

Figure 2.47(i)

2.4.3 Construction of an Ellipse

(a) Definition Method (Given Major Axis and Minor Axis)

- Draw given major axis AB and minor axis CD intersecting each other at point O. (Figure 2.48(a))
- With C as center and OA as radius strike arcs intersecting major axis AB and F_1 and F_2 , which are the foci of the required ellipse. (Figure 2.48(b))
- Mark any number of points between F_1 and F_2 . (Figure 2.48(c))
- With F_1 as center and $A1$ as radius, draw arcs on both sides of major axis AB. With F_2 as center and $1B$ as radius draw arcs on both sides of the major axis AB. Intersections of these arcs give point P_1 and P_1' of the required ellipse. (Figure 2.48(d))
- Similarly, with F_1 as center and $A2$ as radius, draw arcs on both sides of major axis AB. With F_2 as center and $2B$ as radius draw arcs on both sides of the major axis AB. Intersection of these arcs gives point P_2 and P_2' of the required ellipse. (Figure 2.48(e))
- In the similar manner, determine the points $P_2, P_2', P_3, P_3', \dots$ and so on. (Figure 2.48(f))
- Join all the points with a smooth curve to get the required ellipse. (Figure 2.48(g))

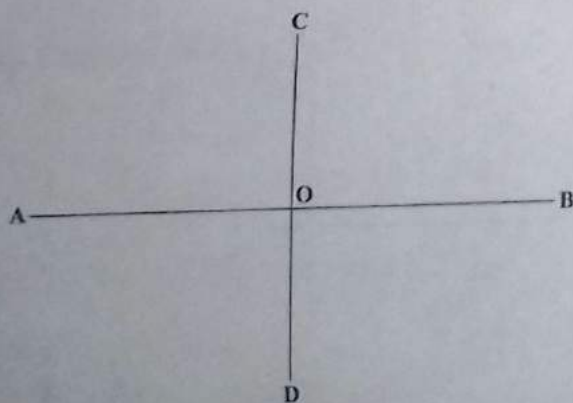


Figure 2.48(a)

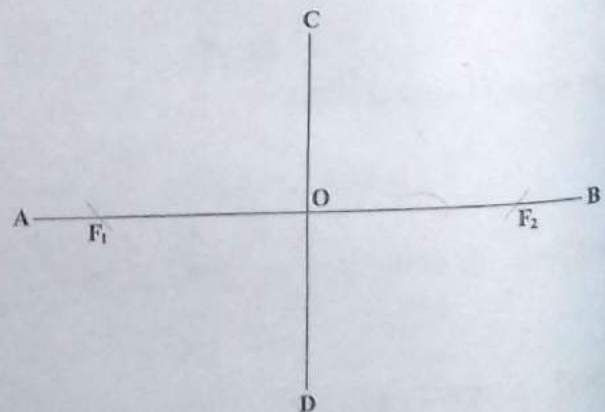


Figure 2.48(b)

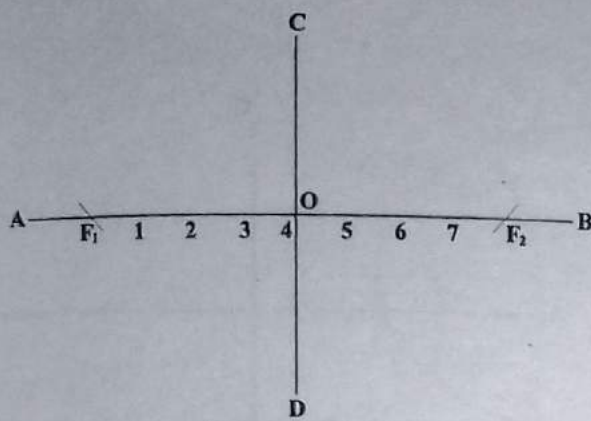


Figure 2.48(c)

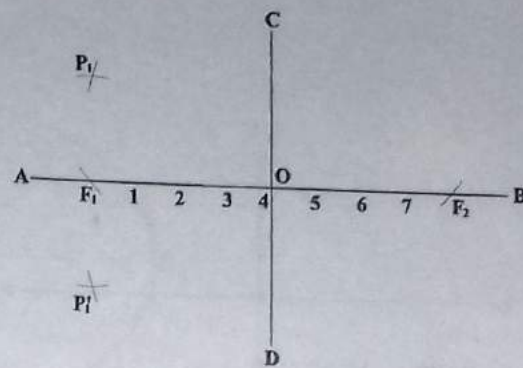


Figure 2.48(d)

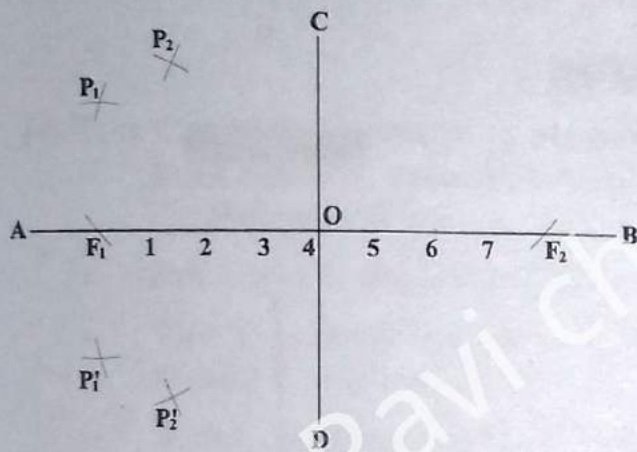


Figure 2.48(e)

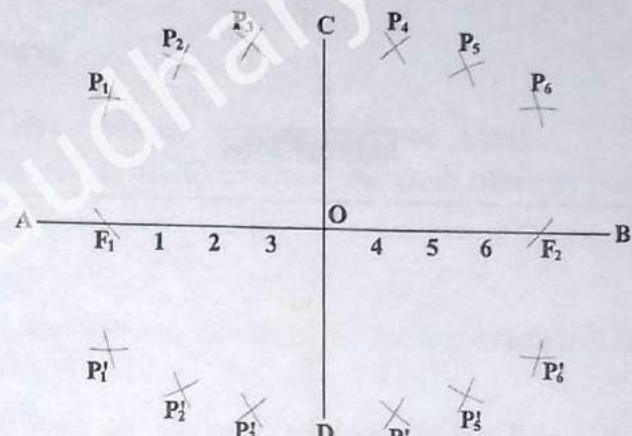


Figure 2.48(f)

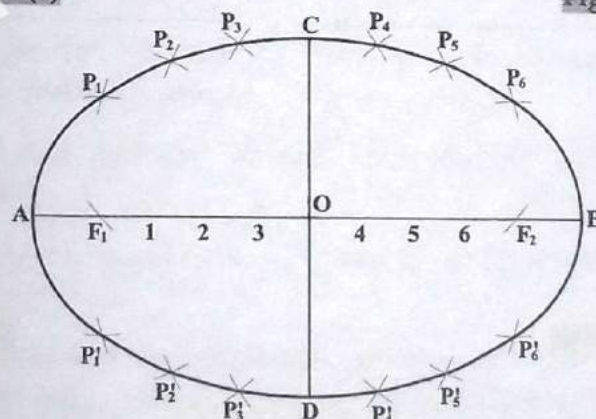


Figure 2.48(g)

(b) Concentric Circle Method (Given Major Axis and Minor Axis)

- Draw the given major axis AB and minor axis CD. (Figure 2.49(a))
- Draw concentric circles with AB and CD as diameters. (Figure 2.49(b))
- Divide circles into any number of equal parts, say 12. (Figure 2.49(c))
- Draw vertical lines inside the circle from each point on the circumference of the larger circle. (Figure 2.49(d))
- Draw horizontal lines inside the circle from each point on the circumference of the smaller circle. (Figure 2.49(e))
- Mark the points of intersection of these lines. (Figure 2.49(f))
- Draw smooth curve passing through these point including the points A, B, C and D to get the required ellipse. (Figure 2.49(g))

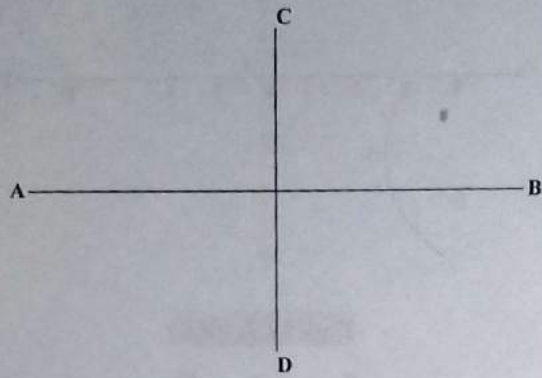


Figure 2.49(a)

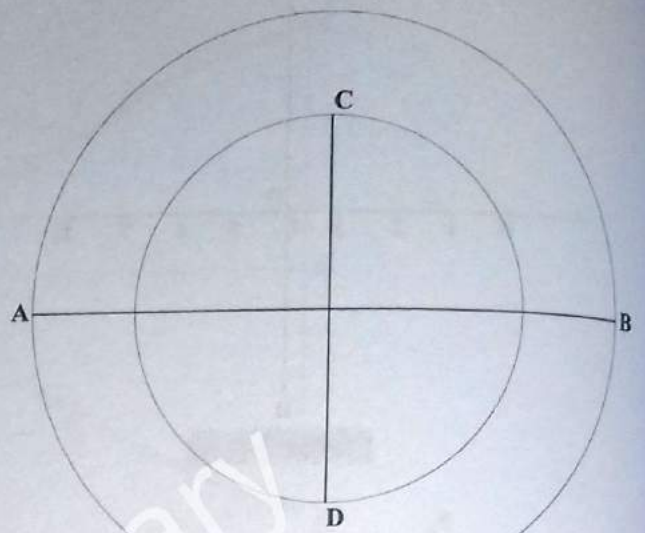


Figure 2.49(b)

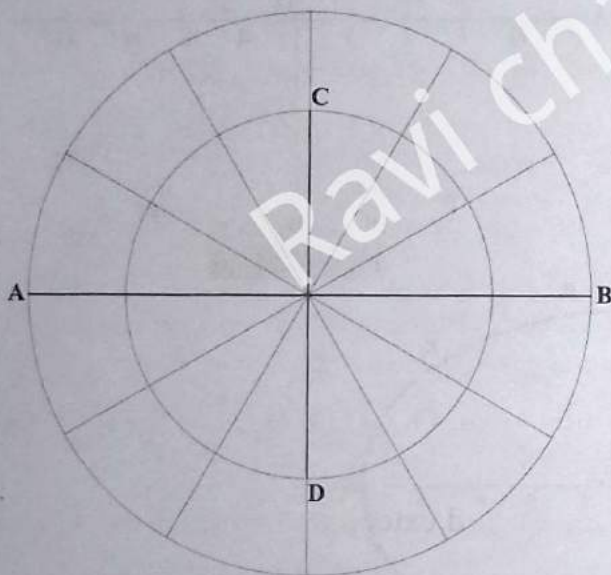


Figure 2.49(c)

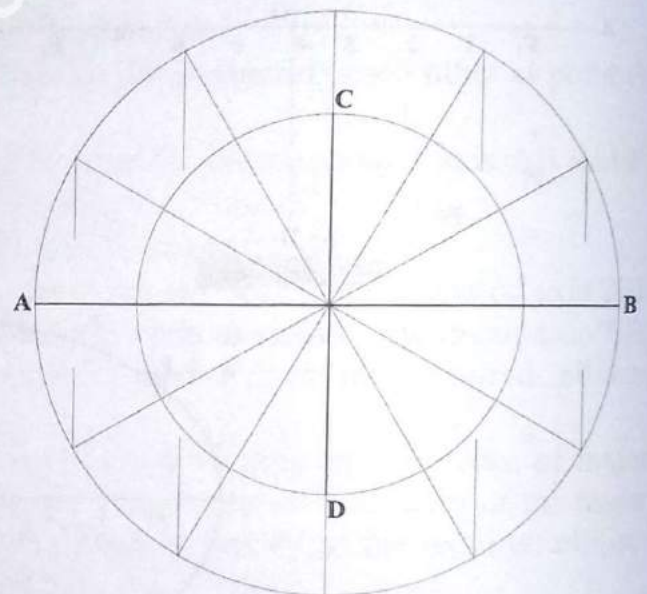


Figure 2.49(d)

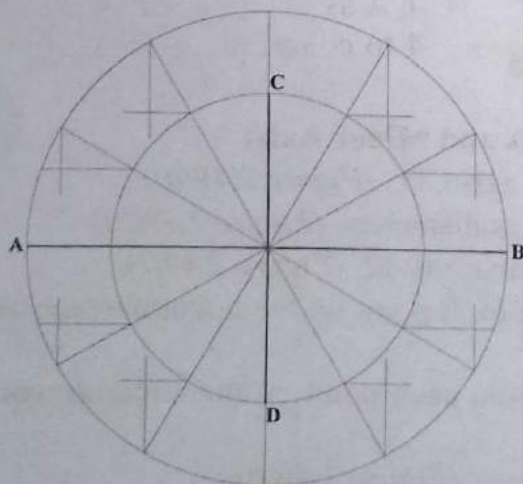


Figure 2.49(e)

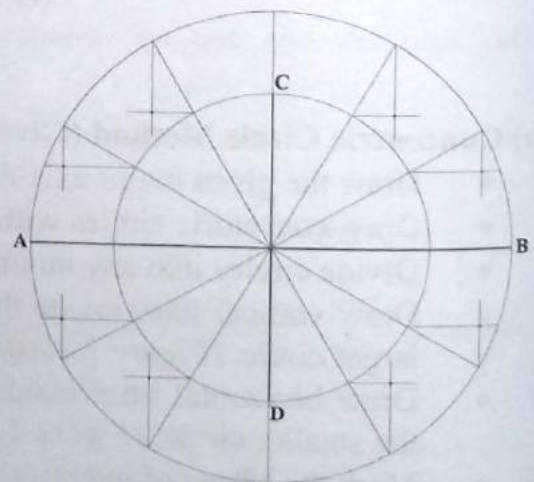


Figure 2.49(f)

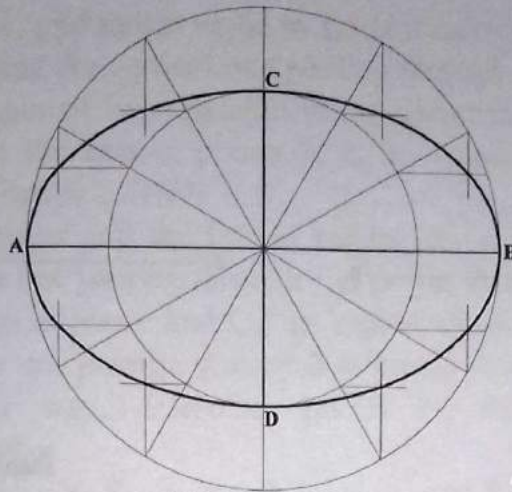


Figure 2.49(g)

(c) Four Center or Approximate Method (Given Major Axis and Minor Axis)

- Draw the given major axis AB and minor axis CD intersecting each other at point O. (Figure 2.50(a))
- Join C and B. (Figure 2.50(b))
- With O as center and OB as radius, draw an arc which intersects the extended DC at point E. (Figure 2.50(c))
- With C as center and CE as radius, draw an arc which intersects the line CB at point F. (Figure 2.50(d))
- Draw perpendicular bisector of FB which intersects OB and (extended) OD respectively at points O_1 and O_2 . (Figure 2.50(e))
- Mark O_1' on AO and O_2' on OC such that $OO_1 = OO_1'$ and $OO_2 = OO_2'$. (Figure 2.50(f))
- Join O_1' and O_2 , O_1' and O_2' and O_2' and O_1 and extend in the direction as shown. (Figure 2.50(g))
- With O_1 as center and O_1B as radius, draw an arc 1. With O_2 as center and O_2C as radius, draw an arc 2. With O_1' as center and $O_1'A$ as radius, draw an arc 3. With O_2' as center and $O_2'D$ as radius, draw an arc 4 to complete the required ellipse. (Figure 2.50(h))

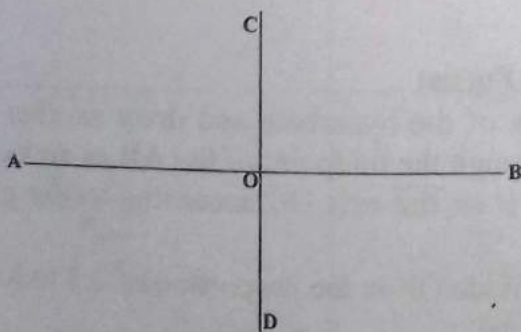


Figure 2.50(a)

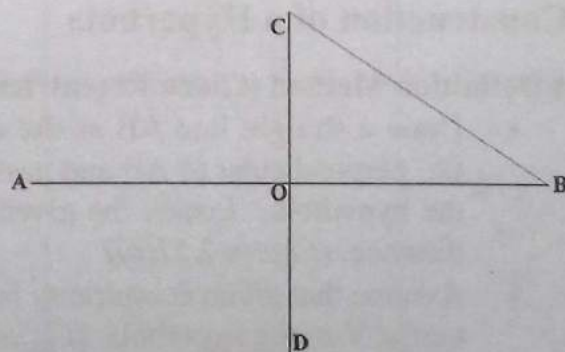


Figure 2.50(b)

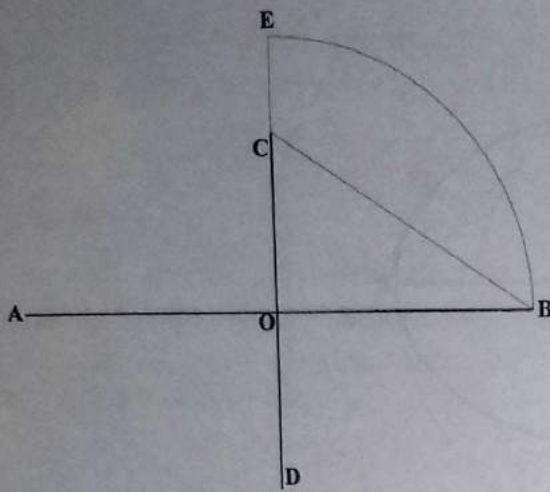


Figure 2.50(c)

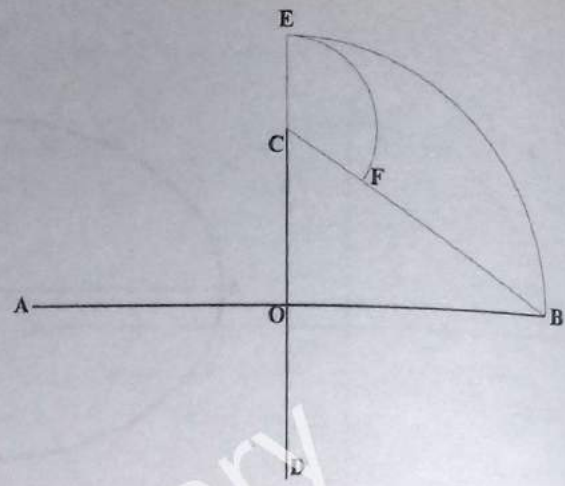


Figure 2.50(d)

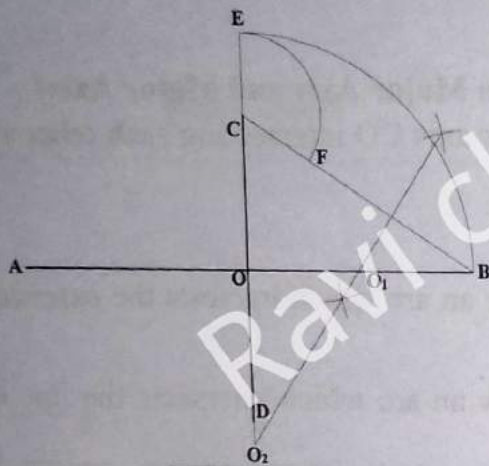


Figure 2.50(e)

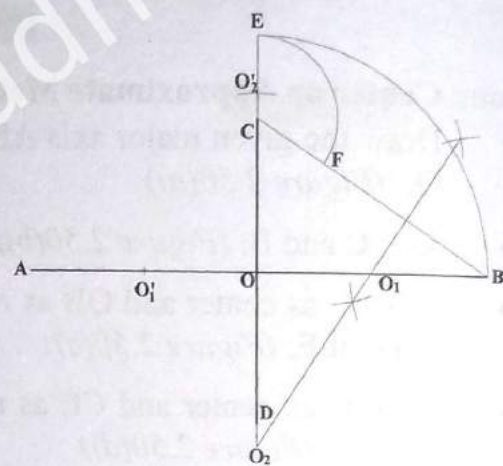


Figure 2.50(f)

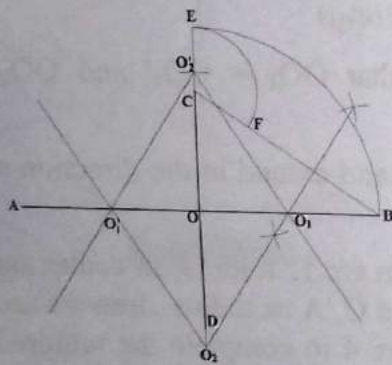


Figure 2.50(g)

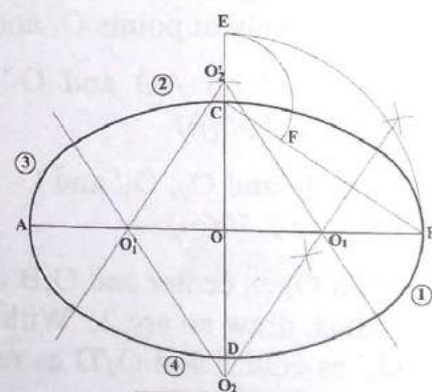


Figure 2.50(h)

2.4.4 Construction of a Hyperbola

(a) Definition Method (Given Eccentricity and Focus)

- Draw a straight line AB as the directrix of the hyperbola and draw another line OC perpendicular to AB and passing through the midpoint of the AB as an axis of the hyperbola. Locate the given focus F on the axis OC according to the given distance. (Figure 2.51(a))
- Assume that given eccentricity is 1.5. Divide OF in the proportion of 2:3 to locate vertex V of the hyperbola. (Figure 2.51(b))
- Mark any point M on the axis OC at any convenient distance, say 30. Draw a line perpendicular to the axis OC at point M. (Figure 2.51(c))