

CHAPTER 12

Areas Related to Circles

Areas of sector and Segment of a circle:

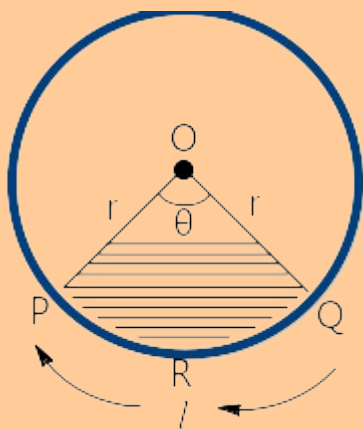
Sector:

The circular region enclosed by two radii and the corresponding arc is called a segment of the circle.

It divides the circle into two parts. They are minor sector and major sector.

Minor sector:

The sector containing the minor arc is called minor sector.



In the given figure, shaded region OPRQ is the minor sector.

$$\text{Area of minor sector} = \frac{\theta}{360^\circ} \times \pi r^2$$

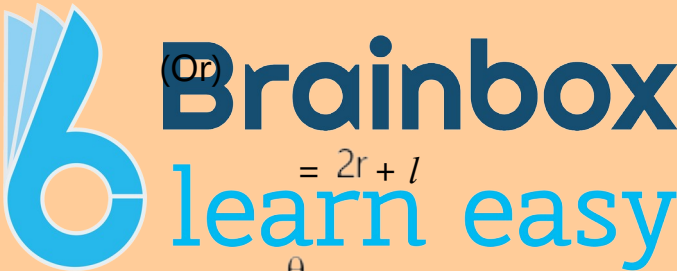
(or)

$$= \frac{1}{2} l r$$

Where, 'l' is length of arc

'r' is radius of circle

$$\text{Perimeter of minor sector} = 2r + \left(\frac{\theta}{360^\circ} \times 2\pi r \right)$$



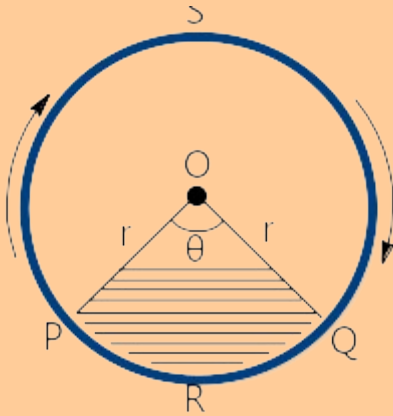
(Or)

$$\text{Length of the arc: } (l) = \frac{\theta}{360^\circ} \times 2\pi r$$

Major sector:

The sector containing the major arc is called the major sector.

In the given figure, unshaded region OPSQ is the major sector.



Length of the arc of major sector is,

$$l = 2\pi r - \left(\frac{\theta}{360^\circ} \times 2\pi r \right)$$

Perimeter of the major arc is $P = 2r (2\pi - \theta)$

Area of major sector =

$$\pi r^2 - \left(\frac{\theta}{360^\circ} \times \pi r^2 \right)$$

- While finding area of sector we should consider area of minor sector unless stated otherwise.

Example:

Find the length of arc and area of the sector of a circle with radius 4cm and of angle 30° and find the area of major sector.

(Use $\pi = 3.14$)

Sol.

Given that,

Radius (r) = 4 cm

Angle (θ) = 30°

Length of the arc (l) = $\frac{\theta}{360^\circ} \times 2\pi r$

$$= \frac{\cancel{30^\circ}}{\cancel{360^\circ}} \times 2 \times \cancel{3.14} \times 4$$

(After simplifying, we get)

Length of the arc (l) = 2.093 cm (Approx.)

Area of the sector (Minor sector) = $\frac{\theta}{360^\circ} \times \pi r^2$

$$= \frac{\cancel{30^\circ}}{\cancel{360^\circ}} \times 3.14 \times \cancel{4} \times 4$$

$$= \frac{12.56}{3}$$

Area of sector = 4.19 cm^2 (Approx.)

Area of the corresponding major sector

= Area of circle – Area of sector OAPB.

$$= 3.14 \times 4 \times 4 - (4.19)$$

$$= 50.24 - 4.19$$

$$= 46.05 \text{ cm}^2$$

Area of the corresponding major sector = 46.1 cm^2 (Approx.)

