YEAR 8 — PROPORTIONAL REASONING...
Multiplicative Change

What do I need to be able to do?

By the end of this unit you should be able to:
- Solve problems and explain direct proportion
- Use conversion graphs to make statements, comparisons and form conclusions.
- Understand and use scale factors for length

Keywords

Proportion: a statement that links two ratios

Variable: a part that the value can be changed

Axes: horizontal and vertical lines that a graph is plotted around

Approximation: an estimate for a value

Scale Factor: the multiple that increases/ decreases a shape in size

Currency: the system of money used in a particular country

Conversion: the process of changing one variable to another

Scale: the comparison of something drawn to its actual size.

Direct Proportion

As one variable changes the other changes at the same rate.

This is a multiplicative change

4 cans of pop = £2.40

x 0.5 ⟨ 4 cans of pop = £2.40 / 2 cans of pop = £1.20 ⟩ x 0.5

x 3 ⟨ 4 cans of pop = £2.40 / 12 cans of pop = £7.20 ⟩ x 3

This multiplier is the same
In the same way that this would be for ratio

Sometimes this is easiest if you work out how much one unit is worth first
e.g. 1 can of pop = £0.60

Conversion Graphs
Compare two variables

kilometres / miles, 80, 50

This is always a straight line because as one variable increases so does the other at the same rate

To make conversions between units you need to find the point to compare – then find the associated point by using your graph.
Using a ruler helps for accuracy
Showing your conversion lines help as a "check" for solutions
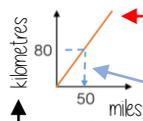
Labelling of both axes is vital

Conversion between currencies

Currency is directly proportional

£1 = 90 Rupees

For every £1 I have 90 Rupees

x 10 ⟨ £1 = 90 Rupees / £10 = 900 Rupees ⟩ x 10
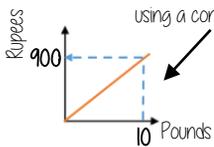
Currency can be converted using a conversion graph

Rupees / Pounds, 900, 10

Convert 630 Rupees into Pounds

x 7 ⟨ £1 = 90 Rupees / £7 = 630 Rupees ⟩ x 7

630 ÷ 90 = 7

Ratio between similar shapes

Angles in similar shapes do not change.
e.g. if a triangle gets bigger the angles can not go above 180°

The two rectangles are similar.

3 m, 8 m   4.5 m, ? m

Corresponding sides

÷ 3 ⟨ 3m : 4.5m / 1 m : 1.5 m ⟩ ÷ 3

x 8 ⟨ 8m : 12m / 1 m : 1.5 m ⟩ x 8

Note
Simplify to the same ratio

Understand Scale Factor

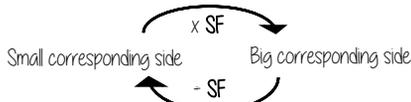The two rectangles are similar.

3 m, 8 m   4.5 m, ? m

3 x 1.5 = 4.5

This is a multiplicative change

Missing length
8 x 1.5 = 12m

Use **corresponding** sides to calculate a scale factor

Scale factor can also be calculated by:

Bigger corresponding side / **Smaller corresponding side**

x SF
Small corresponding side → Big corresponding side
÷ SF

Draw and interpret scale diagrams

A picture of a car is drawn with a scale of 1:30

For every 1cm on my image is 30cm in real life

The car image is 10cm

Image : Real life
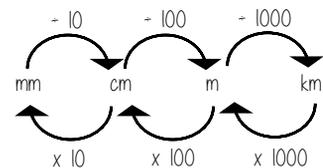x 10 ⟨ 1cm : 30cm / 10cm : 300cm ⟩ x 10

The car in real life is 210cm

Image : Real life
x 7 ⟨ 1cm : 30cm / 7cm : 210 cm ⟩ x 7

Interpret maps with scale factors

÷ 10, ÷ 100, ÷ 1000
mm, cm, m, km
x 10, x 100, x 1000

Ratios need to be in the same units

1 cm : 250 m

1 cm : 250m
1 cm : 25000cm

250 x 100 = 25000

For every 1cm on my map is 25000cm in real life