

Activity 23

OBJECTIVE

An alternative method of constructing a parabola.

MATERIAL REQUIRED

Cardboard, white paper, sketch pen, pencil, compasses, ruler, nails, thread.

METHOD OF CONSTRUCTION

1. Take a cardboard of a convenient size and paste a white paper on it.
2. Take any point S on the white paper fixed on the cardboard.
3. Draw a line through S .
4. Draw another line l perpendicular to the line through S at a distance of k units to the left of S . Let the two lines meet at the point C .

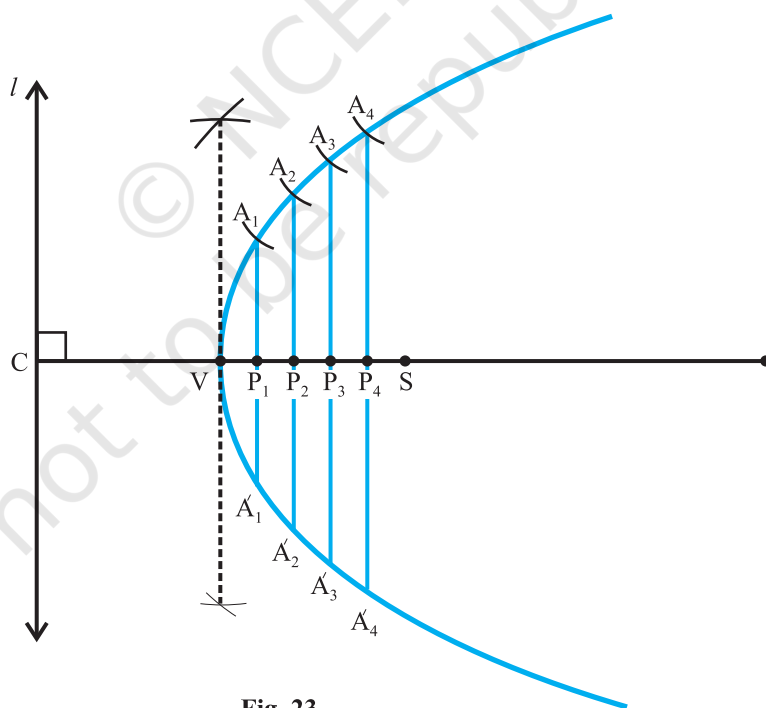


Fig. 23

5. Bisect CS at the point V.
6. Mark the points P_1, P_2, P_3, \dots on VS and draw perpendiculars through these points as shown in the Fig. 23.
7. Take S as centre and radius equal to CP_1 , draw an arc cutting the perpendicular through P_1 at the point A_1 and A_1' . Similarly with S as the centre and CP_2 as radius, obtain points A_2 and A_2' . Repeat this process for some more points P_3, P_4, \dots and obtain points A_3 and A_3' , A_4 and A_4' ;...
8. Fix nails at these points, i.e., $A_1, A_2, \dots, A_1', A_2', \dots$ and join the foot of the nails by a thread to get a curve as shown in the figure.

DEMONSTRATION

Distance of the point A_1 from $l = CP_1 = SA_1$

Similarly, distance of the point A_2 from $l = CP_2 = SA_2$

distance of the point A_3 from $l = CP_3 = SA_3$ and so on.

Also distance of the point A_1' from $l = CP_1 = SA_1'$

distance of the point A_2' from $l = CP_2 = SA_2'$ and so on.

Thus, every point on the curve is equidistant from the line l and the point S. So, the curve is a parabola, with focus S and directrix l .

OBSERVATION

By actual measurement

1. Distance of A_1 from $l =$ _____, $A_1S =$ _____.
2. Distance of A_2 from $l =$ _____, $A_2S =$ _____.
3. Distance of A_3 from $l =$ _____, $A_3S =$ _____.
4. Distance of A_4 from $l =$ _____, $A_4S =$ _____.
5. Distance of A_1' from $l =$ _____, $A_1'S =$ _____.

6. Distance of A'_2 from $l =$ _____, $A'_2S =$ _____.
7. Distance of A'_3 from $l =$ _____, $A'_3S =$ _____.
8. Distance of A'_4 from $l =$ _____, $A'_4S =$ _____.
9. Distance of any point on the curve from $l =$ Distance of the point from _____.
10. So, the curve is _____ with directrix _____ and focus _____.

APPLICATION

1. This activity is useful in understanding the terms related to a parabola, such as directrix and focus of the parabola.