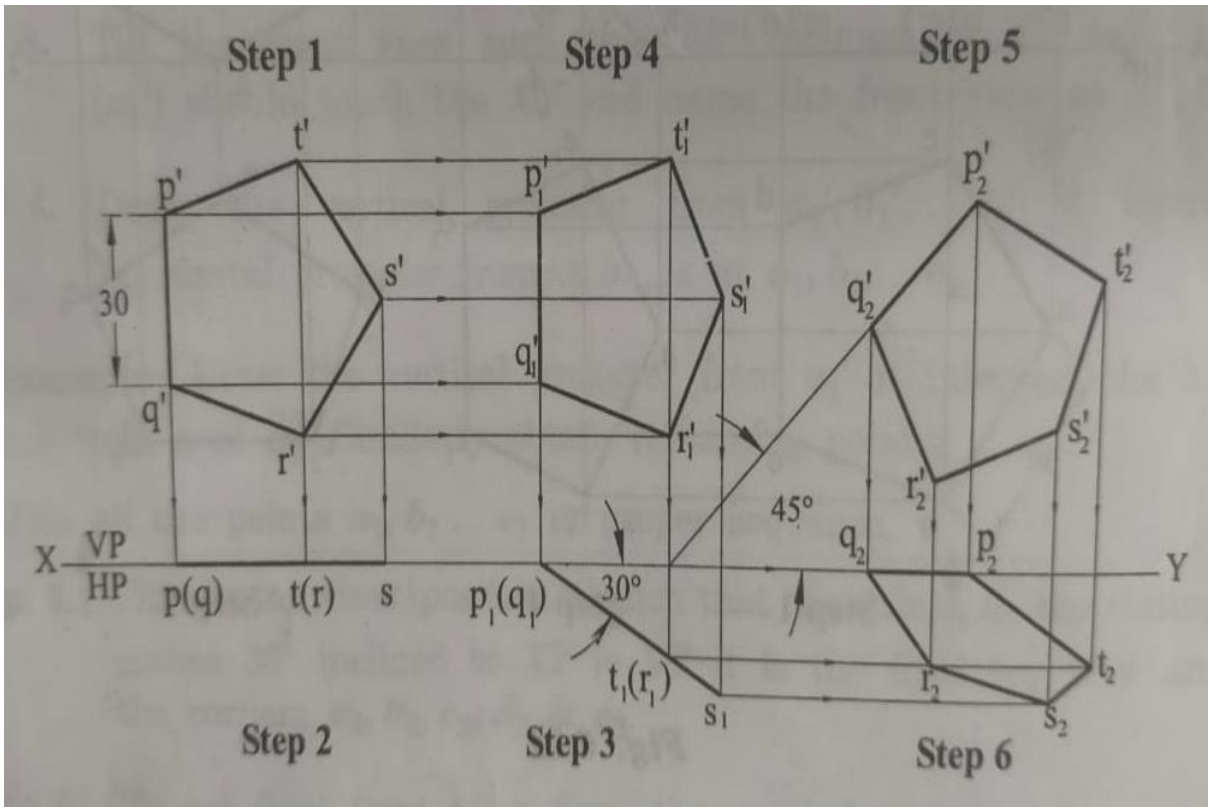
13. A regular pentagonal lamina of 30 mm sides has one edge in HP and inclined at an angle of 30° to VP. Draw its projections when its surface is inclined at 45° to HP.



14. A thin circular plate of 50 mm diameter lies on the HP such that its surface is inclined at 45° to the HP. The diameter through the point on which the plate lies on the HP appears to be inclined at 45° to VP. Draw the projections by change of position method.



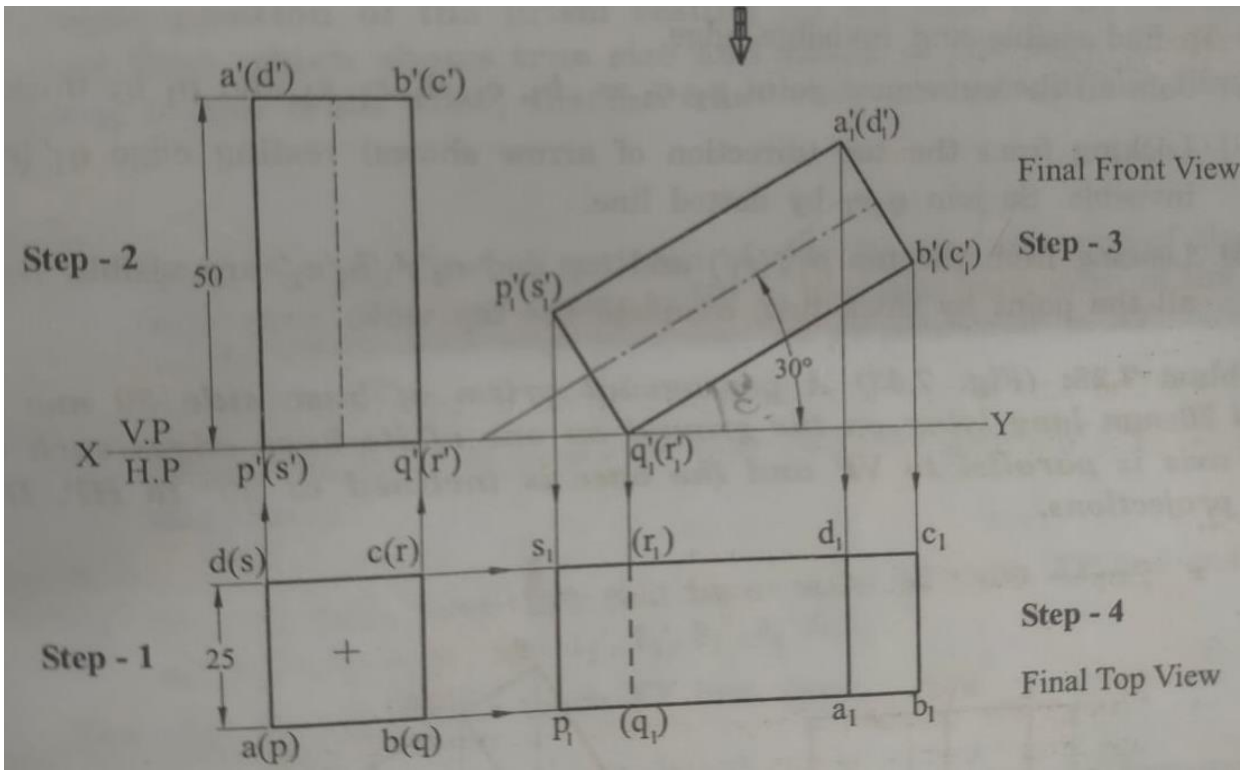
15. Draw the projection of pentagonal sheet of side 30 mm rest on VP on one of its sides inclined at 45° to the HP. The surface of the sheet is inclined at 30° to VP.



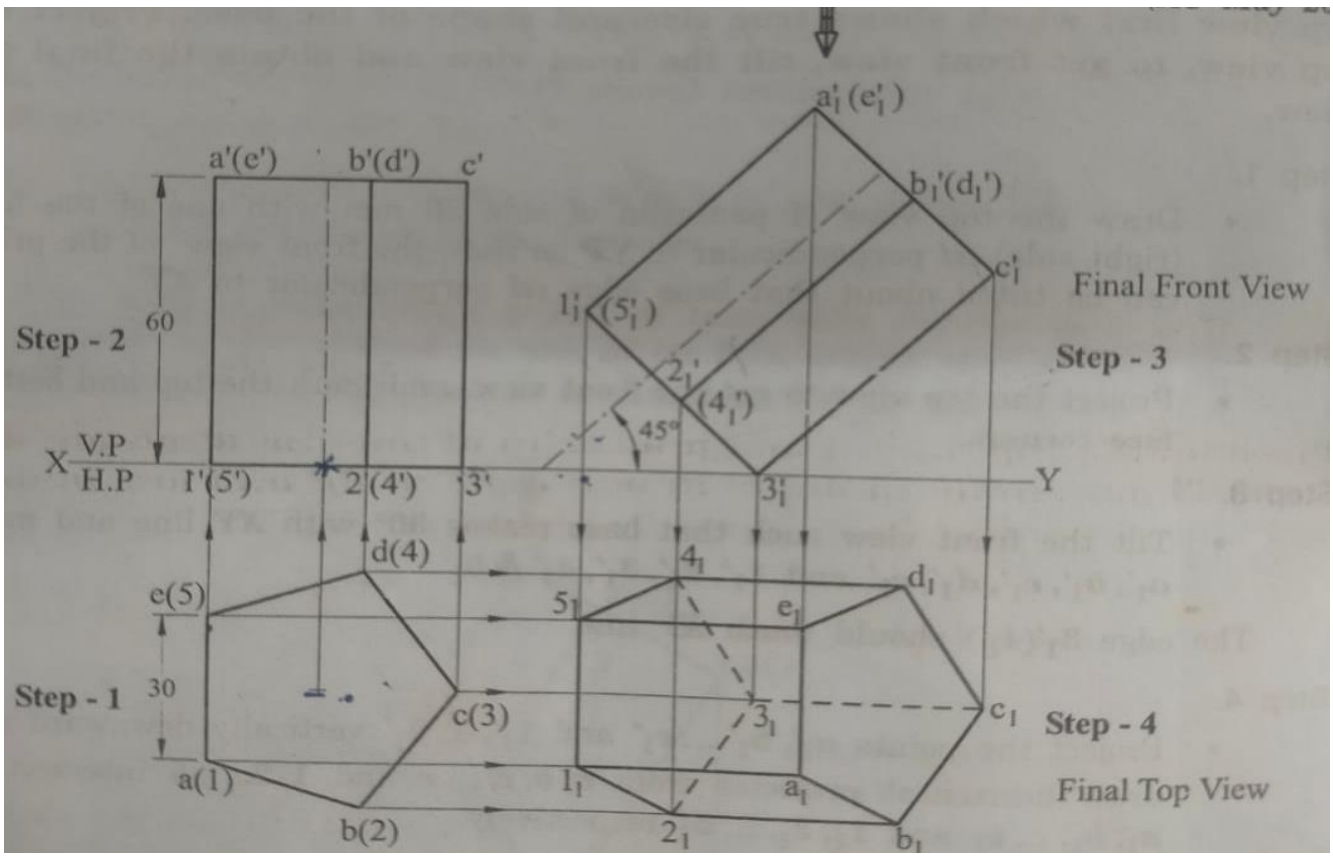
Unit – 3 – PROJECTION OF SOLIDS

Assignment – III

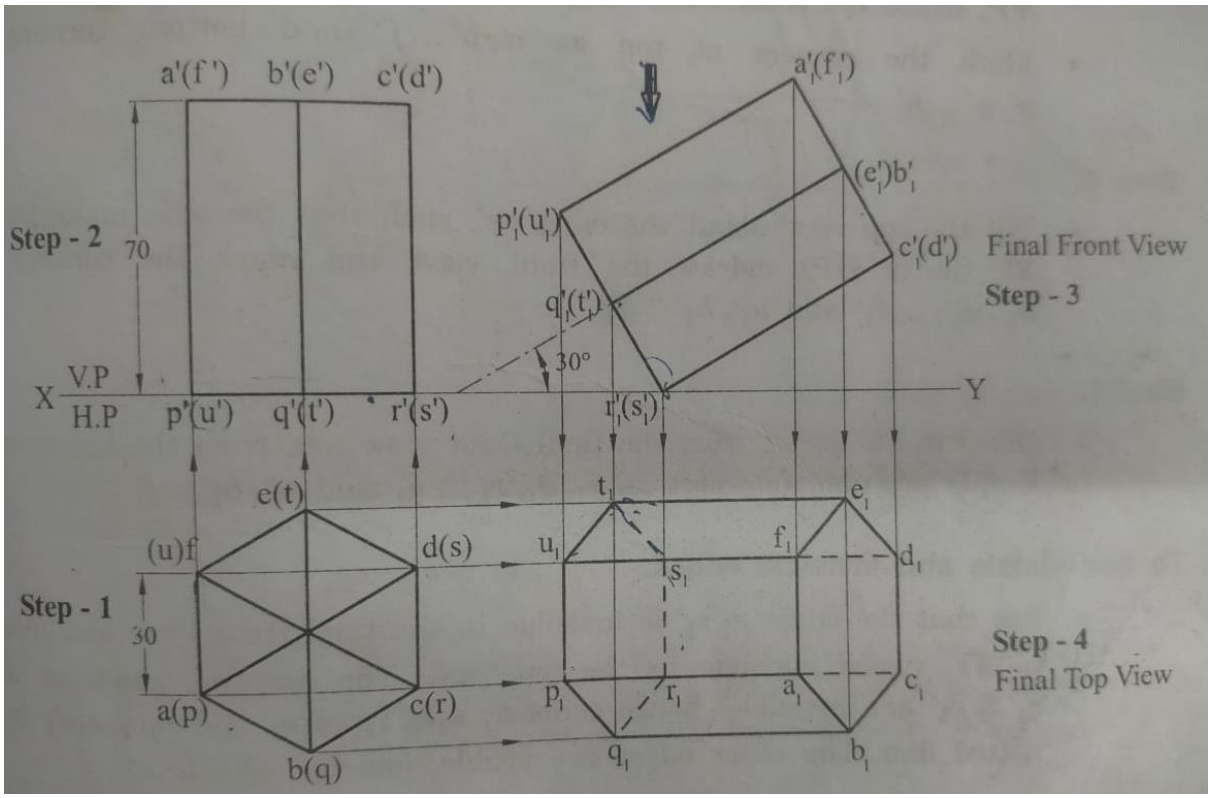
1. Draw Square prism of side 25 mm and axis 50 mm rest on one of its base edges on HP with its axis inclined at 30° to HP. Draw its projections.



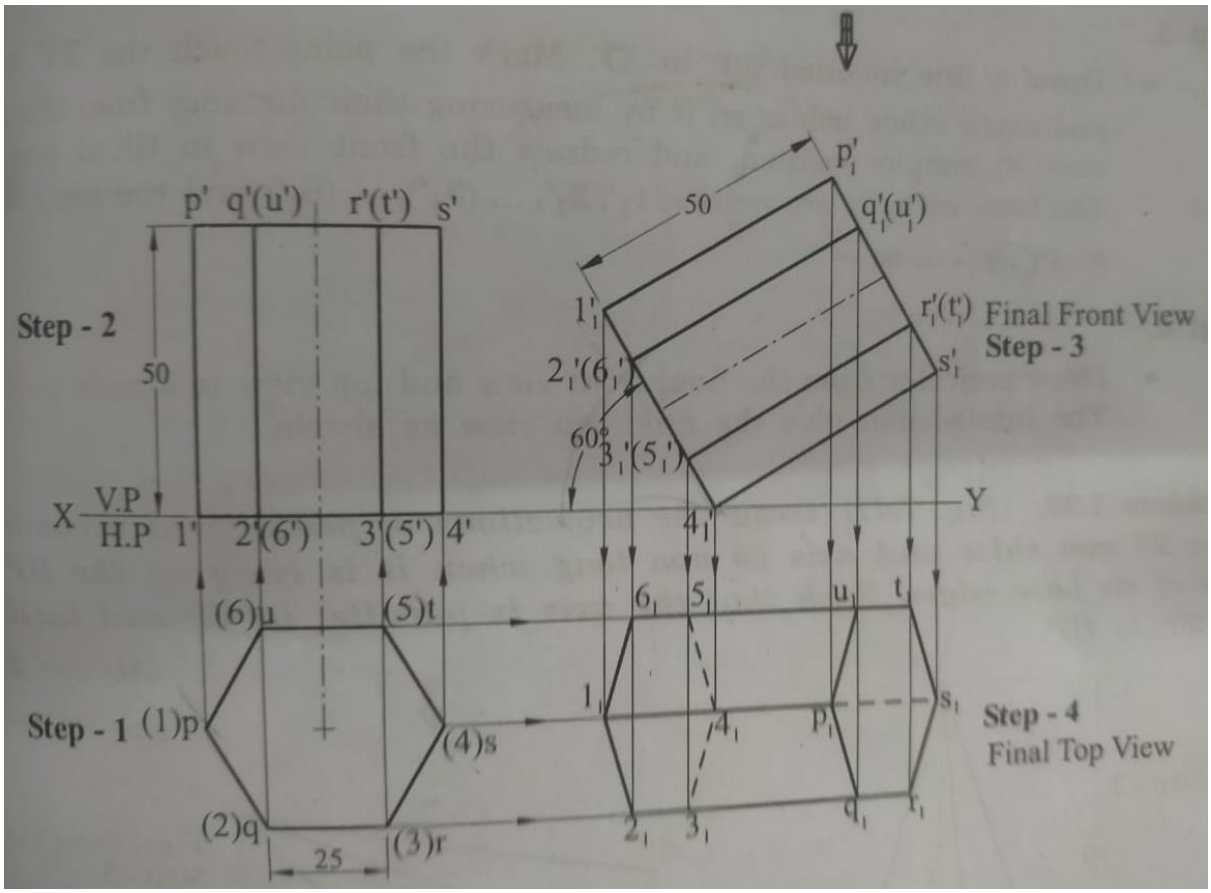
2. A pentagonal prism of base side 30 mm axis length 60 mm rests on HP on one of the base corners with the with the base edges containing it being equally inclined to HP. The axis is inclined 45° to the HP and parallel to VP. Draw the projection prisms by change of position method.



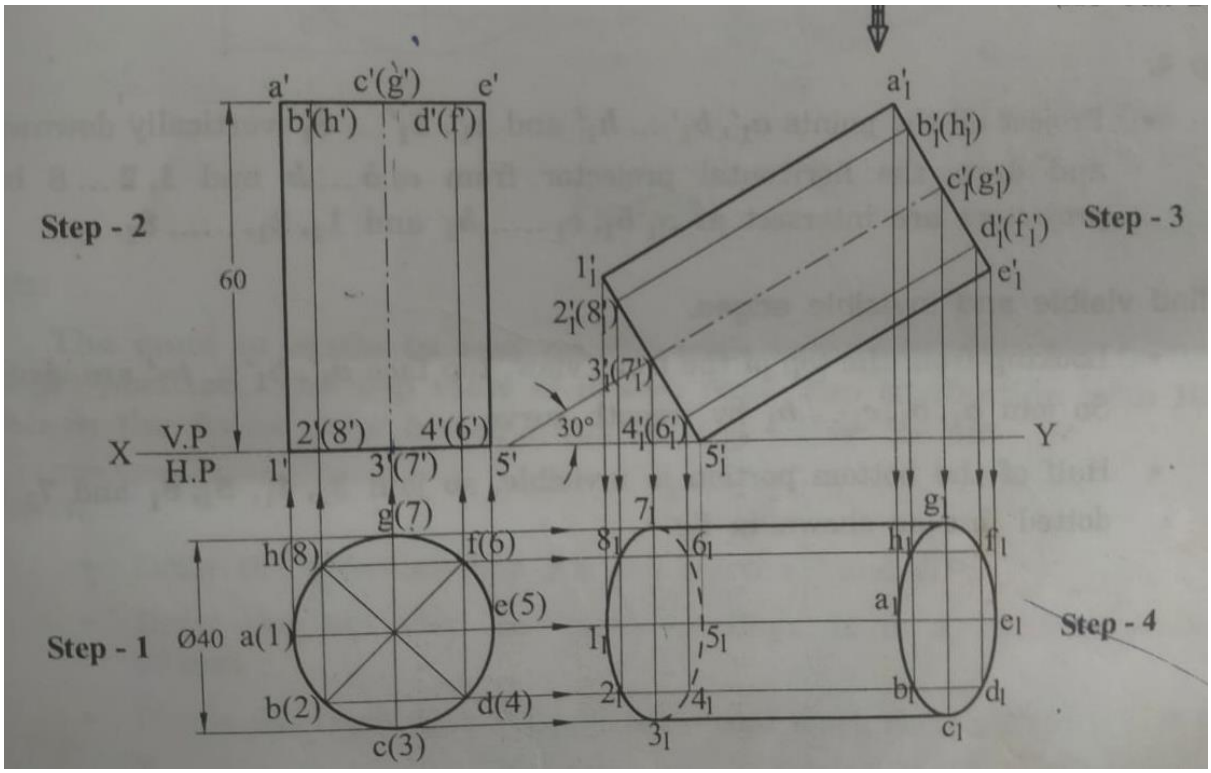
3. A hexagonal prism of base side 30 mm and axis length 70 mm resting on one of its base edges on HP with axis inclined to 30° to HP and parallel to VP. Draw its projections.



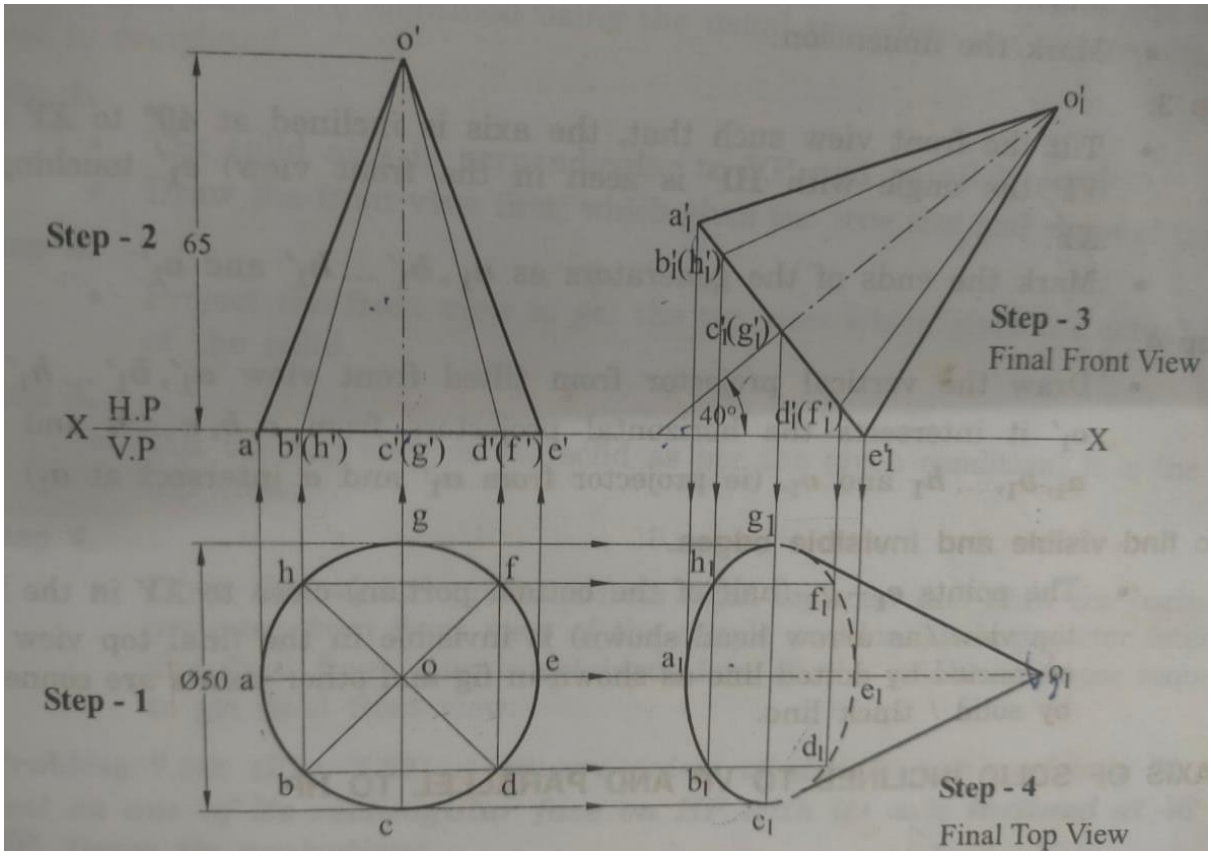
4. A hexagonal prism of base side 25 mm and axis length 50 mm rest with one of its base corners on HP. Such that the base makes an angle of 60° to HP and its axis parallel to VP. Draw its projections.



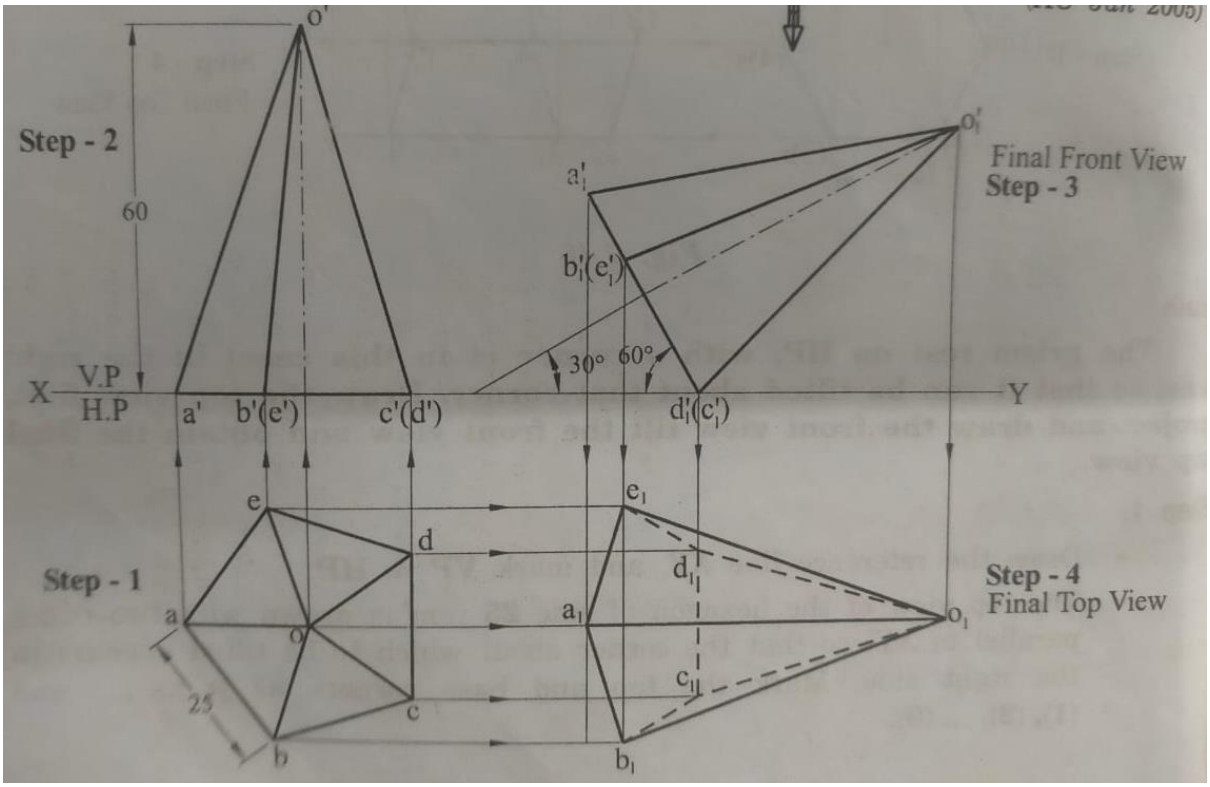
5. Draw the projection of cylinder 40 mm diameter and axis 70 mm long when its rests on the HP on one of its base points. The axis of the cylinder is parallel to VP and inclined at 30° to HP.



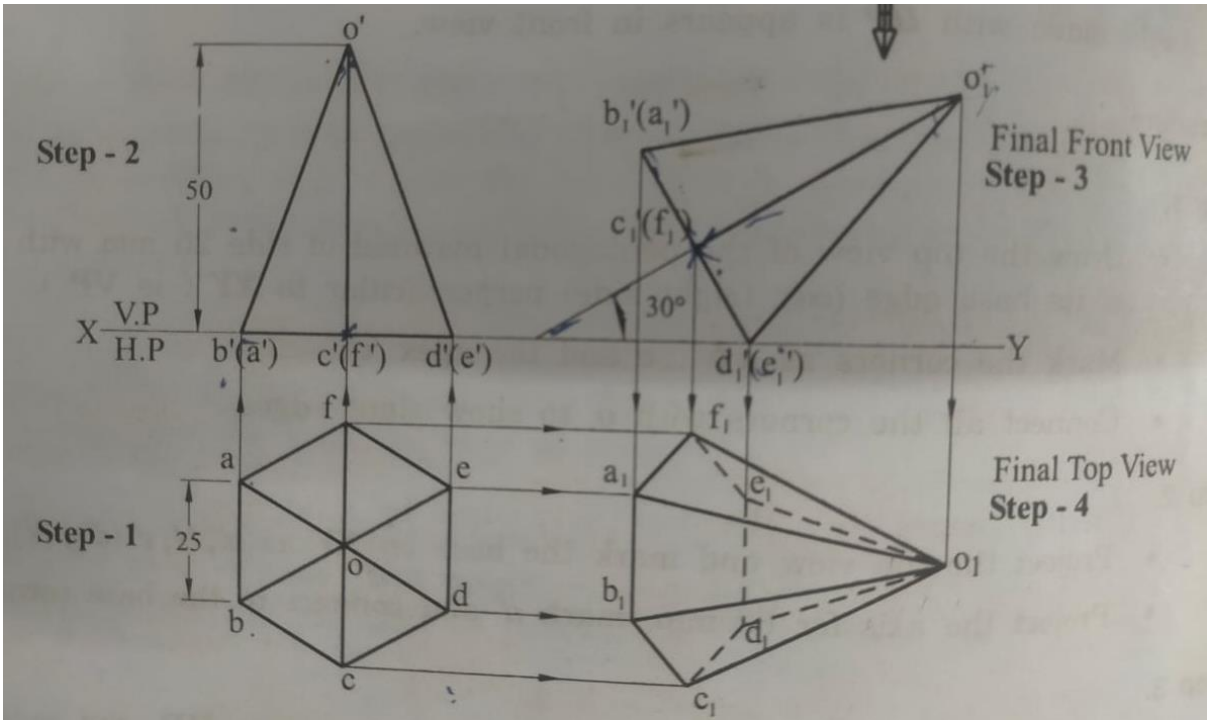
6. A cone of base diameter 50 mm and axis length 65 mm is resting on HP on a point on the circumference of the base with its axis inclined at 40° to HP and parallel to VO. Draw its projections.



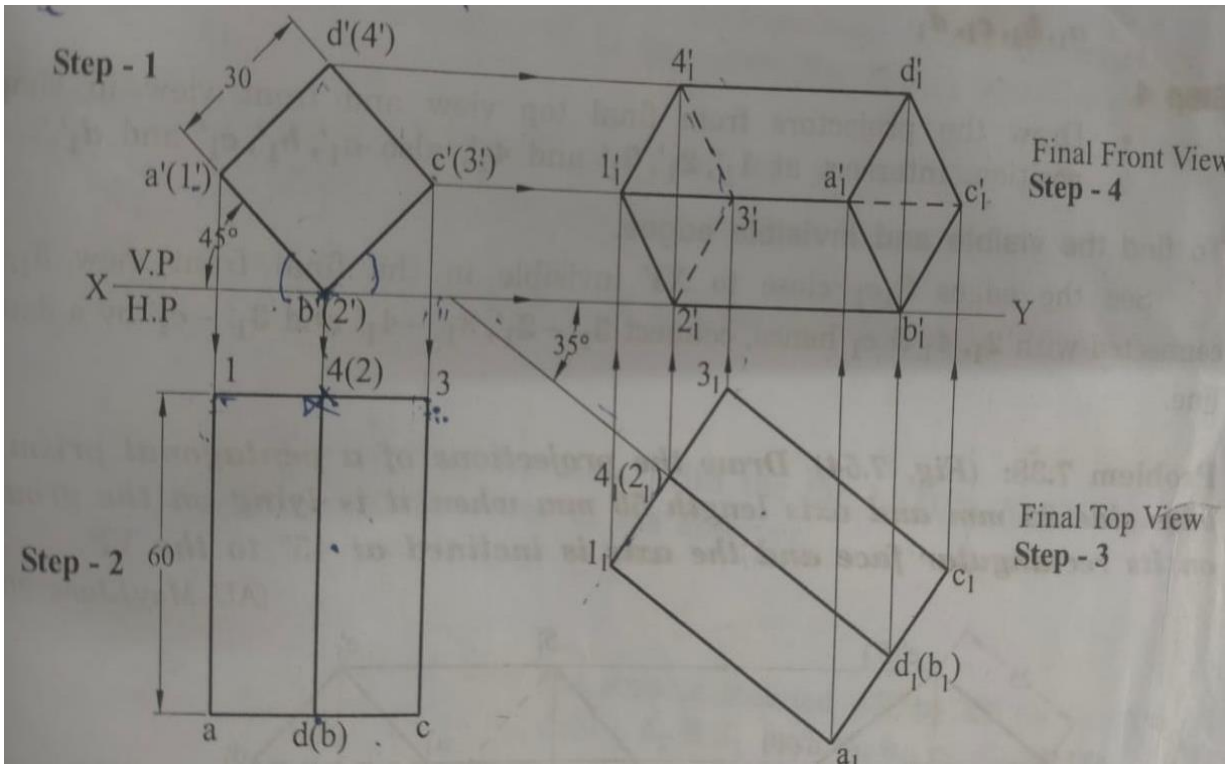
7. Draw the projection of pentagonal pyramid of base side 25 mm and axis 60 mm long when its lying on the HP on one of its base edges, such that the axis is parallel to VP and inclined at 30° to HP.



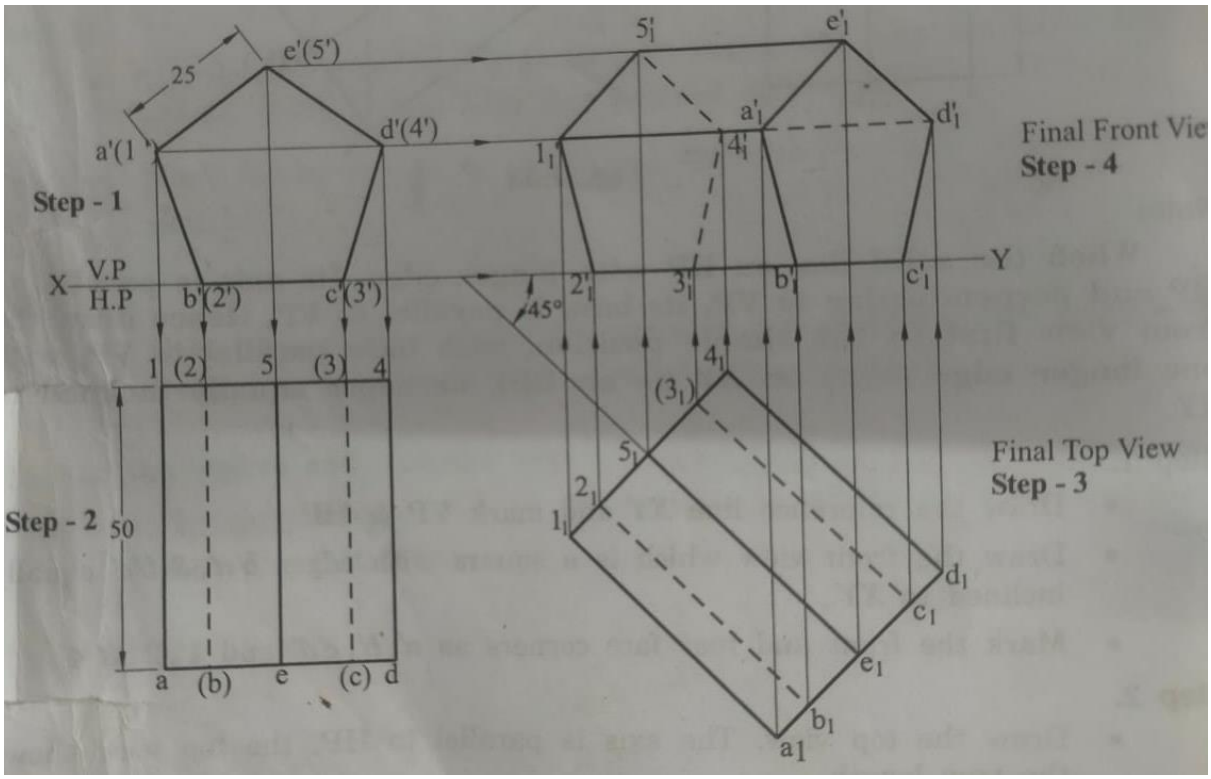
8. A hexagonal pyramid of base edges 25 mm and axis height 50 mm rest on one of its base edges on the HP with its axis is inclined at 30° to HP and parallel to VP. Draw its projections.



9. A square prism of base side 30 mm and axis length 60 mm lies on the HP on one of its longer edges with its faces equally inclined to the HP. Draw the projections when its axis is inclined at 35° to the VP.



10. Draw the projections of a pentagonal prism of base side 25 mm and axis length 50 mm when its lying on the ground on its rectangular face and the axis is inclined at 45° to VP.



11. Draw the projection of a square pyramid of base side 40 mm and axis 60 mm when its resting on the HP on one of its base corners with a base side containing the corner making at 30° to HP. The axis is incline at 45° to VP and is parallel to the HP and vertex is away from the VP.

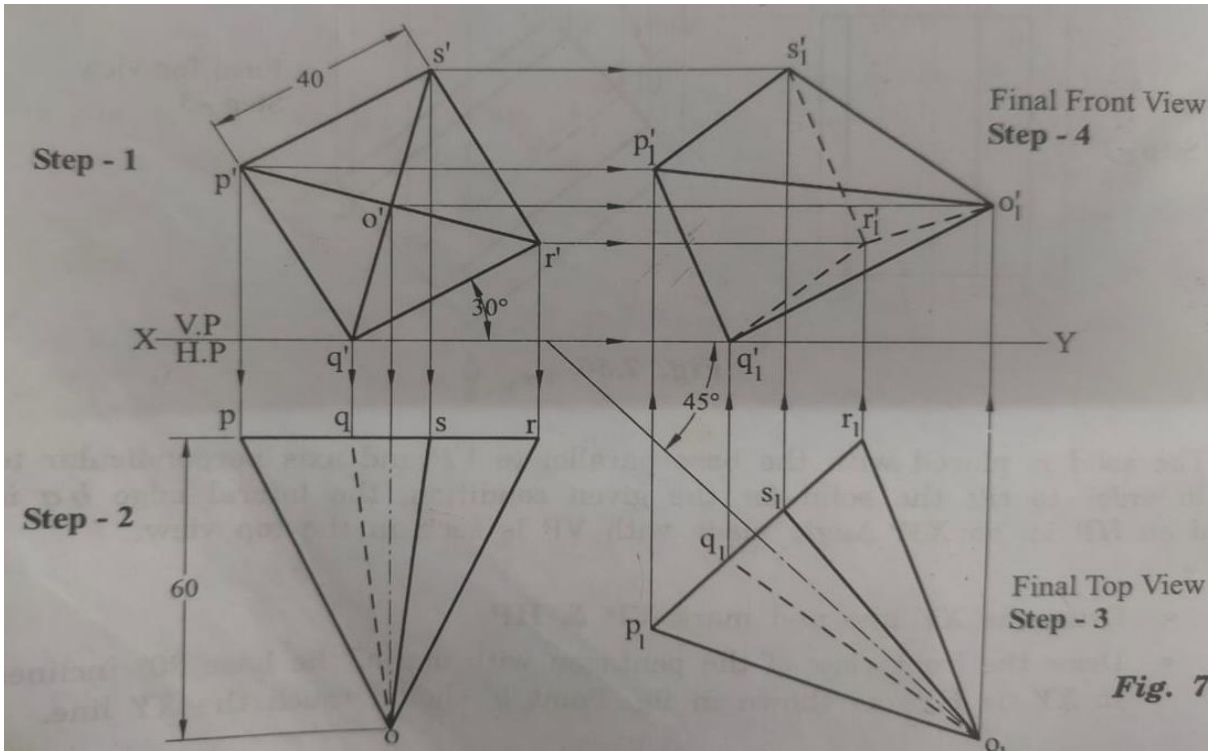
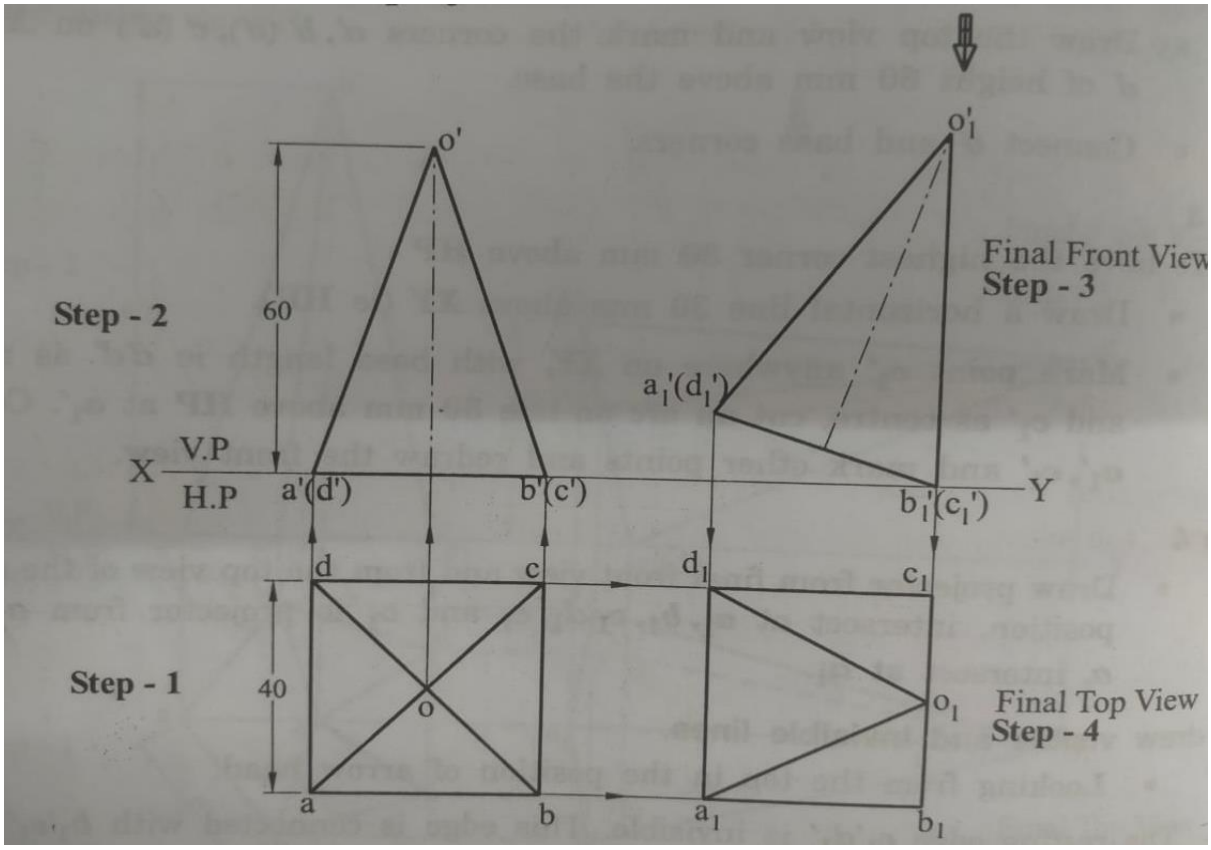
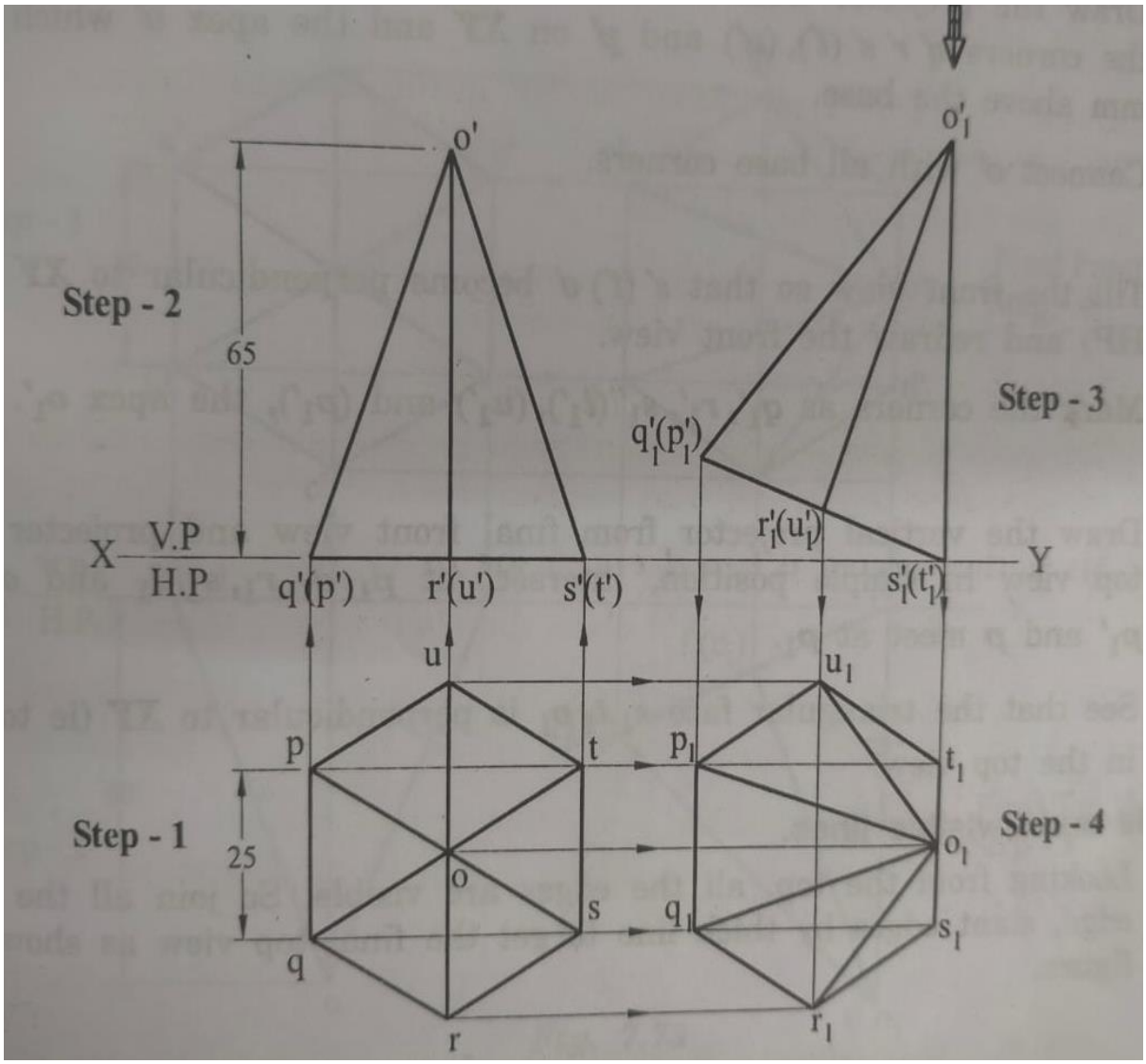


Fig. 7

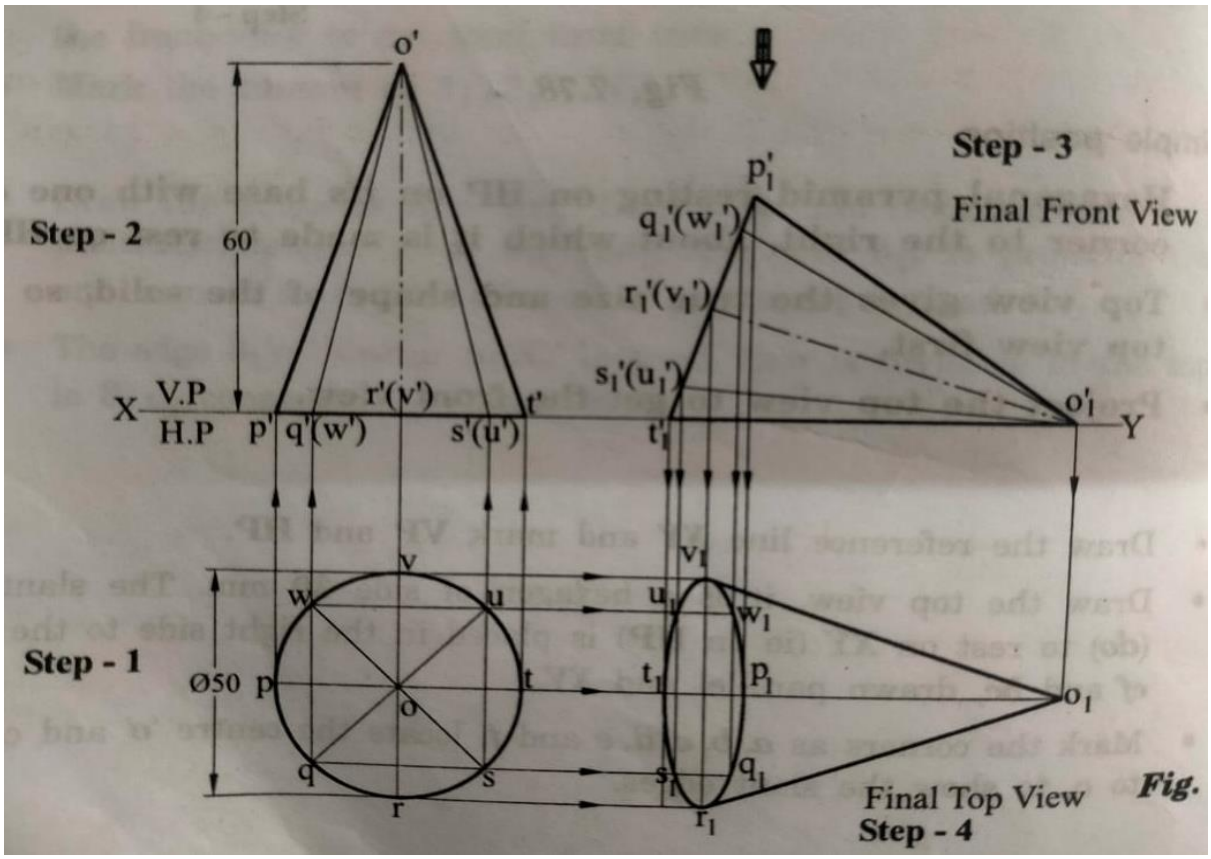
12. A square pyramid of base side 40 mm and axis 60 mm rests on the HP on one of its base edges perpendicular to VP and the triangular faces containing the resting edge is perpendicular to both VP and HP. Draw its projections.



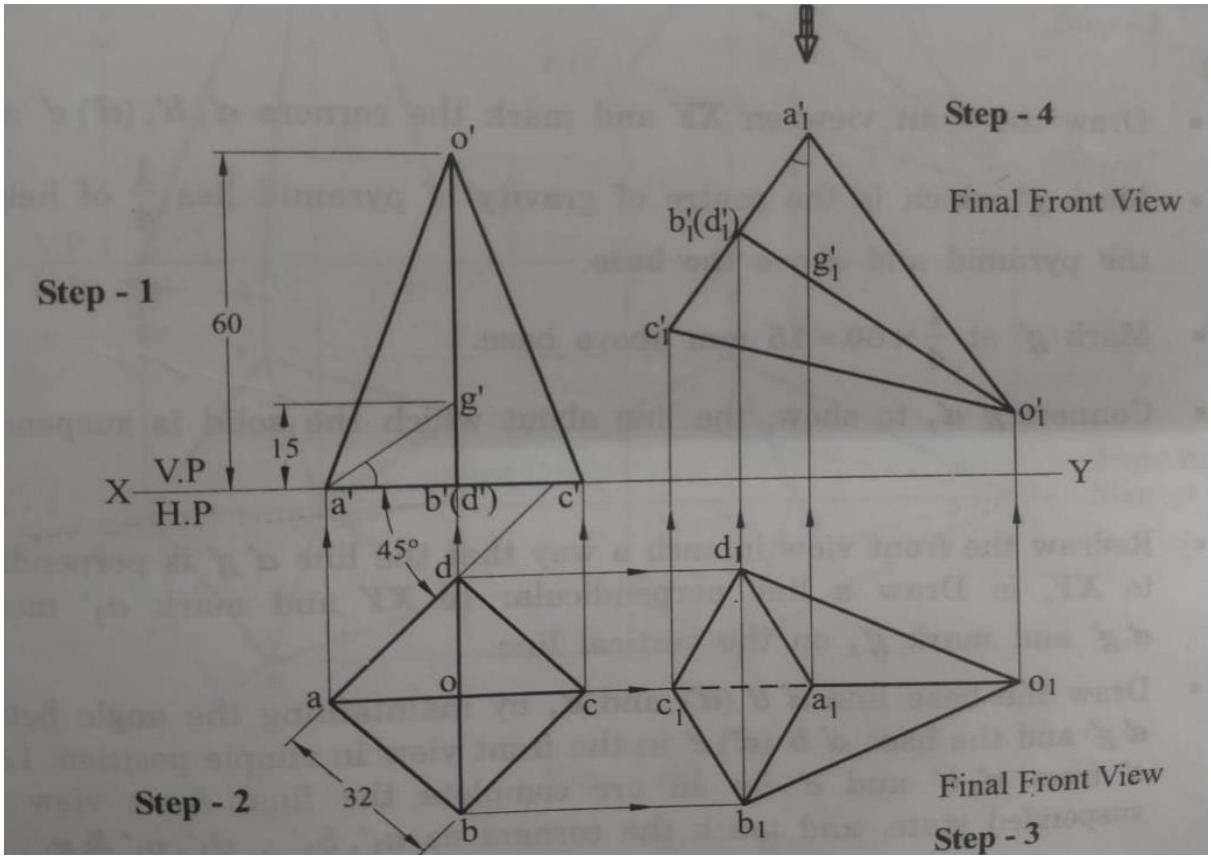
13. Hexagonal pyramid of base side of 25 mm and axis 65 mm rests on the HP on one of its edges such that the triangular face containing the resting edge is perpendicular to both the HP and VP. Draw its projections.



14. Draw the projection of a cone of base diameter 50 mm and axis length 60 mm, when its lies on the ground on one of its generators with the axis parallel to the VP.



15. A square pyramid, base 32 mm side and axis 60 mm long, is freely suspended from one of the corners of its base with the axis parallel to VP. Draw its projections.

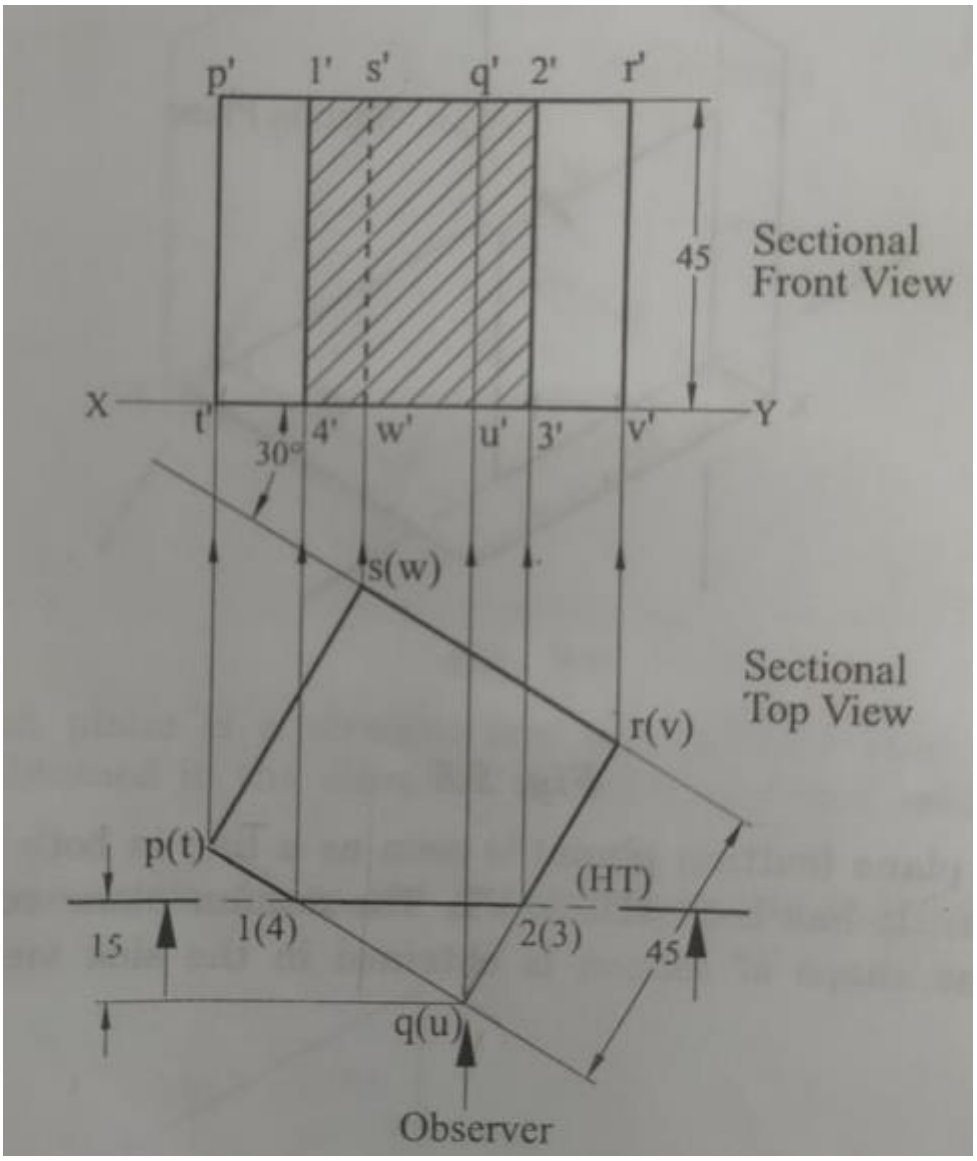


Unit – 4 – SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

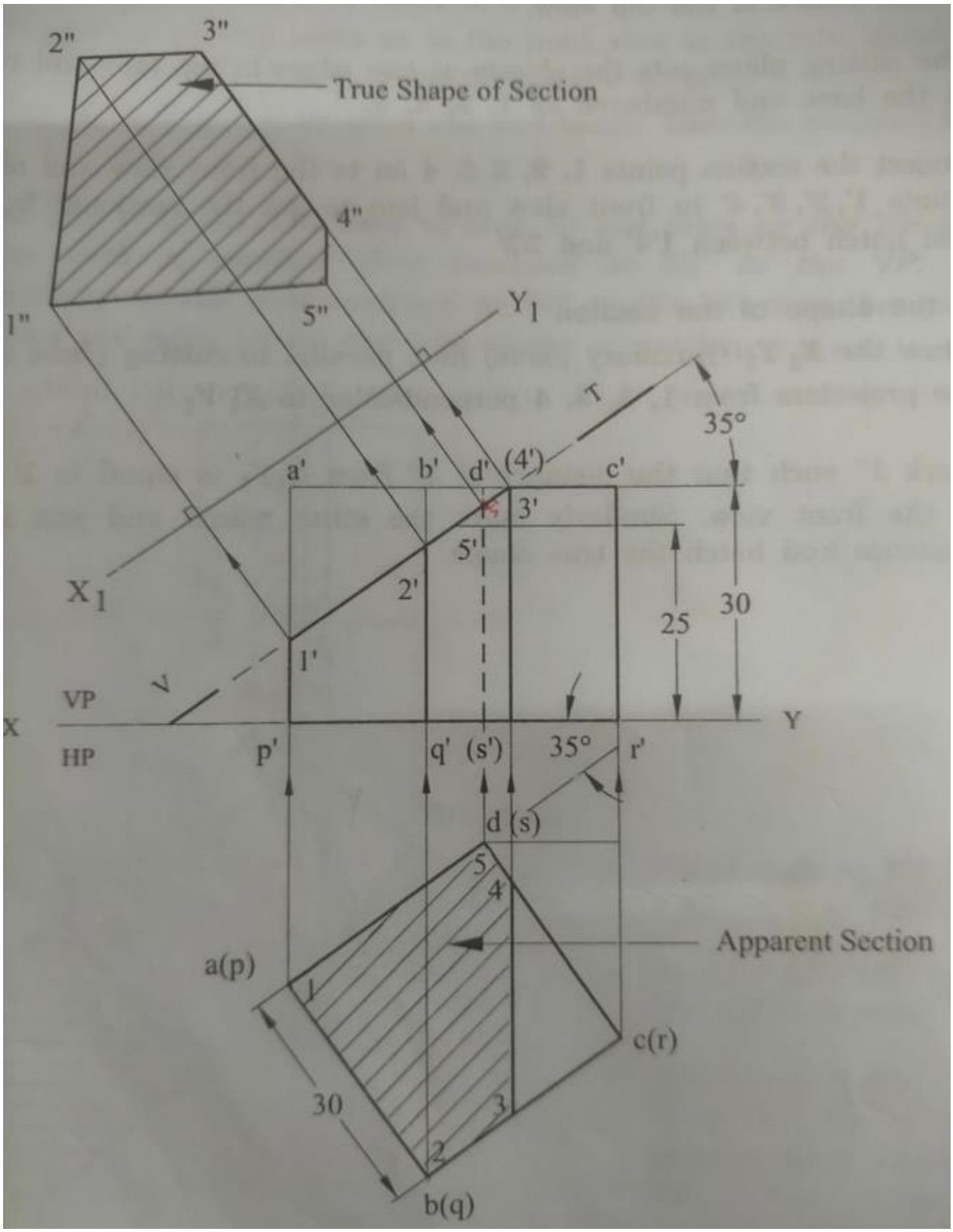
Assignment – IV

Section of Solids:

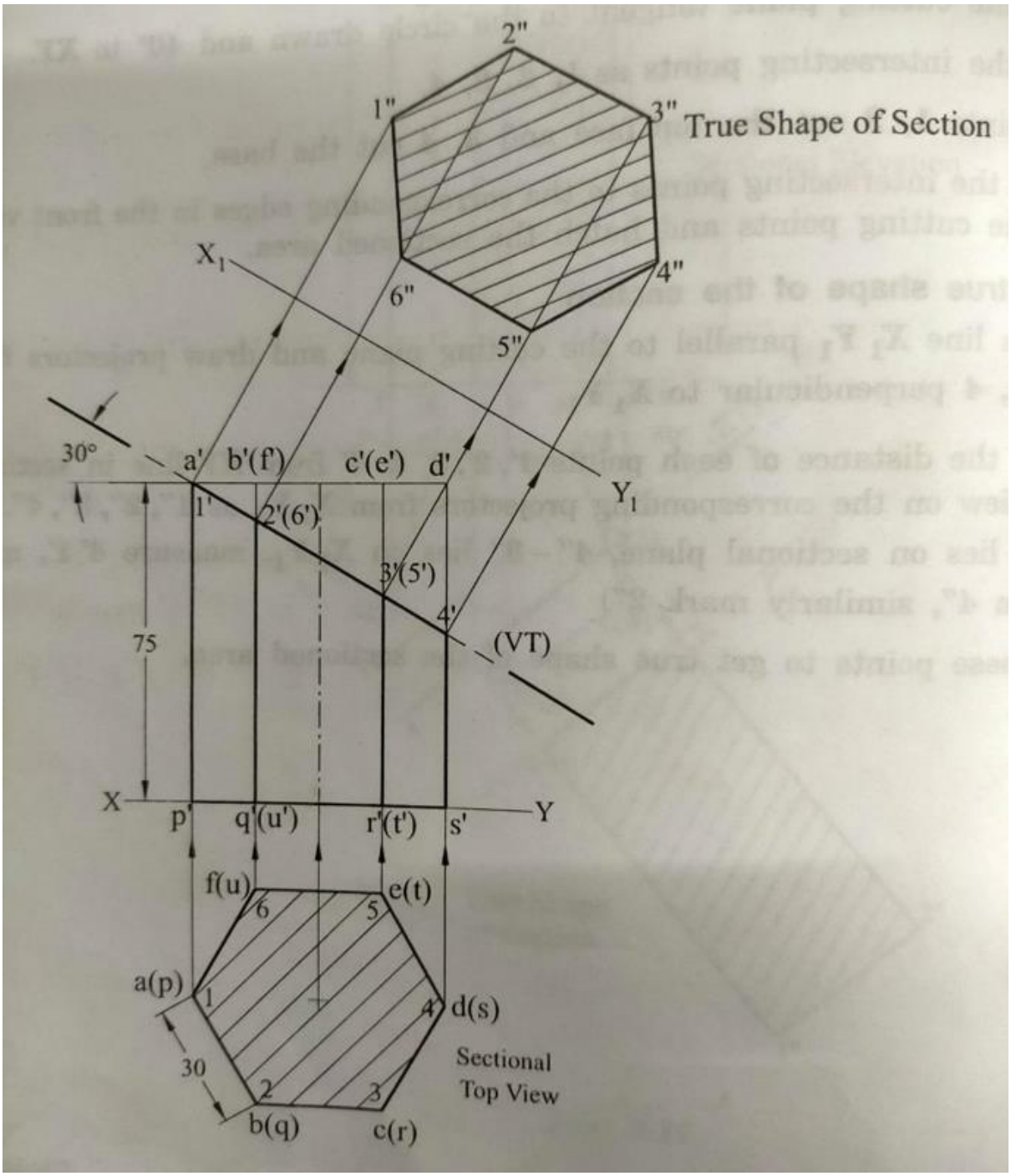
1. A cube of 45 mm side rest with its face on HP such that one of its vertical face is inclined at 30° to VP. As sectional plane is parallel to VP cuts the cube at a distance of 15 mm from the vertical edge nearer to the observer. Draw its top and sectional views.



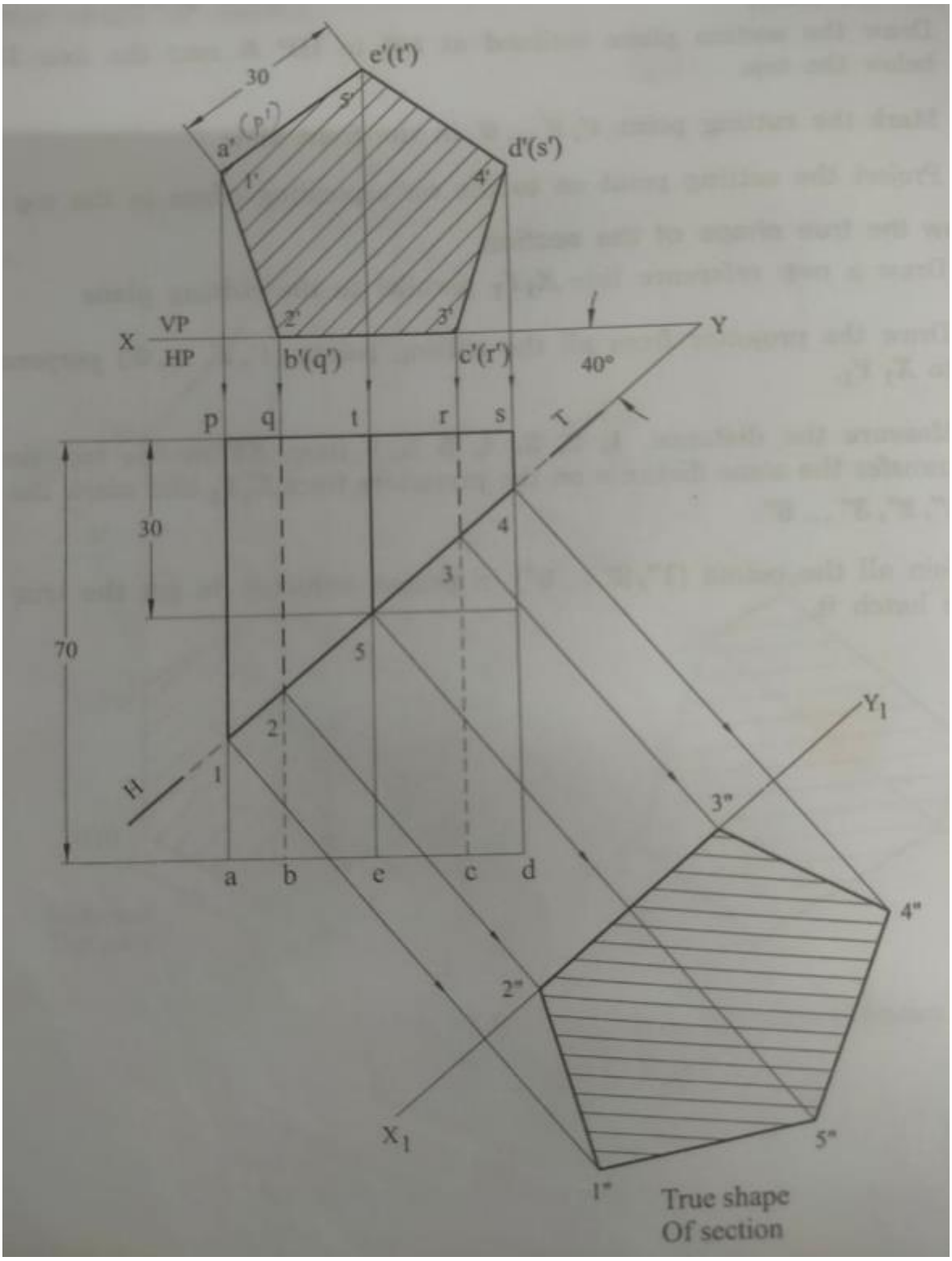
2. A cube of side 30 mm rest on the HP on one of its faces with a vertical face is inclined at 35° to the VP. It is cut by a section plane perpendicular to the VP and inclined at 35° to the HP and meeting the axis at 25 mm above the HP. Draw the front view, sectional top view and the true shape of the sections.



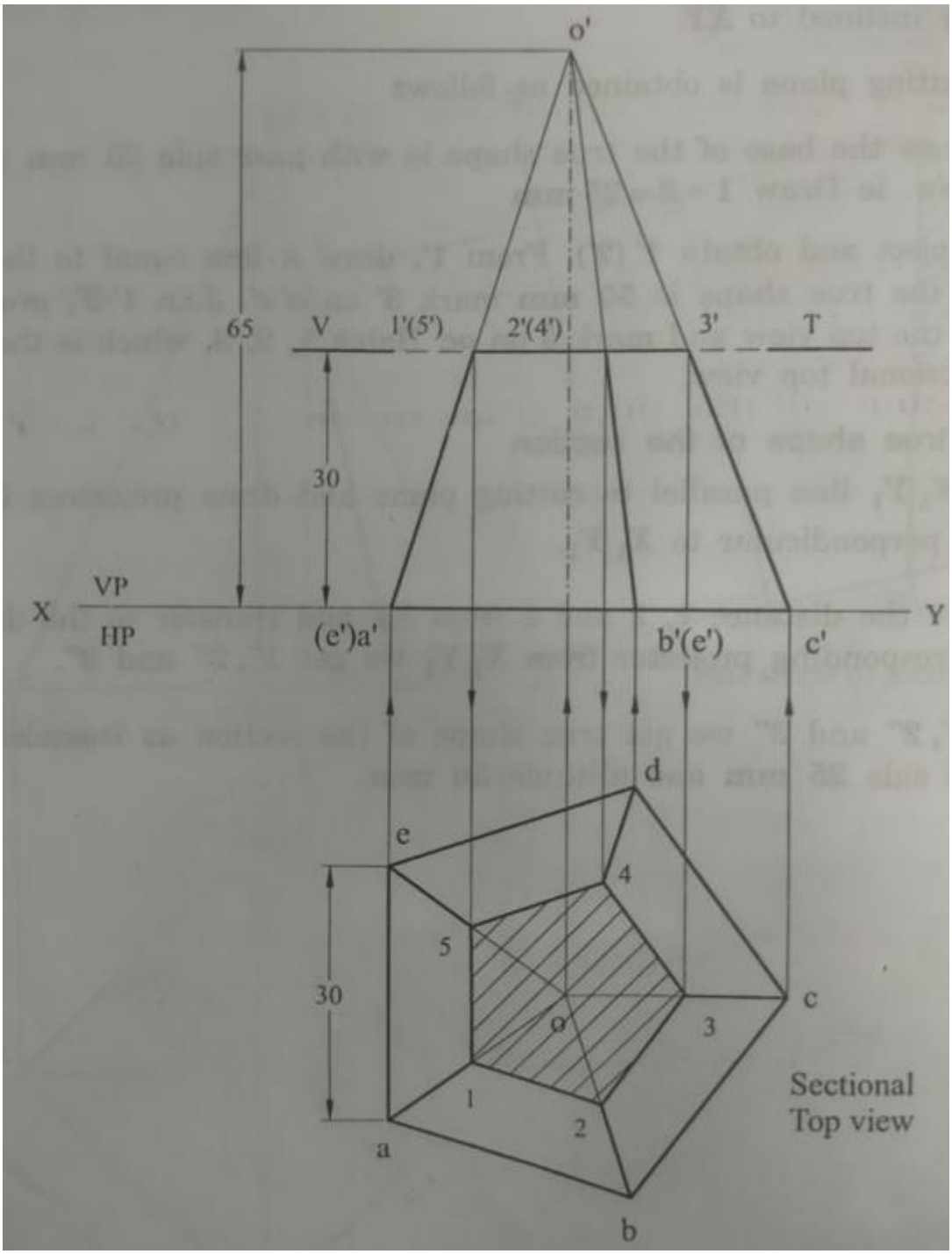
3. A hexagonal prism of side of base 30 mm and axis 75 mm long resting on its base on HP such that a rectangular face is parallel to VP. It is cut by section plane perpendicular to VP and inclined to HP. The sectional plane is passing through the top of an extreme lateral edge of the prism. Draw the sectional top view and true shape of the section.



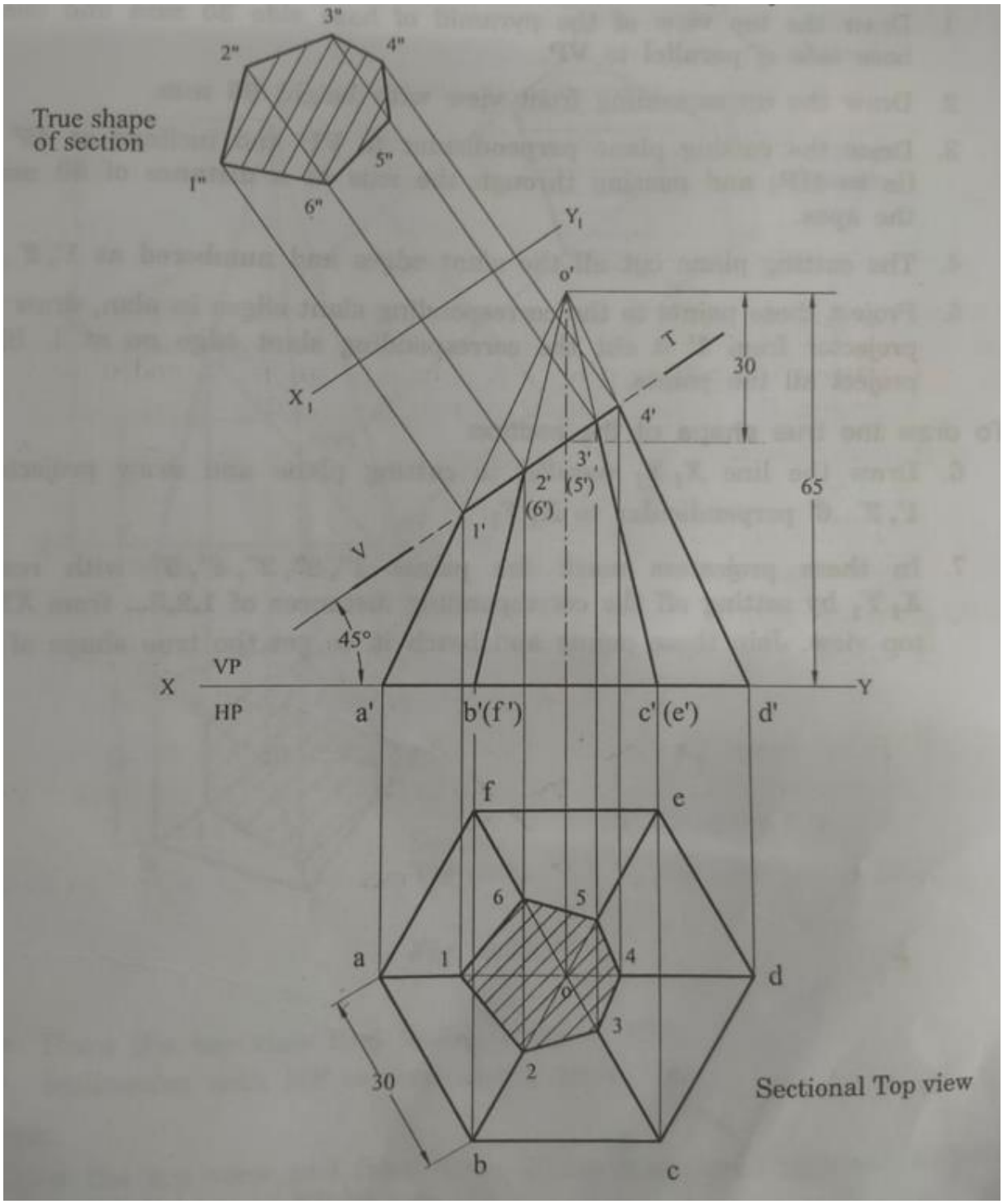
4. A pentagonal prism of base side 30 mm and axis length 70 mm is resting on HP on one of its rectangular faces, with its axis is perpendicular to VP. It is cut by section plane inclined at 40° to VP and perpendicular to HP and passing through a point 30 mm from rear base of the prism. Draw its top view, sectional front view and true shape of the sections.



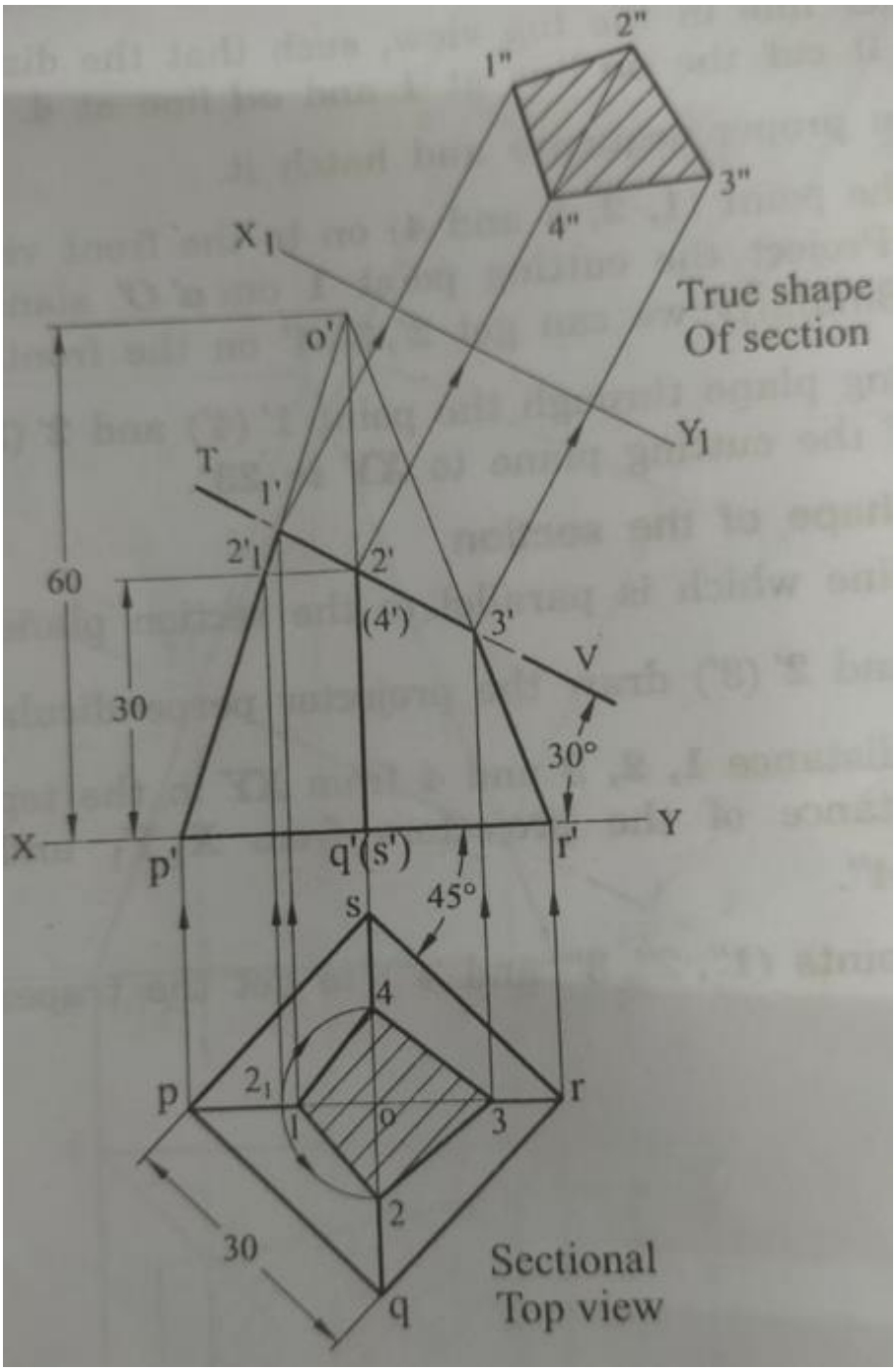
5. A pentagonal pyramid of side of base 30 mm and axis 65 mm long, rests with its base on HP and one of the edges of its base on HP and one of the edges of its base is perpendicular to VP. It is cut by a section plane perpendicular to VP. It is cut by a section plane perpendicular to VP and parallel to HP and passing through the axis at a point 30 mm above the base. Draw the front and sectional top view.



6. A hexagonal pyramid of side of base is 30 mm and altitude 65 mm long rests with its base on HP with two of its base sides are parallel to VP. It is cut by a section plane perpendicular to VP and inclined at 45° to HP and passing through the axis at a distance of 30 mm from the apex. Draw the sectional top view and true shape of the section.

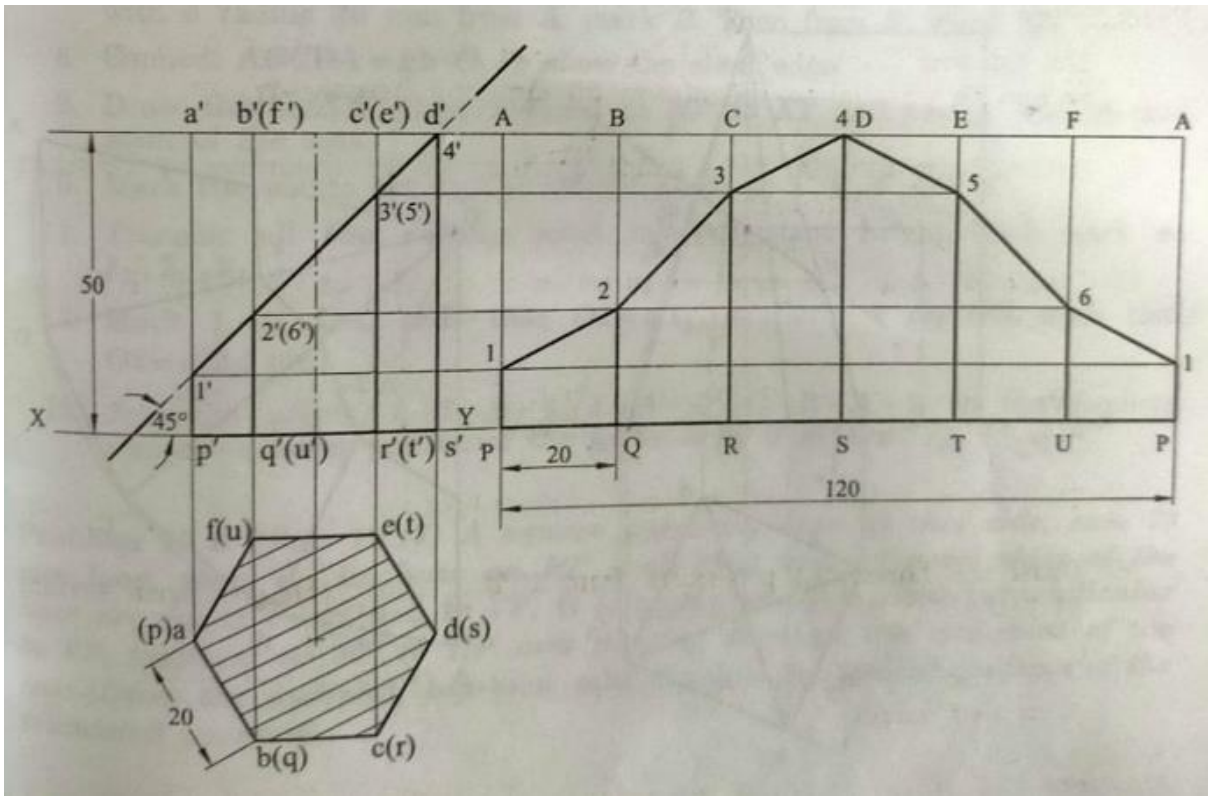


7. A square pyramid of base side 30 mm and axis 60 mm long is standing on the HP with its base edges are equally inclined to VP. It is cut by a section plane perpendicular to the VP and inclined at 30° to the HP bisecting the axis. Draw the sectional top view and true shape of the sections.

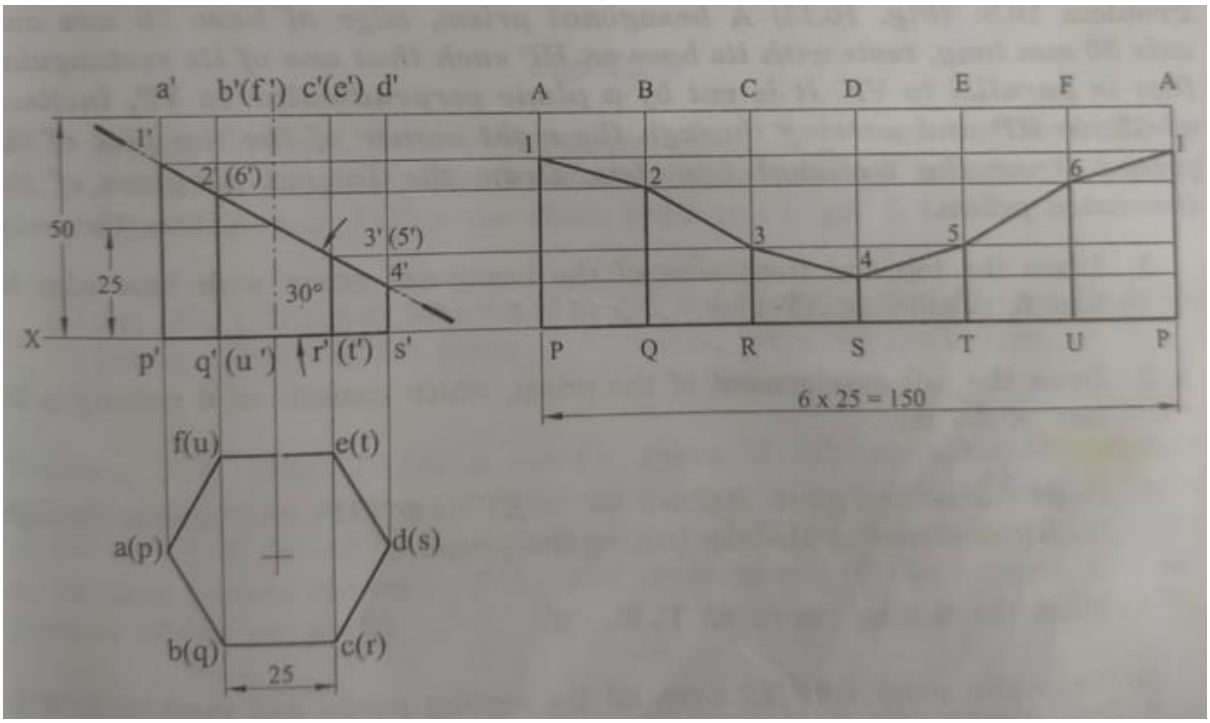


Development of Surfaces:

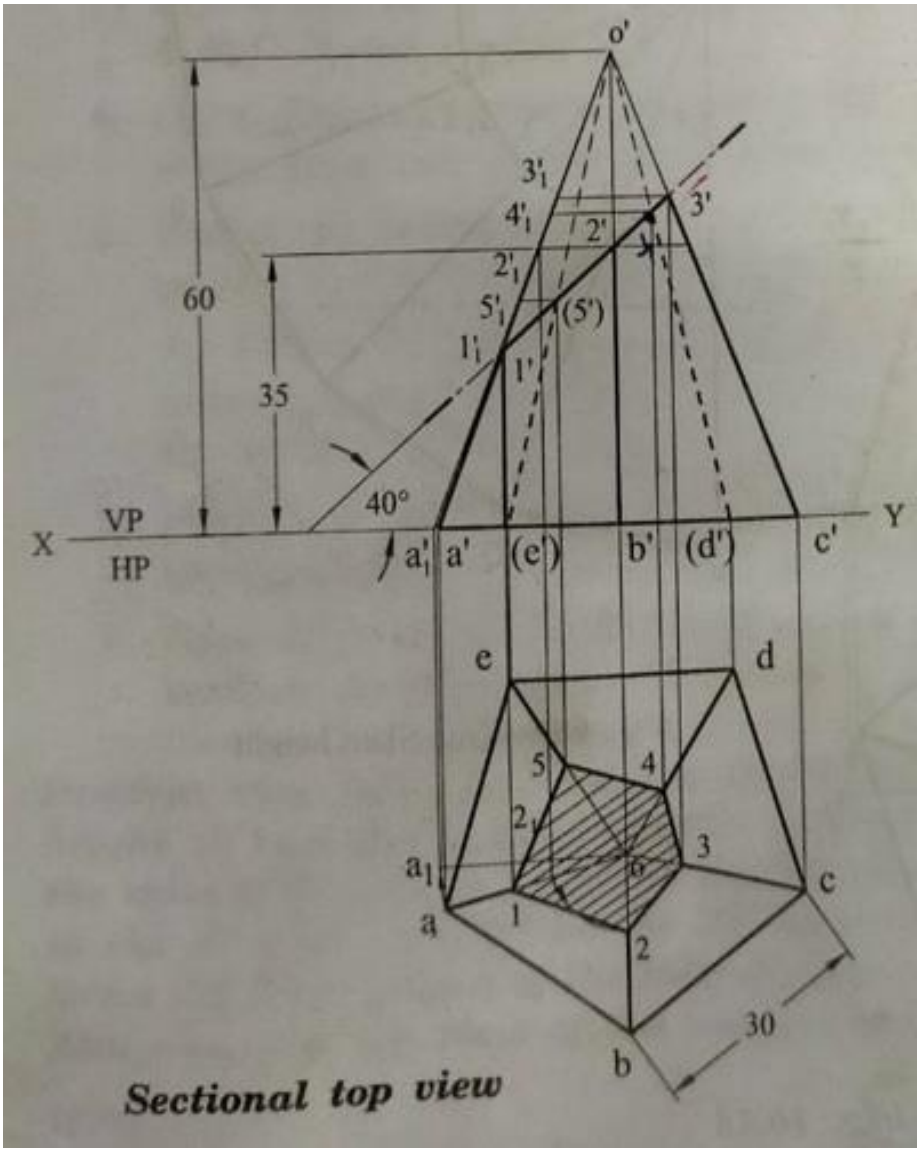
8. A hexagonal prism of base edge 20 mm and axis 50 mm long, rests with its base on HP such that one of its rectangular face is parallel to VP. It is cut by a section plane perpendicular to VP and inclined at 45° to HP and passing through the right corner of the top of the face of the prism. Draw the sectional top view also draw the lateral surfaces.

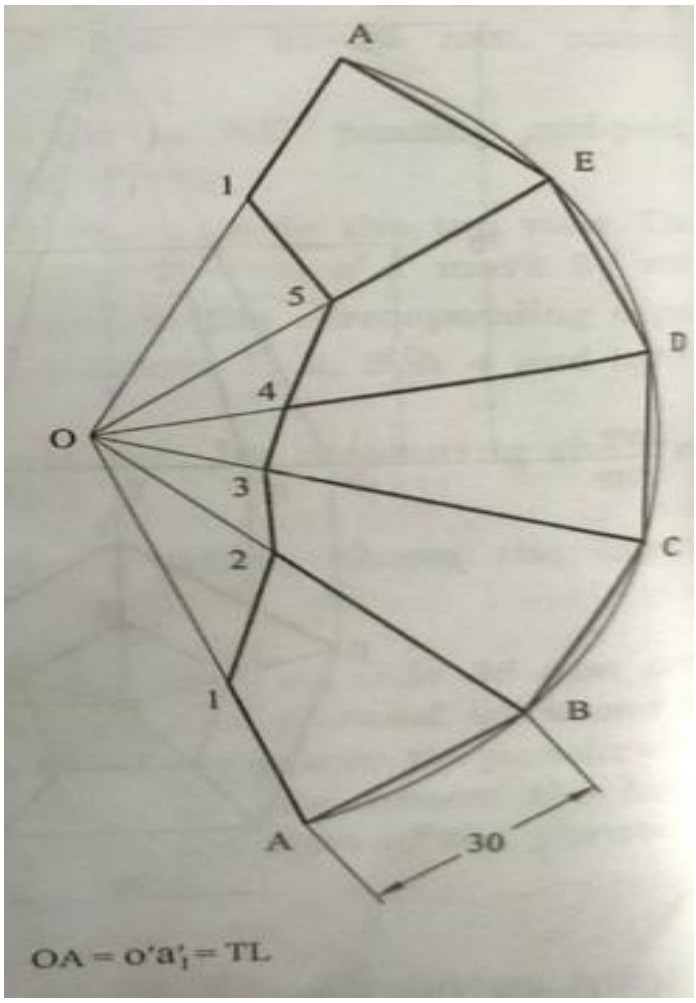


9. A hexagonal prism of base side 25 mm and height 50 mm is resting on one of its base on the HP and two of its lateral faces are parallel to VP. It is cut by a section plane perpendicular to VP and inclined at 30° to the HP. The plane meets the axis at a distance 25 mm above the base. Draw the development of lateral surface of the prism.

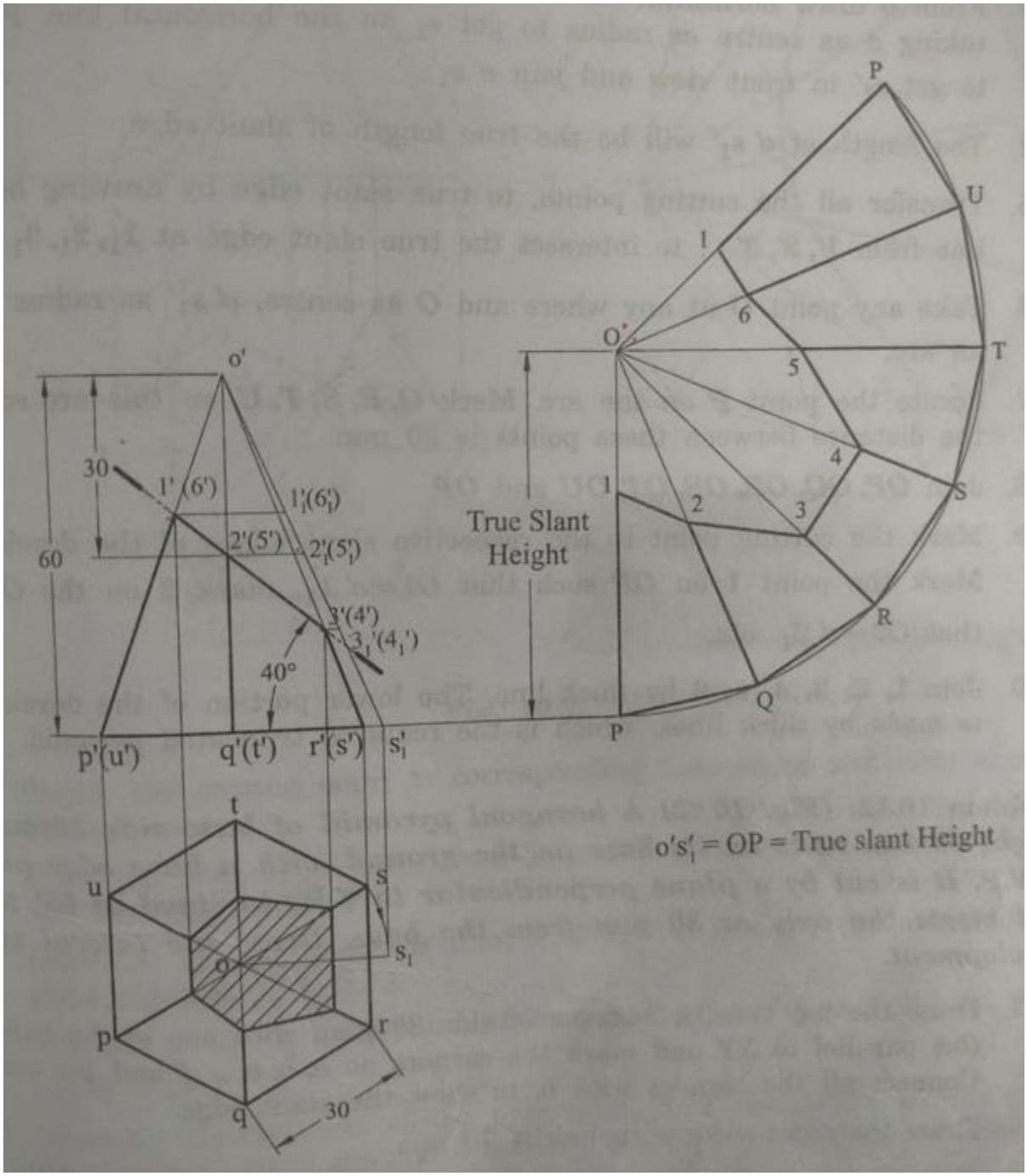


10. A pentagonal pyramid of base side 30 mm and height 60 mm stands with its base on HP and edge of the base is parallel VP and nearer to it. It is cut by section plane perpendicular to VP and inclined at 40° to the HP and passing through a point on the axis 35 mm above the base. Draw the sectional top view. Develop the lateral surfaces of the sectional top view, also draw the lateral surfaces of the truncated pyramid.

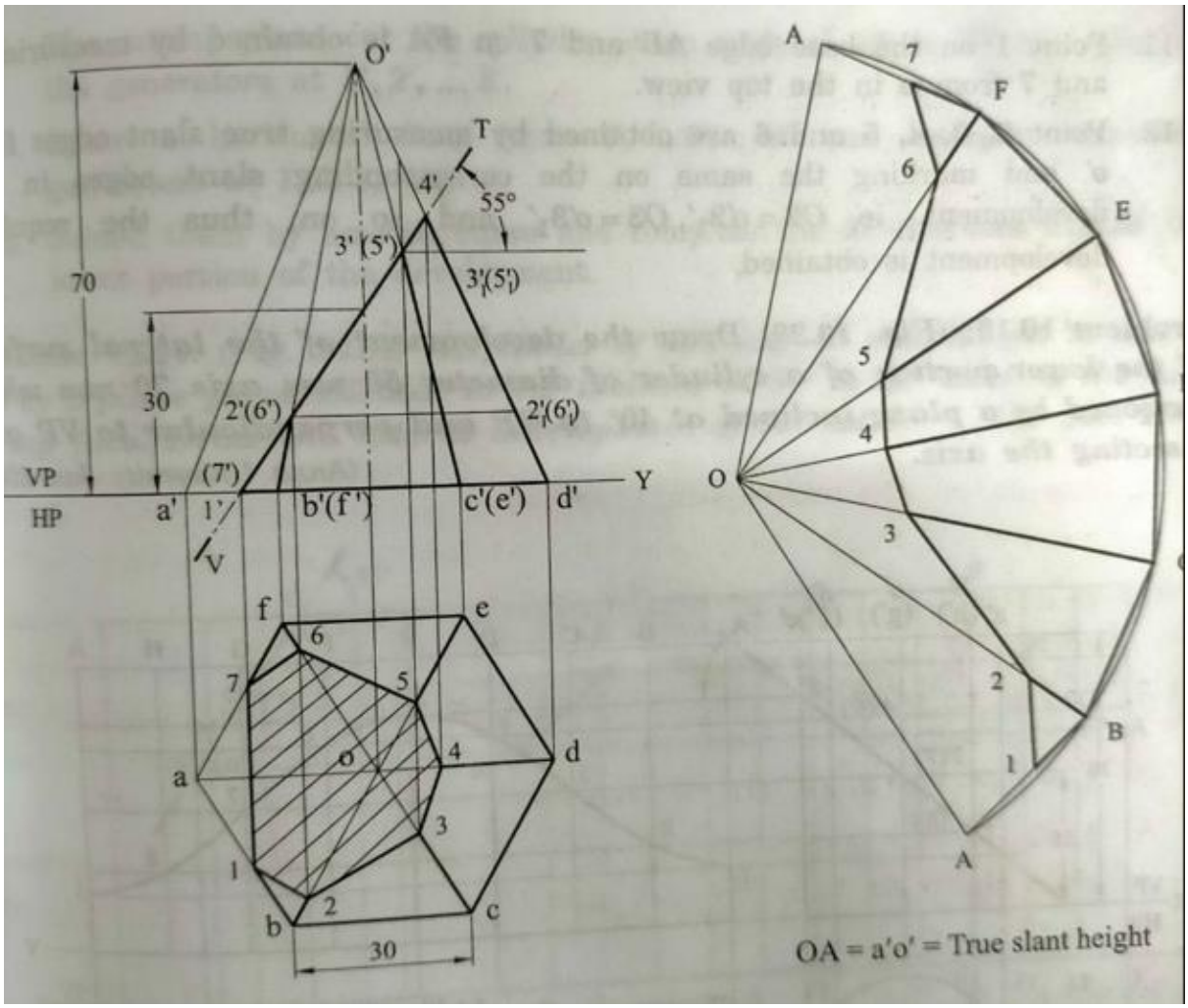



A
E
1
5
D
4
O
3
C
2
1
B
A
30
OA = o'a'1 = TL

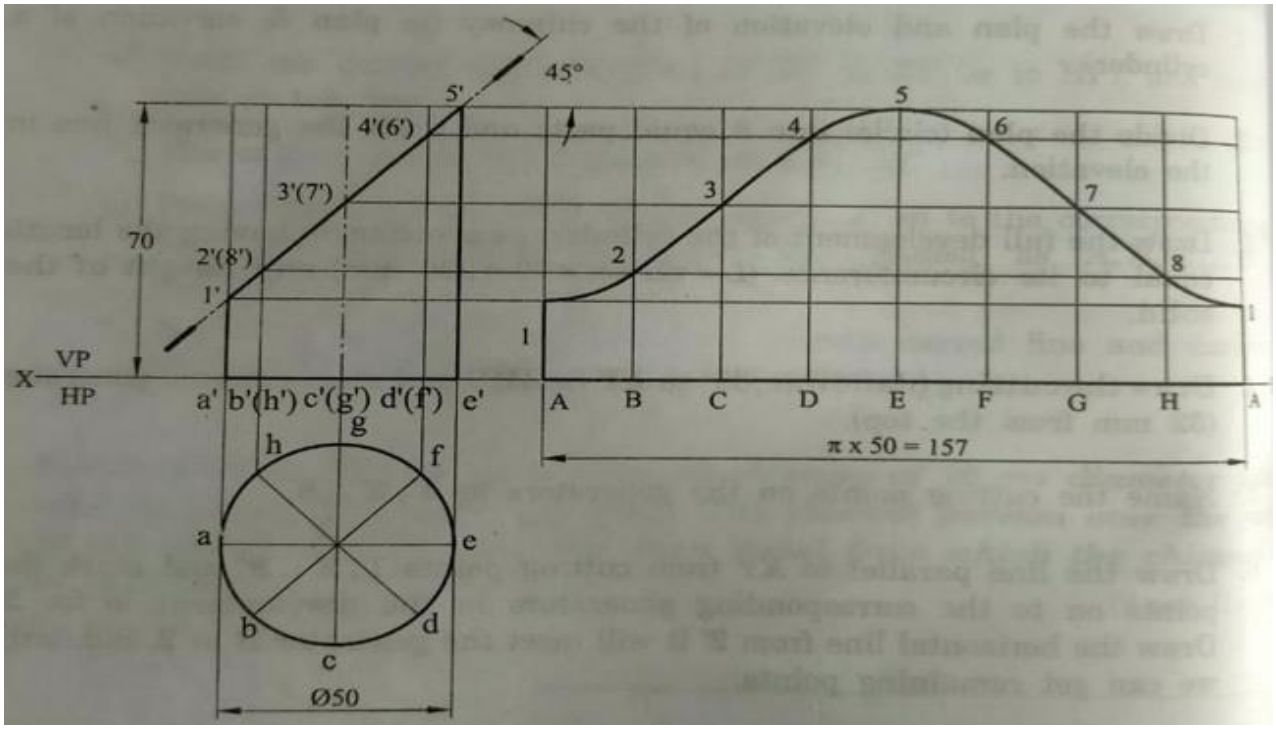
11. A hexagonal pyramid of base side 30 mm and height 60 mm resting on its base on the HP, such that two of its sides are perpendicular to VP. It is cut by section plane inclined at 40° to the HP and perpendicular to the VP. The cutting plane is bisecting the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid.



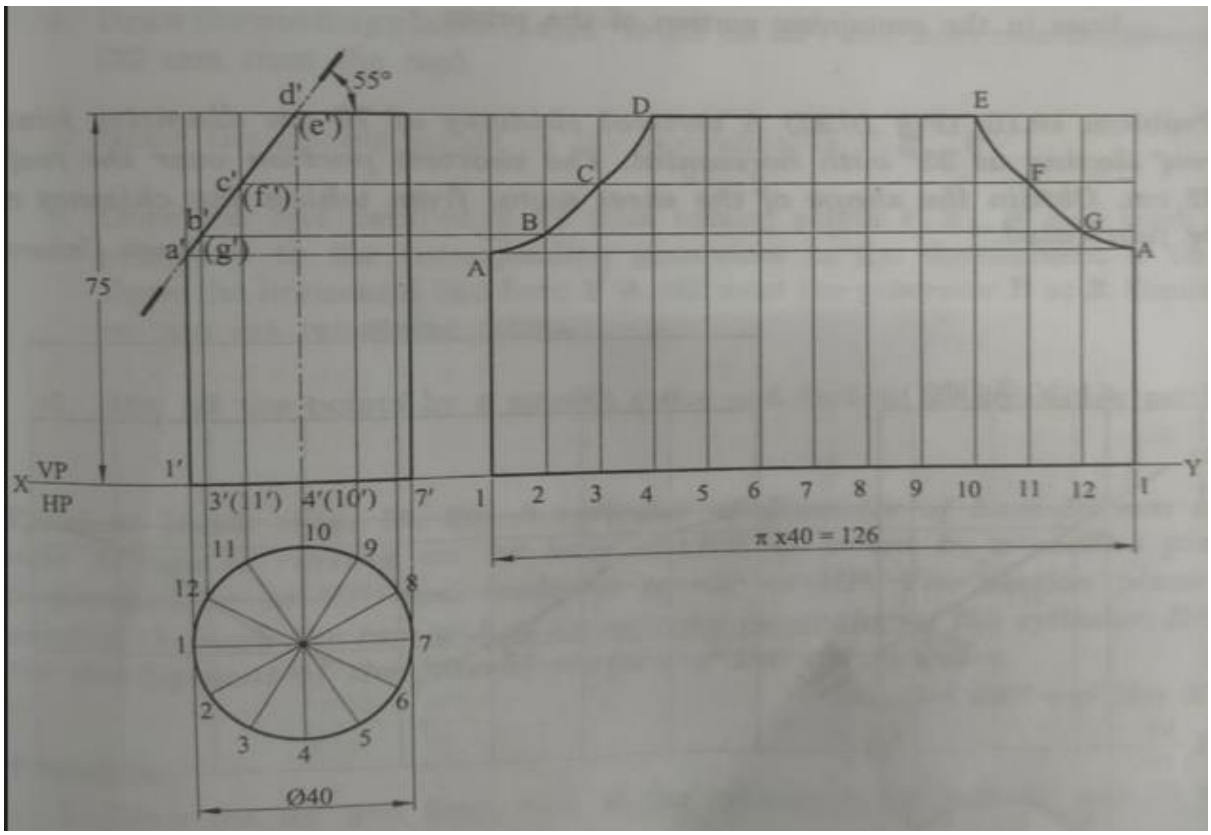
12. A hexagonal pyramid of base side 30 mm and height 70 mm rests with its base on the ground with base edge parallel to VP. It is cut by section plane perpendicular to VP and inclined at 55° to the Hpand meets the axis at 30 mm from the base. Draw the development of surfaces.



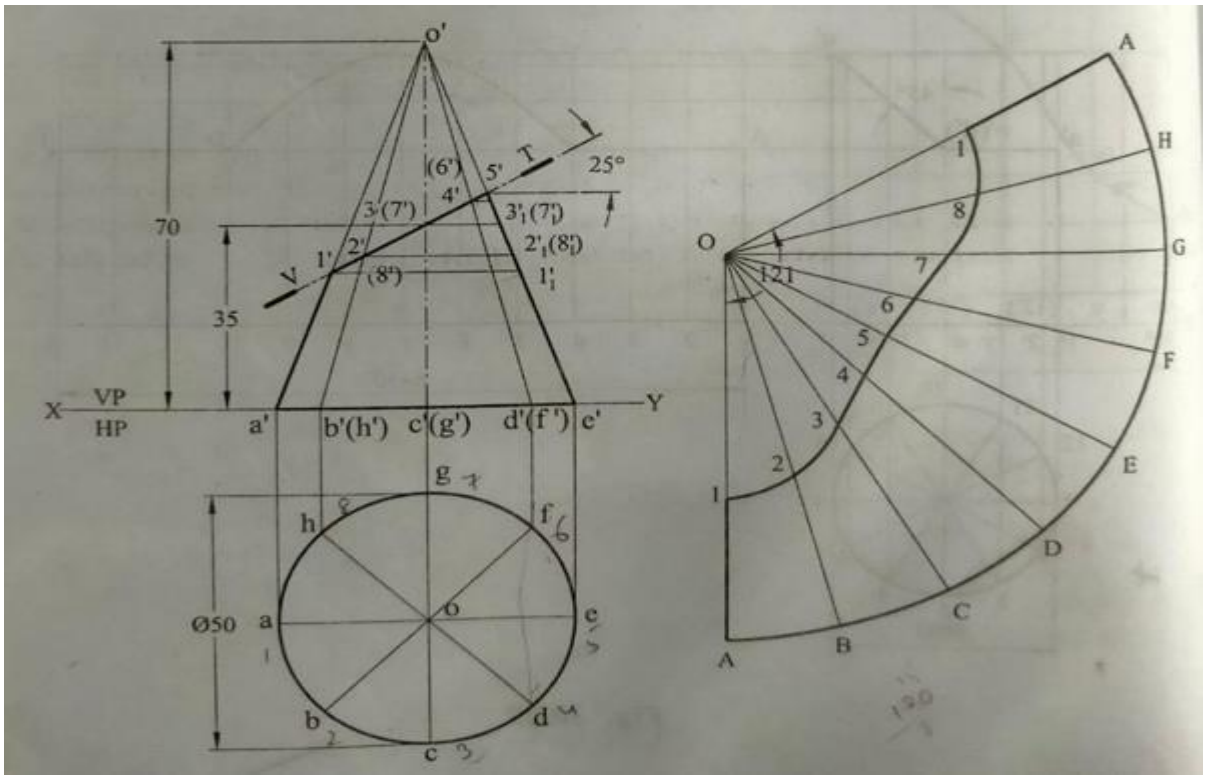
13. A cylinder of diameter 50 mm and axis 70 mm is resting on its base on the HP. It is cut by section plane perpendicular to VP and inclined at 45° to HP. Th section plane is passing through the top and extreme generator of the cylinder. Draw the development of lateral surface of the cylinder.



14. A cylinder of diameter 40 mm and height 70 mm is cut by a section plane perpendicular to VP and inclined at 55° to the HP meeting the axis at top face draw the lateral development of cylinder.



15. A cone of base 50 mm diameter and height 70 mm rest with its base on the HP. A section plane perpendicular to VP and inclined at 25° to the HP and bisecting the axis of the cone. Draw the development of lateral surface of the cone.



16. A right circular cone of base diameter 60 mm and height 70 mm is resting on its base on the ground. It is cut by a section plane perpendicular to VP and inclined at 30° to the HP. The cutting plane bisecting the axis of the cone. Draw the development of lateral surface of the cone.