

Ratio and Map Scales

Ratio

To divide a quantity into a given ratio – eg Karen, David and Judith share £240 in the ratio 8:3:1

- Find how many equal parts you need by adding up the ratio

$$8 + 3 + 1 = 12 \text{ parts}$$

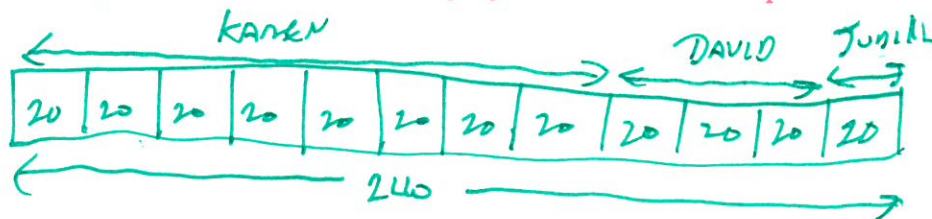
- Divide the quantity by this total to find out how much each part gets

$$240 \div 12 = \pounds 20$$

- Multiply this by the number needed for each section of the ratio

$$\text{KAREN} = 8 \times 20 = \pounds 160, \text{ DAVID} = 3 \times 20 = \pounds 60, \text{ JUDITH} = \pounds 20$$

Often, drawing the ratio as a bar helps you visualise the problem.



Three farmers shared an order for fertiliser between them in the ratio of 3:4:7.

Jade got the largest share.

Bethan got the smallest share.

Noah's share was 60kg.

Calculate how much of the fertiliser Jade and Bethan each received

$$\begin{array}{r}
 \text{B} \quad \text{N} \quad \text{J} \\
 3 : 4 : 7 \\
 \times 15 \quad \times 15 \\
 45 : 60 : 105 \\
 \text{Bethan } 45 \text{ kg} \\
 \text{Jade } 105 \text{ kg}
 \end{array}$$

A colour of paint called 'ochra' is made using a recipe with white, red, blue and yellow paint. The breakdown of the percentages of the different colours in the 'ochra' paint are shown in the table.

'Ochra' paint recipe	
White	90%
Red	5%
Blue	3%
Yellow	2%

Catrin has already bought 2.5 litres of blue paint. She decides to buy white, red and yellow paint to use with **all** of her blue paint to make as much 'ochra' paint as she can.

The sizes of tins of paint available are:

- 1 litre,
- 2.5 litres and
- 10 litres.

Only full tins of paint are available to buy.

Catrin has only a small shed to store her paint, so wants as little white, red and yellow paint left over as possible.

Calculate the amount of each of the colours of paint Catrin needs to buy and complete the shopping list for her on the opposite page.

You **must** show all your working.

$$\begin{array}{ccccccc}
 W & R & B & Y & & & \\
 90 & : & 5 & : & 3 & : & 2 \\
 75\text{l} & : & 4.2\text{l} & & 2.5 & \downarrow \times? & 1.6\text{l}
 \end{array}
 \qquad
 2.5 \div 3 = \frac{5}{6}$$

WHITE
75 litres
7 x 10 litre
2 x 2.5 litres

Red
4.2 litres
2 x 2.5 litres

Yellow
1.6 litres
2 x 1 litre

Scale Drawings

These often use the ratio symbol (:) in a different way.

A scale of 1:200 means 1 of whatever unit you use to measure on a diagram will be 200 times bigger in the same unit in real life.

So a wall measuring 5cm on the scale drawing will be $5 \times 200 = 1000$ in real life.
cm

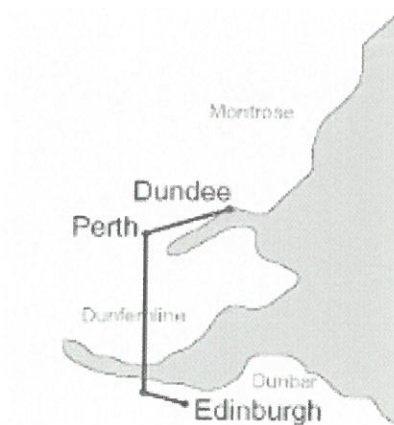
You then turn this into a more sensible unit for its size: $1000 \div 100 = 10$ metres.

If you need to shrink from real life onto the scale drawing, say 7m actually:

$$7\text{m} \times 100 = 700\text{cm}$$

$$\begin{array}{l} 1 : 200 \\ (3.5\text{cm})? : 700 \end{array} \left. \begin{array}{l} \downarrow \\ \times? \end{array} \right\} 700 \div 200 = 3.5$$

The map below shows a route from Edinburgh to Dundee



The route from Edinburgh to Dundee is approximately 4cm on the map.
The actual journey is approximately 100 kilometres.

(a) Calculate the scale of the map, giving your answer in the form 1 :

[2]

$$4\text{cm} : 100\text{ km}$$

$$\times 1000$$

$$4\text{cm} : 100\,000\text{ metres}$$

$$\times 100$$

$$\begin{array}{l} 4\text{cm} : 100\,000\,00\text{ cm} \\ \left(\div 4 \right) \quad 1 : ? \quad 25\,000\,00 \quad \left(\div 4 \right) \end{array}$$

$$1 : 25\,000\,000$$

Cheryl and Ben planned a cycle ride using a 1:25000 scale map.
The route they planned measured approximately 80cm on the map.

- (a) Calculate approximately how far they planned to cycle.
You must give your answer in km.

$$\begin{array}{l}
 1 : 25\,000 \\
 80 : 2\,000\,000 \text{ cm} \\
 \qquad \qquad \qquad \times 80 \\
 \qquad \qquad \qquad \div 100 \\
 20\,000 \text{ m} \\
 \qquad \qquad \qquad \div 1000 \\
 \underline{20 \text{ km}}
 \end{array}$$

[5]

- (b) After the ride Cheryl's cycle-computer showed that she travelled 24 km.
What was this measurement on the map in centimetres?

$$24 \text{ km} \times 1000 \times 100 = 2\,400\,000 \text{ cm}$$

$$\begin{array}{l}
 1 : 25\,000 \\
 ? : 2\,400\,000 \quad \left. \begin{array}{l} \text{)} \\ \text{)} \\ \text{)} \\ \text{)} \end{array} \right\} \times ? \\
 \underline{96 \text{ cm}}
 \end{array}$$

[3]

- (c) Ben and Cheryl's cycle-computers showed 24 km after the ride.
The ratio of the distance Ben cycled to the distance he pushed his bike uphill was 5:1.
The ratio of the distance Cheryl cycled to the distance she pushed her bike uphill was 11:1.

Calculate how far Ben cycled and how far he pushed his bike uphill.

$$\begin{array}{l}
 5:1 = 6 \text{ parts} \\
 24 \div 6 = 4 \text{ km}
 \end{array}$$

Cycled 20 km Pushed bike uphill 4 km

Calculate how far Cheryl cycled and how far she pushed her bike uphill.

$$\begin{array}{l}
 11:1 = 12 \text{ parts} \\
 24 \div 12 = 2 \text{ km}
 \end{array}$$

Cycled 22 km Pushed bike uphill 2 km

[4]