

Exercise 2.1

Q1 (i) $30^\circ = \frac{\pi}{6}$ radians (Table) or $30 \times \frac{\pi}{180} = \frac{\pi}{6}$ radians

(ii) $45^\circ = \frac{\pi}{4}$ radians (Table)

(iii) $150^\circ \times \frac{\pi}{180} = \frac{5\pi}{6}$ radians

(iv) $135^\circ \times \frac{\pi}{180} = \frac{3\pi}{4}$ radians

(v) $36^\circ \times \frac{\pi}{180} = \frac{\pi}{5}$ radians

(vi) $240^\circ \times \frac{\pi}{180} = \frac{4\pi}{3}$ radians

(vii) $390^\circ \times \frac{\pi}{180} = \frac{13\pi}{6}$ radians

To convert
degrees to Radians
 $\times \frac{\pi}{180}$

Q2

(i) $\pi = 180^\circ$ (Table)

(ii) $\frac{\pi}{2} = 90^\circ$

(iii) $\frac{\pi}{6} = 60^\circ$

(iv) $\frac{5\pi}{6} \times \frac{180}{\pi} = 150^\circ$

(v) $\frac{4\pi}{9} \times \frac{180}{\pi} = 80^\circ$

(vi) $\frac{11\pi}{6} \times \frac{180}{\pi} = 330^\circ$

(vii) $\frac{5\pi}{12} \times \frac{180}{\pi} = 75^\circ$

π radians = 180°
1 radian = $\frac{180}{\pi}$
To convert
radians to
degrees
 $\times \frac{180}{\pi}$

Q3 radius = 4. $L = r\theta$

(i) $L = (4)(2) = 8 \text{ cm}$

(ii) $L = (4)(4) = 16 \text{ cm}$

(iii) $L = (4)(\frac{5}{2}) = \frac{20}{2} = 10 \text{ cm}$

(iv) $L = (4)(\frac{5}{4}) = \frac{20}{4} = 5 \text{ cm}$

Q4 radius = 6. $\theta = \frac{L}{r}$

(i) $\theta = \frac{6}{6} = 1 \text{ radian}$

(ii) $\theta = \frac{12}{6} = 2 \text{ radians}$

(iii) $\theta = \frac{3}{6} = \frac{1}{2} \text{ radians}$

(iv) $\theta = \frac{9}{6} = \frac{3}{2} \text{ radians}$

(v) $\theta = \frac{7\frac{1}{2}}{6} = \frac{15}{2} \times \frac{1}{6} = \frac{15}{12} = \frac{5}{4} \text{ radians}$

Q5 $L = 15 \text{ cm}$ $\theta = 2 \text{ radians}$ $r = \frac{L}{\theta}$

$r = \frac{15}{2} = 7\frac{1}{2} \text{ cm}$

Q6 $r = 5$ ~~Q6~~ $L = 6$ $\text{Area} = \frac{1}{2} r^2 \theta$

$\theta = \frac{L}{r} = \frac{6}{5}$ $\text{Area} = \frac{1}{2} (5)^2 (\frac{6}{5}) = 15 \text{ cm}^2$

Q7 $r = 8\text{cm}$ Area = 40cm^2 .

$$A = \frac{1}{2} r^2 \theta$$

$$40 = \frac{1}{2} (8)^2 \theta$$

$$40 = 32 \theta$$

$$\frac{40}{32} = \theta$$

$$\frac{5}{4} \text{ radians} = \theta$$

Q8 Cir = $12\pi\text{cm}$.

$$L = r\theta$$

$$r\theta = 12\pi$$

* But $\theta = 2\pi$ (full circle)

$$r(2\pi) = 12\pi$$

$$r = \frac{12\pi}{2\pi}$$

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

Area^{sector} = $3\pi\text{cm}^2$

$$A = \frac{1}{2} r^2 \theta$$

$$3\pi = \frac{1}{2} r^2 \theta$$

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

$$3\pi = 18 \theta$$

$$\frac{3\pi}{18} = \theta$$

$$\frac{\pi}{6} \text{ radians} = \theta$$

Q9 Area of sector = 27cm^2

radius = 6.

$$\text{Area} = \frac{1}{2} r^2 \theta$$

$$27 = \frac{1}{2} (6)^2 \theta$$

$$27 = 18 \theta$$

$$\frac{27}{18} = \theta$$

$$\frac{3}{2} \text{ radians} = \theta$$

Q.10 $\theta = \frac{\pi}{4}$ $r = 8\text{cm}$.

$$\begin{aligned}\text{Area of full sector} &= \frac{1}{2} r^2 \theta \\ &= \frac{1}{2} (8)^2 \frac{\pi}{4} \\ &= 8\pi \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Area of Non shaded sector} &= \frac{1}{2} r^2 \theta \quad r = 2 \\ &= \frac{1}{2} (2)^2 \frac{\pi}{4} \\ &= \frac{\pi}{2} \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\Rightarrow \text{Shaded Area} &= \text{full sector} - \text{Non shaded sector} \\ &= 8\pi - \frac{\pi}{2} \\ &= \frac{16\pi - \pi}{2} = \frac{15\pi}{2} \text{ cm}^2\end{aligned}$$

Q.11

$l = 10$ $r = 4$ θ

(i) $\left[\theta = \frac{l}{r}\right]$ $\theta = \frac{10}{4} = \frac{5}{2}$ radians

(ii) $\frac{5}{2} \times \frac{180}{\pi} = 143.2394^\circ = 143^\circ$ to nearest degree

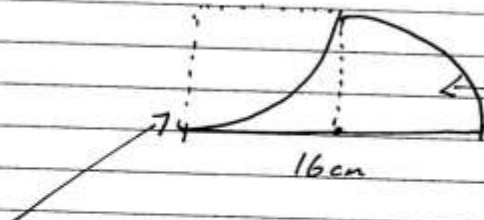
Q.12 Area of Square = $2 \times 2 = 4\text{cm}^2$

$\left(90^\circ = \frac{\pi}{2}\right)$ Area of Sector = $\frac{1}{2} r^2 \theta = \frac{1}{2} (2)^2 \left(\frac{\pi}{2}\right) = \pi$.

$$\begin{aligned}\text{Shaded Area} &= \text{Area Square} - \text{Area Sector} \\ &= (4 - \pi) \text{ cm}^2\end{aligned}$$

Q13

centre is mid pt of AB $\Rightarrow r = 8\text{cm}$.



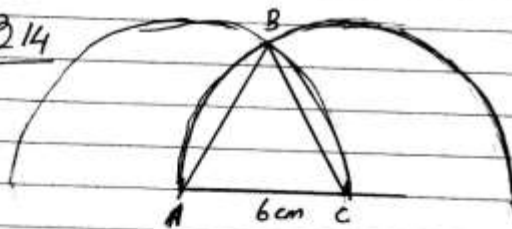
$$90^\circ = \frac{\pi}{2} \text{ radians}$$

$$\begin{aligned} \text{Area} &= \frac{1}{2} r^2 \theta \\ &= \frac{1}{2} (8)^2 \left(\frac{\pi}{2}\right) \\ &= 16\pi \end{aligned}$$

$$\begin{aligned} \text{Area} &= \text{Area of Square} - \text{Area of Sector} \\ &= (8 \times 8) - 16\pi \\ &= (64 - 16\pi) \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Total Area} &= 16\pi + (64 - 16\pi) \\ &= 64 \text{ cm}^2 \end{aligned}$$

Q14



- (i) C is centre \Rightarrow radius = 6cm $\Rightarrow |BC| = 6\text{cm}$
 A is centre \Rightarrow radius = 6cm $\Rightarrow |AB| = 6\text{cm}$.

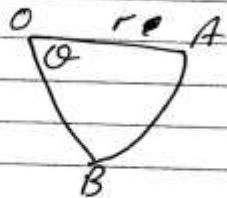
\Rightarrow Isosceles $\Delta \Rightarrow$ all angles = $60^\circ \Rightarrow \angle ABC = 60^\circ$

(ii) $L = r\theta$ $L = (6)\left(\frac{\pi}{3}\right) = 2\pi \text{ cm}$ $60^\circ = \frac{\pi}{3}$

(iii) Area Sector = $\frac{1}{2} r^2 \theta = \frac{1}{2} (6)^2 \left(\frac{\pi}{3}\right) = 6\pi \text{ cm}^2$
 Area of $\Delta = \frac{1}{2} ab \sin C = \frac{1}{2} (6)(6) (\sin 60) = 9\sqrt{3}$

1 shaded part = $(6\pi - 9\sqrt{3}) \Rightarrow$ 2 shaded parts = $2(6\pi - 9\sqrt{3}) = 12\pi - 18\sqrt{3} \text{ cm}^2$.

Q.15 wire = 40cm = perimeter.



$$\text{Area} = 100 \text{ cm}^2$$

$$\begin{aligned} \text{(i)} \quad \angle &= r\theta \\ (40-2r) &= r\theta \\ \frac{40-2r}{r} &= \theta \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \text{Area} &= \frac{1}{2} r^2 \theta \\ 100 &= \frac{1}{2} r^2 \theta \\ \frac{200}{r^2} &= \theta \end{aligned}$$

$$\text{(ii)} \quad \frac{40-2r}{r} = \frac{200}{r^2}$$

$$40r^2 - 2r^3 = 200r$$

$$\begin{aligned} 0 &= 2r^3 - 40r^2 + 200r \\ (\div 2r) \quad 0 &= r^2 - 20r + 100 \end{aligned}$$

$$\begin{aligned} 0 &= (r-10)(r-10) \\ r &= 10 \text{ cm} \end{aligned}$$

(iii)

$$\frac{40-2r}{r} = \theta \quad (r=10)$$

$$\frac{40-2(10)}{10} = \theta$$

$$\frac{20}{10} = \theta$$

$$2 \text{ radians} = \theta$$