Year 8 Knowledge Organisers

Bishop walsh
Catholic School

Autumn Term 1

Ratio & Proportion

Unit 1: Ratio & Scale

Unit 2: Multiplicative Change

Unit 3: Ratio & Proportion Problems

Ratio & Proportion...

Unit 1: Ratio and Scale

What do I need to be able to do?

By the end of this unit you should be able to:

- Simplify any given ratio
- Share an amount in a given ratio
- Solve ratio problems given a part
  Solutions should be modelled, explained and solved.

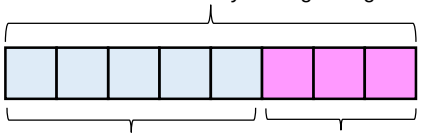
Keywords

Ratio: a statement of how two numbers compare
Part: a section of a whole
Equivalent: of equal value
Factors: integers that multiply together to get the original value
Scale: the ratio between the small version and its actual size.
Circumference: The perimeter of a circle
Radius: The distance from the centre to the outside of a circle
Diameter: The distance right across a circle, through the centre

Representing a ratio

"For every 5 boys there are 3 girls"

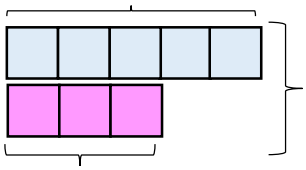
This is the "whole" – boys and girls together



This represents the 5 boys This represents the 3 girls

5:3

This represents the 5 boys



This represents the 3 girls

This is the "whole" – boys and girls together

Order is Important

"For every dog there are 2 cats"

Dogs: Cats

1:2

The ratio has to be written in the same order as the information is given.
e.g. 2:1 would represent 2 dogs for every 1 cat. ✗

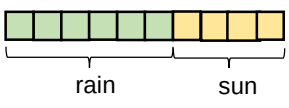
Simplifying a ratio

Cancel down the ratio to its lowest form

"For every 6 days of rain there are 4 days of sun"

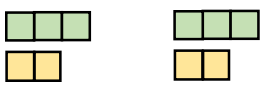
6:4

÷ 2



rain sun

3:2



"For every 3 days of rain there are 2 days of sun" – when this happens twice the ratio becomes 6:4.

Find the biggest common factor that goes into all parts of the ratio

For 6 and 4 the biggest factor (number that multiplies into them is 2)

Ratio 1:n (or n:1)

This is asking you to cancel down until the part indicated represents 1.

Show the ratio 4:20 in the ratio of 1:n

The question states that **this part has to be 1** unit. Therefore **Divide by 4**

4 : 20

1 : 5

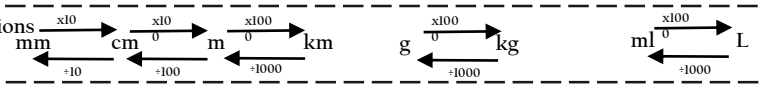
This side has to be divided by 4 too – to keep in **proportion**

H *the n part does not have to be an integer for this type of question*

Units are important:

When using a ratio – all parts should be in the same units

Useful Conversions

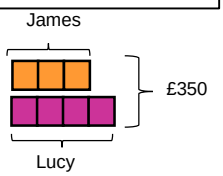


Sharing a whole into a given ratio

James and Lucy share £350 in the ratio 3:4. Work out how much each person earns

Model the Question

James : Lucy
3 : 4



Find the value of one part (one box)

Whole: £350
7 parts to share between (3 James, 4 Lucy)

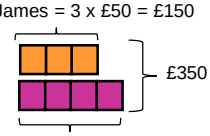
£350 ÷ 7 = £50

□ = one part = **£50**

Put back into the question

James: Lucy
3 : 4
x 50 x 50
£150:£200

James = 3 x £50 = £150



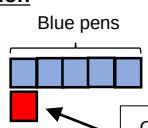
Lucy = 4 x £50 = £200

Finding a value given 1:n (or n:1)

Inside a box are blue and red pens in the ratio 5:1. If there are 10 red pens how many blue pens are there?

Model the Question

Blue : Red
5 : 1



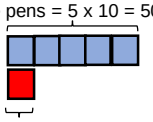
One unit = 10 pens

□ = one part = **10 pens**

Put back into the question

Blue : Red
5 : 1
x 10 x 10
50: 10

Blue pens = 5 x 10 = 50 pens

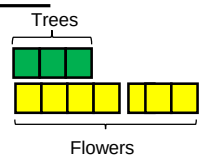


Red pens = 1 x 10 = 10 pens

There are 50 Blue Pens

Ratio as a fraction

Trees : Flowers
3 : 7



Ratio

Fraction of trees

There are **3** parts for trees

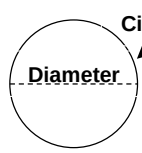
Number of parts of in group / Total number of parts = 3/10

Tree parts 3 + Flower parts 7 = 10

Fraction

Pi

π



The ratio of a circle's circumference to its diameter

Ratio & Proportion...

Unit 2: 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

Variable: a part or letter where the value can be changed
Axes: horizontal and vertical lines that a graph is plotted around
Approximation: an estimate for a value
Similar Shapes: Shapes that are in the same ratio – one is an enlargement of the other.
Scale Factor: the multiple that increases the size of a shape
Currency: the system of money used in a particular country
Conversion: the process of changing one variable to another
Scale: the ratio between the small version and 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 3: 4 cans of pop = £2.40 → 12 cans of pop = £7.20 (x 3)

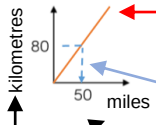
x 0.5: 4 cans of pop = £2.40 → 2 cans of pop = £1.20 (x 0.5)

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



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

Labelling of both axes is vital

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

Conversion between currencies

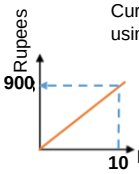
Currency is directly proportional

£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



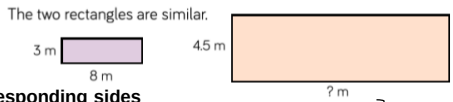
Convert 630 Rupees into Pounds

630 ÷ 90 = 7

x 7: £1 = 90 Rupees → £7 = **630 Rupees** (x 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 180⁰



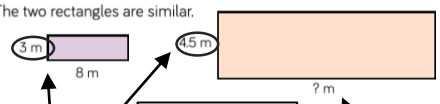
Corresponding sides

÷ 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



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 be calculated by: **Bigger corresponding side / Smaller corresponding side**

Small corresponding side → Big corresponding side: x SF

Big corresponding side → Small 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

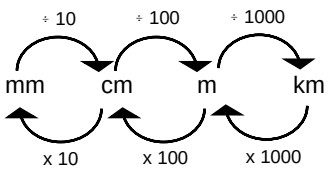
x 10: 1cm : 30cm → 10cm : 300cm (x 10)

The car in real life is 210cm

Image : Real life

x 7: 1cm : 30cm → 7cm : 210 cm (x 7)

Interpret maps with scale factors



1 cm : 250 m

Ratios need to be in the same units

1 cm : 250m ← 250 x 100 = 25000

1 cm : 25000cm

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

Ratio & Proportion...

Unit 3: Solving Ratio & Proportion Problems

What do I need to be able to do?

By the end of this unit you should be able to:

- Understand and solve problems with variables in direct proportion.
- Recognise direct proportion graphs and use conversion graphs.
- Understand and solve problems with variables in inverse proportion.
- Recognise inverse proportion graphs.
- Solve ratio problems
- Solve Best Buy problems

Keywords

Variable: a part or letter where the value can be changed
Direct Proportion: When two variables are connected so that if you double one variable, then you also double the other.
Inverse Proportion: When two variables are connected so that if you double one variable, then you halve the other.
Conversion: the process of changing one variable to another
Origin: the point (0,0) on a graph

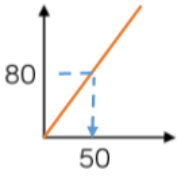
Direct Proportion

As one variable changes the other changes at the same rate. So if one variable doubles, so does the other.

It takes a man 30mins to make 5 toys.
How long will it take him to make 15 toys?

5 toys = 30mins
x 3 ↓ ↓ x 3
15 toys = 1hour 30mins

A graph of direct proportion is a straight line going through the origin.



To make conversions between units you need to find the point to compare then find the associated point by using your graph. If the numbers go off the scale you can use a number that is on the graph and then multiply both by 10, 100 etc

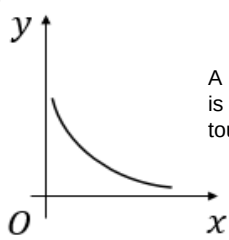
Inverse Proportion

As one variable changes the other changes in the opposite way. So if one variable doubles, the other one halves.

It takes a man 30mins to make 5 toys.
How long will it take 5 men to make the 5 toys?

1 man = 30mins
x 5 ↓ ↓ ÷ 5
5 men = 6 mins

If there are MORE men, it will take LESS time



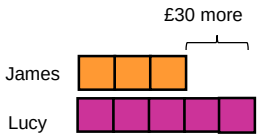
A graph of inverse proportion is a curve like this. It never touches either axis.

Ratio Problems

James and Lucy share some money in the ratio 3:5. Lucy gets £30 more than James. Work out how much each person gets

Model the Question

James : Lucy
3 : 5



Find the value of one part (one box)

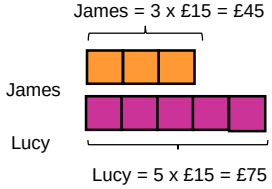
Lucy gets 2 parts more which is £30 more
so £30 = 2 parts (2 boxes)
1 parts =30 ÷ 2 = £15

£30 ÷ 2 = £15

□ = one part
= £15

Put back into the question

James: Lucy
3 : 5
x 15 x 15
£45 : £75



Best Buy Problems

Which tube is the best value for money?

Method 1 - ml per £

Small tube
£2 = 250ml
£1 = 250 ÷ 2 = 125ml per £1

Big tube
£2.50 = 300ml
£1 = 300 ÷ 2.5 = 120ml per £1

So the small tube better value (get more toothpaste per £)

Method 2 - cost per ml

Small tube
250ml = £2 = 200p
1ml = 200 ÷ 250 = 0.8p per ml

Big tube
300ml = £2.50 = 250p
1ml = 250 ÷ 300 = 0.8333p per ml

So the small tube better value (costs less per ml)