



- 1 A sector of a circle has radius 7.5 cm and angle 140° .

- Work out the arc length of the sector.
- Work out the area of the sector.

Give each answer correct to 3 significant figures.

(4 marks)

A full turn is 360° . This sector is $140/360$ of the full circle, so both its arc and its area are that fraction of the full circumference and area respectively

$$\text{a) Arc Length} = \left(\frac{140}{360}\right) \times 2\pi \times 7.5 = \left(\frac{7}{18}\right) \times 15\pi = 18.32\dots = 18.3$$

cm (3 sf)

$$\text{b) Area} = \left(\frac{140}{360}\right) \times \pi \times 7.5^2 = \left(\frac{7}{18}\right) \times 56.25\pi = 68.72\dots = 68.7$$

cm^2 (3 sf)

- 2 A sector of a circle has radius 6 cm and area $15\pi \text{ cm}^2$.

Work out the angle of the sector.

(2 marks)

$$\text{Area of a sector} = \left(\frac{\text{angle}}{360}\right) \times \pi r^2$$

$$\text{The full circle has area } \pi \times 6^2 = 36\pi \text{ cm}^2$$

$$\frac{\text{angle}}{360} = 15\pi \div 36\pi = \frac{5}{12}$$

$$\text{Angle} = \frac{5}{12} \times 360 = 150^\circ$$

150°

3

A sector of a circle has radius 9 cm and angle 120° .

Work out the arc length of the sector.

Give your answer in terms of π .

(2 marks)

Fraction of the circle

$$\frac{120}{360} = \frac{1}{3}$$

$$\begin{aligned} \text{arc} &= \frac{1}{3} \times 2 \times \pi \times 9 \\ &= \frac{1}{3} \times 18\pi \end{aligned}$$

$$\boxed{6\pi \text{ cm}}$$

4

A sector of a circle has radius 5 cm.

The arc length of the sector is 8.4 cm.

Find the angle of the sector.

Give your answer correct to 1 decimal place.

(3 marks)

$$\text{Arc Length} = \left(\frac{\text{angle}}{360} \right) \times 2\pi r, \text{ and the full circumference} = 2\pi$$

$$\times 5 = 10\pi = 31.415... \text{ cm}$$

$$\frac{\text{angle}}{360} = 8.4 \div 31.415... = 0.2673..$$

$$\text{Angle} = 0.2673... \times 360 = 96.25... = 96.3^\circ \text{ (1 dp)}$$

$$\boxed{96.3^\circ}$$

5

A sector of a circle has radius 6 cm.

The perimeter of the sector is 42 cm.

The angle of the sector is reflex.

Work out the angle of the sector.

Give your answer correct to 1 decimal place.

(3 marks)

The perimeter is made of two radii and the arc, so the arc

$$\text{length} = 42 - 6 - 6 = 30 \text{ cm}$$

$$\text{The full circumference} = 2\pi \times 6 = 37.699... \text{ cm}$$

$$\frac{\text{angle}}{360} = 30 \div 37.699... = 0.7957..$$

Angle = $0.7957... \times 360 = 286.47... = 286.5^\circ$ (1 dp), which is reflex as required

$$\boxed{286.5^\circ}$$

6

a. A quarter circle has radius 10 cm. Work out its area. Give your answer in terms of π .

b. A semicircle has diameter 14 cm. Work out its area. Give your answer in terms of π .

(3 marks)

a)

quarter circle = $\frac{1}{4}$ of a circle

$$\text{area} = \frac{1}{4} \times \pi \times 10^2$$

$$= \frac{1}{4} \times 100\pi$$

$$\boxed{25\pi \text{ cm}^2}$$

b)

$$\text{radius} = 14 \div 2 = 7 \text{ cm}$$

$$\text{area} = \frac{1}{2} \times \pi \times 7^2$$

$$= \frac{1}{2} \times 49\pi$$

$$\boxed{24.5\pi \text{ cm}^2}$$

7

A sector of a circle has angle 45° .

The arc length of the sector is 3π cm.

Work out the area of the sector.

Give your answer in terms of π .

(4 marks)

$$\text{Arc length} = \left(\frac{45}{360}\right) \times 2\pi r = \frac{\pi r}{4}$$

$$\frac{\pi r}{4} = 3\pi, \text{ so } r = 12 \text{ cm}$$

$$\text{Area} = \left(\frac{45}{360}\right) \times \pi \times 12^2 = \frac{1}{8} \times 144\pi = 18\pi \text{ cm}^2$$

$$\boxed{18\pi \text{ cm}^2}$$

8

A sector of a circle has angle 120° and area $48\pi \text{ cm}^2$.

Work out the perimeter of the sector.

Give your answer correct to 3 significant figures.

(4 marks)

$$\text{Area} = \left(\frac{120}{360}\right) \times \pi r^2 = \frac{\pi r^2}{3}$$

$$\frac{\pi r^2}{3} = 48\pi, \text{ so } r^2 = 144 \text{ and } r = 12 \text{ cm}$$

$$\text{Arc length} = \left(\frac{120}{360}\right) \times 2\pi \times 12 = 8\pi \text{ cm}$$

$$\text{Perimeter} = 12 + 12 + 8\pi = 24 + 8\pi = 49.13... = 49.1 \text{ cm (3 sf)}$$

$$\boxed{49.1 \text{ cm}}$$

9

A sector of a circle has radius 8 cm and angle 75° .

Work out the perimeter of the sector.

Give your answer correct to 3 significant figures.

(3 marks)

$$\text{arc} = \frac{75}{360} \times 2 \times \pi \times 8$$

$$= 10.47... \text{ cm}$$

Add the two radii

$$\text{perimeter} = 10.47... + 8 + 8$$

$$= 26.47... \text{ cm}$$

$$\boxed{26.5 \text{ cm}}$$

10

A lawn is in the shape of a sector of a circle with radius 6 m and angle 210° .

A gardener puts edging all the way round the edge of the lawn.

Work out the length of edging needed.

Give your answer correct to 3 significant figures.

(3 marks)

$$\begin{aligned}\text{curved edge} &= \frac{210}{360} \times 2 \times \pi \times 6 \\ &= 7\pi \\ &= 21.99... \text{ m}\end{aligned}$$

Two straight edges are radii

$$\begin{aligned}\text{total} &= 21.99... + 6 + 6 \\ &= 33.99... \text{ m}\end{aligned}$$

34.0 m

11

OAB is a sector of a circle, centre O, with radius 10 cm and angle AOB = 60° .

The chord AB divides the sector into a triangle and a segment.

Calculate the area of the segment.

Give your answer correct to 3 significant figures.

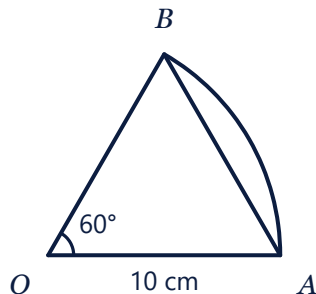


Diagram NOT accurately drawn

(4 marks)

$$\text{Area of the sector} = \left(\frac{60}{360} \right) \times \pi \times 10^2 = \frac{50\pi}{3} = 52.359... \text{ cm}^2$$

$$\text{Area of triangle OAB} = \frac{1}{2} \times 10 \times 10 \times \sin 60^\circ = 50 \times 0.8660... = 43.301... \text{ cm}^2$$

$$\text{Area of the segment} = 52.359... - 43.301... = 9.058... = 9.06 \text{ cm}^2 \text{ (3 sf)}$$

$$\boxed{9.06 \text{ cm}^2}$$

- 12 A sector of a circle has angle 100° .

The arc length of the sector is 5π cm.

Find the radius of the sector.

(3 marks)

$$\begin{aligned}\frac{100}{360} \times 2 \times \pi \times r &= 5\pi \\ \frac{5}{9} \pi r &= 5\pi \\ \div \pi & \quad \div \pi \\ \frac{5}{9} r &= 5 \\ \times \frac{9}{5} & \quad \times \frac{9}{5} \\ r &= 9\end{aligned}$$

$r = 9 \text{ cm}$

- 13 A sector of a circle has radius x cm and angle 144° .

A circle has radius 6 cm.

The area of the sector is equal to the area of the circle.

Work out the value of x .

Give your answer in the form $k\sqrt{10}$.

(5 marks)

$$\text{Area of the sector} = \left(\frac{144}{360}\right) \times \pi x^2 = \left(\frac{2}{5}\right) \pi x^2$$

$$\text{Area of the circle} = \pi \times 6^2 = 36\pi$$

$$\left(\frac{2}{5}\right) \pi x^2 = 36\pi, \text{ so } x^2 = 36 \times \frac{5}{2} = 90$$

$$x = \sqrt{90} = \sqrt{9 \times 10} = 3\sqrt{10}$$

$x = 3\sqrt{10}$