Form a Cone From a Sector Of a Circle

Objective

To form a cone from a sector of a circle and to find the formula for its curved surface area.

Materials Required

1. A piece of wooden hardboard
2. Acrylic sheets
3. White paper
4. Adhesive tape
5. Scissors
6. Geometry box
7. Marker

Prerequisite Knowledge

1. Concept of a circle.
2. Concept of sector of a circle.
3. Concept of a cone.

Theory

1. For concept of a circle refer to Activity 23.
2. **Sector of the Circle:**
   The region between an arc and the two radii joining the centre to the end points of the arc is called a sector.
   Sectors are of two types – minor sector and major sector. Minor sector is the sector of circle, which is less than a semi-circle and major sector is the sector of circle, which is greater than a semi-circle, (see Fig. 28.1)

Area of sector = $\frac{Arc \quad length}{Circumference \quad of \quad circle} \times Area \quad of \quad the \quad circle$

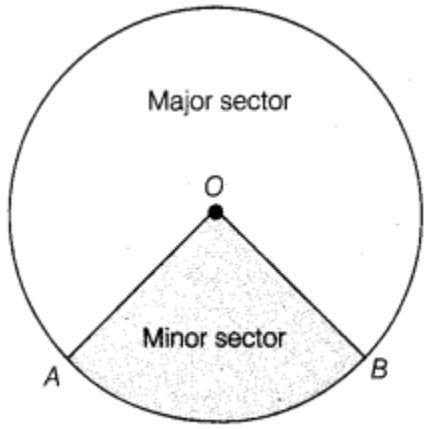

Fig. 28.1

3. **Cone:** A right circular cone is a solid generated by revolving a line segment which passes through a fixed point and which makes a constant angle with a fixed line. In other words, if a right angled triangle is revolved about one of the two sides forming a right angle, keeping the other sides fixed in position, then the solid so obtained by revolving the line segments is called a right circular cone.

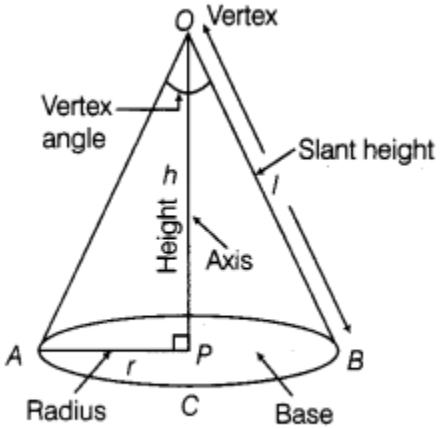

Fig. 28.2

In Fig. 28.2, a right angled ∆OPA on revolving about the segment OP, generates a right circular cone in which ABC is a circle.

Procedure

1. Take a piece of wooden hardboard of suitable size and by using adhesive, paste a white paper on it.

2. From acrylic sheet, cut out a circle of radius l. (see Fig. 28.3)

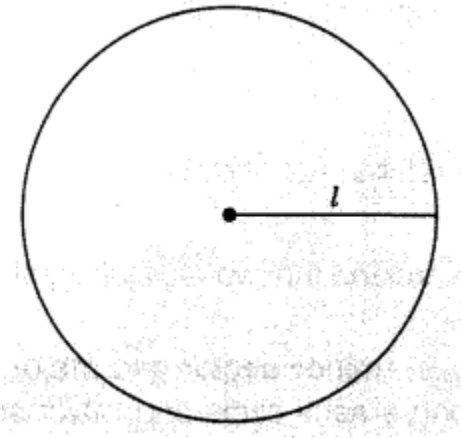

Fig. 28.3

3. Now, cut out a sector having angle θ° from the circle, (see Fig. 28.4)

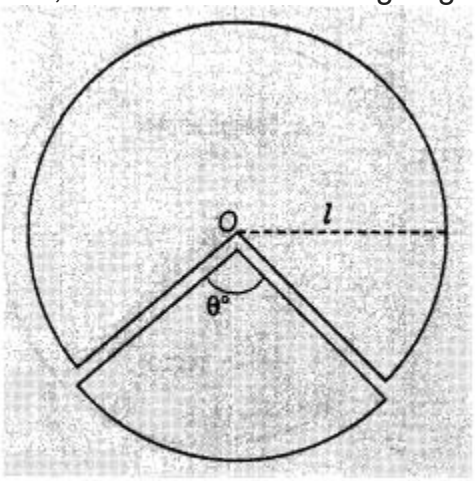

Fig. 28.4

4. To form a cone, bring together both the radii of the sector and by using a adhesive tape, attach the ends and fix it on the hardboard. (see Fig. 28.5)

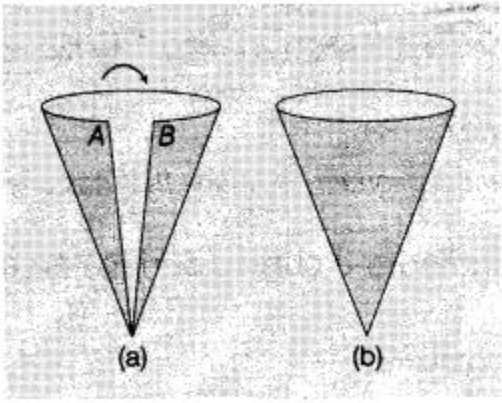

Fig. 28.5

Demonstration

1. Radius of the base of cone = r
2. Slant height of the cone = Radius of circle = l
3. Circumference of the base of cone = Arc length of sector = 2πr
4. Now, curved surface area of cone = Area of the sector
   = Area of sector = $\frac{Arc \quad length}{Circumference \quad of \quad circle} \times Area \quad of \quad the \quad circle$
   = $\frac{2\pi r}{2\pi l} \times \pi l^2$
   = πrl

Observation

By actual measurement,
The slant height (l) of the cone = …… and radius (r) = ……
∴ Arc length, (l) = ……
Area of the sector = ……
curved surface area of the cone = ……
Hence, curved surface area of the cone = Area of the sector

Result

We have derived the formula for calculating the curved surface area of cone.

Applications

This result is useful in

1. estimation of canvas required to make a conical tent.
2. estimation of material required to make joker's cap, ice-cream cone, etc.

Viva-Voce

Question 1.
What is the sector of a circle?
Answer:
The sector of a circle is the portion which is enclosed by two radii and an arc.

Question 2.
How will you define a cone?
Answer:
A cone is a three dimensional geometrical shape that has one circular base and one vertex.

Question 3.
What is the formula for finding the curved surface area of a cone of radius r and slant height l?

Answer:
Curved surface area of a cone = πrl

Question 4.
Do you know about any formula for finding the area of base of a cone?
Answer:
Yes, we know that area of base of a cone can be calculated with help of the formula for finding the area of a circle, i.e. πr^2.

Question 5.
What is the slant height of a cone having radius r and height h?
Answer:
Slant height, $l = \sqrt{(h^2 + r^2)}$

Suggested Activity

After forming a cone from the sector of a circle, verify experimentally that curved surface area of cone is equal to the area of the sector.