

EXERCISE 6.1

Q.1 Find in which quadrant the following angles lie. Write a co-terminal angle for each:

(i) 65°

Ans:

1st Quadrant

$$360^\circ + 65^\circ = 425^\circ$$

$$65^\circ - 360^\circ = -295^\circ$$

(ii) 135°

Ans:

2nd Quadrant

$$135^\circ + 360^\circ = 495^\circ$$

$$135^\circ - 360^\circ = -225^\circ$$

(iii) -40°

Ans:

4th Quadrant

$$-40^\circ + 360^\circ = 320^\circ$$

$$-40^\circ - 360^\circ = -400^\circ$$

(iv) 210°

Ans:

3rd Quadrant

$$210^\circ + 360^\circ = 570^\circ$$

$$210^\circ - 360^\circ = -150^\circ$$

(v) -150°

Ans:

3rd Quadrant

$$-150^\circ + 360^\circ = 210$$

$$-150 - 360^\circ = -510$$

Q.2 Convert the following into degrees, minutes, and seconds:

(i) 123.456°

Ans:

Degree: Whole number part is 123°

Mintes take the decimal part (0.456) and multiply by $60 \times 0.456 = 27.36$

The whole number part is 27 so the minutes is 27

Seconds: Take the decimal part 0.36 and multiply by $60 \times 0.36 = 21.6$ so the second are 21

Final result 123°27'21"

(ii) 58.7891°

Ans:

Degree: Whole number part is 58

Minutes: take decimal part (0.7891) and multiply by $60 \times 0.7891 = 47.346$ the whole number part is 47 so the minutes is 47

Second: Take decimal part (0.346) multiply by $60 \times 0.346 = 20.76$ the whole number part is 20 so the minutes are 20.

Second: Take decimal part (0.76) multiply by $60 \times 0.76 = 45.6$ the whole number part is 45 so the seconds are 45

Final result $58^\circ 47' 45''$

(iii) 90.5678°

Ans:

$$= 90^\circ + 0.5678^\circ = 90^\circ + 0.5678^\circ \times 60'$$

$$= 90^\circ + 34.068' = 90^\circ + 34' + 0.068'$$

$$= 90^\circ + 34' + 4''$$

$$= 90^\circ 34' 4''$$

Q.3 Convert the following into decimal degrees:

(i) $65^\circ 32' 15''$

Ans:

Degree keep 65

$$\text{Minutes } \frac{32}{60} = 0.53$$

$$\text{Second } = \frac{15}{3600} = 0.0042$$

$$65^\circ + 0.53 + 0.0042$$

$$65.5342^\circ$$

Final result is 63.5342°

(ii) $42^\circ 18' 45''$

Ans:

Degree keep 42

$$\text{Minutes } \frac{18}{60} = 0.3$$

$$\text{Second } \frac{45}{3600} = 0.0125$$

$$42^\circ + 0.3^\circ + 0.0125$$

$$42.3125^\circ$$

Final result is 42.3125°

(iii) $78^\circ 45' 36''$

Ans:

Degree keep 78°

$$\text{Minutes } \frac{45}{60} = 0.75$$

$$\text{Second } \frac{36}{3600} = 0.01$$

$$78^\circ + 0.75 + 0.01^\circ$$

$$78.76^\circ$$

Q.4 Convert the following into radians

(i) 36°

Ans:

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

Multiply by 36 on both side

$$36^\circ \times 1 = 36 \times \frac{\pi}{180} = \frac{\pi}{5} = 0.628 \text{ rad}$$

(ii) 22.5°

Ans:

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

Multiply both side by 22.5°

$$22.5^\circ \times 1^\circ = 22.5^\circ \times \frac{\pi}{180}$$

$$= \frac{1}{8} \pi = 0.393 \text{ rad}$$

(iii) 67.5°

Ans:

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

Multiply both side by 67.5°

$$67.5^\circ \times 1^\circ = 67.5^\circ \times \frac{\pi}{180}$$

$$= \frac{3\pi}{8} = 1.178 \text{ rad}$$

Q.5 Convert the following into degrees:

(i)

$$\frac{\pi}{16} \text{ rad}$$

Ans:

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

Multiply both side by $\frac{\pi}{16} \text{ rad}$

$$\frac{\pi}{16} \text{ rad} = \frac{\pi}{16} \times \frac{180}{\pi}$$

$$\frac{\pi}{16} \text{ rad} = 11.25^\circ$$

(ii) $\frac{11\pi}{5} \text{ rad}$

Ans:

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

Multiply both side by $\frac{11\pi}{5}$ rad

$$\frac{11\pi}{5} = \frac{11\pi}{5} = \frac{180}{\pi}$$

$$\frac{11\pi}{5} = 396^\circ$$

(iii) $\frac{7\pi}{6}$ rad

Ans:

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

Multiply both side by $\frac{7\pi}{6}$ rad

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

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

Q.6 Find the arc length and area of a sector if:

(i)

$$r = 6$$

cm and central angle $\theta = \frac{\pi}{3}$ radians:

Ans:

$$\ell = r\theta$$

$$\ell = 6 \times \frac{\pi}{3}$$

$$\ell = 6.28\text{cm}$$

(ii) $r = \frac{4.8}{\pi}$ cm and central angle $\theta = \frac{5\pi}{6}$ radians:

Ans:

$$\ell = r\theta$$

$$\ell = \frac{4.8}{\pi} \times \frac{5\pi}{6}$$

$$\ell = 4\text{cm}$$

Q.7 If the central angle of a sector is 60° and the radius of the circle is 12 cm, find the area of the sector and the percentage of the total area of the circle it represents.

Ans:

$$\theta = 50^\circ$$

$$\theta = \frac{50 \times \pi}{180} = 0.87$$

$$r = 12\text{cm}$$

Area of sector = ?

Percentage of total area = ?

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

$$= \frac{1}{2} (12)^2 (0.87) = \frac{1}{2} (144) (0.87)$$

$$= 62.64\text{cm}^2$$

Q.8 Find the percentage of the area of sector subtending an angle $\frac{\pi}{8}$ radians.

Ans:

$$\text{Area} = \pi r^2$$

$$\text{Sector area} = \frac{\theta}{2\pi} \times \pi r^2$$

$$= \frac{\frac{\pi}{8}}{2\pi} \times 100\% \text{ or } \frac{\pi}{8} \div 2\pi \times 100\%$$

$$\frac{\pi}{8} \times \frac{1}{2\pi} \times \%$$

$$= \frac{1}{16} \times 100\%$$

$$= 6.25\%$$

Q.9 A circular sector of radius $r = 12$ cm has an angle of 150° . this sector is cut out and then bent to form a cone. What is the slant height and the radius of the base of this cone?

Ans:

$$r = 12\text{cm} \quad \theta = 150^\circ$$

$$A = \frac{\theta}{360^\circ} \times \pi r^2$$

$$A = \frac{150^\circ}{360^\circ} \times 3.14 (12)^2$$

$$A = 0.4167 \times 452.39$$

$$A = 188.57\text{cm}$$

Slant height = 12 cm

Cone circumference

$$C = 2\pi r = \frac{\pi}{360^\circ} \times 2\pi R$$

$$C = \frac{150}{360} \times 2 \times 3.14 \times 12$$

$$C = 31.42$$

$$r = \frac{C}{2\pi} = \frac{31.42}{213.14}$$
$$r = 5\text{cm}$$

