



# 'How To' Guide – Metric Units



**Metric Units** – A system of measurement in which the basic **units** are the metre, the litre, and the gram. In this system, the ratios between **units** of measurement are always multiples of ten. For example, a kilogram is a thousand grams, and a centimetre is one-hundredth of a metre.

## Example Mass

a) Convert 3000g into kg.

$$3000 \div 1000 = 3\text{kg}$$

b) Convert 0.5 tonnes into g.

$$0.5 \times 1000 \times 1000 = 500000\text{g}$$

c) A cuboid has a length of 2m, a width of 0.5m and a depth of 20cm. Calculate the volume, giving your answer in  $\text{cm}^3$ .

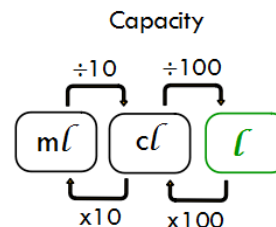
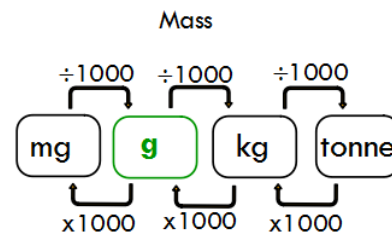
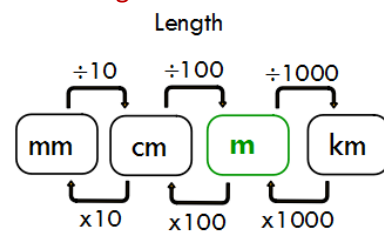
$$\begin{aligned} \text{Volume} &= L \times W \times D \\ &= 200 \times 50 \times 20 \\ &= \underline{200000\text{cm}^3} \end{aligned}$$

d) A cuboid has a length of 2m, a width of 0.5m and a depth of 20cm. Calculate the volume, giving your answer in  $\text{m}^3$ .

$$\begin{aligned} \text{Volume} &= L \times W \times D \\ &= 2 \times 0.5 \times 0.2 \\ &= \underline{0.2\text{m}^3} \end{aligned}$$

## How we teach it

- Knowing the conversions allows us to make the conversion diagrams below.
- To convert between the units, follow the arrow and perform the calculation.
- If you need to jump across two arrows, this can be performed in a single calculation.



## Additional info

- A tonne is used in Europe and consists of 1000kg.
- A ton is used in the USA and consists of 907kg.
- Capacity is the amount that a container can hold.
- Volume is the space taken up by something.
- Students struggle to understand the concept of multiplying to get to a smaller unit and dividing to get to a larger unit. E.g. "But why am I dividing by 1000 if kilograms are bigger than grams?"
- It is often best to talk them through a simple, familiar problem. E.g. "How many centimetres are in 2 metres? And do you multiply or divide to get that answer?" The unit is bigger but the numerical value is smaller.

## Common mistakes

- Multiplying and dividing by 10, 100 and 1000 without a calculator requires knowledge of place value. For example, to multiply by 10, move all digits one column to the left (leaving the decimal point alone).
- The length conversion rules do not apply to area or volume.  $1\text{m}^2 \neq 100\text{cm}^2$ . To convert the units of area and volume a scale factor must be used. It is simpler to convert the lengths before any calculations are performed.



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## Metric Unit Conversions

The following are metric unit conversions that pupils are expected to know.

Length or Distance	Mass	Capacity or Volume
10mm = 1cm	1000mg = 1g	100cl = 1 litre
100cm = 1m	1000g = 1kg	1000ml = 1 litre
1000mm = 1m	1000kg = 1 tonne	1000cm <sup>3</sup> = 1 litre
1000m = 1km		1000l = 1m <sup>3</sup>

## Notation

- mm = millimetre
- cm = centimetre
- m = metre
- km = kilometre
- mg = milligram
- g = gram
- kg = kilogram
- tonne
- cl = centilitre
- ml = millilitre
- l = litre
- cm<sup>3</sup> = centimetres cubed = metres squared

## Metric to Imperial Unit Conversions

In the UK, we use a mixture of metric and imperial units. Pupils do not currently need to memorise these conversions, but they are handy to know.

Note: These conversions are only approximations.

Metric unit	Imperial unit
1 kg	2.2 pounds
1 litre	1.75 pints
4.5 litres	1 gallon
8 km	5 miles
30 cm	1 foot
2.54 cm	1 inch