2.4.2 Construction of a Parabola

(a) Definition Method (Given Directrix and Focus)

- Draw a straight line AB as the directrix of the parabola and draw another line OC perpendicular to AB and passing through the midpoint of the AB as an axis of the parabola. *(Figure 2.45(a))*
- Locate the given focus F on the axis OC according to the given distance. *(Figure 2.45(b))*
- Draw perpendicular bisector of OF to locate its midpoint V, which is the vertex of the required parabola. *(Figure 2.45(c))*
- Draw any number of lines 1, 2, 3, ... parallel to the directrix AB and right to the vertex V. *(Figure 2.45(d))*
- With F as a center and the distance between the line 1 and the directrix as radius, draw arcs on both sides of the axis intersecting the line 1 at points P_1 and P_1'. *(Figure 2.45(e))*
- Again with F as a center and the distance between the line 2 and the directrix as radius, draw arcs on both sides of the axis intersecting the line 2 at points P_2 and P_2'. *(Figure 2.45(f))*
- In the similar way, determine points P_3, P_3', P_4, P_4', ... and so on. *(Figure 2.45(g))*
- Join all the points V, P_1, P_2, P_3, P_4, ... and P_1', P_2', P_3', P_4', ... by a smooth curve to get the required parabola. *(Figure 2.45(h))*

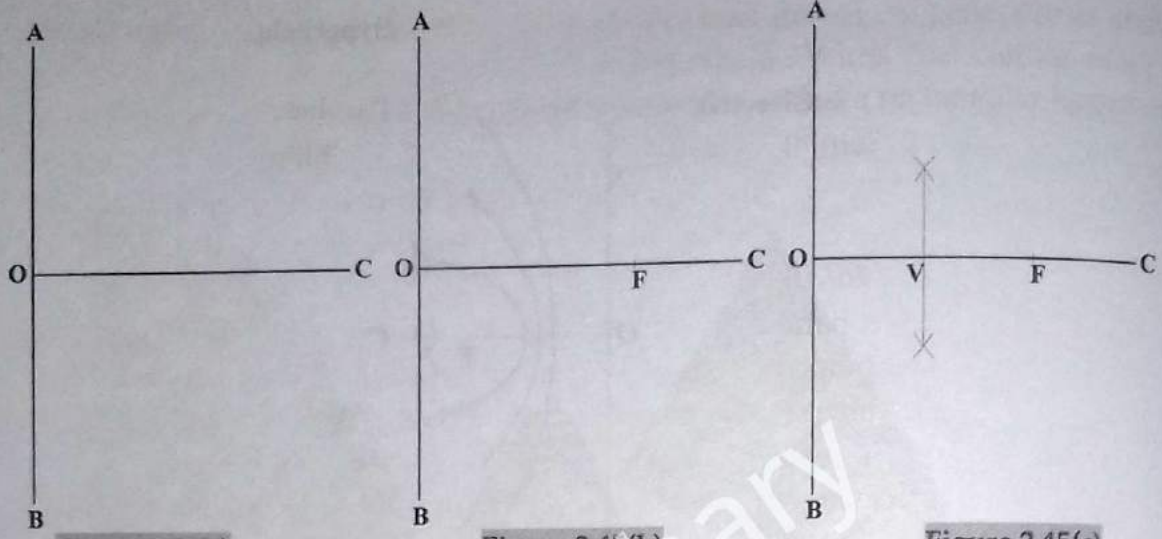


Figure 2.45(a) Figure 2.45(b) Figure 2.45(c)

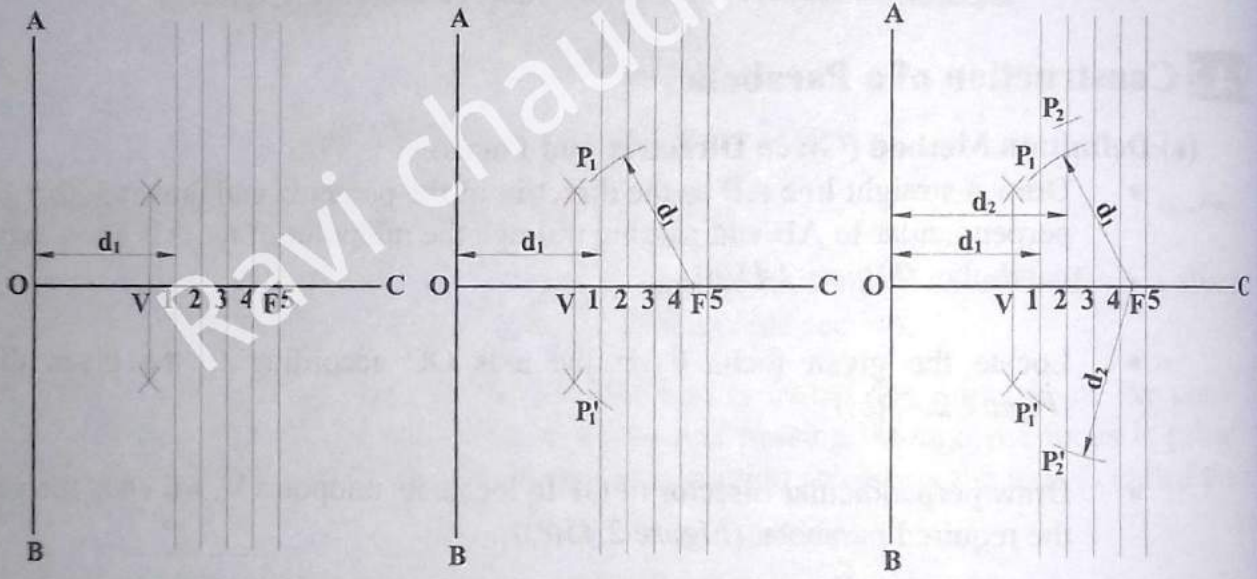


Figure 2.45(d) Figure 2.45(e) Figure 2.45(f)

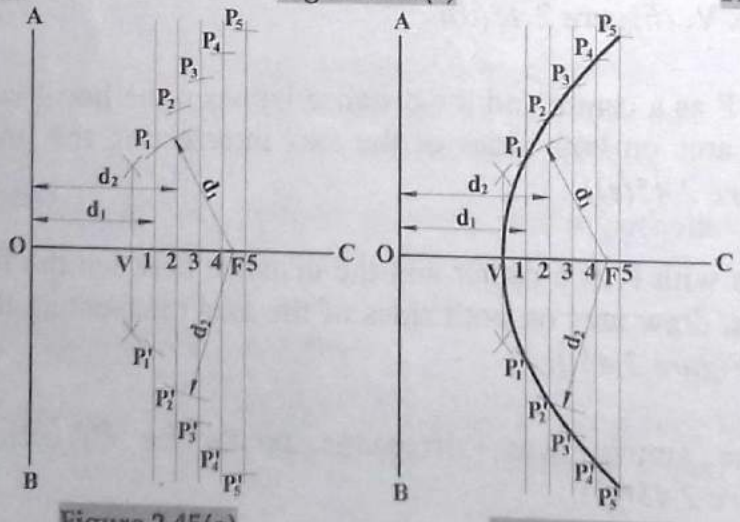


Figure 2.45(g) Figure 2.45(h)

(b) Rectangle Method (Given Double Ordinate and Axis Length)

- Draw a rectangle ABCD with its width as the given axis length (AB = DC) and height as the given double ordinate (AD = BC). *(Figure 2.46(a))*

- Divide rectangle into two equal parts by drawing perpendicular bisector OX of AD (or BC). *(Figure 2.46(b))*
- Divide OD into any number of parts (say 6) and name the dividing points as 0, 1, 2, 3, … 6 with 0 coinciding with O and 6 coinciding with D. *(Figure 2.46(c))*
- Divide DC into the same number of equal parts and name the dividing points as 0', 1', 2' ……. 6' with 0' coinciding with D and 6' coinciding with C. *(Figure 2.46(d))*
- Draw lines parallel to OX and passing through each point 1, 2, 3 …. on line OD. Join each point 1', 2', 3', ……. on line DC to point O. *(Figure 2.46(e))*
- Mark the intersection points of lines passing through 1 and 1', 2 and 2', …. and so on. *(Figure 2.46(f))*
- Draw the smooth curve passing through all these points to get the upper half portion of the required parabola. *(Figure 2.46(g))*
- Repeat the similar procedure to the bottom half portion of the parabola. *(Figure 2.46(h))*

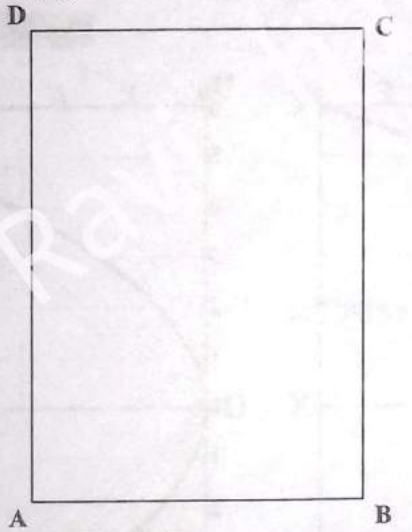
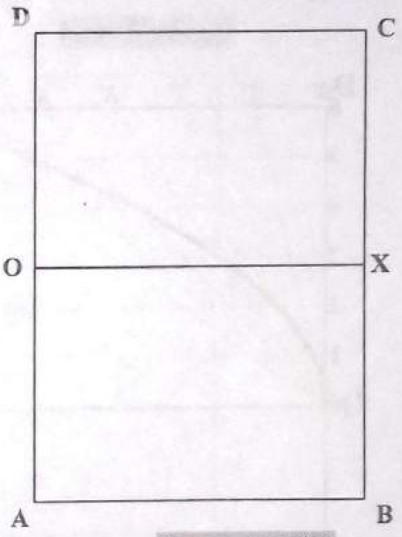


Figure 2.46(a)



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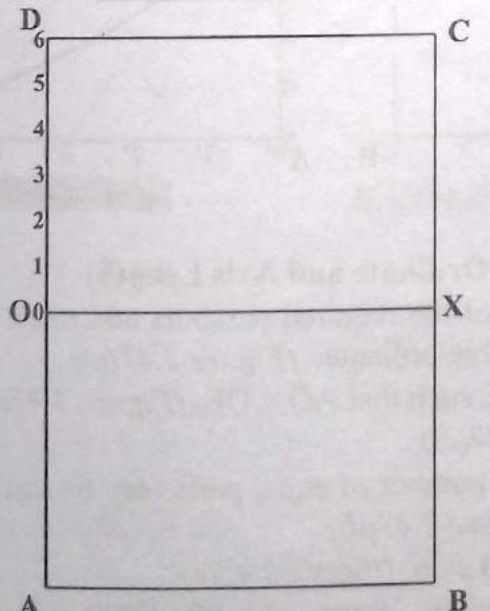

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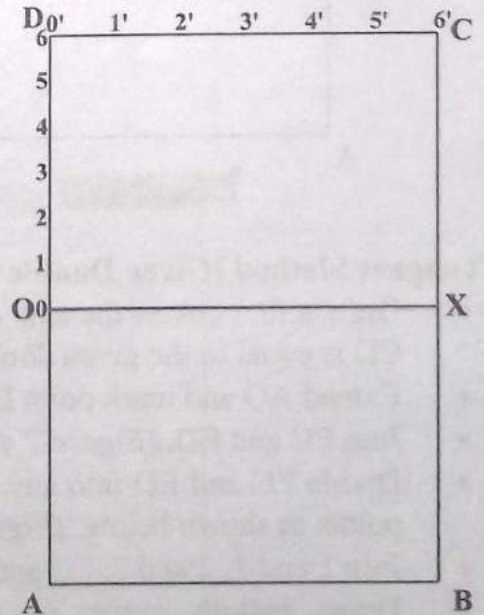


Figure 2.46(d)

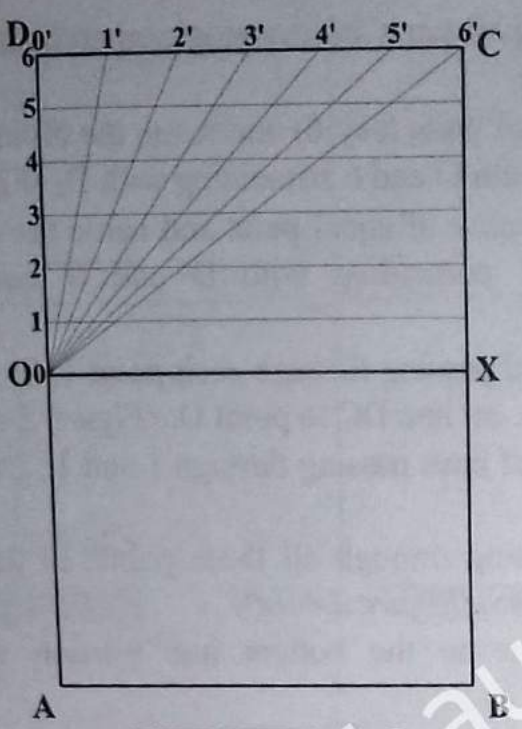


Figure 2.46(e)

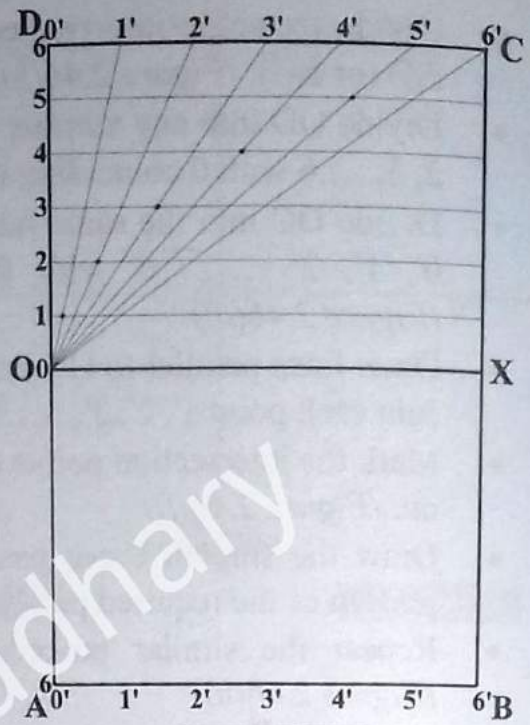


Figure 2.46(f)

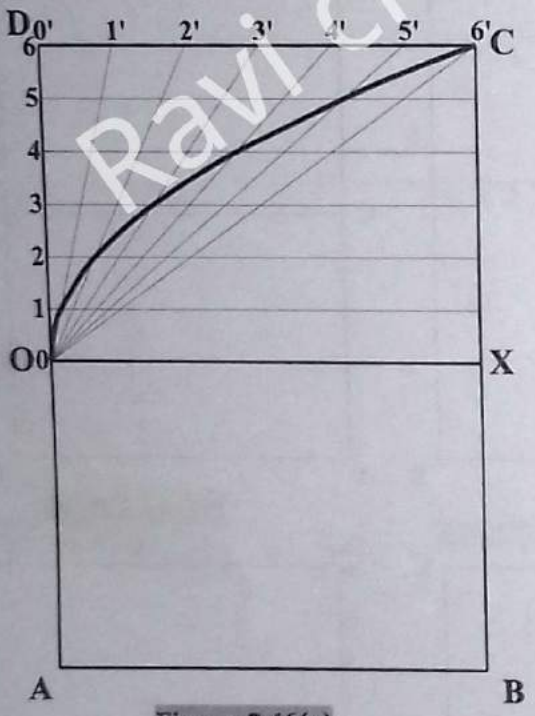


Figure 2.46(g)

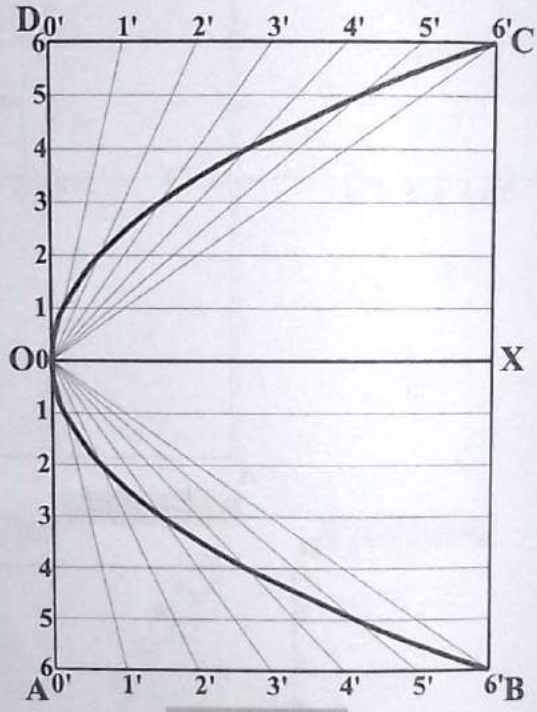


Figure 2.46(h)

(c) Tangent Method (Given Double Ordinate and Axis Length)

- Draw a line OA as the axis of the required parabola and mark C and D such that CD is equal to the given double ordinate. *(Figure 2.47(a))*
- Extend AO and mark point E such that AO = OE. *(Figure 2.47(b))*
- Join EC and ED. *(Figure 2.47(c))*
- Divide EC and ED into any number of equal parts (say 6) and name the dividing points as shown below. *(Figure 2.47(d))*
- Join 1 and 1, 2 and 2, …. and s on. *(Figure 2.47(e))*
- Draw smooth curve all these lines 11, 22, 33, ….. as tangent lines. *(Figure 2.47(f))*

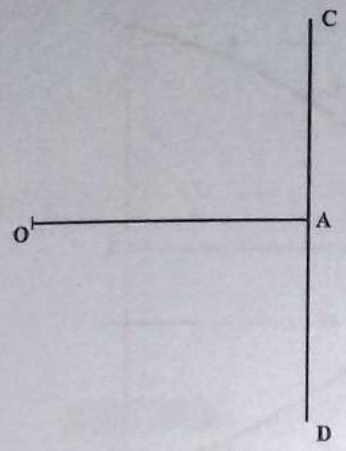


Figure 2.47(a)

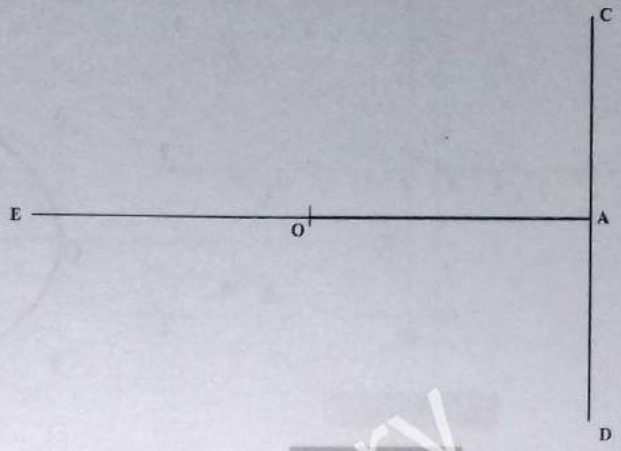
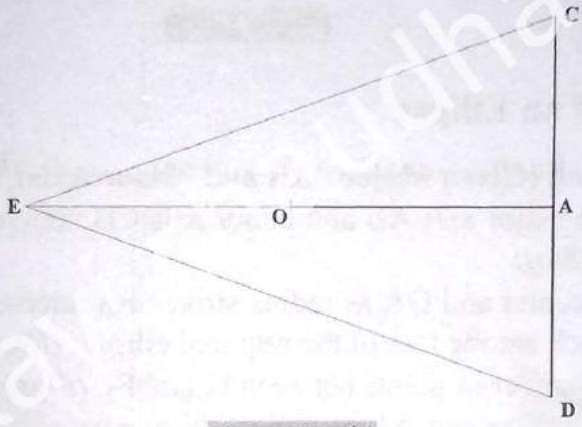


Figure 2.47(b)



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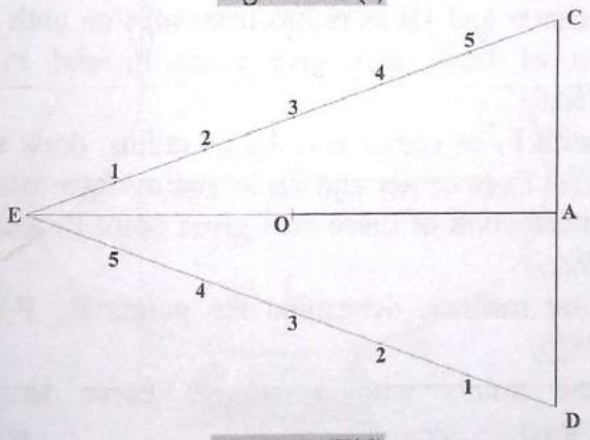

Figure 2.47(d)

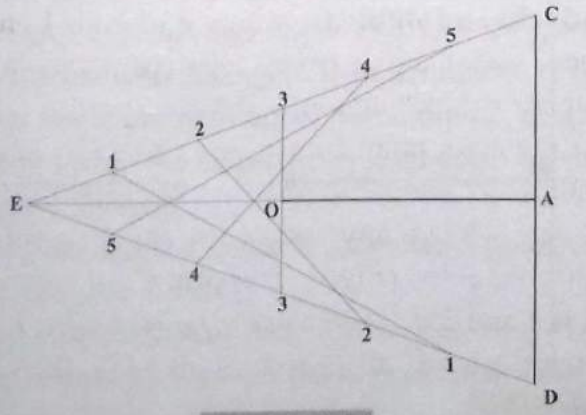

Figure 2.47(e)

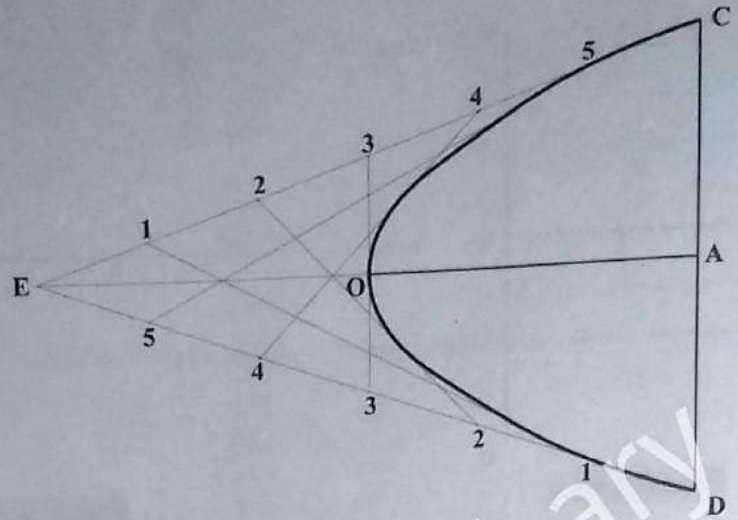

Figure 2.47(i)