EXERCISE 3.1

Q No 1 Find the radian measure corresponding to following degree measures: (i) 25° (ii) $-47^\circ 30'$ (iii) 240° (iv) 520°

Sol: (i) Angle $= 25^\circ = 25 \times \frac{\pi}{180^\circ} = \frac{5\pi}{36}$ radian

(ii) Angle $= -45^\circ 30' = -\left(45^\circ + \frac{30^\circ}{60}\right) = -47\frac{1^\circ}{2} = -\frac{95^\circ}{2}$

$= -\frac{95}{2} \times \frac{\pi}{180} = -\frac{19\pi}{72}$ radian

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

(iv) Angle $= 520^\circ = 520 \times \frac{\pi}{180^\circ} = \frac{26\pi}{9}$ radian.

Q No 2: Find the degree measures corresponding to the following radian measures: (i) $\frac{11}{16}$ (ii) -4 (iii) $\frac{5\pi}{3}$ (iv) $\frac{7\pi}{6}$ (use $\pi = \frac{22}{7}$)

Sol.

(i) Angle $= \frac{11}{16}$ radians

$= \frac{11}{16} \times \frac{180}{\pi}$ degrees

$= \frac{11}{16} \times \frac{180}{22} \times 7 = \frac{315}{8}$ degrees

$= 39^\circ 22' 30''$

$8 \overline{)315} (39$, 24, 75, 72, 3

$3 \times 60 = 180$

$8 \overline{)180} (22$, 16, 20, 14

$4 \times 60 = 240$

$8 \overline{)240} (30$, 24, x

(ii) Angle $= -4$ radians

$= -4 \times \frac{180}{\pi}$ degrees

$= -4 \times \frac{180}{22} \times 7$ degrees

$= -\frac{2520}{11}$

$= -229^\circ 5' 27''$ nearly

$11 \overline{)2520} (229^\circ$, 22, 32, 22, 100, 99, 1

$1 \times 60 = 60$

$11 \overline{)60} (5'$, 55, 5

$5 \times 60 = 300$

$11 \overline{)300} (27''$, 22, 80

(iii) $\text{Angle} = \frac{5\pi}{3}$ radians

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

(iv) $\text{Angle} = \frac{7\pi}{6}$ radians

$= \frac{7\pi}{6} \times \frac{180}{\pi} = 210^\circ$

QNo3 A wheel makes 360° revolution in one minute. Through how many radians does it turn in one second?

Sol Number of revolutions in one minute = 360

∴ No. of revolutions in one second $= \frac{360}{60} = 6$

Now angle traced out in one revolution = $360^\circ = 2\pi$ radians

∴ Angle traced in 6 revolutions = $2\pi \times 6 = 12$ radians.

∴ Angle traced out in one sec. $= 12\pi$ radians.

QNo4 Find the degree of measure of the angle subtended at the centre of a circle of radius 100cm by an arc of length 22 cm. (Use $\pi = \frac{22}{7}$)

Sol. $r = 100$cm, $l = 22$ cm.

$\therefore \theta = \frac{l}{r} = \frac{22}{100} = \frac{11}{50}$ radians

$= \frac{11}{50} \times \frac{180}{\pi}$ degrees

$= \frac{11}{50} \times \frac{180}{22} \times 7 = \frac{63}{5}$

$= 12^\circ 36'$

$5\overline{)63}\,(12$, 60, $3 \times 60 = 180$

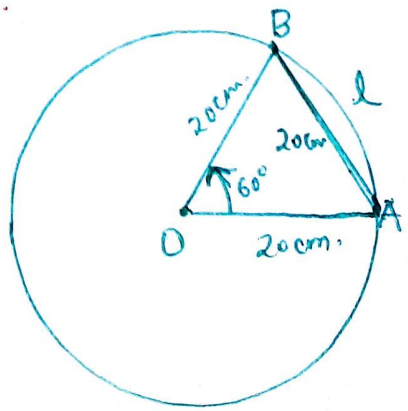
$6\overline{)180}\,(30$, 18, x

QNo 5 In a circle of diameter 40cm, the length of chord is 20cm. Find the angle of minor arc of chord.

Sol Diameter of Circle = 40cm.

$\therefore 2r = 40 \Rightarrow r = 20$cm

Also length of chord = 20cm



∴ Δ AOB formed by chord AB and

'O' as third vertex. ie equilateral triangle

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

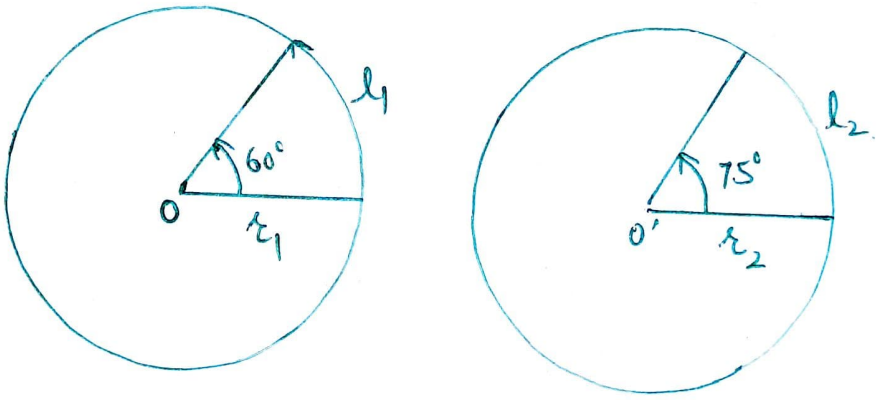
$\therefore \theta = 60^\circ = 60 \times \frac{\pi}{180} = \frac{\pi}{3}$ radian

Now let l be the length of Arc AB.

$\therefore \theta = \frac{l}{r} \Rightarrow l = \theta \times r = 20 \times \frac{\pi}{3} = \frac{20\pi}{3}$ cm.

QNo 6: If in two circles of arcs of same length subtend angles of 60° and 75° at centre, find the ratio of their radii.

Sol: Let r_1, r_2 be the radii of two circles and l_1 and l_2 be the two arcs subtending angles $\theta_1 = 60^\circ$, $\theta_2 = 75^\circ$



Now $\theta_1 = 60^\circ = 60 \times \frac{\pi}{180^\circ} = \frac{\pi}{3}$

$\theta_1 = \frac{l_1}{r_1} \Rightarrow l_1 = r_1 \times \theta_1 = \frac{\pi}{3} r_1$

Again $\theta_2 = 75^\circ = 75 \times \frac{\pi}{180} = \frac{5\pi}{12}$

$\theta_2 = \frac{l_2}{r_2} \Rightarrow l_2 = r_2 \theta_2 = \frac{5\pi}{12} r_2$

But $l_1 = l_2$

$\Rightarrow \frac{\pi}{3} r_1 = \frac{5\pi}{12} r_2$

$\Rightarrow \frac{r_1}{r_2} = \frac{5\pi}{12} \times \frac{3}{\pi}$ ie $\frac{r_1}{r_2} = \frac{5}{4} \Rightarrow r_1 : r_2 = 5:4$

Q No 7: Find the angle in radian through which a pendulum swims if its length is 75cm. and tip describes an arc of length:
(i) 10cm (ii) 15cm (iii) 21 cm.

Sol:

(i) Here $l = 10$ cm.
$r = 75$ cm.
$\therefore \theta = \frac{l}{r} = \frac{10}{75} = \frac{2}{15}$ radians

(ii) Here $l = 15$ cm.
$r = 75$ cm.
$\therefore \theta = \frac{l}{r} = \frac{15}{75} = \frac{1}{5}$ radians

(iii) Here $l = 21$ cm.
$r = 75$ cm.
$\therefore \theta = \frac{l}{r} = \frac{21}{75} = \frac{7}{25}$ radians

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