

MATHEMATICS • CLASS 11

CHAPTER 3

Trigonometric Functions

NCERT SOLUTIONS



EXERCISE 3.1 — QUESTION 1

Q1. Convert each degree measure to radians. Use $\text{radians} = \text{degrees} \times \frac{\pi}{180}$.

$$(i) \quad 25^\circ = \frac{25\pi}{180} = \frac{5\pi}{36} \text{ rad.}$$

$$(ii) \quad -47^\circ 30' = -\left(47 + \frac{30}{60}\right)^\circ \\ = -47.5^\circ = -\frac{95}{2}^\circ.$$

$$\text{Hence } \left(-\frac{95}{2}\right) \times \frac{\pi}{180} = -\frac{19\pi}{72} \text{ rad.}$$

$$(iii) \quad 240^\circ = \frac{240\pi}{180} = \frac{4\pi}{3} \text{ rad.}$$

$$(iv) \quad 520^\circ = \frac{520\pi}{180} = \frac{26\pi}{9} \text{ rad.}$$

EXERCISE 3.1 — QUESTION 2

Q2. Convert each radian measure to degrees. Use $\pi = \frac{22}{7}$ and $\text{degrees} = \text{radians} \times \frac{180}{\pi}$.

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

$$\begin{aligned}\frac{11}{16} \text{ rad} &= \frac{11}{16} \times \left(180 \times \frac{7}{22}\right)^\circ \\ &= \frac{315}{8}^\circ \\ &= 39^\circ 22' 30''.\end{aligned}$$

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

$$\begin{aligned}\frac{5\pi}{3} \text{ rad} &= \left(\frac{5\pi}{3}\right) \times \frac{180}{\pi} \\ &= 300^\circ.\end{aligned}$$

(ii) -4 rad

$$\begin{aligned}-4 \text{ rad} &= -4 \times \left(180 \times \frac{7}{22}\right)^\circ \\ &= -\frac{2520}{11}^\circ \\ &\approx -229.09^\circ.\end{aligned}$$

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

$$\begin{aligned}\frac{7\pi}{6} \text{ rad} &= \left(\frac{7\pi}{6}\right) \times \frac{180}{\pi} \\ &= 210^\circ.\end{aligned}$$

EXERCISE 3.1 – QUESTIONS 3-4

Q3. A wheel makes 360 revolutions in one minute.
How many radians in one second?

Solution:

$$\text{Revolutions per second} = \frac{360}{60} = 6.$$

$$\text{Each revolution} = 2\pi \text{ rad.}$$

$$\text{Angle in 1 s} = 6 \times 2\pi = 12\pi \text{ rad.}$$

Answer: 12π rad.

Q4. A circle has radius 100 cm and arc length 22 cm. Find its central angle in degrees.
Use $\pi = \frac{22}{7}$.

Solution:

$$\theta = \frac{\text{arc}}{\text{radius}} = \frac{22 \text{ cm}}{100 \text{ cm}} = \frac{11}{50} \text{ rad.}$$

$$\theta = \frac{11}{50} \times \left(180 \times \frac{7}{22}\right)^\circ = \frac{63}{5}^\circ.$$

Answer: $12.6^\circ = 12^\circ 36'$.

EXERCISE 3.1 – QUESTIONS 5–6

Q5. In a circle of diameter 40 cm, a chord is 20 cm.
Find the minor arc length.

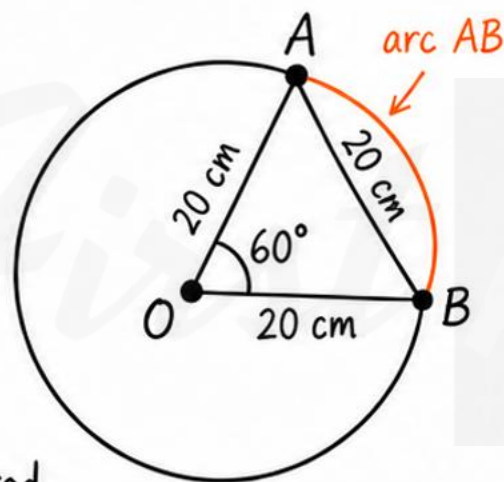
Solution:

Radius $r = 20$ cm, so chord = r .

Joining the chord endpoints to the centre makes an equilateral triangle, because all three sides are 20 cm.

Thus minor central angle $\theta = 60^\circ = \frac{\pi}{3}$ rad.

$$\begin{aligned}\text{Minor arc length } l &= r\theta = 20 \times \frac{\pi}{3} \\ &= \frac{20\pi}{3} \text{ cm.}\end{aligned}$$



Q6. Equal-length arcs in two circles subtend 60° and 75° . Find their radii ratio.

Solution:

Let radii r_1, r_2 correspond to $60^\circ, 75^\circ$.

Equal arcs: $r_1\theta_1 = r_2\theta_2$.

$$\frac{r_1}{r_2} = \frac{\theta_2}{\theta_1} = \frac{75}{60} = \frac{5}{4}.$$

Answer: $r_1 : r_2 = 5 : 4$.



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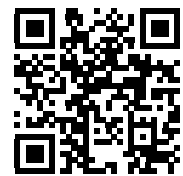


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