

Area of a Sector

Starter

1. Give that:

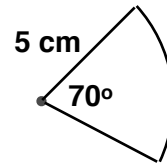
$$\text{length of arc} = \frac{\theta}{360} \times \text{circumference} \quad \text{or} \quad \text{length of arc} = \frac{\theta}{360} \times 2\pi r,$$

find similar expressions for the area of a sector.

$$\begin{aligned} \text{Working: Area of sector} &= \frac{\theta}{360} \times \text{area of circle} && \text{or} \\ \text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \end{aligned}$$

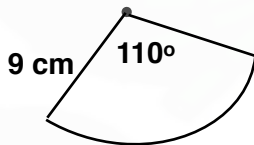
2. Find the area of the sector. Give your answer in terms of π .

$$\begin{aligned} \text{Working: Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{70}{360} \times \pi \times 5^2 \\ &= \frac{360}{175\pi} \\ &= \frac{175\pi}{36} \end{aligned}$$

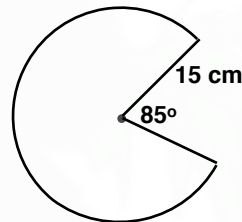


E.g. 1 Find the area of the sector, giving your answer in terms of π .

(a)



(b)



$$\begin{aligned} \text{Working: (a) Area of sector} &= \frac{\theta}{360} \times \pi r^2 = \frac{110}{360} \times \pi \times 9^2 = \frac{99\pi}{4} \\ \text{(b) Area of sector} &= \frac{\theta}{360} \times \pi r^2 = \frac{85}{360} \times \pi \times 15^2 = \frac{1375\pi}{8} \end{aligned}$$

E.g. 2 A sector has area $\frac{3\pi}{8}$ cm² and its radius is 3 cm. Find the angle subtended at the centre.

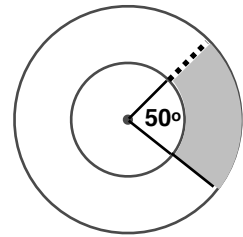
$$\begin{aligned} \text{Working: } \frac{\theta}{360} \times \pi \times 3^2 &= \frac{3\pi}{8} \\ \frac{\theta}{40} &= \frac{8}{8} && \text{cancel the } \pi \text{ both sides} \\ \theta &= \frac{40 \times 3}{8} = 15^\circ \end{aligned}$$

E.g. 3 The angle subtended at the centre of a sector is 300° . Given that the area of the sector is $\frac{40\pi}{3}$ cm², find the radius of the sector.

Working:

$$\frac{300}{360} \times \pi \times r^2 = \frac{40\pi}{3}$$
$$\frac{5r^2}{6} = \frac{40}{3} \quad \text{cancel the } \pi \text{ both sides}$$
$$r^2 = \frac{40 \times 6}{3 \times 5} = 16$$
$$r = \sqrt{16} = 4 \text{ cm}$$

E.g. 4 Find the value of the shaded area.
The radius of the outer circle is 7 cm.
The radius of the inner circle is 3 cm.



Working: Shaded area = Larger sector – Smaller sector

$$= \frac{50}{360} \times \pi \times 7^2 - \frac{50}{360} \times \pi \times 3^2$$
$$= \frac{50\pi}{9} = 17.5 \text{ cm}^2 \text{ (3 s.f.)}$$

Video: [Area of a sector](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p432 M13.3 Qu 1-13
A*-G class textbook:	p387 E13.3 Qu 1-10
9-1 homework book:	p148 M13.3 Qu 1-6
A*-G homework book:	p108 E13.3 Qu 1-6

[Homework book answers \(only available during a lockdown\)](#)