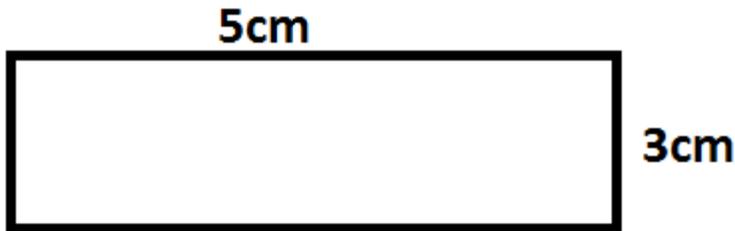


Area and Volume

The 'perimeter' of a shape is the distance around it. In order to calculate the perimeter of a shape, you must add up the lengths of all its sides. For example, if a rectangle has a width of 5cm and a length of 3cm, its perimeter would be:

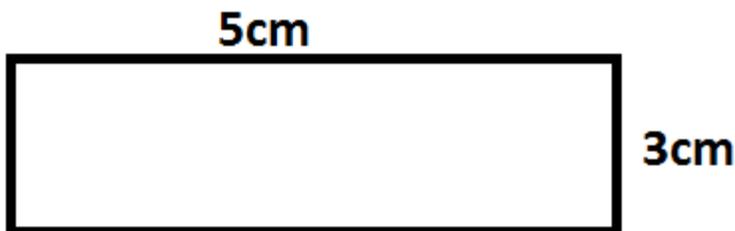


$$\text{Perimeter} = 5\text{cm} + 3\text{cm} + 5\text{cm} + 3\text{cm} = 16\text{cm}$$

The 'area' of a shape is the number of square units which cover it, i.e. the size of the surface of a shape.

Due to the fact that the area of a shape is calculated by multiplying a shape's length by its width, it is measured in 'square units'. For example, the area of a square which is 1 metre on each side is 1 metre x 1 metre = 1 square metre or m^2 .

Other examples of square units include: millimetres squared (mm^2) and centimetres squared (cm^2).



$$\text{Area} = 5 \times 3 = 5\text{cm}^2$$

There are several shapes which follow simple area formulae:

The area of a triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

The area of a rectangle = $\text{base} \times \text{height}$

The area of a parallelogram = $\text{base} \times \text{height}$

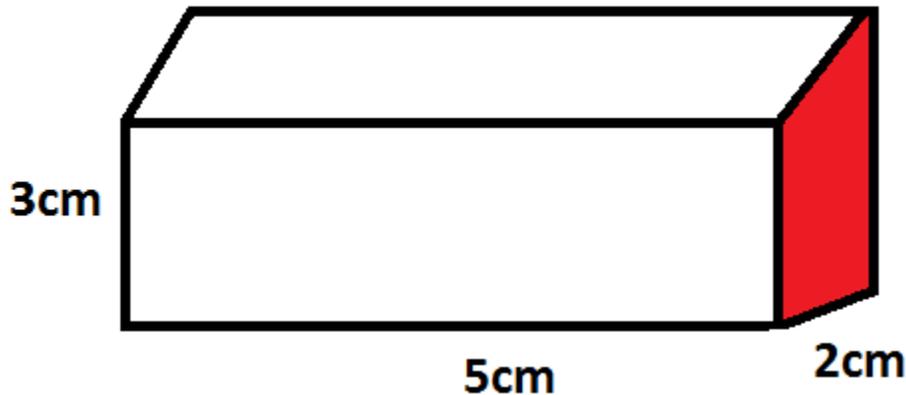
The 'volume' of a shape is the number of cubic units which occupy it, i.e. the amount of 3D space which the shape occupies.

Due to the fact that the volume of a shape is calculated by multiplying a shape's length by its width by its depth, it is measured in 'cubic units'. For example, the volume of a cube which is 1 metre in length, 1 metre in width and 1 metre in depth is 1 metre x 1 metre x 1 metre = 1 cubic metre or m^3 .

Area and Volume

Other examples of cubic units include: millimetres cubed (mm³) and centimetres cubed (cm³).

For example, if a cuboid has a width of 5cm, a length of 3cm and a depth of 2cm, its volume would be:



$$\text{Volume} = 3 \times 5 \times 2 = 30\text{cm}^3$$

Key Concepts

In the new linear GCSE Maths paper, you will be required to solve various mathematical problems involving perimeter, area and volume. The specific questions you will be expected to answer will vary depending upon which examination board with which you are registered, but as a rule you will be required to:

- Calculate the perimeter of various shapes
- Calculate the area of various shapes
- Calculate the volume of various shapes

Listed below are a series of summaries and worked examples to help you solidify your knowledge about perimeter, area and volume.

Worked Examples

1 - Calculating the area of a trapezium

A trapezium is a 4-sided shape with straight sides and a pair of parallel sides. In order to calculate the area of a trapezium, you must follow the rule:

Area of a trapezium =

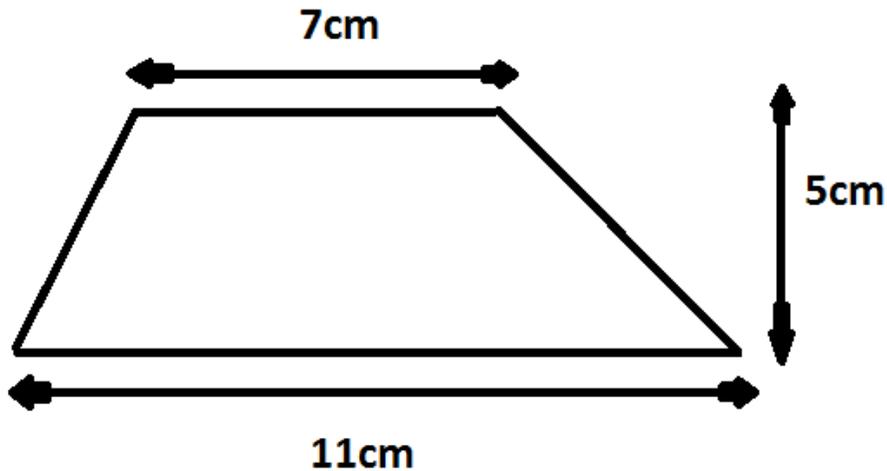
$$\frac{a+b}{2} * h$$

Area and Volume

Where 'a' and 'b' are the two side lengths of the trapezium and 'h' is its height.

Example

(a) - Calculate the area of the following trapezium:



Solution

(a) - Using the formula for the area of a trapezium, you can calculate that:

Area =

$$\frac{7+11}{2} * 5 = 9 * 5 = 45$$

Therefore the area of the trapezium =

$$45\text{cm}^2$$

2 - Calculating the area of a circle

During your GCSE maths exam, you will be required to calculate the area of a circle. In order to calculate a circle's area, you need to know the values of some of its parts. For example,

If you know the radius of a circle, you can calculate its area using the formula:

$$\text{Area} = \pi * \text{radius}^2$$

If you know the diameter of a circle, you can calculate its area using the formula:

$$\text{Area} = \frac{\pi}{4} * \text{diameter}^2$$

If you know the circumference of a circle, you can calculate its area using the formula:

$$\text{Area} = \frac{\text{circumference}^2}{4\pi}$$

Area and Volume

The '**radius**' of a circle is the distance from its centre to its edge.

The '**diameter**' of a circle is the distance from one edge of a circle through its centre to the edge on the other side of the circle.

The '**circumference**' of a circle is the distance around its edge.

(Note: When you divide the circumference of a circle by its diameter you get 3.141592654... which is the value of Pi (π)).

Example

(a) - Calculate the area of a circle which has a radius of 4cm

Solution

(a) - From the question, you know that the circle has a radius of 4cm. As a result you can use the formula

$$\text{Area} = \pi * 4^2 = 16\pi = 50.265482....$$

to calculate its area:

Therefore, the area of a circle to 2dp, with radius 4cm =

$$50.27\text{cm}^2$$