

Circumference and perimeter of a sector



Year 9 Mathematics

www.maffsguru.com

Learning Objectives

By the end of the lesson I would hope that you have an understanding and be able to apply to questions the following concepts:

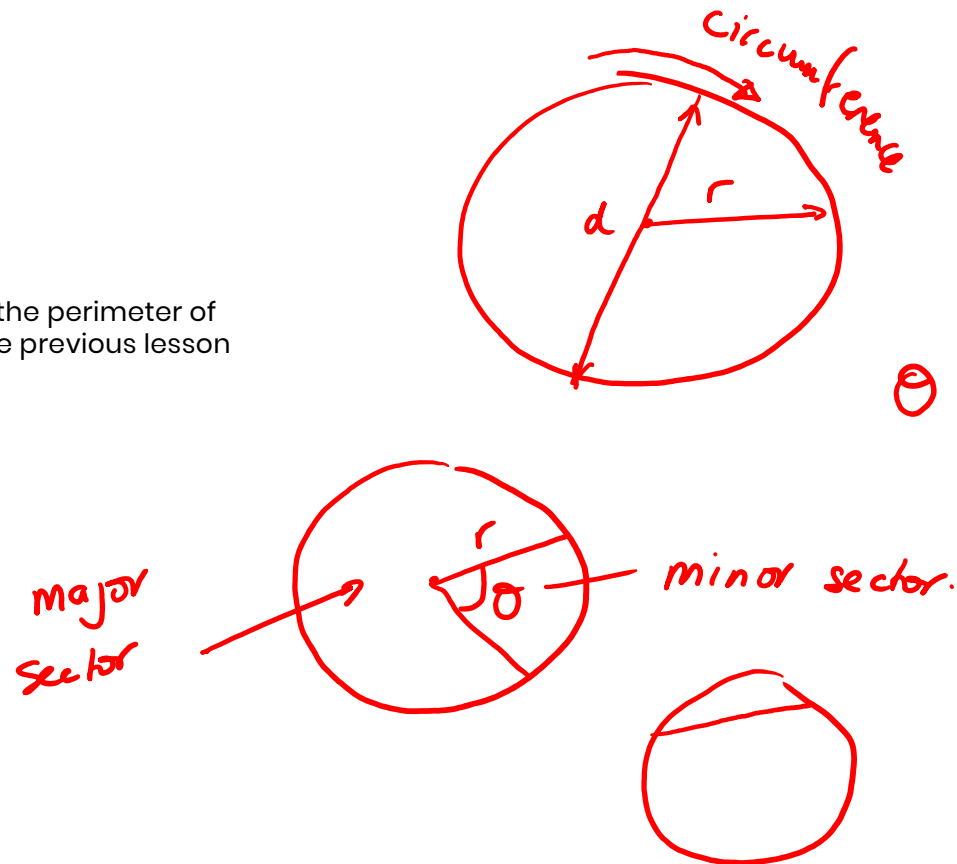
- Recap what the important parts of a circle
- Find the circumference of a whole circle
- Use exact values
- Understand what arc length is and how to find it
- Understand what a sector is (minor and major)
- Know how to find the perimeter of a sector

Recap

In a previous lesson we looked at finding circles and the various names for parts of a circle.

- Circumference
- Diameter
- Radius
- Minor sector
- Major sector
- Chord

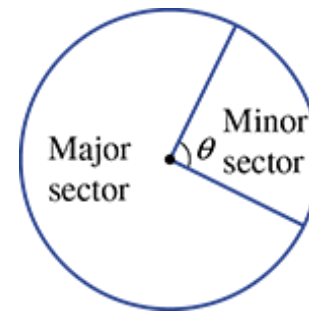
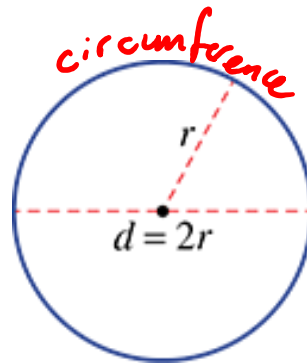
We are going to be looking at sectors and how to find the perimeter of a sector using the knowledge we have gained from the previous lesson and those from last year.



The parts of a circle

These are the parts of a circle which are important to most of the mathematics we do at a Year 9 level.

- Circumference
- Diameter
- Radius
- Minor sector
- Major sector
- Chord



Finding the circumference of a circle

We can use a formula to find the circumference (perimeter) of a circle:

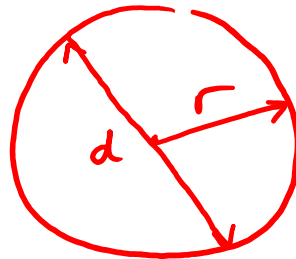
$$\text{Circumference} = 2 \times \pi \times \text{radius}$$

There is another version:

$$\text{Circumference} = \pi \times \text{diameter}$$

We can find the circumference of a whole circle and express the answers in **exact** form and **decimal** form.

$$d = 2 \times r$$



$$\begin{aligned} C &= 2 \times \pi \times r \\ \hline C &= 2 \times r \times \pi \\ C &= d \times \pi \\ \hline C &= \pi \times d \end{aligned}$$

$$1 \times 2 \times 3 = 6$$

$$2 \times 3 \times 1 = 6$$

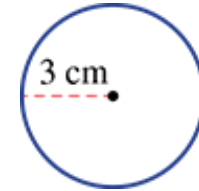
$$1 \times 3 \times 2 = 6$$

Finding the circumference of a circle: Example

We can use a formula to find the circumference (perimeter) of a circle:

$$\text{Circumference} = 2 \times \pi \times \text{radius}$$

Find the circumference of this circle and the perimeter of this sector in exact form and correct to two decimal places.



$$F. \quad C = 2 \times \pi \times r$$

$$S. \quad C = 2 \times \pi \times 3$$

$$C = 2 \times 3 \times \pi$$

$$= \underline{\underline{6\pi}} \quad \text{EXACT VALUE}$$

$$C = \underline{\underline{18.85 \text{ cm}}}$$

Finding the arc length of a circle

An arc length is simply a part of a circle.

We can find the length of this in the same way as we did when finding the area of a sector.

The arc is a **fraction** of a whole circle.

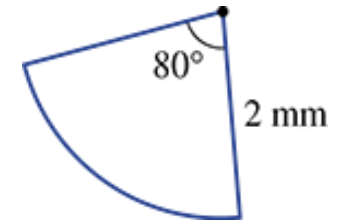
Hence, we find the circumference of the whole circle and then multiply it by the fraction of the circle we have.

This changes the formula to

$$\underline{\underline{\text{Arc Length}}} = \frac{\text{angle of sector}}{360} \times 2 \times \pi \times \text{radius}$$

$$= \frac{4\pi}{9}$$

$$= \underline{\underline{1.396 \text{ mm}}}$$



$$C = 2 \times \pi \times r$$

$$C = 2 \times \pi \times 2$$

$$= \underline{\underline{4\pi}}$$

$$C_{\text{sector}} = \frac{80}{360} \times 4\pi$$

Finding the arc length of a circle

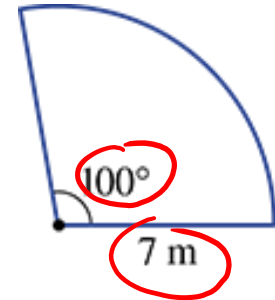
Use the formula below to find the arc length of the sector shown:

$$\text{Arc Length} = \frac{\text{angle of sector}}{360} \times 2 \times \pi \times \text{radius}$$

$$\text{Arc length} = \frac{100}{360} \times 14\pi$$

$$= \frac{35\pi}{9}$$

$$= \underline{\underline{12.22 \text{ m}}}$$



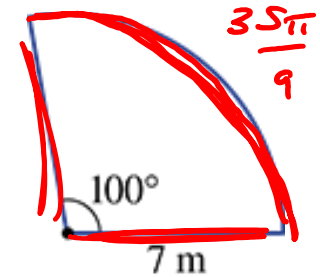
$$\begin{aligned} C &= 2 \times \pi \times r \\ &= 2 \times \pi \times 7 \\ &= \underline{\underline{14\pi}} \end{aligned}$$

Using arc length to find the perimeter of a sector

Once we know the arc length then we can use this to find the perimeter of a sector.

Remember the perimeter is the distance around the whole shape.

$$\begin{aligned}\therefore \text{Perimeter} &= \frac{35\pi}{9} + 7 + 7 \\ &= \frac{35\pi}{9} + 14 \\ &= \underline{\underline{26.22 \text{ m}}}\end{aligned}$$

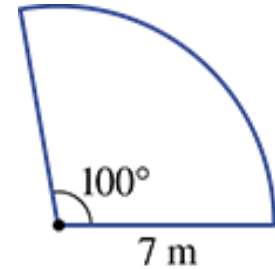


Using arc length to find the perimeter of a sector

Once we know the arc length then we can use this to find the perimeter of a sector.

Remember the perimeter is the distance around the whole shape.

Find the perimeter of the sector in **exact** form and **decimal** form.



Examples have been extracted, with permission, from the Cambridge Essential Mathematics (Year 8) Textbook

www.maffsguru.com

Exact and Decimal: Is there much more working out needed?

Remember, finding answers in exact form is one step from finding the answer in decimal form.

Always make sure you take a note of the **degree of accuracy** they want from you.

$$\frac{35\pi}{9} + 14$$

More examples

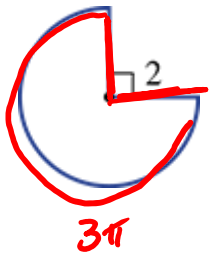
Give the exact circumference/perimeter of these shapes.



$$\begin{aligned}C &= 2 \times \pi \times r \\&= 2 \times \pi \times 4 \\&= 2 \times 4 \times \pi \\&= \underline{\underline{8\pi}}\end{aligned}$$

More examples

Give the exact circumference/perimeter of these shapes.



$$\begin{aligned}C &= 2 \times \pi \times r \\&= 2 \times \pi \times 2 \\&= \underline{\underline{4\pi}}\end{aligned}$$

$$\begin{aligned}\text{Arc length} &= \frac{3}{4} \times \cancel{4} \pi \\&= \underline{\underline{3\pi}}\end{aligned}$$

$$\begin{aligned}\therefore \text{Perimeter} &= 3\pi + 2 + 2 \\&= \underline{\underline{3\pi + 4}} \text{ units}\end{aligned}$$