Circumference of a circle

Sunday, 12 April 2020   10:49 am

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

- Understand the various names for sections of a circle
- Understand what the circumference of a circle is
- Understand how to find the circumference when given a radius or diameter
- How to find the radius or diameter when given the circumference

RECAP

This is the first lesson in a section dealing with Circles.
This is part of the Real Number section of work for the Victorian Curriculum.

In previous lessons we have been looking at Fractions, Decimals and Percentages.
Whilst we are taking a "break" from this work at the moment, it doesn't mean we're finished.
Fractions, decimals and percentages appear in all areas of Mathematics.
Being able to covert between each of them is important.

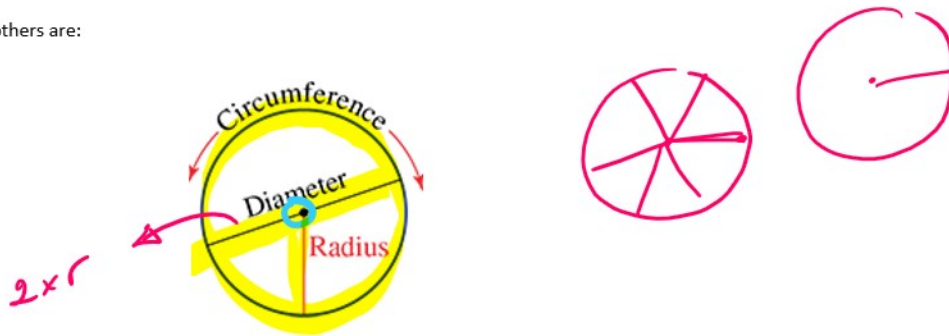## Maths is doing it again: Tricks of the language

If I asked you what the perimeter of a shape is ... I'm sure you could all tell me.

It's the distance I would travel around the edge of a shape.

This is exactly what the circumference of a circle is.

This is one of the important things to understand and know about circles.

The others are:

Circumference: The distance around the edge of the circle (also known as the perimeter)
Diameter: The straight line distance from one side of a circle to the other **passing through the centre** (origin)
Radius: The straight line distance from the centre of a circle to the outside edge

Finding the Circumference of a circle.

With most shapes it's easy to find the perimeter.
We simply work out and then add the straight lines together
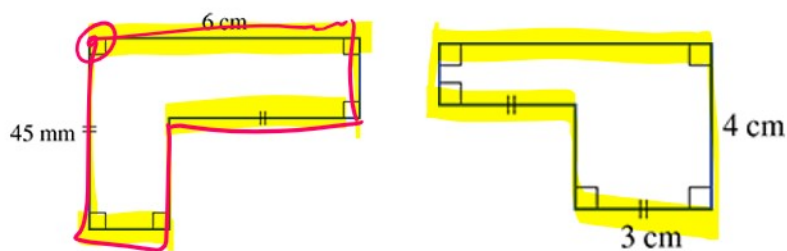
This isn't easy with a circle as there are no straight edges.

This is why there is a formula to help us find the circumference of a circle.
The formula tells us we need to know **either the radius or the diameter of the circle.**
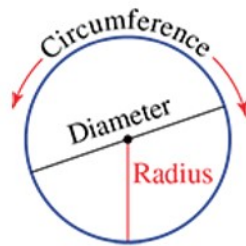
$$C = 2 \times \pi \times r \qquad\qquad C = \pi \times D$$

$$C = 2\pi r$$

$$C = \pi D$$

r stands for the radius of the circle
D stands for the diameter.

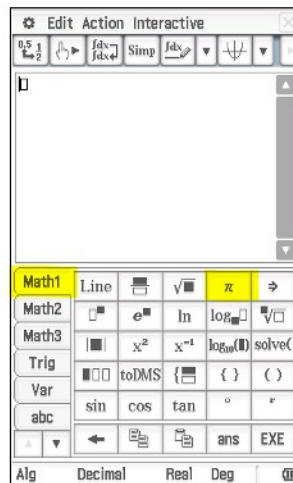Remember, you can find the radius from the diameter and vice versa.

$$Diameter = 2 \times radius$$

Wot is that funny π thing?

It's called pi.

It's a number (and a ratio) which helps us find the circumference of a circle.

It's a button on your calculator.

Knowing what we do, we can look at some examples of how to find the circumference
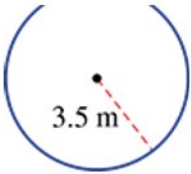
Examples
The following examples are taken, with permission, from the Cambridge Essentials Year 8 Textbook
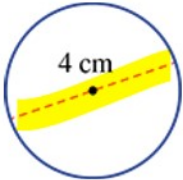
Find the circumference of these circles correct to two decimal places. Use a calculator for the value π

$$C = 2\pi r$$
$$= 2 \times \pi \times 3.5$$

$$C = 2\pi r$$
$$= 2 \times \pi \times 3.5$$
$$= 21.99 \text{ m}$$

$$r = 2 \text{ cm}$$

$$C = 2\pi r$$
$$= 2 \times \pi \times 2$$
$$= 12.57 \text{ cm}$$

Sometimes we don't have a calculator and have to use an **approximation to** π.

Approximate values for π

There are three values we might use which means we don't need to use a calculator.
These will mean you have to use **pencil and paper** methods.

$\pi \approx 3$

$$C = 2 \times \pi \times r$$
$$= 2 \times 3 \times 10$$
$$= 6 \times 10$$
$$= 60 \text{ cm}$$

$\pi \approx 3.14(2)$

$$C = 2 \times \pi \times r$$
$$= 2 \times 3.14 \times 10$$
$$= 2 \times 31.4$$
$$= 62.8 \text{ cm}.$$

$\pi \approx \dfrac{22}{7}$

$\pi \approx \dfrac{}{7}$

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

$= 2 \times \dfrac{\cdot 22}{7} \times \dfrac{14^{\,2}}{1}$

$= 4 \times 22$

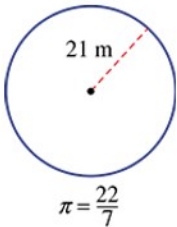$= 88\ cm.$

$= 2 \times 22 \times 2$

Example

The following examples are taken, with permission, from the Cambridge Essentials Year 8 Textbook

Calculate the circumference of these circles using the given approximation of π.

50 cm

$\pi = 3.14$

$r = 25$
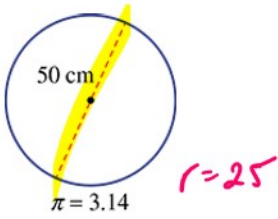
$C = 2 \times \pi \times r$

$= 2 \times 3.14 \times 25$

$= 50 \times 3.14$

$= 5 \times 10 \times 3.14$

$= 5 \times 31.4$

$= 157\ cm.$

$\begin{array}{r} 31.4 \\ \times\quad 5 \\ \hline 157.0 \\ \hline 2 \end{array}$

21 m

$\pi = \dfrac{22}{7}$

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

$= 2 \times \dfrac{22}{7} \times \dfrac{21^{\,3}}{1}$

$= 2 \times 22 \times 3$

$= 6 \times 22$

$= 132\ m.$

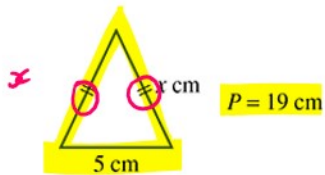$\begin{array}{r} 22 \\ 6 \\ \hline 132 \end{array}$

Finding the value of the radius or diameter when given the circumference

In Maths, what you are asked to do forwards, you may also be asked to do backwards.

For example, with a non-circle question you might be asked to find the value of x.

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$$P = x + x + 5 \quad F$$
$$19 = x + x + 5 \quad S$$
$$-s \quad 19 = 2x + 5 \quad S$$
$$14 = 2x$$
$$x = 7cm.$$

You might also be asked to find the value of the diameter or radius from a circumference.
We simply have to rearrange the formula to make r or D the subject

$$Diameter = \frac{Circumference}{\pi}$$

In fact, we only need to remember one formula. If we know the diameter we can find the radius pretty easily!

Example:
From my own head!

Find the Diameter and Radius of a circle which has a circumference of 25 cm

$$D = \frac{C}{\pi}$$
$$D = \frac{25}{\pi}$$
$$D = 7.96 \ cm.$$

$$r = D \div 2$$
$$= 7.957.. \div 2$$
$$= 3.98 \ cm$$