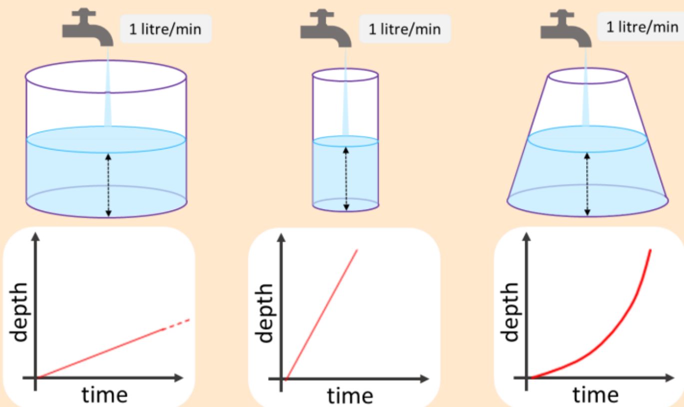
Year 8 Summer 1 Knowledge Organiser

HARROW HIGH MATHEMATICS

Unit 11: Rates of change

We can **sketch** relationships showing how **rate** changes.

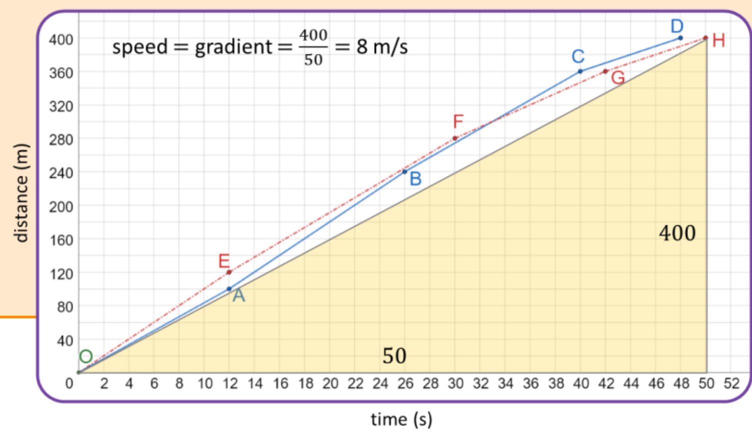
The graphs show the **depth of water** in each container.



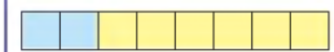
*Assume the containers start empty in each case

Speed is an example of **rate.** We can calculate speed as the **gradient** of a **distance-time** graph.

We can calculate **average speed** by looking at a **whole journey.**



Unit 10: Ratio review

Language	Meaning	Example
Proportion	A proportion is a part of the whole. Two quantities are in proportion if one is always the same multiple of the other.	If there are 6 eggs in a carton Total number of eggs $= 6 \times$ number of full cartons
Ratio	A ratio compares the size of one quantity with the size of another.	 Ratio of blue squares to yellow squares $= 2:6 = 1:3$
Simplify (ratio)	Divide both parts by common factors.	
Scale	The ratio of the length of an object in a scale drawing to the length of the real object.	The Ordnance survey produce maps with scales such as: 1 : 100 000, 1 : 50 000 and 1 : 25 000.
Scale drawing	An accurate drawing of an object to a given scale.	

Speed × Time = Distance. If we keep **one** of these measures the same, the remaining measures are proportionally related.

Speed × **Time** = Distance

Speed	Distance
10	40
15	60
20	80
30	**120**
40	160
60	240

Speed × Time = Distance

Time	Distance
1	30
2	60
3	90
4	**120**
6	180
10	300

Speed × Time = **Distance**

Speed	Time
10	12
15	8
20	6
30	**4**
40	3
60	2

Mathematics Mastery

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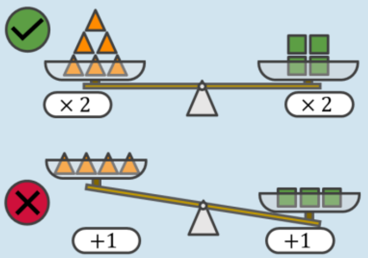
HARROW HIGH MATHEMATICS

Unit 12: Direct and inverse proportion



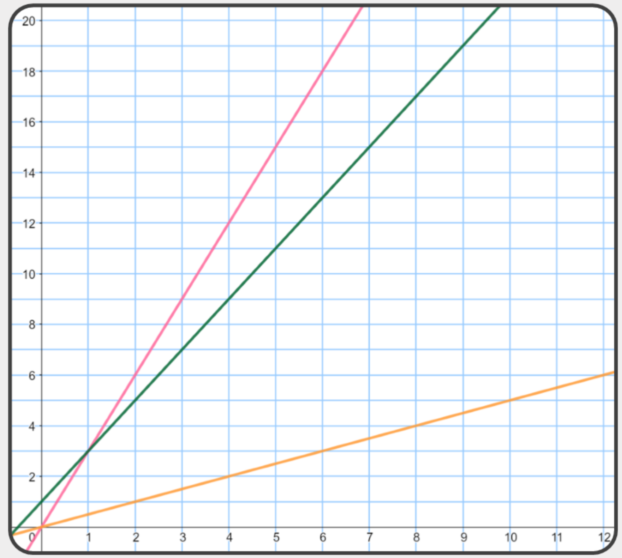
When there are two quantities of different measures that are balanced, we can equate them.

We can find other quantities of these measures that balance, by scaling.

Scaling involves multiplying both parts by the same scale factor.

If measure A is **directly proportional** to measure B, the **multiplier** between them is called the **constant of proportionality**.

We can also scale the relationship by multiplying all the parts by a **scale factor**.



We can graph direct proportionality. If the relationship is directly proportional, the graph will be a **straight line** and will **pass through the origin (0,0).**

x	y
0	0
2	1
4	2
6	3

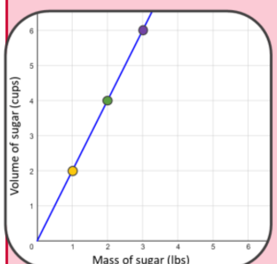
Constant of proportionality: 0.5

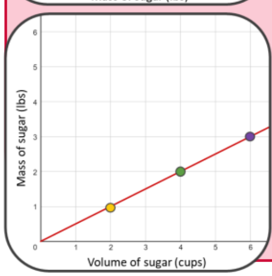
x	y
0	0
1	3
2	6
3	9

Constant of proportionality: 3

x	y
0	1
1	3
2	5
3	7

Constant of proportionality: ?





These graphs show both show a conversion between the mass of sugar in lbs and the volume of sugar in cups. The three marked points show the same information:

- 1 lb of sugar is equal to 2 cups of sugar
- 2 lbs of sugar is equal to 4 cups of sugar
- 3 lbs of sugar is equal to 6 cups of sugar

The gradient of the graphs are different.

The gradient is the **constant of proportionality**.

The gradient of the blue graph is the **reciprocal** of the orange graph. Look at the axes and see if you can work out why.

The below table is an example of an **inversely proportional** relationship. As one quantity increases, the other decreases. Notice that each row has a **product** of 96.

Base	Height
1	96
2	48
3	32
4	24
6	16
8	12
10	9.6

$y \propto \frac{1}{x}$

x	y
1	72
2	36
3	24
4	18
5	14.4
6	12
x	$\frac{72}{x}$

Formula:

$y = \frac{72}{x}$

or $xy = 72$

$y \propto x$

x	y
1	4.5
2	9
3	13.5
4	18
5	22.5
6	27
x	$4.5x$

Formula:

$y = 4.5x$

or $\frac{y}{x} = 4.5$

We can express inversely and directly proportional relationships using algebra.

For inversely proportional relationships, we can write:

$$y = \frac{k}{x}$$

For directly proportional relationships, we can write:

$$y = kx$$

Mathematics Mastery

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Week 1 – Ratio review (clip 333)

Quiz 1	**Quiz 2**
Quiz 3	**Quiz 4**

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Week 2 – Real life graphs (clips 894 and 897)

Quiz 1	**Quiz 2**
Quiz 3	**Quiz 4**

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Week 3 – Flow graphs (clip 899)

Quiz 1	**Quiz 2**
Quiz 3	**Quiz 4**

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Week 4 – Converting length, mass and capacity (clip 692, 695 and 698)

Quiz 1	**Quiz 2**
Quiz 3	**Quiz 4**

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Week 5 – Direct proportion (clip 339 and 340)

Quiz 1	Quiz 2
Quiz 3	**Quiz 4**

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Week 6 – Inverse proportion / Speed (clip 342 and 716)

Quiz 1	Quiz 2

Quiz 3	Quiz 4