

# Area and perimeter, dimensions and volume

Understanding the difference between perimeter, area and volume. Calculating the perimeter, area and volume of different 2-D and 3-D shapes.

## Estimating area

The area of a shape is a measure of how much space the shape takes up.

If a shape is drawn on a square grid, the area of the shape will be the number of squares inside the shape. If the shape is irregular, we need to count the whole squares and half squares.

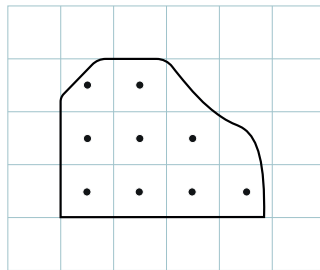
However, a shape may have curved sides, or it may take up some part squares that are not half squares.

With this type of shape, we are usually asked to **estimate the area**.

One method to do this is to count the number of whole squares and squares that are half a square or greater. Ignore the squares that are less than half a square, as we can assume these areas will add to the squares that are half a square or greater to make full squares.

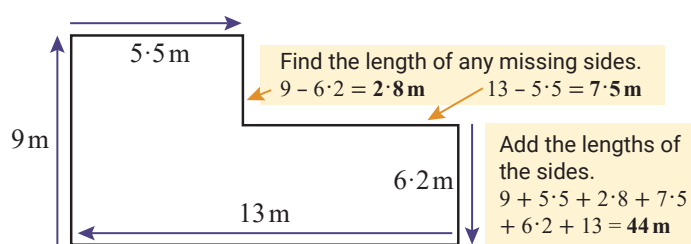
### Example

There are nine dots. This means our estimate of the area of the shape is  $9\text{cm}^2$ .



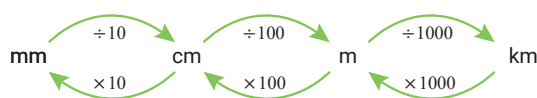
## Perimeter

This measures the distance around the outline of a shape



Perimeter is measured in units as mm, cm, m...

## Converting between measurements of length

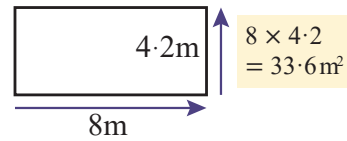


## Area

**Area** This measures the amount of space within a 2-D shape.

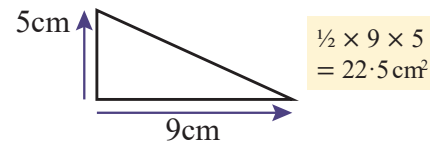
### Area of a Rectangle

Area of Rectangle = length  $\times$  width



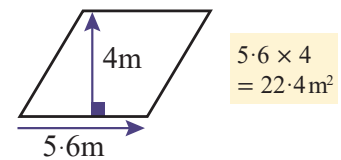
### Area of a Triangle

Area of triangle =  $\frac{1}{2} \times$  base  $\times$  height



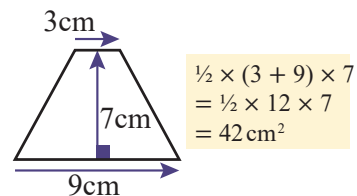
### Area of a Parallelogram

Area of a parallelogram = base  $\times$  height



### Area of a Trapezium

Area of a trapezium =  $\frac{1}{2} (a + b) \times$  height



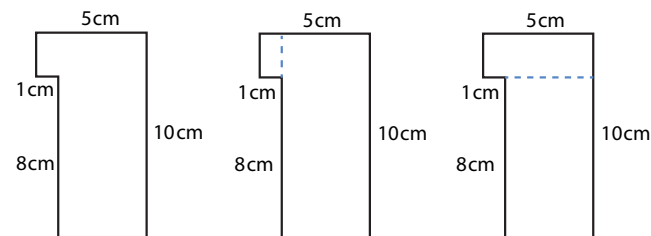
Area is measured in units<sup>2</sup> e.g. mm<sup>2</sup>, cm<sup>2</sup>, m<sup>2</sup> ...

## Area of compound shapes

To calculate the area of a compound shape, we need to cut the shape up into its different parts. The area of the shape then comes from adding the areas of these different parts.

### Example

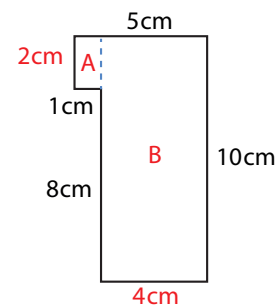
The shape on the left can be cut into two rectangles in two different ways. We can either make a vertical cut or a horizontal cut.



To calculate the area using the vertical cut we can label the two shapes **A** and **B**. Calculate any missing sides, then calculate the area.

$$\begin{aligned} \text{Area A} &= 1 \times 2 \\ &= 2\text{cm}^2 \\ \text{Total area} &= \text{A} + \text{B} \\ &= 2 + 40 \\ &= 42\text{cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area B} &= 4 \times 10 \\ &= 40\text{cm}^2 \end{aligned}$$



## Check that you:

- can confidently add and multiply decimal numbers
- understand the relationship between different units of measurement.

## Circumference of a circle

The perimeter of a circle is called the **circumference**.

Using  $C$  to represent circumference, and  $d$  to represent diameter, we write the formula for the circumference of a circle as:

$$C = \pi d$$

Since the diameter is twice as long as the radius ( $d = 2r$ ), we can also write the formula for the circumference:

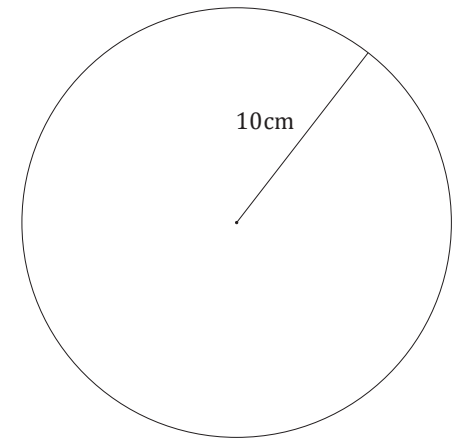
$$C = 2\pi r$$

We can use  $\pi$  in our calculators, or we can use an estimate of  $3.14$ .

### Area of a Circle

Using  $A$  to represent area and  $r$  to represent radius, the formula for the area of a circle is:

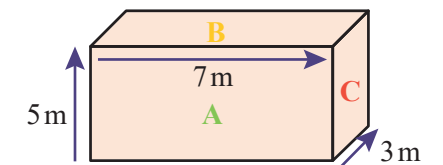
$$A = \pi r^2$$



$$\begin{aligned} C &= 2\pi r \\ &= 2 \times 3.14 \times 10 \\ &= 62.8\text{ cm} \end{aligned}$$

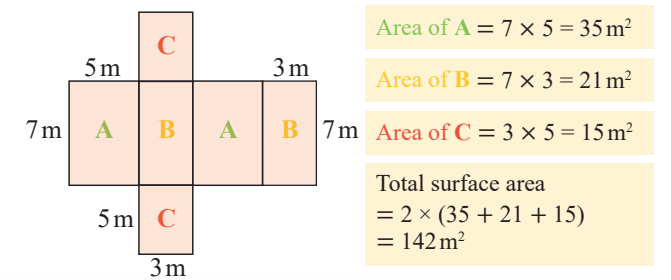
$$\begin{aligned} A &= \pi r^2 \\ &= 3.14 \times 10^2 \\ &= 3.14\text{ cm}^2 \end{aligned}$$

**Surface Area** This is the total area of every surface (face) of a 3-D shape



It is useful to consider the net of the 3-D shape, to find the area of each face.

In order to calculate the total surface area.

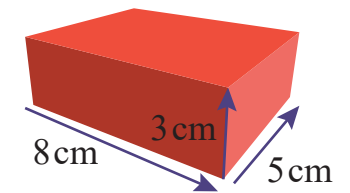


**Volume** This measures the amount of space within a 3-D shape.

### Volume of a cuboid

Volume of a cuboid = length  $\times$  width  $\times$  height

$$\begin{aligned} &= 8 \times 5 \times 3 \\ &= 120\text{cm}^3 \end{aligned}$$



## REMEMBER!

Perimeter is the length around the shape (like a running track). Area is the space inside the shape (e.g. how much grass we need to plant on a football pitch).