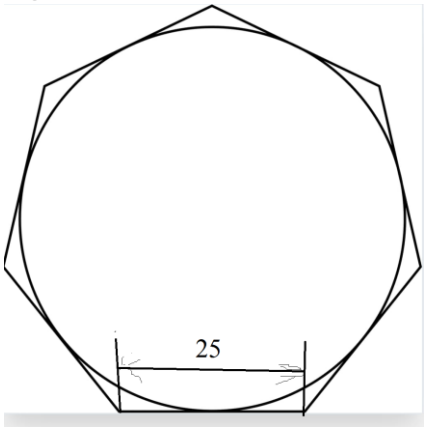
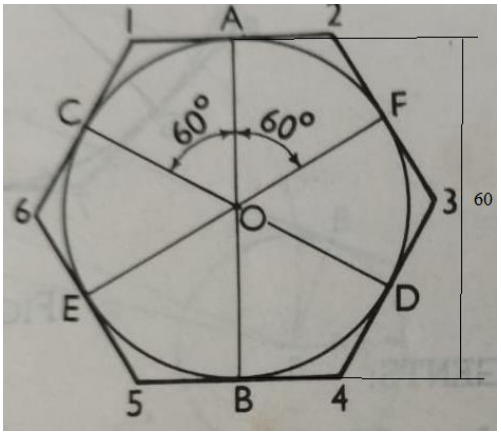
ENGINEERING GRAPHICS MID-I QUESTION BANK

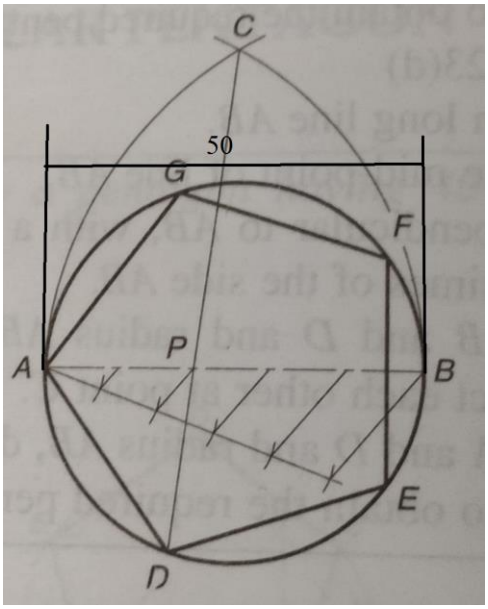
1. Construct a regular heptagon of 25 mm side and inscribe a circle in it.



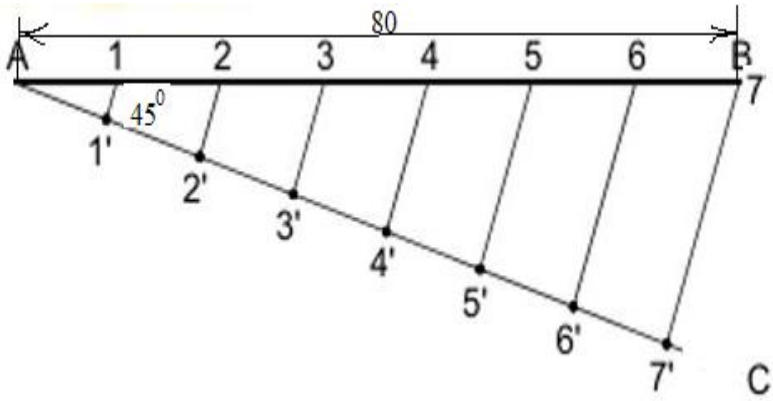
2. Circumscribe a hexagon about a circle of 60 mm diameter with one side horizontal.



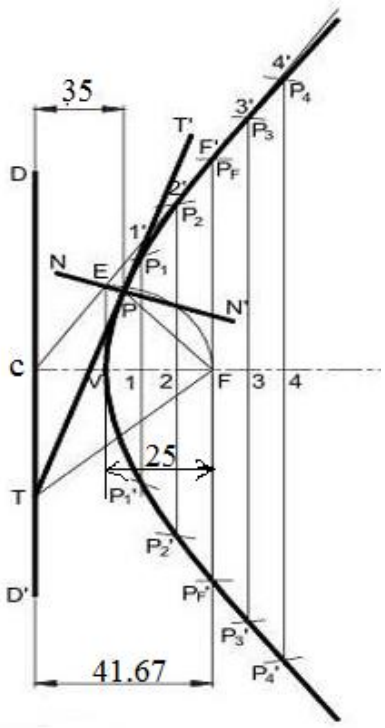
3. Construct a pentagon in a circle 50 mm diameter using the general method.



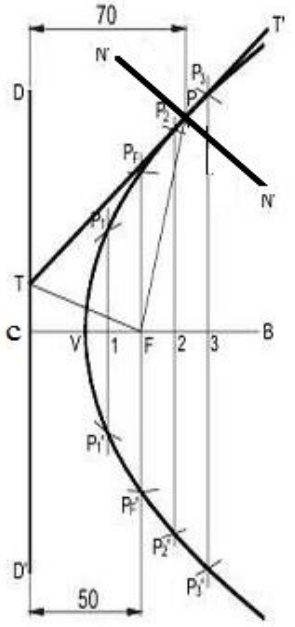
4. Divide a straight line AB of 80 mm long into seven numbers of equal parts.



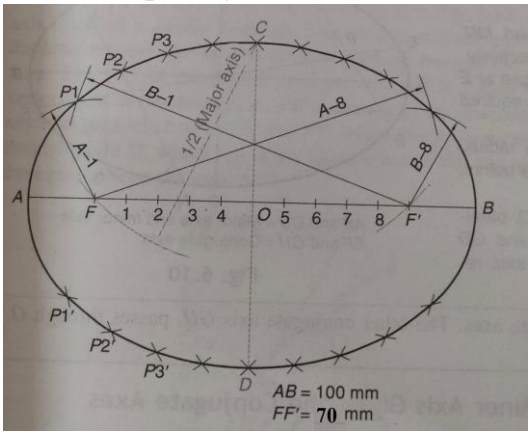
5. Draw the hyperbola when the focus and the vertex are 25mm apart. Consider eccentricity as 3/2. Draw a tangent and normal to the curve at a point that is 35mm from the focus.
   - Calculate the distance from the directrix to the vertex (V). Since eccentricity $e = \frac{VF}{VC} = \frac{3}{2}$ and $VF = 25$ mm, then $VC = \frac{VF}{e} = \frac{25}{1.5} = \mathbf{16.67}$ mm.
   - Mark V on the axis 16.67 mm from C, and mark the **focus** (F) 25 mm from V (total $CF = 41.67$ mm).



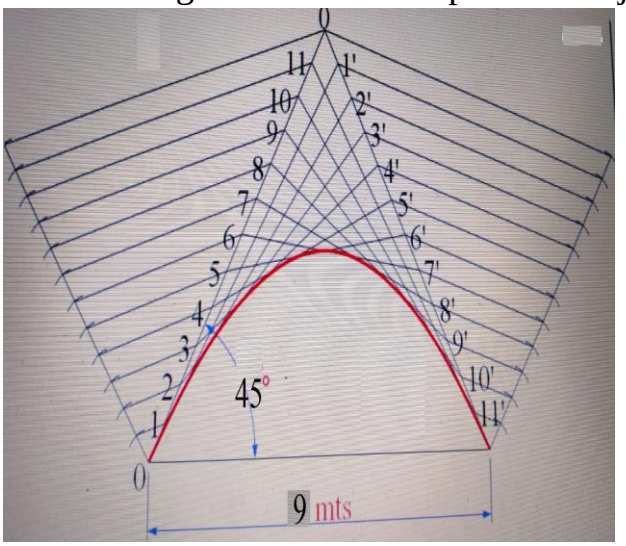
6. Draw a parabola when the distance between focus and directrix is 50 mm. Draw a tangent and a normal on the curve at a distance of 70 mm from the directrix.



7. The major axis of an ellipse is 100 mm long and the distance between its foci is 70 mm. Draw the ellipse by arcs of circle method.

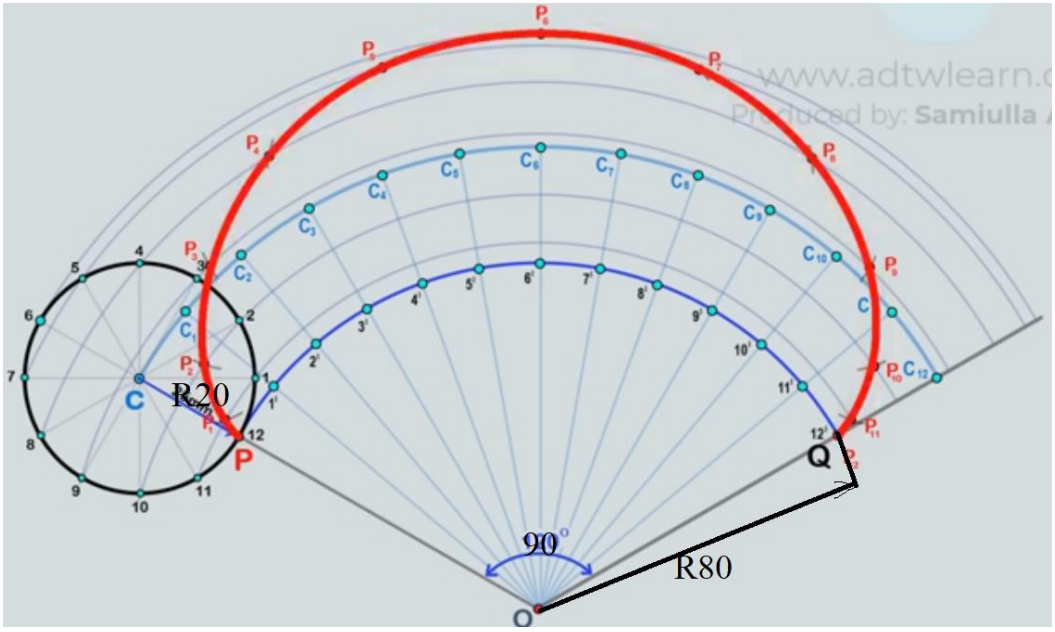


8. A fountain jet discharges water from ground level at an inclination of 50° to the ground. The jet travels a horizontal distance of 9 cm from the point of discharge and falls on the ground. Trace the path of the jet.

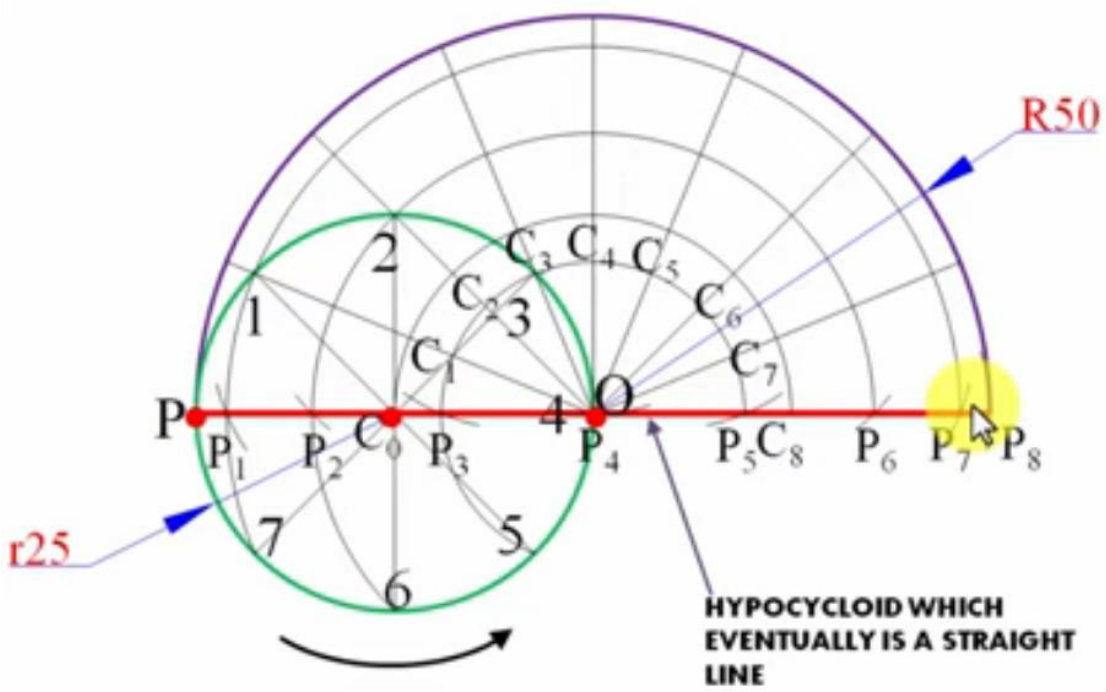


9. Draw the curve traced by a point on the circumference of a circle of 40 mm diameter, which rolls on another circle of 160 mm diameter, for one complete revolution. Name the curve.

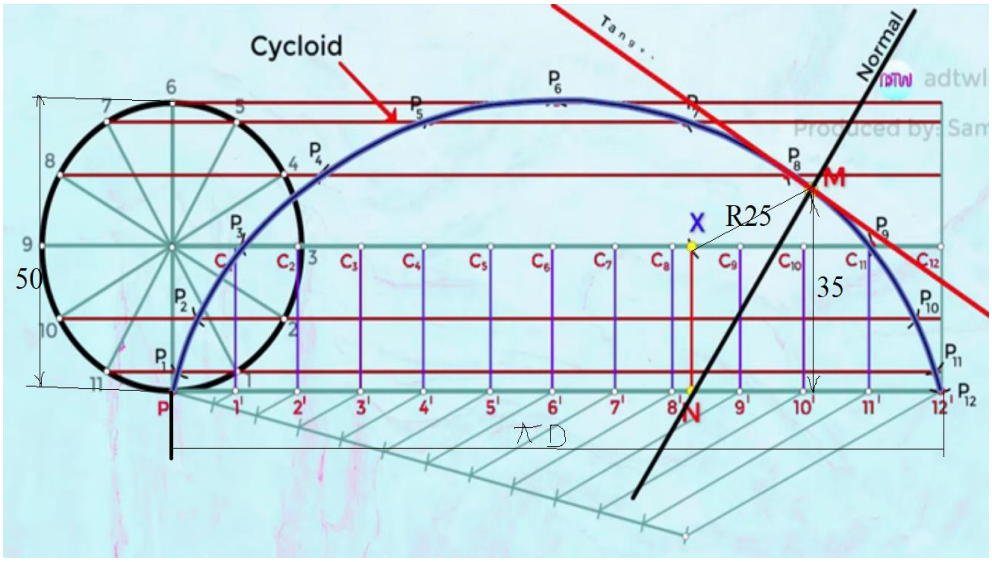
$$\theta = \frac{r}{R} \times 360^\circ = \frac{20}{80} \times 360^\circ = 90^\circ$$



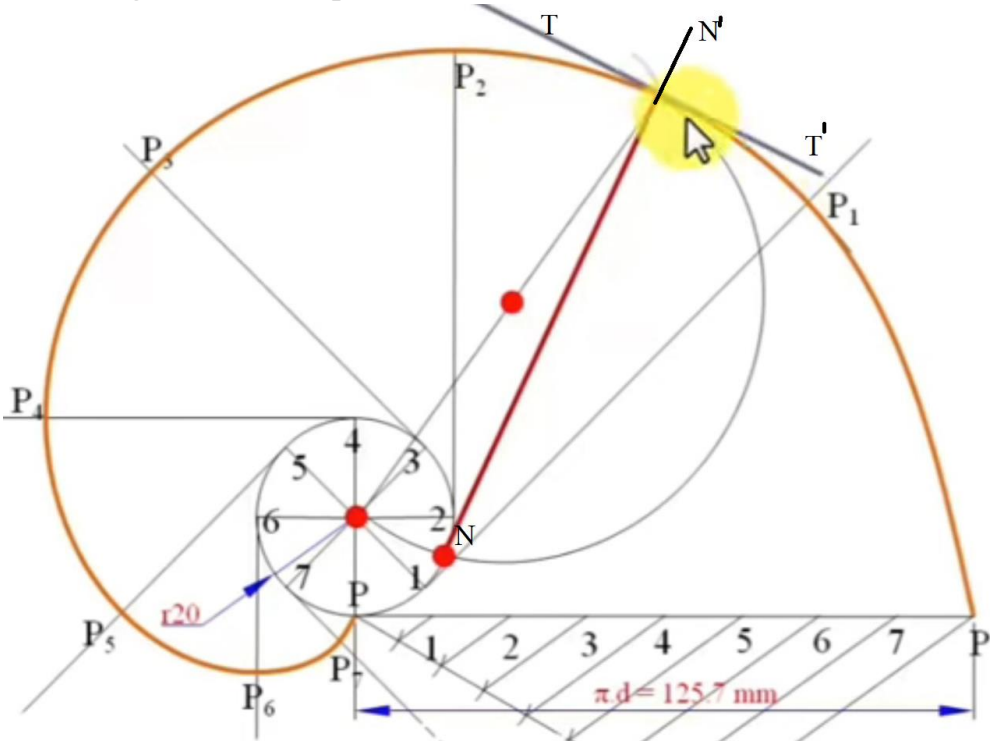
10. Prove that the hypocycloid is a straight line if the diameter of generating circle is equal to the radius of directing circle. Take generating circle diameter as 50 mm.



11. A wheel of diameter 50 mm rolls on a straight horizontal road. Draw the locus of a point on the periphery of the wheel for one revolution of the wheel, if P is initially on the road, and also draw normal and tangent to the curve at distance 35 mm above the base line.

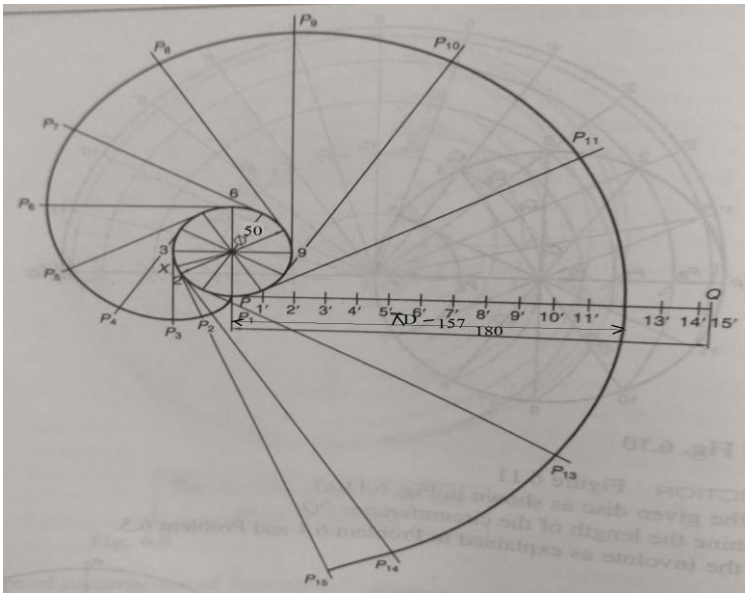


12. Construct an involute of a circle of 40 mm diameter, also draw a normal and a tangent to it at a point 100 mm from the center of the circle.

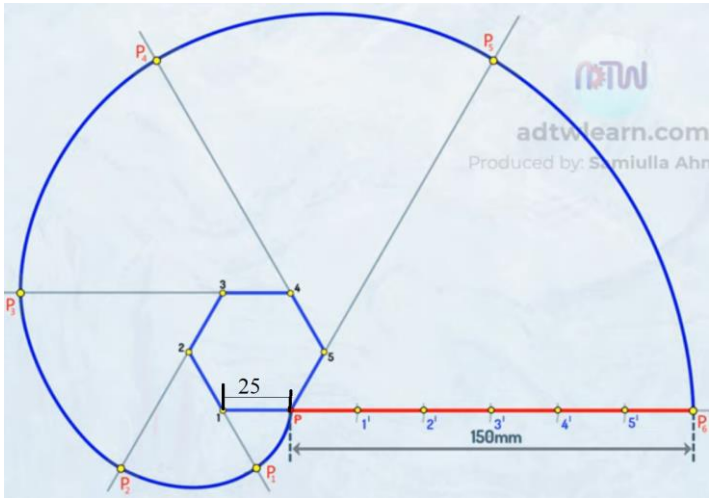


13. One end of an inelastic string of length 180 mm is attached to the circumference of a ring of diameter 50 mm and is tightly wound around

the ring. Draw the curve traced by the other end of the string when string is unwound.



14. Draw an involute of a hexagon of 25 mm side.



15. A Tunnel on the Konkan railway route has a size of 640 m x10 m x10 m. It is represented on a model by the volume of 27 cm^3. Find RF. Device a diagonal scale of this RF to read up to 300 meters, show the distances of 299 meters and 171 meters on it.

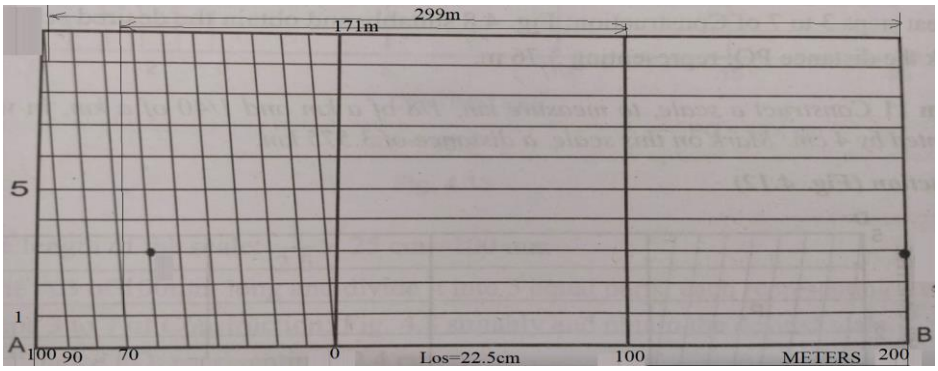
$$R.F. = \sqrt[3]{\frac{\text{Volume of Model}}{\text{Actual Volume of Tunnel}}}$$

- **Actual Volume**: $640\ \text{m} \times 10\ \text{m} \times 10\ \text{m} = 64,000\ \text{m}^3$.
- Convert to cm^3: $64,000 \times (100)^3 = 64,000,000,000\ \text{cm}^3$.
- **Model Volume**: $27\ \text{cm}^3$.
- **Calculation**:

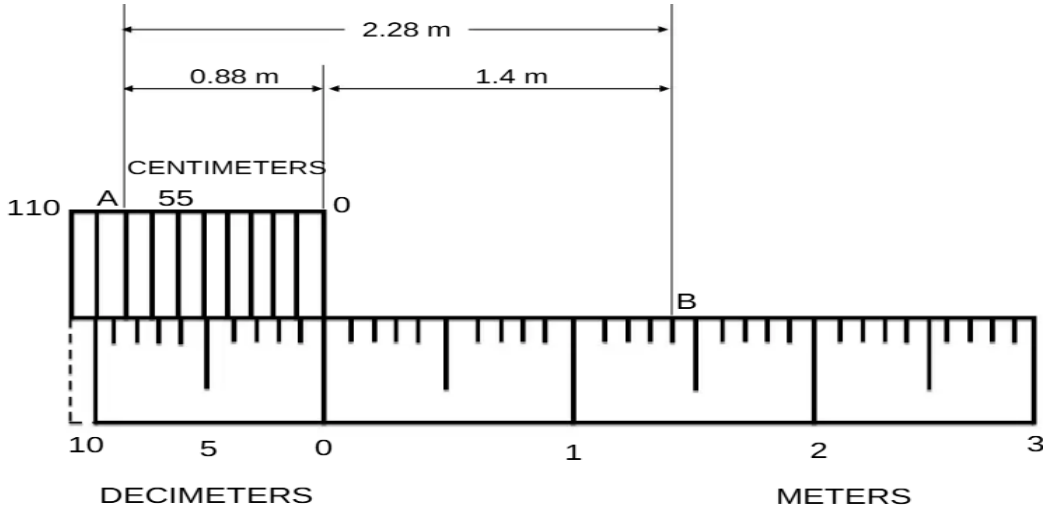
$$R.F. = \sqrt[3]{\frac{27}{64 \times 10^9}} = \frac{3}{4 \times 10^3} = \frac{3}{4000}$$

$$L = R.F. \times \text{Max Distance}$$

$$L = \frac{3}{4000} \times (300 \times 100)\ \text{cm} = \frac{3}{4000} \times 30,000\ \text{cm} = 22.5\ \text{cm}$$



16. Construct a Vernier scale to read meters, decimeters and centimeters and long enough to measure up to 4 m. The RF of the scale is 1/20. Mark on it a distance of 2.28 m.



17. The distance between two stations is 130 km, a train covers this distance in 2.5 hours. Construct a plain scale to measure time up to a single minute. The RF of the scale is 1:260000. Find the distance covered by the train in 45 minutes.

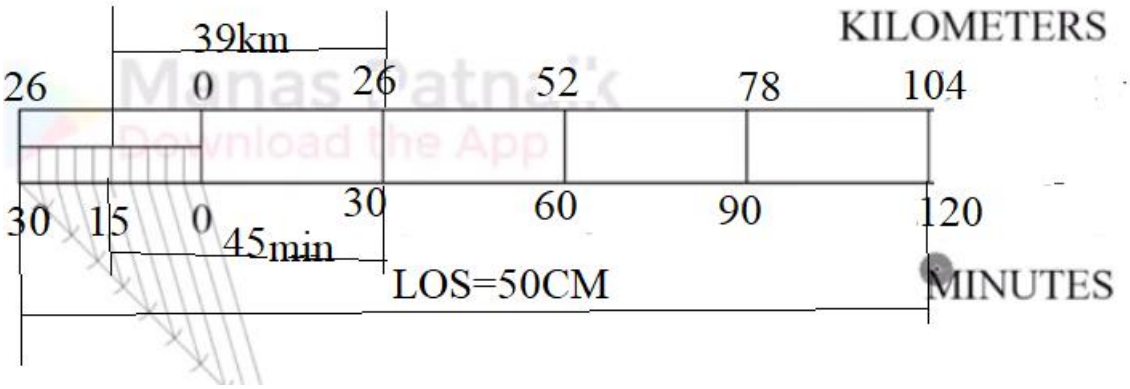
$$Speed = \frac{Distance}{Time} = \frac{130\ \text{km}}{2.5\ \text{hours}} = 52\ \text{km/hr}$$

$$Length\ of\ Scale = \frac{1}{260,000} \times (130 \times 10^5\ \text{cm}) = 50\ \text{cm}$$

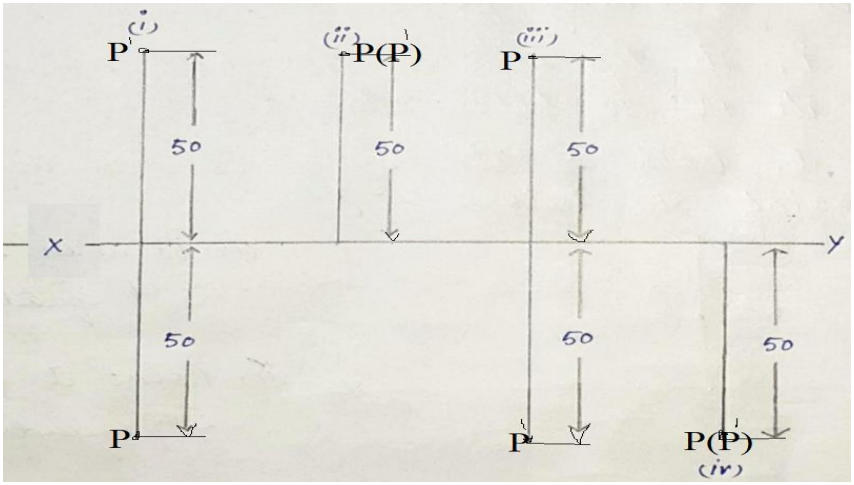
Convert 45 minutes to hours and multiply by the speed:

$$Time = \frac{45}{60} = 0.75 \text{ hours}$$

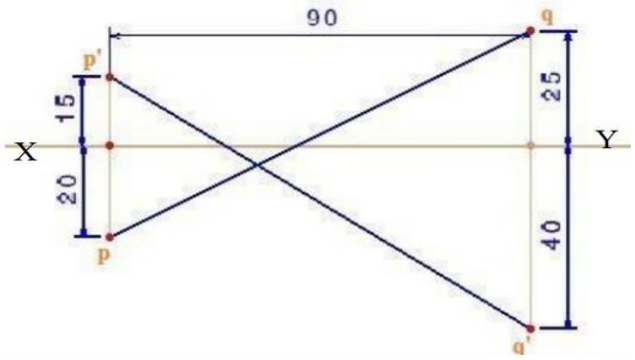
$$Distance = Speed \times Time = 52 \text{ km/hr} \times 0.75 \text{ hours} = 39 \text{ km}$$



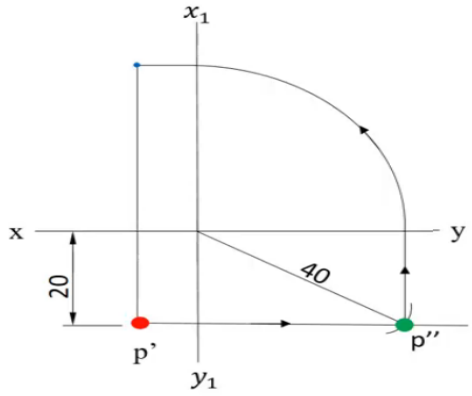
18. A point P is 50 mm from both the reference planes. Draw its projections in all possible positions.



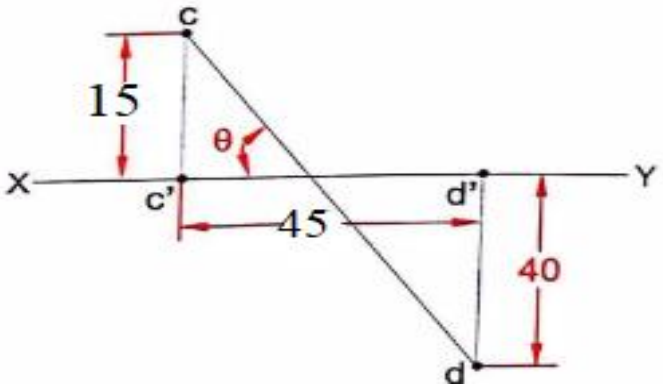
19. A point P is 15 mm above the H.P and 20 mm infront of the V.P. Another point Q is 25 mm behind the V.P. and 40 mm below the H.P. Draw projections of P and Q keeping the distance between their projectors equal to 90 mm. draw straight lines joining (i) their top views and (ii) their front views.



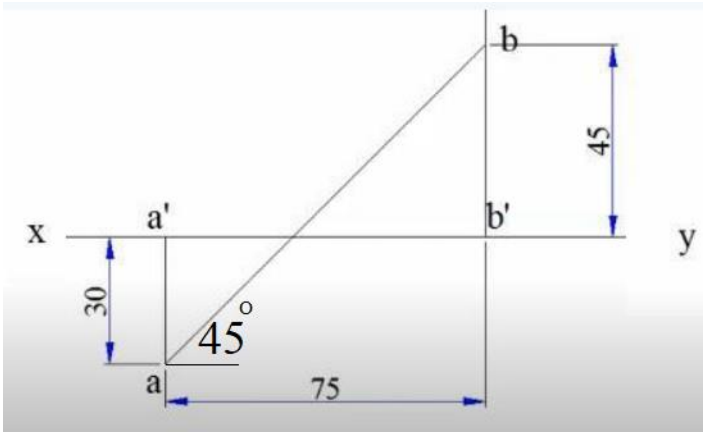
20. A point P is 20 mm below the H.P and lies in the third quadrant. Its shortest distance from XY is 40 mm. draw its projections.



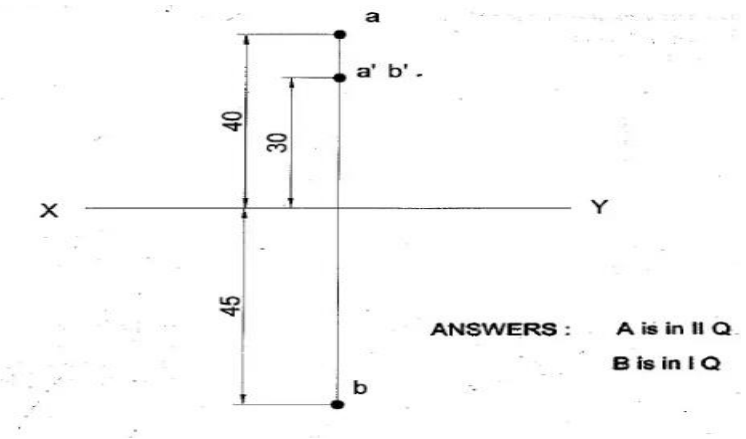
21. A point C is on H.P and 15mm behind V.P. Another point D is also on H.P and 40 mm in front of V.P. The distance between their projectors is 45 mm. Join their front views and determine inclination of this line with XY line.



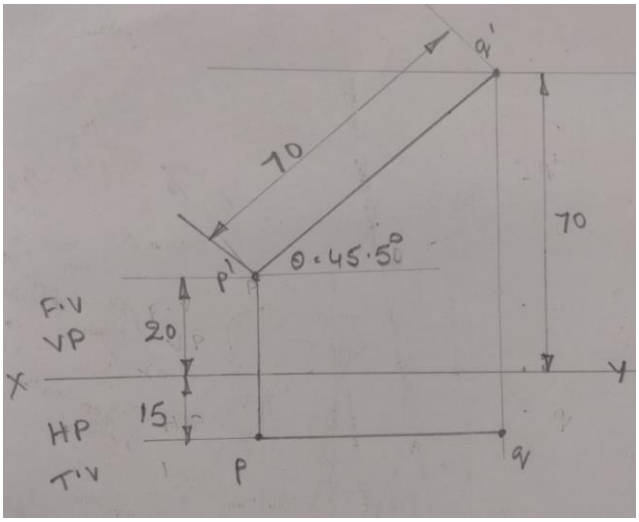
22. Two points A and B are on H.P. the point A being 30 mm infront of V.P, while B is 45 mm behind V.P. The line joining their top views makes an angle of 45° with xy. Find the horizontal distance between two points.



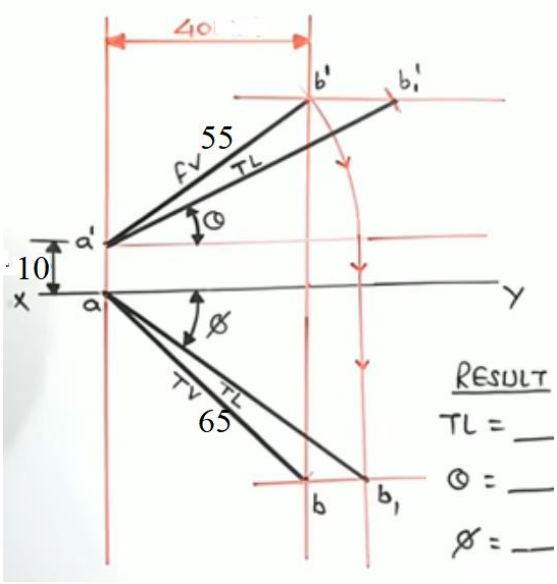
23. A point 30 mm above XY line is the front view of two points A&B. The top view of A is 40 mm behind V.P. and the top view of B is 45 mm front of V.P. Draw the projection of the points and state the quadrants in which the points are situated.



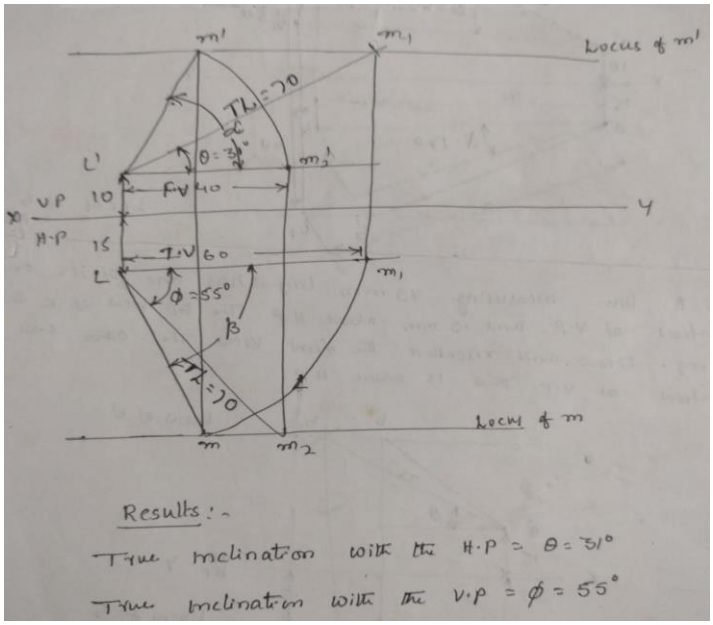
24. A line PQ of 70 mm length is parallel to and 15 mm in front of the V.P. Its ends p and Q are respectively, 20 mm and 70 mm above H.P. Draw its projections and find its inclination with the H.P.



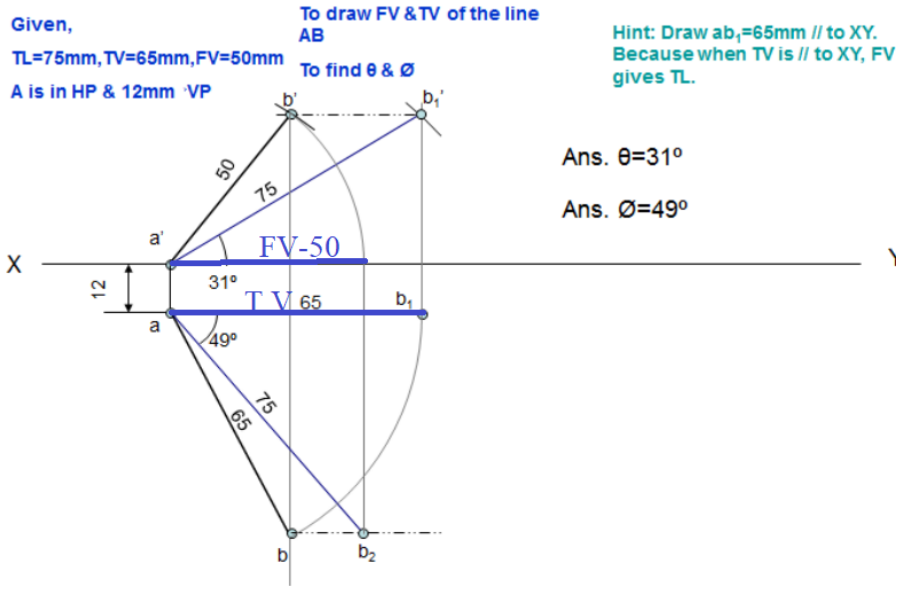
25. The front view and top view of a line measures 55mm and 65mm respectively. Their end projectors are 40mm apart and one end of the line is 10mm above the H.P and in the V.P. draw the projections and find the true length and true inclination of line.



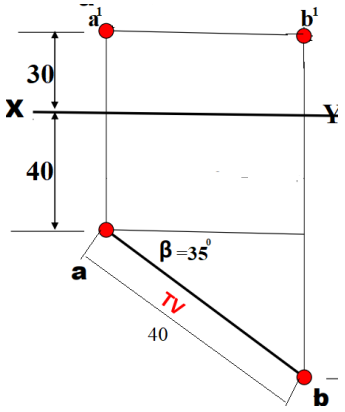
26. A line LM 70 mm long has its end 'L' 10 mm above HP and 15 mm in front of V.P. Its top view and front view measures 60 mm and 40 mm respectively. Draw the projections of the line and determine its inclination with H.P and V.P.



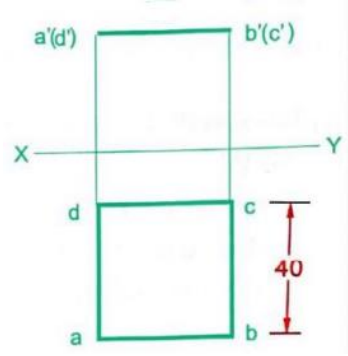
27. The top view of a 75 mm long line AB measures 65 mm, while the length of its front view is 50 mm, its one end A is in the H.P and 12 mm in front of the V.P. Draw the projections of AB and determine its inclinations with the H.P and the V.P.



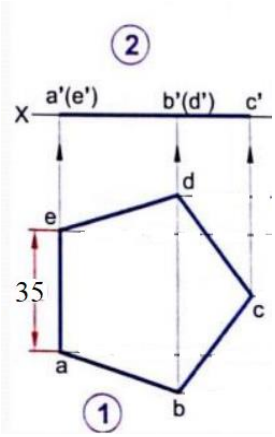
28. A line AB is 40 mm long and is inclined at 35° to V.P and parallel to H.P. The end A of the line is 30 mm above H.P and 40 mm in front of V.P. Draw its projections.



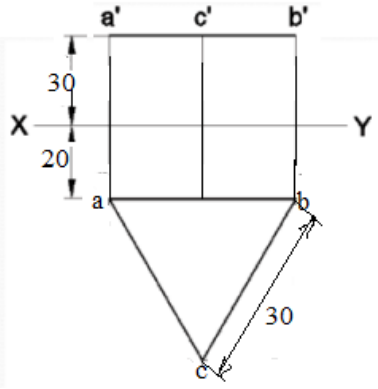
29. A square lamina of 40mm side is perpendicular to H.P. One of its side is 20 mm above H.P and 15 mm infront of V.P. Draw its projections



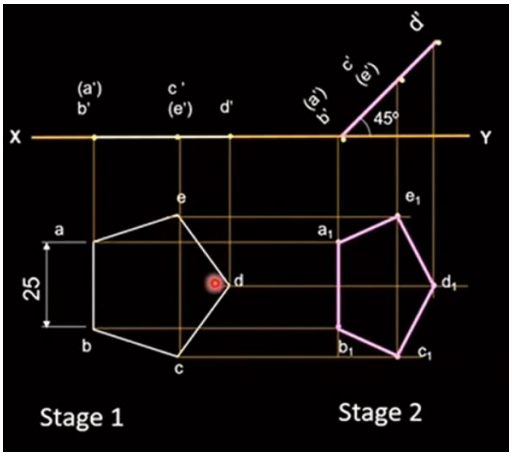
30. A pentagonal plate of 35mm side is perpendicular V.P and parallel to H.P. One of its edges is perpendicular to V.P. Draw its projections.



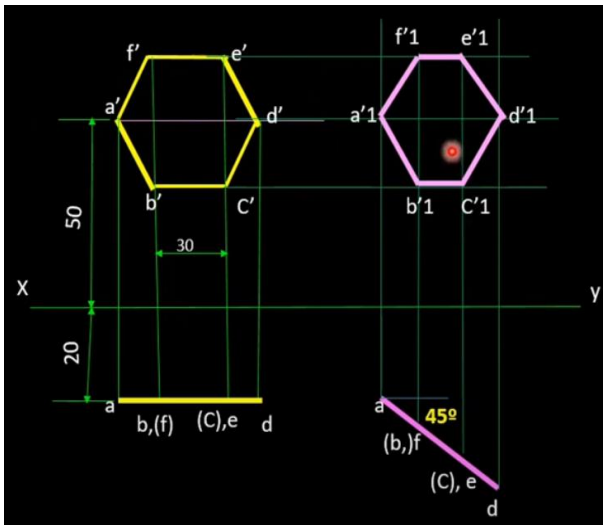
31. An equilateral triangular lamina of a side 30 mm is parallel to H.P. and perpendicular to V.P. one of its sides is 20mm infront of V.P and 30 mm above H.P. Draw its projections.



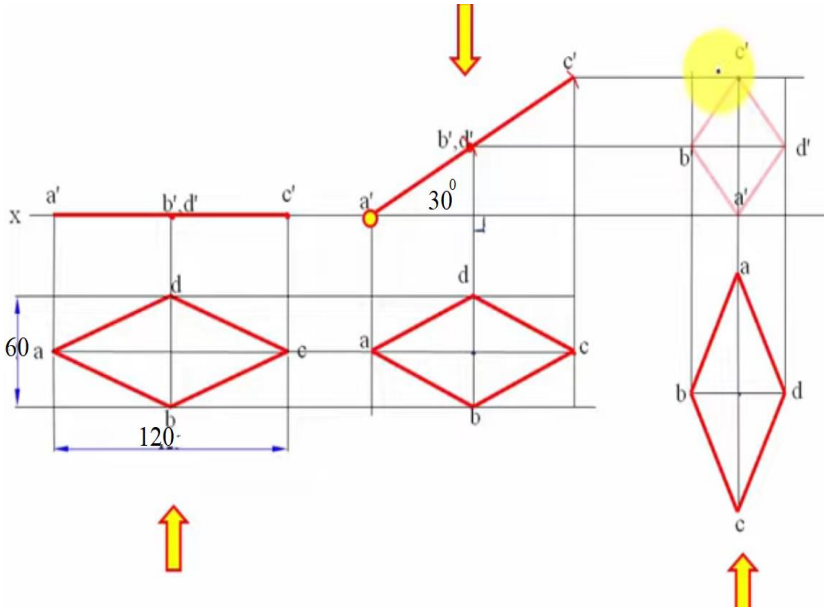
32. A regular pentagonal plate of side 25 mm is placed with one side on H.P. such that the surface is inclined at 45° to H.P and perpendicular to V.P. Draw its projections.



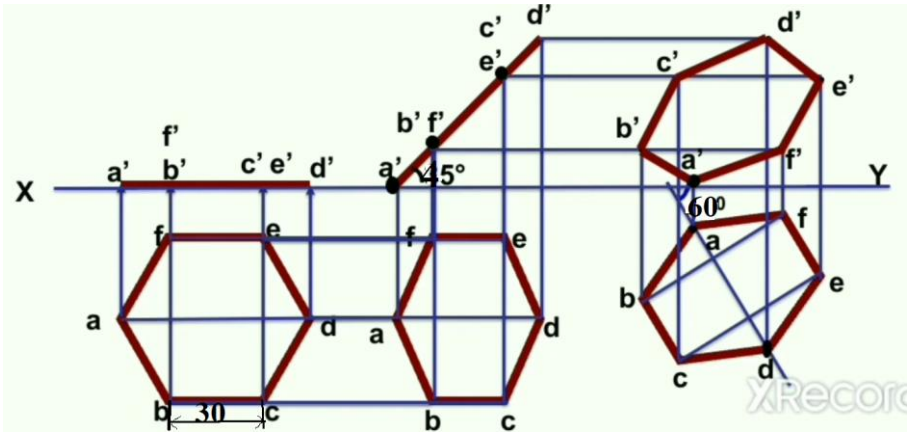
33. A regular hexagonal plane of 30 mm side has a corner at 20 mm from V.P and 50 mm from H.P. Its surface is inclined at 45° to the V.P and perpendicular to H.P. Draw the projections of the plane



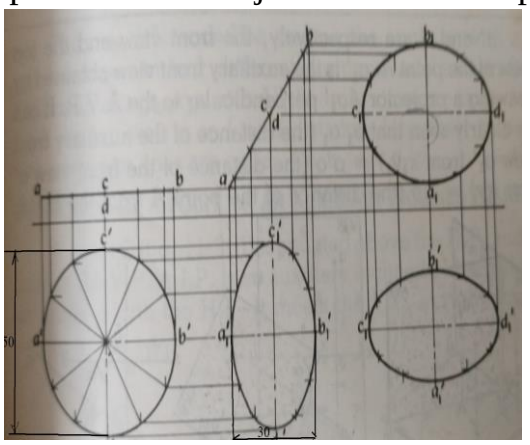
34. Draw the projections of a rhombus of diagonals 120 mm and 60 mm long, the smaller diagonal of which is parallel to both the principal planes, while the other is inclined at 30° to the H.P.



35. A hexagonal plane of side 30 mm has a corner on the ground. Its surface is inclined at 45°to the H.P. and the top view of the diagonal through the corner which is in the H.P makes an angle of 60° with the V.P. Draw its projections.



36. A circular plate of negligible thickness and 50mm diameter appears as an ellipse in the front view, having its major axis 50 mm long and minor axis 30mm long. Draw top view when major axis of the ellipse is horizontal.



37. Draw the projection of a circle of 50 mm diameter, when its plane is equally inclined to H.P& V.P. One end of a diameter of the circle touches the H.P while the other end touches the V.P.