

## Length of Arc

### Starter

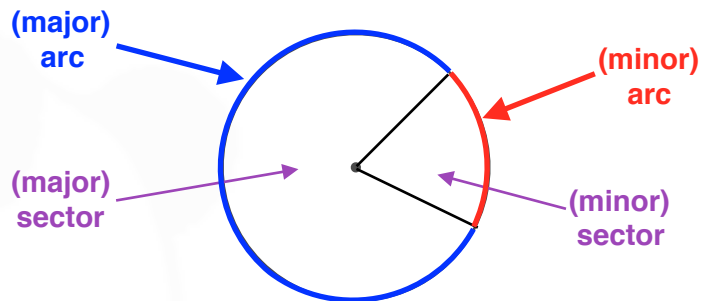
1. **(Review of last lesson)** An isosceles triangle has two sides of length 4 cm and its one distinct angle is  $54^\circ$ . Find its area.

### Key language

**Arcs** form part of the **circumference**.

**Sectors** form part of the **area**.

**N.B.** A **sector** is like a **pizza slice**



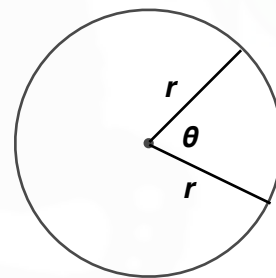
2. A circle has a radius of 18 cm. Express the following in terms of  $\pi$ . Find:
- the **circumference** of the circle
  - the **length of arc** when we have only half the circle (angle is  $180^\circ$ ).
  - the **length of arc** when we have one quarter of a circle (angle is  $90^\circ$ ).
  - the **length of arc** when the angle at the centre is  $60^\circ$ .
  - the **length of arc** when the angle at the centre is  $\theta$  (give your answer in terms of  $\theta$ ).
3. Based on your answer to (e), write down a formula for the **length of arc** of a when the radius of the sector is  $r$  and the angle at the centre is  $\theta$ . Give your answer in terms of  $r$  and  $\theta$ .

### Notes

#### Formula for length of arc

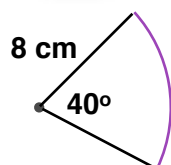
$$\text{Length of arc} = \frac{\theta}{360} \times \text{circumference}$$

$$\text{Length of arc} = \frac{\theta}{360} \times 2\pi r$$

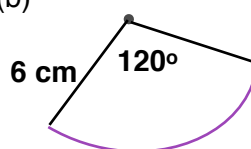


**E.g. 1** Find the length of the **arc**, giving your answers to 3 s.f.

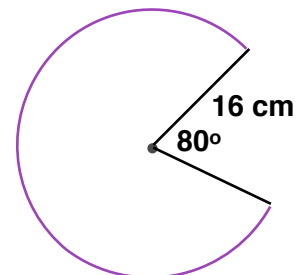
(a)



(b)



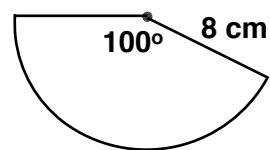
(c)



**Working:** (a) Length of arc =  $\frac{40}{360} \times 2\pi \times 8 = \frac{16\pi}{9} = 5.59 \text{ cm (3 s.f.)}$

**E.g. 2** The length of an arc is 20 cm when the angle subtended at the centre is  $50^\circ$ . Find the radius of the sector.

**E.g. 3** Find the perimeter of the sector.



Video: [Arc length](#)

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

### Exercise

9-1 class textbook: p429 M13.2 Qu 1, 3, 5, 7-9, 12-15

A\*-G class textbook: p384 E13.2 Qu 1, 3, 5, 7-9, 12-15

9-1 homework book: p146 M13.2 Qu 1-9

A\*-G homework book: p107 E13.2 Qu 1-8

### Summary

$$\text{Length of arc} = \frac{\theta}{360} \times \text{circumference}$$

$$\text{Length of arc} = \frac{\theta}{360} \times 2\pi r$$

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