

Madani Boys School

Mathematics

YEAR 8

KNOWLEDGE ORGANISER

YEAR 8	
WEEK	HALF TERM 3
18	Fractions/Percentages of Amounts (calc/no-calc)
19	Increase/decrease an amount by a fraction or percentage, including use of multipliers
20	
21	Best Buy/Recipes
22	Unit Conversions/Scale Drawings
23	Revision and Assessment 3



YEAR 8 - DEVELOPING NUMBER... Fractions & Percentages

@whisto_maths

What do I need to be able to do?

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

- Convert between FDP less than and more than 100
- Increase or decrease using multipliers
- Express an amount as a percentage

Keywords

- Percent:** parts per 100 – written using the % symbol
- Decimal:** a number in our base 10 number system. Numbers to the right of the decimal place are called decimals
- Fraction:** a fraction represents how many parts of a whole value you have.
- Equivalent:** of equal value.
- Reduce:** to make smaller in value
- Growth:** to increase/ to grow
- Integer:** whole number, can be positive, negative or zero
- Invest:** use money with the goal of it increasing in value over time (usually in a bank)

Convert FDP

$\frac{70}{100}$ → This also means $70 \div 100$ → 70 out of 100 squares → 70 "hundredths" = 7 "tenths" = 0.7 → 70 hundredths = 70%.

Using a calculator: $\frac{70}{100}$ → S=D → Convert to a decimal → × 100 converts to a percentage

Be careful of recurring decimals
eg $\frac{1}{3} = 0.3333333$
 $\frac{1}{3} = 0.\dot{3}$
The dot above the 3

Fraction/ Percentage of amount

Find $\frac{3}{5}$ of £60

Remember $\frac{3}{5} = 60\%$

10% of £60 = £6
50% of £60 = £30
60% of £60 = £36

Remember $\frac{3}{5} = 60\% = 0.6$
60% of £60 = $0.6 \times 60 = £36$

Convert FDP < and > 100%

100 hundredths = 10 tenths = 100%

40 hundredths = 4 tenths = 40%

140 hundredths = 14 tenths = 140%

$100\% + 40\% = 1 + 0.40 = 1.40$

Percentage decrease: Multipliers

100% → Decrease by 58% → 42%

$100\% - 58\% = 42\%$
 $100 - 0.58 = 0.42$

Multiplier Less than 1

Percentage increase: Multipliers

100% → Increase by 12% → 112%

$100\% + 12\% = 112\%$
 $100 + 0.12 = 1.12$

Multiplier More than 1

Express as a % - Non-calculator

7 per every 10 are orange → $\frac{7}{10}$ → This means that 70 per every 100 are orange → $\frac{70}{100}$ → 70%

27 per every 50 shaded → $\frac{27}{50}$ → 54 per every 100 shaded → $\frac{54}{100}$ → 54%

Denominator 100 Equivalent fractions

Express as a % - Calculator

Rosie $\frac{13}{30}$ → $\frac{13}{30}$ → × 100 → 43.333...% → 43%

This is the same as $\frac{13}{30}$

Can't use equivalence easily to find 'per hundred'

Decimal percentages are still a percentage

Percentage Increase/ Decrease

Decrease: 100% → Decrease by 58% → 42%
 $100 - 0.58 = 0.42$ (Multiplier Less than 1)

Increase: 100% → Increase by 12% → 112%
 $100\% + 12\% = 112\%$
 $100 + 0.12 = 1.12$ (Multiplier More than 1)

Choose appropriate method

The language and wording of the question is the key

Have you represented the question in a bar model?
Can you use a calculator?

YEAR 8 — REASONING WITH GEOMETRY...

Solving ratio & proportion problems

What do I need to be able to do?

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

- Solve problems with direct proportion
- Use conversion graphs
- Solve problems with inverse proportion
- Solve ratio problems
- Solve 'best buy' problems

Keywords

Proportion: a comparison between two numbers

Ratio: a ratio shows the relative size of two variables

Direct proportion: as one variable is multiplied by a scale factor the other variable is multiplied by the same scale factor.

Inverse proportion: as one variable is multiplied by a scale factor the other is divided by the same scale factor.

Direct Proportion

As one variable changes the other changes at the same rate

R



4 cans of pop = £2.40

$\times 0.5$
2 cans of pop = £1.20

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

This is a multiplicative change

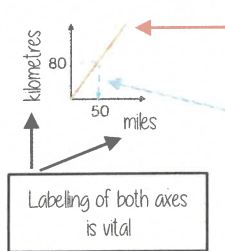
$\times 3$
4 cans of pop = £2.40
12 cans of pop = £7.20

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

R



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

Inverse Proportion

As one variable is multiplied by a scale factor the other is divided by the same scale factor

Examples of inversely proportional relationships

Time taken to fill a pool and the number of taps running

Time taken to paint a room and the number of workers

T is inversely proportional to G. When T=2 then G=20

T	1	2	8
G	40	20	5

Annotations: $\div 2$ (from 1 to 2), $\times 4$ (from 2 to 8), $\times 2$ (from 40 to 20), $\div 4$ (from 20 to 5)

Best Buys

Have a directly proportional relationship

To calculate best buys you need to be able to compare the cost of one unit or units of equal amounts



Shop A

4 cans for £1.20

\downarrow £1.20 \div 4

1 can is £0.30
Or 30p

Shop B

3 cans for 93p

\downarrow £0.93 \div 3

1 can is £0.31
Or 31p

Cost per item

Shop A is the best value as it is 1p cheaper per can of pop



Shop A

4 cans for £1.20

\downarrow 4 \div £1.20

£1 buys 3.333 cans of pop

3 cans for 93p

\downarrow 3 \div £0.93

£1 buys 3.23 cans of pop

Cost per pound

Shop A is still shown as being the best value but pay attention to the unit you are calculating, per item or per pound

Best value is the most product for the lowest price per unit

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: 10cm
Real life: 300cm
 $\times 10$

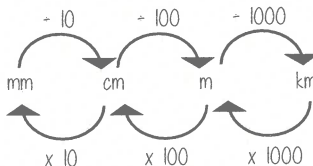


The car in real life is 210cm

Image: 7cm
Real life: 210cm
 $\times 7$



Interpret maps with scale factors



1 cm : 250 m

Ratios need to be in the same units

1 cm 250m
1 cm 25000cm

$250 \times 100 = 25000$

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



What do I need to be able to do?

You should be able to :

- Recognise metric measures
- Convert metric measures
- Calculate with metric measures
- Convert between units of time
- Understand compound measures
- Work out compound units

Metric Units

Length

- Millimetres (mm)
- Centimetres (cm)
- Metres (m)
- Kilometres (km)

The average height of a man is 2m



Mass

- Grams (g)
- Kilograms (kg)
- Tonnes (t)

The average weight of a 6 week old puppy is 3kg



Capacity

- Millilitre (ml)
- Litre (l)

The average capacity of a water bottle is 500ml



Imperial Units

Length

" - inches
' - feet

1 inch \approx 2.5cm 1 foot = 12 inches 1 mile \approx 1.6km

Mass

1 ounce \approx 28g 1 pound = 16 ounces 1 stone = 14 pounds

lb - pounds
oz - ounces
st - stone

Capacity

1 pint \approx 568ml

1 gallon = 8 pints

In your exam, you will be given the conversion from metric to imperial if needed but it's always useful to be familiar with them!

Time

Remember:

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
7 days = 1 week



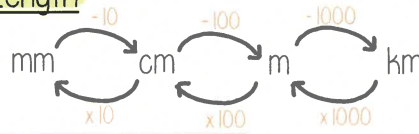
DON'T FORGET, 15 minutes is often referred to as a quarter of an hour (as 15 is a quarter of 60) and 30 minutes is referred to as half an hour.

UNIT CONVERSIONS

Key Words

- Length: the distance from one point to another
- Mass: a measure of how much matter is in an object
- Capacity: the amount an object can contain (usually liquids)
- Volume: the amount of 3-dimensional space an object takes up
- Convert: change a value or expression from one value to another
- Unit: any measurement that there is one of
- Imperial: a system of weights and measures originally developed in England
- Metric: a system of measuring that replaced the imperial system to fall in line with the rest of Europe
- Compound Units: units which require two types of measurement

Length



10mm = 1cm
100cm = 1m
1000m = 1km } REMEMBER!

Example 1

Convert 1.23m to mm

$$1.23\text{m} = 123\text{cm}$$

$$123\text{cm} = 1230\text{mm}$$

It is always helpful to break it up into stages. You could, of course, do this in one step!

Example 2

Convert 28400mm to km

$$28400\text{mm} = 2840\text{cm}$$

$$2840\text{cm} = 28.4$$

$$28.4 = 0.0284\text{km}$$

Imperial Units

Length

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Time

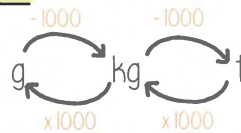
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Mass



1000g = 1kg
1000kg = 1t } REMEMBER!

Example 1

Convert 1458t to g

$$1458\text{t} = 1458\text{kg}$$

$$1458\text{kg} = 1458000\text{g}$$

Example 2

Convert 15600 to kg

$$15600\text{g} = 15.6\text{kg}$$

Example 3

One parcel weighs 280g. How much will 12 weigh? Leave your answer in kg

$$280\text{g} \times 12 = 3360\text{g}$$

$$3360\text{g} = 3.36\text{kg}$$

ALWAYS make sure you check back to ensure you've used the right units

Volume



1000ml = 1l } REMEMBER!

Example 1

Convert 5000ml to litres

$$1000\text{ml} = 1\text{litre}$$

$$5000\text{ml} = 5\text{litres}$$

5 litres

Example 2

Convert 1257l to ml

we multiply by 1000,

so

$$1257\text{l} = 1257000\text{ml}$$

don't forget to add a 0 place holder!

Example 3

I need 10l of water. I can only buy 300ml bottles. How many bottles do I need to buy?

$$10\text{l} = 10,000\text{ml}$$

$$10,000 \div 300 = 33.3333$$

So we need 33.333 bottles, but we can't buy 0.33 of a bottle! So we need to buy 34!

Compound Measures

Speed, Distance, Time

A car travels 200m in 30 minutes, calculate its speed in mph

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

$$\text{SPEED} = \frac{200\text{m in } 30\text{ mins}}{0.5\text{ hours}} = 400\text{mph}$$

It takes Ryan 12 minutes to travel 15km, what is his average speed in km/h?

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

$$\text{SPEED} = \frac{15}{0.2}$$

$$\text{SPEED} = 75\text{km/h}$$

notice this says km/h. Our time is in minutes right now! 12 minutes is 0.2 of an hour, so instead of 12 mins, we write time as 0.2 hours



Density, Mass, Volume

Density is a way of looking at the amount of mass contained in a certain volume

The standard units are kg/m^3 or g/cm^3

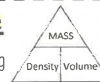
The density of air is 13kg/m^3 . Calculate the mass of a balloon which holds 0.0035m^3 of air

$$\text{MASS} = \text{DENSITY} \times \text{VOLUME}$$

$$\text{MASS} = 13 \times 0.0035$$

$$\text{MASS} = 0.00455\text{kg}$$

we know the units must be kg as the density is given in kg/m^3



Pressure, Force, Area

Pressure indicates the amount of force being exerted per unit area

A box is placed on a table and exerts a force of 200N on an area of 40cm^2 . Find the pressure

$$\text{PRESSURE} = \frac{\text{FORCE}}{\text{AREA}}$$

$$\text{PRESSURE} = \frac{200}{40}$$

$$\text{PRESSURE} = 5\text{N/cm}^2$$

$$\text{PRESSURE} = 5\text{N/cm}^2$$

N = newtons

