'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.

$3000 ÷ 1000 = 3kg$

b) Convert 0.5 tonnes into g.

$0.5 × 1000 × 1000 = 500000g$

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 cm^3.
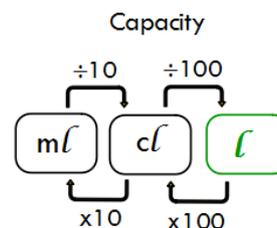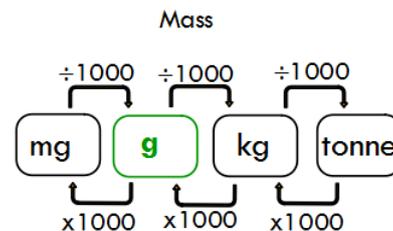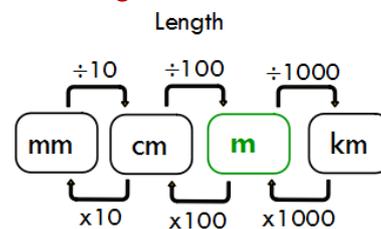
Volume = L × W × D

$= 200 × 50 × 20$

$= \underline{200000cm^3}$

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 m^3.

Volume = L × W × D

$= 2 × 0.5 × 0.2$

$= \underline{0.2m^3}$

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.

Length

mm cm m km

÷10 ÷100 ÷1000

x10 x100 x1000

Mass

mg g kg tonne

÷1000 ÷1000 ÷1000

x1000 x1000 x1000

Capacity

ml cl l

÷10 ÷100

x10 x100

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. $1m^2 ≠ 100cm^2$. 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.

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	$1000cm^3$ = 1 litre
1000m = 1km		$1000l = 1m^3$

Notation

- mm = millimetre
- cm = centimetre
- m = metre
- km = kilometre

- mg = milligram
- g = gram
- kg = kilogram
- tonne

- cl = centilitre
- ml = millilitre
- l = litre
- cm^3 = 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