

Area of a Segment

Starter

1. **(Review of last lesson)** Find the area of a sector whose radius is 10 cm and whose angle at the centre is 153° , giving your answer exactly (i.e. in terms of π).

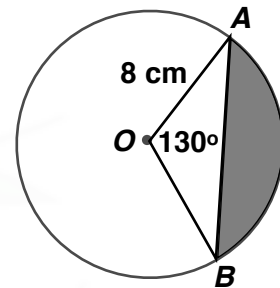
Working: Area of sector = $\frac{153}{360} \times \pi \times 10^2 = \frac{85}{2}\pi = 42.5\pi \text{ cm}^2$

2. **(Review of previous material)** A field in the shape of an equilateral triangle has sides of length 32 m. Find the area of the field.

Working: Area of triangle = $\frac{1}{2}ab \sin C = \frac{1}{2} \times 32 \times 32 \times \sin 60 = 443 \text{ cm}^2$ (3 s.f.)

E.g. 1 Consider the diagram to the right.

- (a) Find the area of the sector OAB .
 (b) Find the area of the triangle OAB .
 (c) Hence, find the area of the (minor) segment (i.e. the shaded area.)



Working: (a) Area of sector = $\frac{130}{360} \times \pi \times 8^2 = \frac{208\pi}{9} \approx 72.61 \text{ cm}^2$

(b) Area of $\triangle = \frac{1}{2} \times 8 \times 8 \times \sin 130 = 32 \sin 130 \approx 24.51 \text{ cm}^2$

(c) Area of segment = $\frac{208\pi}{9} - 32 \sin 130 = 48.1 \text{ cm}^2$ (3 s.f.)

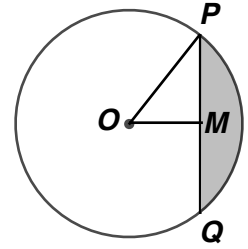
E.g. 2 Find the area of the minor segment when the radius of the circle is 6 cm and angle subtended at the centre is 70° .

Working: Area of segment = Area of sector – Area of triangle
 $= \frac{70}{360} \times \pi \times 6^2 - \frac{1}{2} \times 6 \times 6 \times \sin 70$
 $= 7\pi - 18 \sin 70$
 $= 5.08 \text{ cm}^2$ (3 s.f.)

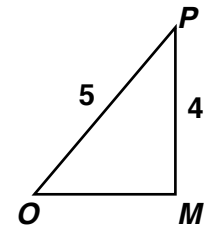
E.g. 3 The chord PQ has length 8 cm and radius of the circle is 5 cm.
 M is the mid-point of PQ .

- (a) Calculate angle \hat{POM} .
 (b) Calculate the area of the triangle OPQ .
 (c) Calculate the shaded area.

Hint: Sketch the diagram and put measurements on known lengths.



Working: (a) Using trigonometry: $\sin \hat{POM} = \frac{4}{5}$
 $\hat{POM} = \sin^{-1} \frac{4}{5}$
 $\hat{POM} = 53.1^\circ$ (3 s.f.)



(b) $\hat{POQ} = 2 \sin^{-1} \frac{4}{5} = 106.26^\circ$
 Area of $\triangle OPQ = \frac{1}{2} \times 5 \times 5 \times \sin 106.26 = 12 \text{ cm}^2$

(c) Shaded area = Area of sector – Area of triangle
 $= \frac{106.26}{360} \times \pi \times 5^2 - 12$
 $= 23.18... - 12$
 $= 11.2 \text{ cm}^2$ (3 s.f.)

Video: [Area of a segment](#)

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

Exercise

- 9-1 class textbook: p433 M13.4 Qu 11-19
 A*-G class textbook: p387 E13.3 Qu 11-19
 9-1 homework book: p433 M13.3/M13.4 Qu 11-19
 A*-G homework book: p106 E13.1 Qu 1-8

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