# Maths Y9 - Compound Units & Standard Form

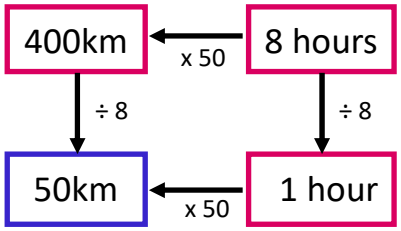
## 1. Compound units

### A. Speed, distance, time

**Speed** is the **distance** travelled per unit of **time**

A cyclist travels 400 kilometres in 8 hours.
What is his average speed?

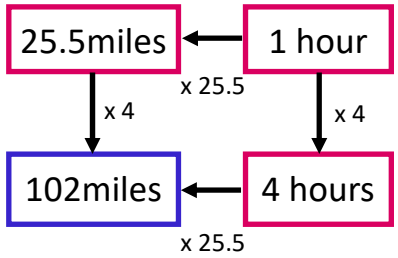
To calculate speed we need to find how far he travels in one hour




**Speed is 50km/h**

Fiona drives for 4 hours.
Her average speed is 25.5mph.
How far does Fiona drive?

Her speed is 25.5mph so we know she travels 25.5miles in one hour



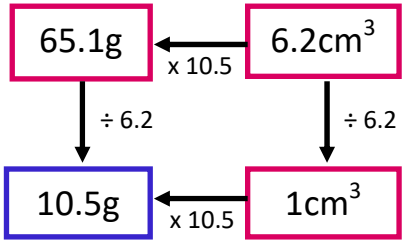

**Distance is 102miles**

### B. Density, mass, volume

**Density** is the amount of **mass** per unit of **volume**

A solid silver spoon has a mass of 65.1g. The volume of the spoon is $6.2cm^3$.
Calculate the density of silver.

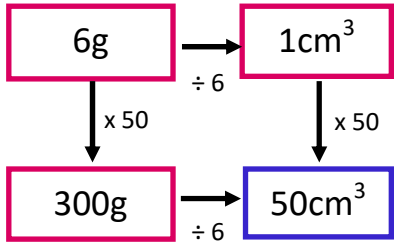
To calculate density we need to find the mass per $cm^3$




**Density is 10.5g/$cm^3$**

A piece of metal has a mass of 300g and density $6g/cm^3$
Calculate the volume of the metal

The density is $6g/cm^3$ so we know $1cm^3$ has a mass of 6g




**Volume is 50$cm^3$**

## 2. Standard form

### A. Large numbers

Standard form is another way of writing very large numbers
The first number must always be greater than or equal to 1 and less than 10.
For large number the power will be positive.

$$1{,}360{,}000 = 1.36 \times 1{,}000{,}000$$

we know that: $1{,}000{,}000 = 10^6$

therefore: $1{,}360{,}000 = 1.36 \times 10^6$

$1{,}360{,}000$ is the **ordinary number**

$1.36 \times 10^6$ is the **standard form**

### B. Small numbers

Standard form is also a way of writing very small numbers
The first number still must be greater than or equal to 1 and less than 10.
For small numbers the power will be negative.

$$0.00535 = 5.35 \times 0.001$$

we know that: $0.001 = 10^{-3}$

therefore: $0.00535 = 5.35 \times 10^{-3}$

**Hint:** Count how many places left the digits move so that the decimal point sits just after the first non-zero figure.

## 3. Calculating with standard form (non-calculator)

### A. Multiplying and dividing

Calculate $7.5 \times 10^3 \times 3 \times 10^3$

Give your answer in standard form.

rewrite with the coefficients at the start: $= 7.5 \times 3 \times 10^3 \times 10^3$

multiply the coefficients: $= 22.5 \times 10^3 \times 10^3$

add the indices to multiply the powers of 10: $= 22.5 \times 10^6$

rewrite in standard form: $= 2.25 \times 10^7$

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Calculate $\dfrac{2.5 \times 10^2}{5 \times 10^6}$

Give your answer in standard form.

split the division, to divide the coefficients and powers separately: $= \dfrac{2.5}{5} \times \dfrac{10^2}{10^6}$

divide the coefficients: $= 0.5 \times \dfrac{10^2}{10^6}$

subtract the indices to divide the powers of 10: $= 0.5 \times 10^{-4}$

rewrite in standard form: $= 5 \times 10^{-5}$

### B. Adding and subtracting

Calculate $7.5 \times 10^3 + 5.25 \times 10^5$

Give your answer in standard form.

rewrite the with the same power of 10: $= 7.5 \times 10^3 + 525 \times 10^3$

add the coefficients: $= (7.5 + 525) \times 10^3$

rewrite in standard form: $= 532.5 \times 10^3$

$= 5.325 \times 10^5$

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Calculate $1.25 \times 10^5 - 8.2 \times 10^4$

Give your answer in standard form.

rewrite with the same power of 10: $= 1.25 \times 10^5 - 0.82 \times 10^5$

subtract the coefficients: $= (1.25 - 0.82) \times 10^5$

rewrite in standard form: $= 0.43 \times 10^5$

$= 4.3 \times 10^4$