RAT10

Ratios are similar to fractions - they can be ‘cancelled down’ in the same way.

\[ 16 : 24 = 2 : 3 \]

(divide both by 8)

We need to make sure we are using the same units.

\[ \begin{align*}
40 \text{ cm} & \to 3 \text{ m} = 40 \text{ cm} : 300 \text{ cm} \\
& = 4 : 30 \\
& = 2 : 15
\end{align*} \]

Ratios are often used as a **scale** on a map or diagram.

\[ 1 : 50000 \text{ means that 1 cm on the map represents 50000 cm on the ground.} \]

**Example**

(a) On a 1 : 50000 map my house is 12 cm from the school. How many km from school do I live?

On the ground the distance is

\[ \begin{align*}
12 \text{ cm} & \times 50000 \\
= & \ 600000 \text{ cm} \\
= & \ 6000 \text{ m} \\
= & \ 6 \text{ km}
\end{align*} \]

(b) My friend lives 14.5 km from the school. How far is this on the map?

\[ \begin{align*}
14.5 \text{ km} & = 14500 \text{ m} \\
& = 1450000 \text{ cm on the ground} \\
& = \frac{1450000}{50000} \text{ cm on the map} \\
& = 29 \text{ cm on the map}
\end{align*} \]
Scale on Maps

The scale of a map tells us how many times bigger a distance is on the ground compared to the map.

Examples

1. A map has a scale of 1:25000. On the map it is 16 cm from A to B. How many kilometres is it from A to B on the ground?

\[
16 \times 25000 = 400000 \text{ cm} \\
= 4000 \text{ m} \\
= 4 \text{ km}
\]

(Remember: \( 100 \text{ cm} = 1 \text{ m} \) \\
\( 1000 \text{ m} = 1 \text{ km} \) )

2. A map has a scale of 1:200000. From Oxford to London is 85 km. How many cm will this be on the map?

\[
85 \text{ km} = 85000 \text{ m} \\
= 8500000 \text{ cm}
\]

On the map this will be

\[
8500000 \div 200000 = 42.5 \text{ cm}
\]
Dividing into parts in a given ratio

Example A certain metal contains copper and zinc in the ratio 5:3.

(a) How much zinc is there in 2kg of this metal?

\[5 + 3 = 8 \text{ parts}\]

Each part is \( \frac{2000 \text{ g}}{8} = 250 \text{ g} \)

So there are \(250 \text{ g} \times 5 = 1250 \text{ g}\) of copper and \(250 \text{ g} \times 3 = 750 \text{ g}\) of zinc.

(b) A lump of this metal contains 45g of copper. How much zinc does it contain?

\[5 \text{ parts} = 45 \text{ g}\]

\[1 \text{ part} = \frac{45}{5} = 9 \text{ g}\]

Zinc = 3 parts = \(9 \times 3 = 27 \text{ g}\).

(c) A third lump of this metal contains 45g of zinc. How much copper does it contain?

\[3 \text{ parts} = 45 \text{ g}\]

\[1 \text{ part} = \frac{45}{3} = 15 \text{ g}\]

Copper = 5 parts = \(15 \times 5 = 75 \text{ g}\).
Example: The number of pages in a newspaper increases from 36 to 54. The price increases in the same ratio. If the old price is 28p what is the new price?

\[36 : 54\text{ can be simplified (cancelled)}\]

\[
\begin{align*}
\div 6 & : \quad 6 : 9 \\
\div 3 & : \quad 2 : 3 \\
\end{align*}
\]

Old price is 2 parts = 28p

1 part = 14p

New price is 3 parts = 14 \times 3 = 42p