

$$= \pi r^2 + \pi r^2 + 2\pi r h - \pi r^2$$

$$= \pi r (r + 2h)$$

Hence, proved

Exercise 13.2

Q.1

$$\theta = 30^\circ$$

$$r = 4 \text{ cm}$$

$$\text{Length of arc} = \frac{\theta}{360^\circ} \times 2\pi r$$

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

$$= \frac{2\pi \text{ cm}}{3}$$

Q.2

$$r = 5 \text{ cm}$$

$$\text{Length of arc} = \frac{5\pi \text{ cm}}{3}$$

ATO,

$$\frac{\theta}{360^\circ} \times 2\pi r = \frac{5\pi}{3}$$

$$\theta = \frac{5\pi \times 360^\circ}{2 \times \pi \times 5}$$

$$\theta = 60^\circ$$

Q.3

$$\theta = 144^\circ$$

$$\text{Length of arc} = 20\pi \text{ cm}$$

ATO,

$$\frac{\theta}{360^\circ} \times 2\pi r = 20\pi \text{ cm}$$

$$\frac{144^\circ}{360^\circ} \times 2\pi r = 20\pi$$

$$r = \frac{20\pi \times 360}{144 \times 2\pi}$$

$$r = 25 \text{ cm}$$

$$\theta = 45^\circ$$

$$\text{Length of arc} = 15 \text{ cm}$$

ATQ,

$$\frac{\theta}{360^\circ} \times 2\pi r = 15 \text{ cm}$$

$$\frac{45^\circ}{360^\circ} \times 2\pi r = 15$$

$$r = \frac{15 \times 360}{45 \times 2\pi}$$

$$r = \frac{60}{\pi} \text{ cm}$$

$$r = \frac{60}{\pi} \text{ cm}$$

$$Q.5 \quad r = (a) \text{ cm}$$

$$\text{Length of arc} = \frac{a\pi}{4} \text{ cm}$$

ATQ,

$$\frac{\theta}{360^\circ} \times 2\pi(a) = \frac{a\pi}{4}$$

$$\theta = \frac{360 \times 180}{4 \times 2\pi \times a}$$

$$\theta = 45^\circ$$

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Ch-13
Exercise 13.2

Q.6

$$r = 4 \text{ cm}$$

$$\theta = 30^\circ$$

$$\begin{aligned} \text{Area of sector} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{30^\circ}{360^\circ} \times \pi \times 4 \times 4 \\ &= \frac{4\pi \text{ cm}^2}{3} \end{aligned}$$

Q.7

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

$$\theta = 135^\circ$$

$$\begin{aligned} \text{Area of sector} &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{135^\circ}{360^\circ} \times \pi \times 8 \times 8 \\ &= 24\pi \text{ cm}^2 \end{aligned}$$

Q.8

$$r = 2 \text{ cm}$$

$$\text{Area of sector} = \pi \text{ cm}^2$$

ATQ,

$$\frac{\theta}{360^\circ} \times \pi (2)^2 = \pi$$

$$\theta = \frac{360^\circ}{4} \times 1$$

$$\theta = 90^\circ$$

Q.9 $r = 5 \text{ cm}$
Area of sector = $5\pi \text{ cm}^2$

ATQ,
$$\frac{\theta}{360^\circ} \times \pi (5)^2 = 5\pi$$

$\theta = \frac{360 \times 72}{5}$

$\theta = 72^\circ$

Q.10 $r = 5 \text{ cm}$
Length of arc = 3.5 cm
Area of sector = $\frac{\theta}{360^\circ} \times \pi r^2$

$$= \frac{1}{2} \left(\frac{\theta}{180^\circ} \times \pi r \right) r = \frac{1}{2} \times l \times r$$

$$= \frac{1}{2} \times 3.5 \times 5 = 8.75 \text{ cm}^2$$

Q.11 $r = 35 \text{ cm}$
 $\theta = 72^\circ$

Length of arc = $\frac{\theta}{360^\circ} \times 2\pi r = \frac{72^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 35$
$$= 44 \text{ cm}$$

Area of sector = $\frac{\theta}{360^\circ} \times \pi r^2 = \frac{72^\circ}{360^\circ} \times \frac{22}{7} \times 35 \times 35$
$$= 770 \text{ cm}^2$$

Q.12 $r = 5.7 \text{ m}$

Perimeter of sector = 27.2 m

Perimeter of sector = $2(\text{Radius}) + \text{Length of arc}$

Length of arc = $27.2 - 2(5.7) = 27.2 - 11.4 = 15.8 \text{ m}$

ATQ,

$$\text{Length of arc} = \frac{\theta}{360^\circ} \times 2\pi r$$

$$15.8 = \frac{\theta}{360^\circ} \times 2\pi r$$

$$\frac{\theta}{360^\circ} = \frac{15.8}{2\pi r} \quad \text{--- (1)}$$

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

$$= \frac{15.8}{2\pi r} \times \pi r^2 \quad (\text{Putting (1)})$$

$$= \cancel{15.8} \times 7.9 \times 5.7$$

$$= \boxed{45.03 \text{ m}^2}$$

Q.13

$$r = 5.6 \text{ m}$$

$$\text{Perimeter of sector} = 2(\text{Radius}) + \text{Length of arc}$$

$$= 27.2 \text{ m}$$

$$\text{Length of arc} = 27.2 - 2(5.6)$$

$$= 27.2 - 11.2$$

$$= 16 \text{ m}$$

ATQ,

$$\text{Length of arc} = \frac{\theta}{360^\circ} \times 2\pi r$$

$$16 = \frac{\theta}{360^\circ} \times 2\pi r$$

$$\frac{\theta}{360^\circ} = \frac{16}{2\pi r} \quad \text{--- (1)}$$

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

$$\begin{aligned}
 &= \frac{168}{2\pi r} \times \pi r^2 \quad (\text{Putting ①}) \\
 &= 8 \times 5.6 \\
 &= \boxed{44.8 \text{ m}^2}
 \end{aligned}$$

$$\begin{aligned}
 r &= 21 \text{ cm} \\
 \theta &= 120^\circ
 \end{aligned}$$

$$\begin{aligned}
 \text{Length of arc} &= \frac{\theta}{360^\circ} \times 2\pi r \\
 &= \frac{120^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 21 \\
 &= \boxed{44 \text{ cm}}
 \end{aligned}$$

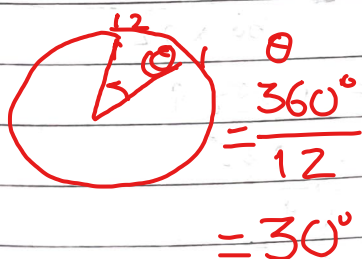
$$\begin{aligned}
 \text{Area of sector} &= \frac{\theta}{360^\circ} \times \pi r^2 \\
 &= \frac{120^\circ}{360^\circ} \times \frac{22}{7} \times 21 \times 21 \\
 &= \boxed{462 \text{ cm}^2}
 \end{aligned}$$

Q.15 Angle formed by minute hand in five minutes = $\frac{360^\circ \times 5}{60}$

$$= 30^\circ$$

Length of minute hand = $\sqrt{21}$ cm

Area covered between 7 am & 7:05 am = Area of sector



$$\begin{aligned}
 &= \frac{\theta}{360^\circ} \times \pi r^2 = \frac{30^\circ}{360^\circ} \times \frac{22}{7} \times (\sqrt{21})^2 \\
 &= \frac{2\pi \times 11}{7} \times \frac{1}{12} \times 21 \\
 &= \boxed{5.5 \text{ cm}^2}
 \end{aligned}$$

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Exercise 13.2

Q.16

$$\begin{aligned}\text{Length of minute hand} &= 10 \text{ cm} \\ \text{Angle made by minute hand in 25 mins} &= \frac{360^\circ \times 30}{12} \times 5 \\ &= 150^\circ\end{aligned}$$

OR

$$\frac{360^\circ}{60} \times 25$$

$$\begin{aligned}\text{Area covered by minute hand between 8 am &\& 8:25 am} &= \text{Area of sector} \\ &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{150^\circ}{360^\circ} \times \frac{22}{7} \times 10 \times 10 \\ &= 330000 \\ &\quad 2520 \\ &= \boxed{130.95 \text{ cm}^2}\end{aligned}$$

Q.17

$$\begin{aligned}\theta &= 56^\circ \\ \text{Area of sector} &= 4.4 \text{ cm}^2\end{aligned}$$

ATQ,

$$\frac{\theta}{360^\circ} \times \pi r^2 = 4.4 \text{ cm}^2$$

$$\frac{56^\circ}{360^\circ} \times \frac{22}{7} \times r^2 = 4.4$$

$$r^2 = \frac{4.4 \times 7 \times 360^\circ}{56 \times 22}$$

$$r^2 = \frac{110880}{1232}$$

$$r = \sqrt{9}$$

$$\boxed{r = 3 \text{ cm}}$$

Q13 Area of sector = 770 cm^2
 $\theta = 260^\circ$

ATQ,

$$\frac{\theta}{360^\circ} \times \pi r^2 = 770 \text{ cm}^2$$

$$\frac{518 \cancel{260}^\circ}{918 \cancel{360}^\circ} \times \frac{22}{7} \times r^2 = 770$$

$$r^2 = \frac{154}{770 \times 9 \times 7}$$

$$r^2 = \frac{5 \times 22}{910 \times 441}$$

$$r = \sqrt{441}$$

$$r = 21 \text{ cm}$$

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

$$= \frac{2005}{360^\circ \times 3} \times \frac{2 \times 22}{7} \times 21$$

$$= \frac{220}{3} = 73.33 \text{ cm}$$

Q14 Length of minute hand = 5 cm

Angle made by minute hand in 35 mins = $\frac{360^\circ 30}{12} \times 7$
 $= 210^\circ$

Area covered by minute hand between 6:05 am & 6:40 am = Area of sector

$$= \frac{\theta}{360^\circ} \times \pi r^2$$

$$= \frac{3210^\circ}{12 \times 360^\circ} \times \frac{22}{7} \times 5 \times 5$$

$$= \frac{550}{12} \times 45.83 = 45.83 \text{ cm}^2$$

Q.20 Length of minute hand = 14 cm
 Angle made by minute hand in 5 mins = $\frac{360^\circ}{12} \times 5$
 $= 30^\circ$

Area swept = Area of sector
 $= \frac{\theta}{360^\circ} \times \pi r^2$
 $= \frac{30^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14$
 $= \frac{154}{7} = 51.33 \text{ cm}^2$

Q.21 $r = 21 \text{ cm}$
 $\theta = 60^\circ$

(i) Length of arc = $\frac{\theta}{360^\circ} \times 2\pi r$
 $= \frac{60^\circ}{360^\circ} \times 2 \times \frac{22}{7} \times 21$
 $= 22 \text{ cm}$

(ii) Area of sector = $\frac{\theta}{360^\circ} \times \pi r^2$
 $= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 21 \times 21$
 $= 231 \text{ cm}^2$

Q.22 $r = 3 \text{ cm}$

Two sectors of 90° have been cut off.
 Remaining angle = $360^\circ - (90^\circ + 90^\circ)$
 $= 180^\circ$

Perimeter of semicircle = $\pi r + 2r$

$$= r(\pi + 2)$$

$$= 3 \left(\frac{22}{7} + 2 \right)$$

$$= 3 \times \frac{36}{7}$$

$$= \boxed{15.43 \text{ cm}}$$

Fig

Q23 Let the radius of the circle be r .
ATQ,

Area of sector = $\frac{\theta}{360^\circ} \times \text{Area of circle}$

$$\frac{\theta}{360^\circ} \times \pi r^2 = \frac{1}{12} \times \pi r^2$$

$$\frac{\theta}{360^\circ} = \frac{1}{12}$$

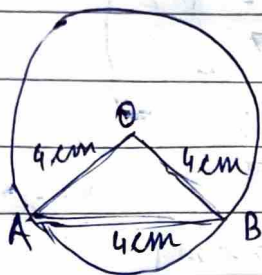
$$\theta = 360^\circ \times \frac{1}{12}$$

$$\theta = 30^\circ$$

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Exercise 13.2 → PART 2

Q.24



$$r = OA = OB = 4 \text{ cm}$$

$$AB = 4 \text{ cm}$$

$$\therefore OA = OB = AB,$$

$\therefore \Delta AOB$ is an equilateral Δ .

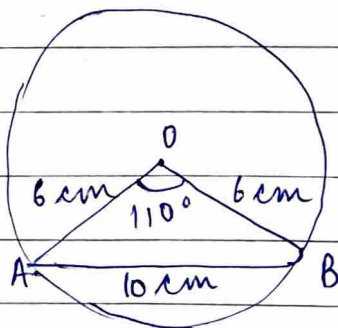
$$\therefore \angle AOB = \angle OBA = \angle BAO = 60^\circ$$

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

$$= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 4 \times 4$$

$$= \frac{176}{21} = 8.38 \text{ cm}^2$$

Q.25



$$r = OA = OB = 6 \text{ cm}$$

$$\theta = 110^\circ$$

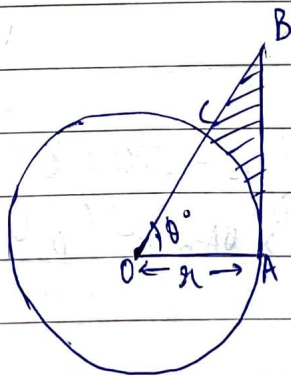
$$AB = 10 \text{ cm}$$

$$\begin{aligned}
 \text{(i) Circumference of circle} &= 2\pi r \\
 &= 2 \times \frac{22}{7} \times 6 \\
 &= \frac{264}{7} = \boxed{37.71 \text{ cm}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Area of circle} &= \pi r^2 \\
 &= \frac{22}{7} \times 6 \times 6 = \frac{792}{7} \\
 &= \boxed{113.14 \text{ cm}^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) Length of arc AB} &= \frac{\theta}{360^\circ} \times 2\pi r \\
 &= \frac{110^\circ}{360^\circ} \times 37.71 \\
 &= \frac{414.81}{36} = \boxed{11.52 \text{ cm}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv) Area of sector AOB} &= \frac{\theta}{360^\circ} \times \pi r^2 \\
 &= \frac{110^\circ}{360^\circ} \times 113.14 \\
 &= \frac{1244.54}{36} = \boxed{34.57 \text{ cm}^2}
 \end{aligned}$$



To prove - (i) Perimeter of shaded region

$$= r \left(\tan \theta + \sec \theta + \frac{\pi \theta}{180^\circ} - 1 \right)$$

(ii) Area of shaded region

$$= \frac{r^2}{2} \left(\tan \theta - \frac{\pi \theta}{180^\circ} \right)$$

Proof -

(i) $\angle OAB = 90^\circ$ (Tangent is perpendicular to radius through the point of contact)

In right $\triangle OAB$,

$$\cos \theta = \frac{r}{OB}$$

$$OB = \frac{r}{\cos \theta}$$

$$OB = r \sec \theta \quad \text{--- (1)}$$

$$\tan \theta = \frac{AB}{r}$$

$$AB = r \tan \theta \quad \text{--- (2)}$$

Perimeter of shaded region = $AB + BC + \widehat{CA}$ ✓

$$= r \tan \theta + (OB - OC) + \frac{\theta}{360^\circ} \times 2\pi r$$

$$= r \tan \theta + r \sec \theta - r + \frac{\pi \theta r}{180^\circ}$$

$$= \boxed{r \left(\tan \theta + \sec \theta + \frac{\pi \theta}{180^\circ} - 1 \right)}$$

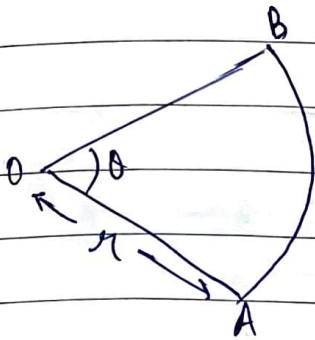
(ii) Area of shaded region = Area of $\triangle$ - Area of sector

$$= \left(\frac{1}{2} \times OA \times AB \right) - \left(\frac{\theta}{360^\circ} \times \pi r^2 \right)$$

$$= \frac{1}{2} \times r \times r \tan \theta - \frac{r^2}{2} \left(\frac{\pi \theta}{180^\circ} \right)$$

$$= \frac{r^2}{2} \left(\tan \theta - \frac{\pi \theta}{180^\circ} \right)$$

Hence, proved ✓



Radius = r cm

Area = A cm²

Perimeter = 50 cm

} given

To prove - (i) $\theta = \frac{360}{\pi} \left(\frac{25}{r} - 1 \right)$ | (ii) $A = 25r - r^2$

Proof - (i) Perimeter = $OA + \widehat{AB} + OB$

$$50 = r + r + \left(\frac{\theta}{360^\circ} \times 2\pi r \right)$$

$$50 = 2r + \left(\frac{\theta}{360^\circ} \times 2\pi r \right)$$

$$\frac{2550}{r} = 1 + \frac{\pi \theta}{360^\circ}$$

$$\frac{25 - 1}{r} = \frac{\pi \theta}{360^\circ}$$

$$\theta = \frac{360^\circ}{\pi} \left(\frac{25 - 1}{r} \right) \quad \text{--- (1) ✓}$$

(ii) Area = $\frac{\theta}{360^\circ} \times \pi r^2$