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(Affiliated to CBSE up to +2 Level)

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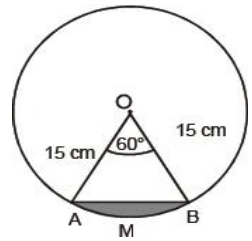
Exercise 12.2

Q.6. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle.



Sol. Here, radius (r) = 15 cm

Sector angle θ = 60°

∴ Area of the sector with θ = 60°

$$= \frac{\theta}{360} \times \pi r^2 = \frac{60}{360} \times \frac{314}{100} \times 15 \times 15 \text{ cm}^2 = \frac{11775}{100} \text{cm}^2 = 117.75 \text{ cm}^2$$

Since ∠O = 60° and OA = OB = 15 cm

∠AOB is an equilateral triangle.

⇒ AB = 15 cm and ∠A = 60°

Draw OM ⊥ AB

$$\therefore \frac{OM}{OA} = \sin 60° = \frac{\sqrt{3}}{2}$$

$$\Rightarrow OM = OA \times \frac{\sqrt{3}}{2} = \frac{15\sqrt{3}}{2} \text{cm}$$

$$\text{Now, ar}(\Delta AOB) = \frac{1}{2} \times AB \times OM$$

$$= \frac{1}{2} \times 15 \times 15 \frac{\sqrt{3}}{2} \text{cm}^2 = \frac{225\sqrt{3}}{4} \text{cm}^2$$

Now area of the minor segment

= (Area of minor sector) – (ar ΔAOB)

= (117.75 – 97.3125) cm^2 = 20.4375 cm^2

Area of the major segment

= [Area of the circle] – [Area of the minor segment]

$$= \pi r^2 - 20.4375 \text{ cm}^2 = \left[\frac{314}{100} \times 15^2\right] - 20.4375 \text{ cm}^2$$

= 706.5 – 20.4375 cm^2 = 686.0625 cm^2.

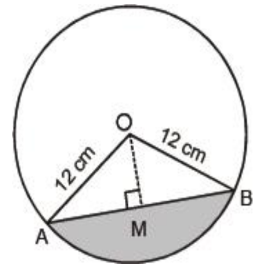
Q.7. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle.

Sol. Here, θ = 120° and r = 12 cm

$$\therefore \text{ Area of the sector} = \frac{\theta}{360°} \times \pi r^2$$

$$= \frac{120}{360} \times \frac{314}{100} \times 12 \times 12 \text{ cm}^2$$

$$= \frac{314 \times 4 \times 12}{100} \text{cm}^2 = \frac{15072}{100} \text{cm}^2 = 150.72 \text{ cm}^2 \qquad ...(1)$$



Now, area of $\Delta AOB = \frac{1}{2} \times AB \times OM$ ...(2)

In ΔOAB, $\angle O = 120°$

$\Rightarrow \angle A + \angle B = 180° - 120 = 60°$

$\because OB = OA = 12$ cm $\Rightarrow \angle A = \angle B = 30°$

So, $\frac{OM}{OA} = \sin 30° = \frac{1}{2} \Rightarrow OM = OA \times \frac{1}{2}$

$\Rightarrow OM = 12 \times \frac{1}{2} = 6$ cm

In right ΔAMO, $12^2 - 6^2 = AM^2$

$\Rightarrow 144 - 36 = AM^2$

$\Rightarrow 108 = AM^2$

$\Rightarrow AM = \sqrt{108} = 6\sqrt{3}$

$\Rightarrow 2\,AM = 12\sqrt{3}$

$\Rightarrow AB = 12\sqrt{3}$

Now, from (2),

$$\text{Area of } \Delta AOB = \frac{1}{2} \times AB \times OM = \frac{1}{2} \times 12\sqrt{3} \times 6 \text{ cm}^2 = 36\sqrt{3} \text{ cm}^2$$

$= 36 \times 1.73 \text{ cm}^2 = 62.28 \text{ cm}^2$ ...(3)

From (1) and (3)

Area of the minor segment

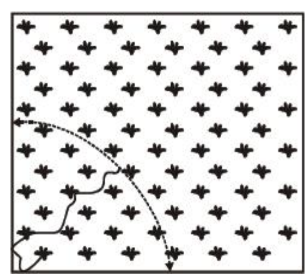
= [Area of minor segment] – [Area of ΔAOB]

= [150.72 cm^2] – [62.28 cm^2] = 88.44 cm^2.

Q.8. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5m long rope (see figure). Find:

(i) the area of that part of the field in which the horse can graze.

(ii) the increase in the grazing area if the rope were 10m long instead of 5m.



Sol. Here, Length of the rope = 5 m

∴ Radius of the circular region grazed by the horse = 5 m

(i) Area of the circular portion grazed

$$= \frac{90°}{360°} \times \pi r^2$$

$$= \frac{90}{360} \times \frac{314}{100} \times 5 \times 5 m^2 = \frac{1}{4} \times \frac{314}{16} m^2 = \frac{157}{8} m^2 = 19.625 \text{ m}^2$$

(ii) When length of the rope is increased to 10 m,

∴ r = 10 m

⇒ Area of the circular region where θ = 90°.

$$= \frac{\theta}{360°} \times \pi r^2 = \frac{90}{360} \times \frac{314}{100} \times (10)^2 m^2 = \frac{1}{4} \times 314 m^2 = 78.5 m^2$$

∴ Increase in the grazing area

= 78.5 – 19.625 m^2 = 58.875 m^2.