

CBSE Class-11 Mathematics
NCERT Solutions
Chapter - 3 Trigonometric Functions
Exercise 3.1

1. Find the radian measures corresponding to the following degree measures:

(i) 25°

(ii) $-47^\circ 30'$

(iii) 240°

(iv) 520°

Ans. (i) $25^\circ = \left(25 \times \frac{\pi}{180}\right)^c = \left(\frac{5\pi}{36}\right)^c$

(ii) $-47^\circ 30' = -\left(47\frac{30}{60}\right)^\circ = -\left(\frac{95}{2}\right)^\circ = -\left(\frac{95}{2} \times \frac{\pi}{180}\right)^c = -\left(\frac{19\pi}{72}\right)^c$

(iii) $240^\circ = \left(240 \times \frac{\pi}{180}\right)^c = \left(\frac{4\pi}{3}\right)^c$

(iv) $520^\circ = \left(520 \times \frac{\pi}{180}\right)^c = \left(\frac{26\pi}{9}\right)^c$

2. Find the degree measures corresponding to the following radian measures

$\left(\text{Use } \pi = \frac{22}{7}\right).$

(i) $\frac{11}{16}$

(ii) -4

(iii) $\frac{5\pi}{3}$

(iv) $\frac{7\pi}{6}$

Ans. (i) $\left(\frac{11}{16}\right)^c = \left(\frac{11}{16} \times \frac{180}{\pi}\right)^\circ = \left(\frac{11}{16} \times \frac{180 \times 7}{22}\right)^\circ = \left(\frac{315}{8}\right)^\circ = \left(39\frac{3}{8}\right)^\circ = \left(39\frac{3}{8} \times 60\right)^\circ$
 $= 39^\circ 22\frac{1}{2}' = 39^\circ 22' \frac{1}{2} \times 60 = 39^\circ 22' 30''$

(ii)

$(-4)^c = -\left(4 \times \frac{180}{\pi}\right)^\circ = -\left(4 \times \frac{180 \times 7}{22}\right)^\circ = -\left(\frac{2520}{11}\right)^\circ = -\left(229\frac{1}{11}\right)^\circ = -229^\circ \left(\frac{1}{11} \times 60\right)^\circ$
 $= -229^\circ 5' \left(\frac{5}{11} \times 60\right)'' = -229^\circ 5' 27''$

(iii) $\left(\frac{5\pi}{3}\right)^c = \left(\frac{5\pi}{3} \times \frac{180}{\pi}\right)^\circ = 300^\circ$

(iv) $\left(\frac{7\pi}{6}\right)^c = \left(\frac{7\pi}{6} \times \frac{180}{\pi}\right)^\circ = 210^\circ$

3. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?

Ans. Number of revolutions in 1 minute = 360

\therefore Number of revolution in 60 seconds = 360

\Rightarrow Number of revolutions in 1 second = $\frac{360}{60} = 6$ revolutions

\therefore Angle made by wheel in 6 revolutions = $360 \times 6 = 2160^\circ$

$$\Rightarrow 2160^\circ = \left(2160 \times \frac{\pi}{180} \right)^\circ = (12\pi)^\circ$$

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

Ans. Here $r = 100$ cm and $l = 22$ cm

$$\therefore \theta^\circ = \frac{l}{r}$$

$$\therefore \theta^\circ = \frac{22}{100} = \left(\frac{11}{50} \right)^\circ$$

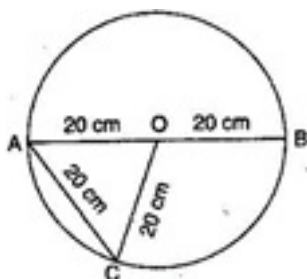
$$\Rightarrow \left(\frac{11}{50} \right)^\circ = \left(\frac{11}{50} \times \frac{180^\circ}{\pi} \right) = \left(\frac{11}{50} \times \frac{180^\circ \times 7}{22} \right)$$

$$= \left(\frac{63}{5} \right)^\circ = 12^\circ \left(\frac{2}{5} \times 60 \right)' = 12^\circ 36'$$

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

Ans. Given: Diameter AB = 40 cm, Radius OA = 20 cm and Chord AC = 20 cm

$\therefore \triangle AOC$ is an equilateral triangle.



$$\therefore \angle AOC = 60^\circ = \left(60^\circ \times \frac{\pi}{180}\right)^c = \left(\frac{\pi}{3}\right)^c$$

$$\text{Now, } \theta^c = \frac{l}{r} \Rightarrow \frac{\pi}{3} = \frac{l}{20}$$

$$\Rightarrow l = \frac{20\pi}{3} \text{ cm}$$

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

Ans. Let r_1 and r_2 be radii of two circles in which arcs of same length l subtend angles $\theta_1 = 60^\circ$ and $\theta_2 = 75^\circ$ respectively.

$$\therefore \theta_1 = \frac{l}{r_1} \Rightarrow \left(60 \times \frac{\pi}{180}\right)^c = \frac{l}{r_1}$$

$$\Rightarrow r_1 = \frac{3l}{\pi}$$

$$\text{And } \theta_2 = \frac{l}{r_2} \Rightarrow \left(75 \times \frac{\pi}{180}\right)^c = \frac{l}{r_2}$$

$$\Rightarrow r_2 = \frac{12l}{5\pi}$$

$$\therefore \frac{r_1}{r_2} = \frac{3l/\pi}{12l/5\pi} = \frac{5}{4}$$

$$\Rightarrow r_1 : r_2 = 5 : 4$$

7. Find the angle in radians through which a pendulum swings if its length is 75 cm and the tip describes an arc of length:

(i) 10 cm

(ii) 15 cm

(iii) 21 cm

Ans. (i) Given: length of pendulum (r) = 75 cm and length of arc (l) = 10 cm

$$\therefore \theta^\circ = \frac{l}{r} = \frac{10}{75} = \left(\frac{2}{15}\right)^\circ$$

(ii) Given: length of pendulum (r) = 75 cm and length of arc (l) = 15 cm

$$\therefore \theta^\circ = \frac{l}{r} = \frac{15}{75} = \left(\frac{1}{5}\right)^\circ$$

(iii) Given: length of pendulum (r) = 75 cm and length of arc (l) = 21 cm

$$\therefore \theta^\circ = \frac{l}{r} = \frac{21}{75} = \left(\frac{7}{25}\right)^\circ$$