

Ex 4.1

Q1

(i) $\frac{9\pi}{5}$

We have,

$$\pi \text{ radians} = 180^\circ$$

$$1^c = \left\{ \frac{180}{\pi} \right\}^0$$

Now,

$$\begin{aligned} \left(\frac{9\pi}{5} \times \frac{180}{\pi} \right)^0 \\ = 324^\circ \end{aligned}$$

(ii) $\frac{-5\pi}{6}$

We have,

$$\pi \text{ radians} = 180^\circ$$

$$1^c = \left(\frac{180}{\pi} \right)^0$$

Now,

$$\left(\frac{-5\pi}{6} \right)^c = \left(\frac{-5\pi}{6} \times \frac{180}{\pi} \right)^0 = -150^\circ$$

(iii) $\left(\frac{18\pi}{5} \right)^c$

We have,

$$\pi \text{ radians} = 180^\circ$$

$$1^c = \left(\frac{180}{\pi} \right)^0$$

Now,

$$\begin{aligned} \left(\frac{18\pi}{5} \right)^c &= \left(\frac{18\pi}{5} \times \frac{180}{\pi} \right)^0 \\ &= 648^\circ \end{aligned}$$

(iv) We have,

$$\pi \text{ radians} = 180^\circ$$

$$1^c = \left(\frac{180}{\pi} \right)^0$$

Now,

$$\begin{aligned}
(-3)^c &= \left(-3 \times \frac{180}{\pi}\right)^0 \\
&= \left(\frac{180}{22} \times 7 \times -3\right)^0 \\
&= \left(-171 \frac{9}{11}\right)^0 \\
&= -171^0 \left(\frac{9}{11} \times 60\right)^1 \\
&= -171^0 49^1 5^{11}
\end{aligned}$$

(v) We have,

$$\pi \text{ radians} = 180^0$$

$$1^c = \left(\frac{180}{\pi}\right)^0$$

Now,

$$\begin{aligned}
(11)^c &= \left(11 \times \frac{180}{\pi}\right)^0 \\
&= \left(11 \times 180 \times \frac{7}{22}\right)^0 \\
&= 630^0
\end{aligned}$$

(vi) We have,

$$\pi \text{ radians} = 180^0$$

$$1^e = \left(\frac{180}{\pi}\right)^0$$

Now,

$$\begin{aligned}
1^e &= \left(1 \times \frac{180}{\pi}\right)^0 \\
&= 1 \times \frac{180 \times 7}{22} \\
&= 57^0 \left(\frac{3}{11} \times 60\right) \\
&= 57^0 16^1 \left(\frac{4}{11} \times 60\right)^{11} \\
&= 57^0 16^1 21^{11}
\end{aligned}$$

Q2

(i) 300°

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

Now,

$$300^\circ = 300 \times \frac{\pi}{180} = \frac{5\pi}{3}$$

(ii) 35°

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

Now,

$$35^\circ = 35 \times \frac{\pi}{180} = \frac{7\pi}{36}$$

(iii) -56°

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

Now,

$$-56^\circ = -56 \times \frac{\pi}{180} = \frac{-14\pi}{45}$$

(iv) 135°

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

Now,

$$135^\circ = 135 \times \frac{\pi}{180} = \frac{3\pi}{4}$$

(v) -310°

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

Now,

$$-300^\circ = -300 \times \frac{\pi}{180} = \frac{-5\pi}{3}$$

(vi) $7^\circ 30^1$

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

$$\begin{aligned} 7^\circ 30^1 &= \left(7 \times \frac{\pi}{180}\right)^c \times \left(\frac{30}{60}\right)^0 \\ &= \left(7\frac{1}{2}\right)^0 \times \left(\frac{\pi}{180}\right)^c \\ &= \left(\frac{15}{2} \times \frac{\pi}{180}\right)^c \\ &= \frac{\pi}{24} \end{aligned}$$

(vii) $125^\circ 30^1$

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

$$\begin{aligned} 125^\circ 30^1 &= 125^\circ \left(\frac{30}{60}\right)^0 \\ &= \left(125\frac{1}{2}\right)^0 \\ &= \left(\frac{251}{2} \times \frac{\pi}{180}\right)^c = \frac{251\pi}{360} \end{aligned}$$

(viii) $-47^\circ 30^1$

We have,

$$180^\circ = \pi^c$$

$$\therefore 1^\circ = \left(\frac{\pi}{180}\right)^c$$

$$\begin{aligned} -47^\circ 30^1 &= -47^\circ \left(\frac{30}{60}\right)^0 \\ &= \left(-47\frac{1}{2}\right)^c \\ &= \left(-\frac{95}{2}\right)^0 \end{aligned}$$

$$\begin{aligned}
 &= \left(\frac{-95}{2} \times \frac{\pi}{180} \right)^c \\
 &= \frac{-19\pi}{72}
 \end{aligned}$$

Q3

Let θ_1 and θ_2 be two acute angles of a right angled triangle.

$\therefore$ difference of acute angles

$$\theta_1 - \theta_2 = \frac{2\pi}{5} \text{ radians}$$

$\therefore$ in a right angled triangle,

$$\theta_1 + \theta_2 = \frac{\pi}{2}$$

$$\theta_1 - \theta_2 = \frac{2\pi}{5} \quad \text{---(i)}$$

$$\theta_1 + \theta_2 = \frac{\pi}{2} \quad \text{---(ii)}$$

On solving

$$2\theta_1 = \frac{2\pi}{5} + \frac{\pi}{2}$$

$$\theta_1 = \frac{9\pi}{20}$$

From equation (ii)

$$\theta_2 = \frac{\pi}{20}$$

So angles in degrees

$$\theta_1 = \frac{9\pi}{20} \times \frac{180}{\pi} = 81^\circ$$

$$\text{and } \theta_2 = \frac{\pi}{20} \times \frac{180}{\pi} = 9^\circ$$

Q4

Let θ_1 and θ_2 and θ_3 be the angle of triangle.

$$\theta_1 = \frac{2}{3}x \text{ radians}$$

$$\theta_2 = \frac{3}{2}x \text{ degrees and}$$

$$\theta_3 = \frac{\pi x}{75} \text{ radians}$$

Now,

we have to express all the angles in degrees

$$\begin{aligned}\therefore \theta_1 &= \left(\frac{3}{2}x \times \frac{90}{100} \right)^0 \\ &= \frac{3}{5}x \quad \left[1g = \frac{90}{100} \text{ degree} \right] \\ \theta_2 &= \frac{3}{2}x^0 \\ \theta_3 &= \frac{\pi x}{75} \times \frac{180}{\pi} = \frac{12x}{5}\end{aligned}$$

By angleslam property,

$$\theta_1 + \theta_2 + \theta_3 = 180^\circ$$

$$\therefore \frac{3}{5}x^0 + \frac{3}{2}x^0 + \frac{12x}{5} = 180^\circ$$

$$\Rightarrow \frac{9}{2}x^0 = 180^0$$

$$\Rightarrow x = 40^0$$

$$\therefore \theta_1 = 24^0, \theta_2 = 60^0, \theta_3 = 96^0$$

Q5

General formula for interior angles of polygon with n side

$$= \left(\frac{2n - 4}{n} \right) \times 90^\circ$$

(i) Pentagon has 5 sides

$\therefore$ magnitude of the interior angle

$$= \frac{2 \times 5 - 4}{5} \times 90^\circ$$

$$= \frac{6}{5} \times 90 = 108^\circ$$

Now,

$$\therefore 1^\circ = \frac{180}{\pi}$$

And each angle of Pentagon

$$= \frac{2 \times 5 - 4}{5} \times \frac{\pi}{2}$$

$$= \left(\frac{3\pi}{5} \right)^\circ$$

$$\therefore 108^\circ, \left(\frac{3\pi}{5} \right)^\circ$$

(ii) Octagon

$$n = 8$$

$$\therefore \text{each angle} = \frac{2 \times 8 - 4}{8} \times 90^\circ$$
$$= 135^\circ$$

Again,

$$\text{each angle} = \frac{2 \times 8 - 4}{8} \times \frac{\pi}{2}$$
$$= \left(\frac{3\pi}{4} \right)^\circ$$

$$\therefore 135^\circ, \left(\frac{3\pi}{4} \right)^\circ$$

(iii) Heptagon

$$n = 7$$

$$\therefore \text{each angle} = \frac{2 \times 7 - 4}{7} \times 90^\circ$$
$$= \frac{10}{7} \times 90^\circ$$
$$= \frac{900^\circ}{7}$$

$$= 128^0 34^1 17^{11}$$

Again,

$$\begin{aligned}\text{each angle} &= \frac{2 \times 7 - 4}{7} \times \frac{\pi}{2} \\ &= \frac{10}{7} \times \frac{\pi}{2} \\ &= \left(\frac{5\pi}{7}\right)^c\end{aligned}$$

$$\therefore 128^0 34^1 17^{11}, \left(\frac{5\pi}{7}\right)^c$$

(iv) Duodecagon

$$n = 12$$

$$\begin{aligned}\therefore \text{each angle} &= \frac{2 \times 12 - 4}{12} \times 90^0 \\ &= \frac{20}{12} \times 90^0 \\ &= 150^0\end{aligned}$$

Again,

$$\begin{aligned}\text{each angle} &= \frac{2 \times 12 - 4}{12} \times \frac{\pi}{2} \\ &= \frac{20}{12} \times \frac{\pi}{2} \\ &= \left(\frac{5\pi}{6}\right)^c\end{aligned}$$

$$\therefore 150^0, \left(\frac{5\pi}{6}\right)^c$$

Q6

Let the angles in degrees be $a - 3d$, $a - d$, $a + d$, $a + 3d$

Then,

$$\text{sum of the angles} = 360^\circ$$

$$\Rightarrow 4a = 360^\circ$$

$$a = 90^\circ$$

Also,

$$\text{greatest angle} = 120^\circ$$

$$a + 3d = 120^\circ$$

$$\Rightarrow 90^\circ + 3d = 120^\circ$$

$$\Rightarrow 3d = 30^\circ$$

$$\Rightarrow d = 10^\circ$$

Hence, angles in degrees

$$60^\circ, 80^\circ, 100^\circ, 120^\circ$$

and in radians, we know that

$$1^\circ = \left(\frac{\pi}{180}\right)^c$$

$$\therefore 60 \times \frac{\pi}{180} = \frac{\pi}{3}, \quad 80 \times \frac{\pi}{180} = \frac{4\pi}{9},$$

$$100 \times \frac{\pi}{180} = \frac{5\pi}{9} \quad \text{and} \quad 120 \times \frac{\pi}{180} = \frac{2\pi}{3}$$

$$\therefore \frac{\pi}{3}, \frac{4\pi}{9}, \frac{5\pi}{9}, \frac{2\pi}{3}$$

Q7

Let A, B & C be the angles of triangle ABC .

We are given that A, B & C are in A.P.

$$\therefore \text{Let } A = a - d, B = a \text{ and } C = a + d$$

According to the question,

$$A + B + C = 180^\circ$$

[By angle sum property]

$$\therefore a - d + a + a + d = 180^\circ$$

$$\Rightarrow 3a = 180^\circ \Rightarrow a = 60^\circ \quad \text{---(i)}$$

Again,

$$\frac{\text{least angle}}{\text{mean angle}} = \frac{1}{120^\circ}$$

$$\Rightarrow \frac{a - d}{a} = \frac{1}{120}$$

$$\Rightarrow 119a = 120d$$

$$\Rightarrow d = \frac{119a}{120}$$

$$\Rightarrow d = \frac{119}{120} \times 60^\circ$$

$$= \left(\frac{119}{2}\right)^\circ$$

$$= \frac{119}{2} \times \frac{\pi}{180} = \frac{119\pi}{360} \text{ radians}$$

Now,

$$1^\circ = \frac{\pi}{180} \text{ radians}$$

$$\therefore B = a = 60^\circ = \frac{\pi}{3} \text{ radians}$$

$$A = a - d = \frac{\pi}{3} - \frac{119\pi}{360} = \frac{\pi}{360} \text{ radians}$$

$$C = a + d = \frac{\pi}{3} + \frac{119\pi}{360} = \frac{239\pi}{360} \text{ radians.}$$

Q8

Let n & m be the number of sides in two regular polygon respectively.

We know that each angle of n -sided regular polygon is $\frac{(2n-4)}{n}$ right angles.

Now,

According to the question,

$$\frac{\left(\frac{2n-4}{n}\right) \times 90^\circ}{\left(\frac{2m-4}{m}\right) \times 90^\circ} = \frac{3}{2}$$
$$\Rightarrow \frac{(2n-4)m}{(2m-4)n} = \frac{3}{2} \quad \text{---(i)}$$

Also,

$$n = 2m \quad \text{---(ii)} \quad \text{[given]}$$

Put (ii) in (i), we get

$$\frac{(4m-4)m}{(2m-4)2m} = \frac{3}{2}$$
$$\Rightarrow 4m-4 = 6m-12$$
$$\Rightarrow 2m = 8$$
$$\therefore m = 4$$

From (ii)

$$n = 2m$$
$$= 2 \times 4 = 8$$

$$\therefore n = 8, m = 4$$

Q9

According to the question,

A, B & C are in A.P

$$\therefore \text{Let } A = a - d, B = a \text{ \& } C = a + d$$

$$\text{So, } A + B + C = 180^\circ \quad [\text{By angle sum property}]$$

$$\Rightarrow a - d + a + a + d = 180^\circ$$

$$\Rightarrow 3a = 180^\circ \Rightarrow a = 60^\circ \quad \text{---(i)}$$

Also,

greatest angle is 5 times the least

$$\therefore a + d = 5(a - d)$$

$$\Rightarrow 4a = 6d$$

$$\Rightarrow d = \frac{2}{3}a$$

$$\Rightarrow d = \frac{2}{3} \times 60 = 40^\circ \quad \text{---(ii)}$$

$$\therefore A = a - d = 20^\circ$$

$$B = a = 60^\circ$$

$$C = a + d = 100^\circ$$

$$\therefore 1^\circ = \left(\frac{\pi}{180^\circ} \right) \text{ radians}$$

$$\therefore A = 20 \times \frac{\pi}{180} = \frac{\pi}{9}$$

$$B = 60 \times \frac{\pi}{180} = \frac{\pi}{3}$$

$$C = 100 \times \frac{\pi}{180} = \frac{5\pi}{9}$$

Thus,

$$A = \frac{\pi}{9}, B = \frac{\pi}{3}, C = \frac{5\pi}{9}$$

Q10

Let n and m be the number of sides in two regular polygon respectively.

We know that each angle of n -sided regular polygon is

$$\left(\frac{2n-4}{n}\right) \text{ right angles.}$$

Now,

According to the question

$$\frac{n}{m} = \frac{5}{4} \Rightarrow \frac{5m}{4} = n \quad \text{---(i)}$$

Also,

$$\left(\frac{2n-4}{n}\right) 90^\circ - \left(\frac{2m-4}{m}\right) 90^\circ = 9^\circ$$

$$\Rightarrow \frac{(2n-4)m - (2m-4)n}{mn} = \left(\frac{1}{10}\right)^\circ \quad \text{---(ii)}$$

From (i) and (ii), we get

$$\frac{\left(2 \times \frac{5}{4}m - 4\right)m - (2m-4)\frac{5}{4}m}{\frac{5}{4}m^2} = \frac{1}{10}$$

$$\Rightarrow \frac{(10m-16)m - (10m-20)}{5m} = \frac{1}{10}$$

$$\Rightarrow \frac{4}{m} = \frac{1}{2} \Rightarrow m = 8$$

From (i)

$$n = \frac{5}{4}m = 10$$

Thus,

$$n = 10, m = 8$$

Q11

Let AB be the rail road

$$\angle AOB = 25^\circ = 25 \times \frac{\pi}{180} = \left(\frac{5\pi}{36}\right)^c$$

$$\left[\because 1^\circ = \left(\frac{\pi}{180}\right)^c \right]$$

We know that

$$\theta = \frac{\text{arc}}{\text{radius}}$$

$$\Rightarrow \angle AOB = \frac{AB}{OA}$$

$$\Rightarrow \frac{5\pi}{36} = \frac{40}{r}$$

$$\Rightarrow r = \frac{40 \times 36}{5\pi}$$

$$\Rightarrow r = \frac{288}{\pi} \text{ meter}$$

$$\Rightarrow r = 91.64 \text{ meter}$$

$$\left[\because \pi = \frac{22}{7} \right]$$

Q12

Let, $\angle AOB = \theta = 1'$

$$AB = \text{arc } AB = l$$

$$OA = OB = r = 5280m$$

$$\therefore 1^\circ = 60'$$

$$\Rightarrow 1' = \left(\frac{1}{60}\right)^0 = \left(\frac{1}{60} \times \frac{\pi}{180}\right)^c$$

$$\left[\because 1^\circ = \left(\frac{\pi}{180}\right)^c \right]$$

Now,

We know that

$$\theta = \frac{\text{arc}}{\text{radius}}$$

$$\Rightarrow \left(\frac{\pi}{180 \times 60}\right)^c = \frac{l}{5280}$$

$$\Rightarrow l = \frac{5280\pi}{180 \times 60} = 1.5365 \text{ m}$$

$$\left[\because \pi = \frac{22}{7} \right]$$

Q13

Since A wheel makes 360 revolution in 1 minutes

∴ Wheel will make $\frac{360}{60}$ revolution in 1 seconds

That is, 6 revolutin in1 second

Now,

In one revolutin the wheel makes 360^0 angle

∴ In 6 revolution the wheel will make $360^0 \times 6$ angles
 $= 2160^0$

$$\therefore 1^0 = \left(\frac{\pi}{180} \right)^c$$

$$\therefore 2160^0 = \left(\frac{2160}{180} \times \pi \right)^c \\ = 12\pi$$

Q14

(i) We have,

$$OA = \text{length of pendulum} = 75 \text{ cm} \\ = 0.75 \text{ m}$$

$$AB = \text{arc } AB = 10 \text{ cm} \\ = 0.1 \text{ m}$$

Also,

$$\theta = \frac{\text{arc}}{\text{radius}} \quad \text{---(i)}$$

$$\Rightarrow \theta = \frac{0.1}{0.75} = \left(\frac{2}{15}\right)^\circ$$

$$\theta = \frac{2}{15} \text{ radian}$$

(ii)

$$OA = 75 \text{ cm} = 0.75 \text{ m}$$

$$AB = 15 \text{ cm} = 0.15 \text{ m}$$

From (A)

$$\theta = \frac{0.15}{0.75} = \frac{1}{5} \text{ radian}$$

$$\theta = \frac{1}{5} \text{ radian}$$

(iii)

$$OA = 75 \text{ cm} = 0.75 \text{ m}$$

$$AB = 21 \text{ cm} = 0.21 \text{ m}$$

From (A)

$$\theta = \frac{0.21}{0.75} = \frac{7}{25}$$

$$\therefore \theta = \frac{7}{25} \text{ radian}$$

Q15

We have,

$$OA = OB = \text{radius of circle} = 30 \text{ cm} = 0.3 \text{ m}$$

$$AB = \text{chord } AB = 30 \text{ cm} = 0.3 \text{ m}$$

$$\text{Arc } AB = \widehat{AB} = l \text{ (say)}$$

Now,

$$\triangle AOB \text{ is equilateral triangle as } OA = OB = AB = 30 \text{ cm}$$

$$\therefore \angle AOB = 60^\circ = \frac{\pi}{3} \text{ radian,}$$

$$\therefore \theta = \frac{\text{arc}}{\text{radius}}$$

$$\Rightarrow \frac{\pi}{3} = \frac{l}{0.3}$$

$$\Rightarrow l = \frac{0.3}{3} \pi = 0.1\pi \text{ m}$$

$$\therefore l = \text{arc } AB = 10\pi \text{ cm,}$$

Q16

We have,

In circular track,

$$OA = OB = r = 150 \text{ m}$$

$$\angle AOB = \theta = \text{angle the train turns in 10 seconds}$$

$$\text{Speed of train} = 66 \text{ km/hr}$$

$$= \frac{66 \times 1000}{60 \times 60} \text{ m/sec}$$

$$= \frac{110}{6} \text{ m/sec}$$

$$\therefore \text{Train will travel in 10 sec} = \frac{110}{6} \times 10 = \frac{1100}{6} \text{ m}$$

$$\therefore \text{arc } AB = \frac{1100}{6} \text{ m}$$

Thus,

$$\theta = \frac{\text{arc}}{\text{radius}} = \frac{1100}{6 \times 1500} = \frac{11}{90} \text{ radian}$$

$$\therefore \text{The train will turn by } \left(\frac{11}{90}\right)^\circ \text{ angle in 10 sec.}$$

Q17

Let, r be the distance, at which coin is placed, so that it completely conceals the full moon.

Let, E be the eye of the observer.

Now,

$$\begin{aligned}\theta = 31' &= \left(\frac{31}{60}\right)^\circ & [\because 60' = 1^\circ] \\ &= \frac{31}{60} \times \left(\frac{\pi}{180}\right)^c & \left[\because 1^\circ = \left(\frac{\pi}{180}\right)^c\right]\end{aligned}$$

Also,

$$\widehat{AB} = \text{arc } AB = 2 \text{ cm} = 0.02 \text{ m.}$$

Now,

$$\begin{aligned}\text{by } \theta &= \frac{\text{arc}}{\text{radius}} \\ \frac{31\pi}{60 \times 180} &= \frac{0.02}{r} \\ \Rightarrow r &= \frac{0.02 \times 60 \times 180}{31\pi} \\ &= 2.217 \text{ m} & \left[\because x = \frac{22}{7}\right]\end{aligned}$$

Thus,

The coin should be placed at a distance of 2.217 m from the eye.

Q18

Let, E be the eye of the observer and S be the sun.

Now,

$$\begin{aligned}\angle ACB = \theta &= 32' \\ &= \left(\frac{32}{60}\right)^\circ \\ &= \left(\frac{32}{60} \times \frac{\pi}{180}\right)^c\end{aligned}$$

$$\begin{aligned}\therefore \theta &= \frac{\text{arc}}{\text{radius}} \\ \Rightarrow \frac{32}{60} \times \frac{\pi}{180} &= \frac{AB}{91 \times 10^6} \text{ km} \\ \Rightarrow AB &= \frac{91 \times 10^6 \times 32 \times \pi}{60 \times 180} \\ &= 8.474074 \times 10^5 \text{ km} \\ &= 847407.4 \text{ km}\end{aligned}$$

$\therefore$ Distance of sun is 847407.4 km.

Q19

Let, C_1 & C_2 are two circles with same Arc length l .

That is $AB = CD = l$

Let, θ_1 and θ_2 are two angles subtended by arc AB and CD on respective circles.

Let, $OA = OB = r$ [radius of C_1]

and $OC = OD = R$ [radius of C_2]

Also,

$$\theta_1 = 65^\circ = \left(\frac{65\pi}{180}\right)^c$$

$$\text{and } \theta_2 = 110^\circ = \left(\frac{110\pi}{180}\right)^c$$

We know

$$\theta = \frac{\text{arc}}{\text{radius}}$$

$\therefore$ For C_1

$$\theta_1 = \frac{AB}{r}$$

$$\Rightarrow \theta_1 = \frac{l}{r}$$

$$\Rightarrow r = \frac{l}{\theta_1} \quad \text{---(i)}$$

For C_2

$$\theta_2 = \frac{CD}{R}$$

$$\Rightarrow \theta_2 = \frac{l}{R}$$

$$\Rightarrow R = \frac{l}{\theta_2} \quad \text{---(ii)}$$

From (i) and (ii)

$$\frac{r}{R} = \frac{\frac{l}{\theta_1}}{\frac{l}{\theta_2}} = \frac{\theta_2}{\theta_1} = \frac{\frac{110\pi}{180}}{\frac{65\pi}{180}} = \frac{22}{13}$$

$$\therefore r : R = 22 : 13$$

Q20

Let, $AB = \text{arc } AB = 22 \text{ cm}$
 $OA = OB = r = 100 \text{ cm}$

Let θ be the angle subtended by arc AB at centre O .

$$\therefore \text{ by } \theta = \frac{\text{arc}}{\text{radius}}$$

$$\Rightarrow \theta = \frac{22}{100} \text{ radian}$$

$$\therefore \theta = \left(\frac{22}{100} \times \frac{180}{\pi} \right)^{\circ}$$
$$= 12.6^{\circ}$$
$$= 12^{\circ}36'$$

$$\left[\because 1 \text{ radian} = \left(\frac{180}{\pi} \right)^{\circ} \right]$$

$$\left[\because 1^{\circ} = 60' \right]$$

$$\therefore \theta = 12^{\circ}36'$$