Length of an arc and area of a sector

Year 11 General Maths
Units 1 and 2

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Learning Objectives

By the end of the lesson, I hope that you understand and can apply the following to a range of questions from the Unit 1 and 2 General Mathematics course.

- To be able to find the length of an arc.
- To be able to find the area of a sector.

Recap

This is the fourth video in the Year 11 General Maths series looking at measurement, scale and similarity. In the past lessons we have looked at how to round to a certain number of decimal places and significant figures alongside how to write really large (or small!) numbers using scientific notation.

We have looked at Pythagoras' Theorem and how we might use it to help us find missing side lengths for right-angled triangles and, in the last lesson, how to find areas and perimeters of a range of shapes.

It's now time to look at Noah and how he saved humanity …

Finding the arc length

OK … it has nothing to do with Noah's Ark … but everything to do with circles.

There is a formula we can use:

$$s = \frac{\theta}{360} \times 2 \times \pi \times r$$

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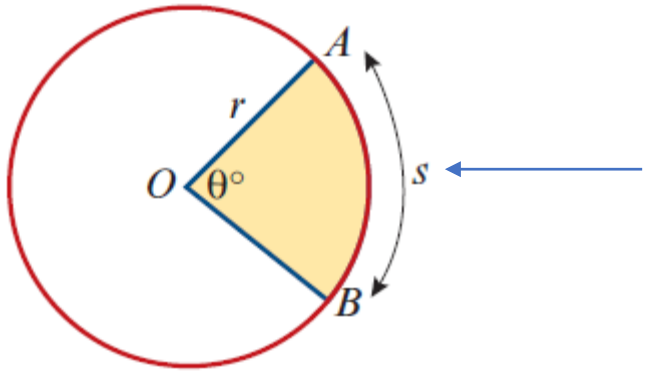


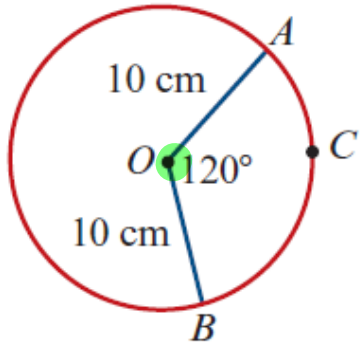
This is an arc length. It is just a small section of the circumference.

If connect the arc to the centre, we can find an angle.

This angle can help us find the percentage of the circle we have used and hence the percentage of the circumference.

Example …

In this circle with a centre at point O and a radius length of 10 cm, the angle subtended at O by arc ACB has a magnitude of 120°. Find the length of the arc, ACB, to one decimal place.



$$S = \frac{\theta}{360} \times 2 \times \pi \times r = \frac{120}{360} \times 2 \times \pi \times 10$$

$$= 20.9 \text{ cm}$$

Slices of pie and cake and pizza

Now I'm feeling a little hungry! But … a slice of pie or pizza or cake is actually a sector of a circle.

We can find the area of a sector using a formula:

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

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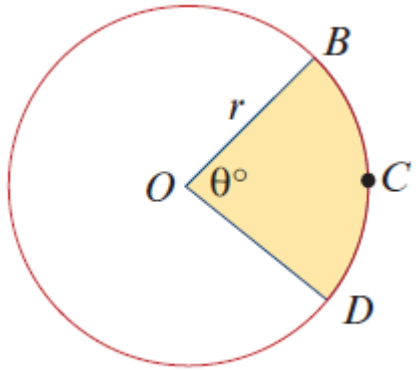
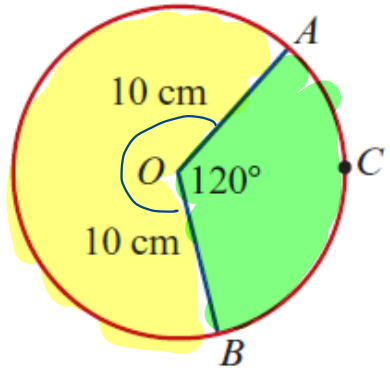


This is a sector. We need to know the angle of the slice.

Example

In this circle with a centre at point O and a radius length of 10 cm, the angle subtended at O by arc ACB has magnitude 120°.



Find:

a the area of the minor sector AOB

b the area of the major sector AOB.

Give your answer to two decimal places.

240°

a) $A = \frac{120^\circ}{360^\circ} \times \pi \times 10^2$

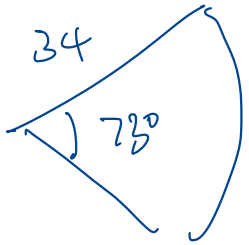
$= 104.72 \text{ cm}^2$

$A = \frac{240}{360^\circ} \times \pi \times 10^2$

$= 209.44 \text{ cm}^2$

Example

Find the area of a sector that subtends an angle of 73° at the centre of a circle with a radius of 34 cm. Answer to one decimal place.



$$A = \frac{73}{360} \times \pi \times 34^2$$

$$= 736.4 \text{ cm}^2$$

Work to complete

The work I am asking to be completed for this topic is shown below.

This is the minimum work which should be completed. The more questions which are answered the better your chance of success in exams. Questions towards the end of the exercises and in the Chapter Review are the best practice you can do.

Questions to complete:
Exercise 10D: All