EXERCISE 7.2

Q.1. Find θ, when:

(i) l = 2cm, r = 3.5 cm

Solution : Using rule

$$l = r\theta,$$
$$2 = 3.5\,\theta$$
$$\frac{2}{3.5} = \theta$$
$$\theta = 0.57 \text{ radian}$$

(ii) l = 4.5 m, r = 2.5 m

Solution : Using rule

$$l = r\theta,$$
$$\frac{l}{r} = \theta$$
$$\frac{4.5}{2.5} = \theta$$
$$\theta = 1.8 \text{ radian}$$

Q.2. Find l, when

(i) θ = 180°, r = 4.9 cm

Solution: As θ should be in radians so

$$\theta = 180°$$
$$= 180\frac{\pi}{180} \text{ radian}$$
$$= \pi \text{ radian}$$

Using rule   l = rθ

$$= 4.9 \text{ cm} \times \pi$$
$$= 15.4 \text{ cm}$$

(ii) θ = 60°30′, r = 15 mm 07(036)

Solution : As 'θ' should be in radians, so

$$\theta = 60°30′$$
$$= 60° + \frac{30}{60}^{o}$$
$$= 60° + 0.5°$$
$$= 60.5°$$
$$= 60.5\frac{\pi}{180} \text{ radian}$$
$$\theta = 1.056 \text{ radian}$$

Using rule   l = rθ

$$= 15 \text{ mm} \times 1.056$$
$$= 15.84 \text{ mm}$$

Q.3. Find r, when

(i) l = 4 cm, θ = $\frac{1}{4}$ radian

Solution: Using rule l = rθ

$$4\text{cm} = r\frac{1}{4}$$
$$4\text{cm} \times 4 = r$$
$$r = 16 \text{ cm}$$

(ii) l = 52 cm , θ = 45°

Solution : As θ should be in radians.

$$\theta = 45°$$
$$= 45\frac{\pi}{180} \text{ radian}$$
$$= \frac{\pi}{4} \text{ radian}$$

Now using rule l = r θ

$$52 \text{ cm} = r\frac{\pi}{4}$$
$$\frac{52\text{cm} \times 4}{\pi} = r$$
$$r = 66.21 \text{ cm}$$

Q.4. In a circle of radius 12m, find the length of an arc which subtends a central angle θ = 1.5 radian.

Solution : Radius = r = 12m

Arc length = l ? =

Central angle = θ = 1.5 radian

Using rule l = rθ

$$l = 12\text{m} \times 1.5$$
$$l = 18\text{m}$$

Q.5. In a circle of radius 10m, find the distance travelled by a point moving on this circle if the point makes 3.5 revolution.

Solution: Radius = r = 10m

Number of revolutions = 3.5

Angle of one revolution = 2π radian

Angle of 3.5 revolution = θ

$$= 3.5 \times 2\pi \text{ radian}$$
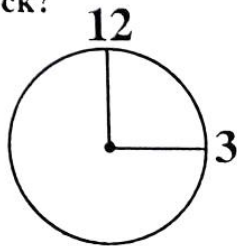$$\theta = 7\pi \text{ radian}$$

Distance travelled = l ? =

Using rule l = r θ

$$l = 10 \text{ m} \times 7\pi$$
$$l = 220 \text{ m}$$

Q.6. What is the circular measure of the angle between the hands of the watch at 3 O' clock?

Solution:

At 3 O' clock the minute hand will be at 12 and hour hand will be at 3 i.e the angle between the hands of watch will be one quarter of the central angle of full circle
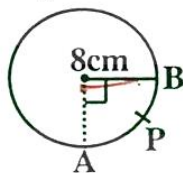
$$\text{i.e} = \frac{1}{4} \text{ of } 360°$$

$$= \frac{1}{4} \times 360°$$

$$= 90°$$

$$= 90 \frac{\pi}{180} \text{ radian}$$

$$= \frac{\pi}{2} \text{ radian.}$$

Q.7. What is **the length of arc APB?**

Solution: From the figure we see that

$$\text{Radius} = r = 8cm$$

$$\text{Central angle} = \theta$$

$$= 90°$$

$$= \frac{\pi}{2} \text{ radian}$$

Arc length $= l \quad ? =$

By rule $l = r\theta$

$$l = \overset{4}{\cancel{8}}cm \times \frac{\pi}{\cancel{2}}$$

$$l = 4cm \times \pi$$

$$l = 12.57 \text{ cm}$$

So, length of arc APB is 12.57 cm

Q.8. In a circle of radius 12 cm, how long an arc subtends a central angle of 84°?

Solution: Radius $= r = 12cm$

Arc length $= l \quad ? =$

Central angle $= \theta = 84°$

$$= 84 \frac{\pi}{180} \text{ radian}$$

$$= 1.466 \text{ radian}$$
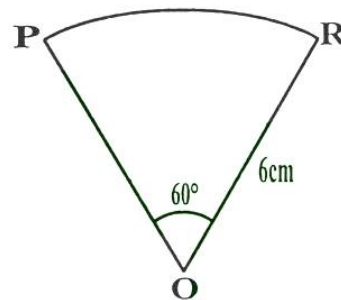
Now by rule $l = r\theta$

$$= 12cm \times 1.466$$

$$= 17.6 \text{ cm}$$

Q.9. Find the area of sector OPR.

(a)

Radius $= r = 6cm$

Central angle $= \theta = 60°$

$$= 60 \frac{\pi}{180} \text{ radian}$$

$$= \frac{\pi}{3} \text{ radian}$$

Area of sector $= ?$

As Area of sector $= \frac{1}{2} r^2 \theta$

$$= \frac{1}{2} \times (6cm)^2 \times \frac{\pi}{3}$$

$$= \frac{1}{\cancel{6}} \times \overset{6}{\cancel{36}}cm^2 \times \pi$$

$$= 6\pi \text{ cm}^2$$

$$= 18.85 \text{ cm}^2$$

(b)

Radius $= r = 20$cm

Central angle $= \theta = 45°$

$$= 45 \; \frac{\pi}{180} \; \text{radian}$$

$$= \frac{\pi}{4} \text{ radian}$$

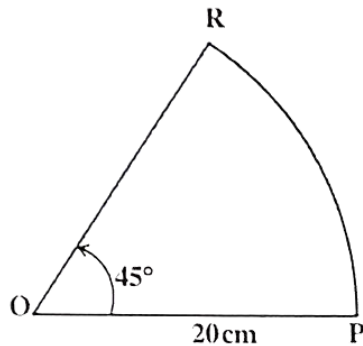Area of sector $= \; ?$

Area of sector $= \dfrac{1}{2} r^2 \theta$

$$= \frac{1}{2}(20\text{cm})^2 \times \frac{\pi}{4}$$

$$= \frac{400\text{cm}^2}{8} \times \pi$$

$$= 50 \, \pi \text{ cm}^2$$

$$= 157.1 \text{ cm}^2$$

Q.10. Find area of sector inside a central angle of 20° in a circle of radius 7 m.

Solution: Area of sector $= ?$

Radius $= r = 7$m

Central angle $= \theta = 20°$

$$= 20 \; \frac{\pi}{180} \; \text{radian}$$

$$= \frac{\pi}{9} \text{ radian}$$
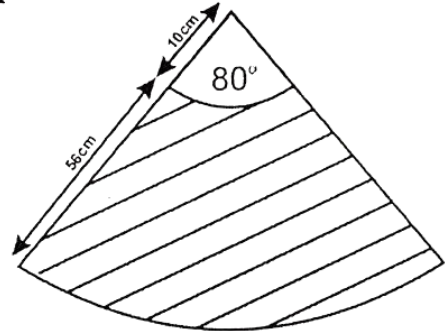
Area of sector $= \dfrac{1}{2} r^2 \theta$

$$= \frac{1}{2} \times (7\text{m})^2 \times \frac{\pi}{9}$$

$$= \frac{49\pi}{18} m^2$$

$$= 8.55 \text{ m}^2$$

Q.11. Sehar is making skirt. Each panel of this skirt is of the shape shown shaded in the diagram. How much material (cloth) is required for each panel?

Solution: Central angle $= \theta = 80°$

$$= 80 \; \frac{\pi}{180} \; \text{radian}$$

$$= \frac{4\pi}{9} \text{ radian}$$

Radius of bigger sector $= R = (56 + 10)$cm

$$R = 66 \text{ cm}$$

Radius of smaller sector $= r = 10$ cm

Shaded area $= \; ?$

Area of bigger sector $= \dfrac{1}{2} R^2 \theta$

$$= \frac{1}{2} \times (66cm)^2 \times \frac{\overset{2}{\cancel{4}} \pi}{9}$$

$$= \overset{484}{\cancel{4356}} \text{cm}^2 \times \frac{2\pi}{\cancel{9}}$$

$$= 968 \, \pi \text{ cm}^2$$

Area of smaller sector $= \dfrac{1}{2} r^2 \theta$

$$= \frac{1}{2}(10cm)^2 \times \frac{\overset{2}{\cancel{4}} \pi}{9}$$

$$= \frac{200}{9} \pi \; cm^2$$

Shaded area $= 968 \, \pi - \dfrac{200}{9} \pi$

$$= \frac{8712\pi - 200\pi}{9}$$

$$= \frac{8512}{9} \pi \; cm^2$$

$$= 2971.25 \text{ cm}^2$$

Q.12. Find the area of a sector with central angle of $\dfrac{\pi}{5}$ radian in a circle of radius 10 cm.

Solution: Area of sector = ?

Central angle = θ = $\dfrac{\pi}{5}$ radian

Radius = r = 10cm

Area of sector = $\dfrac{1}{2}r^2\theta$

= $\dfrac{1}{2}(10cm)^2 \times \dfrac{\pi}{5}$

= $\dfrac{1}{10}\times 100cm^2 \times \pi$

= 10π cm²

= 31.43 cm²

Q.13. The area of sector with central angle θ in a circle of radius 2m is 10 square meter. Find θ in radians.

Solution: Area of sector = 10 m²

Radius = r = 2m

Central angle = θ ? =

As Area of sector = $\dfrac{1}{2}r^2\theta$

$10m^2 = \dfrac{1}{2}(2m)^2\,\theta$

$10\ m^2 = \dfrac{1}{2}\left(4m^2\right)\theta$

$10m^2 = 2\theta m^2$

$\theta = \dfrac{10m^2}{2m^2}$

$\theta = 5$ radian