Year 9 - Mathematics . . .

Milestone Assessment 1

Speak Like a Mathematician

Fraction - How many parts of a whole we have

Whole - A number with no fractional or decimal part

Substitute - Putting numbers where letters are - replacing numbers into a formula

Percent - Parts per 100 - written using the % symbol

Equivalent - Of equal value.

Reduce - To make smaller in value.

Growth - To increase/ to grow

Exponent - How many times we use a number in multiplication. It is written as a power

Compound interest - Calculating interest on both the amount plus previous interest

Depreciation - A decrease in the value of something over time

Fraction midpoint

Find midpoint of $\frac{1}{3}$ and $\frac{2}{5}$ $= \frac{11}{30}$

1) Add the fractions

$\frac{1}{3} + \frac{2}{5} = \frac{5+6}{15} = \frac{11}{15}$

2. Divide by 2 to find the midpoint

$\frac{11}{15} \div 2$

$\frac{11}{15} \div \frac{2}{1}$ Remember to write your integer as a fraction

$\frac{11}{15} \times \frac{1}{2} = \frac{11}{30}$ Remember dividing is the same as multiplying by the reciprocal.

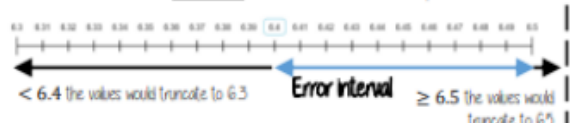
Limits of accuracy

A width **w** has been rounded to 6.4cm correct to 1dp

The error interval $6.35 \leq w < 6.45$

Any value within these limits would round to 6.4 to 1dp

A width **w** has been truncated to 6.4cm correct to 1dp



$6.4 \leq w < 6.5$ Any value within these limits would **truncate** to 6.4 to 1dp

Fraction increase / decrease

Increase 40 by $\frac{2}{5}$

1. $\frac{2}{5}$ of 40 $= 16$

(8)(8)(8)(8)(8) = 40

2. Increase 40 by 16

$40 + 16 = 56$

Decrease 15 by $\frac{1}{3}$

1. Find $\frac{1}{3}$ of 15 $= 5$

(5)(5)(5) = 15

2. Decrease 15 by 5

$15 - 5 = 10$

Fraction of a given amount

Find $\frac{2}{5}$ of £205

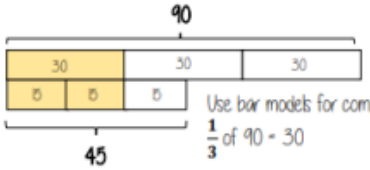
The bar represents the whole amount

2 out of the 5 equal parts

2 x £41 = **£82**

£205 ÷ 5 = £41

Each part of the bar model represents £41



Use bar models for comparisons

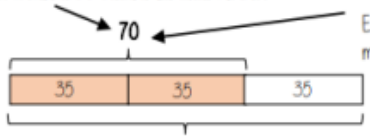
$\frac{1}{3}$ of 90 = 30

$\frac{2}{3}$ of 45 = 30

$\therefore \frac{1}{3}$ of 90 = $\frac{2}{3}$ of 45

Use a fraction of amount

$\frac{2}{3}$ of a value is 70. What is the whole number?



70 ÷ 2 = 35

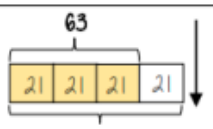
Each part of the bar model represents 35

35 x 3 = 105

The whole number is 105

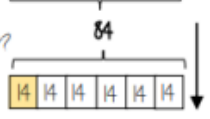
The wording of the question is important to setting up the bar model

$\frac{3}{4}$ of a number is 63



Find the whole

What is $\frac{1}{6}$ of the number?



Use the whole to find a given part

-14

Speed, Distance, Time

minutes ⇄ hours: ÷ 60 / × 60

Before calculations – make sure you are working in the same units as the speed

Learn or learn how to rearrange the formular for speed, distance and time

Substitute in the variables given

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

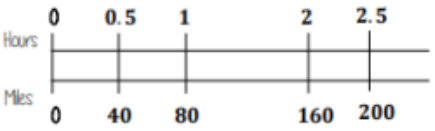
$$\text{distance} = \text{speed} \times \text{time}$$

Speed, Distance, Time

"per" for every
e.g. 80 miles per hour (mph)
Travel 80 miles every hour

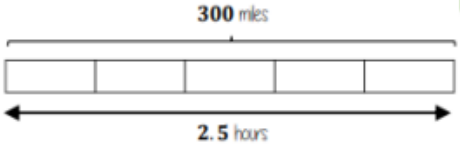
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

You can use a double number line to help you calculate distance



e.g. A boat travels at a constant speed for 2.5 hours
It travels 300 miles

Bar models can help to calculate mph



Each part is half an hour
Each part is 60 miles

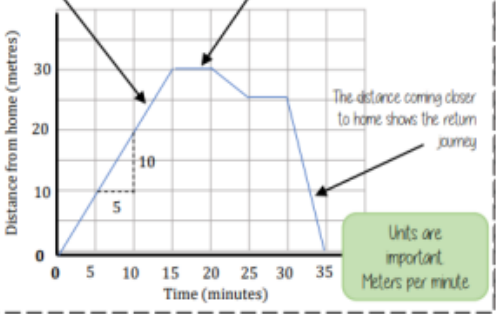
Distance – Time graphs

Gradient = speed

The steeper a gradient, the faster the speed

$\frac{10}{5}$ = 2 metres per min

Horizontal lines represent staying still



The distance coming closer to home shows the return journey

Units are important. Meters per minute

Reverse Percentages

40% of my number is 16. What am I thinking of?

140% of my number is 84. What is the original number?

40% = 16
10% = 4
100% = 40

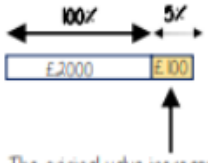
Try to scale down to 10% or 1% and then scale back up to 100%

140% = 84
10% = 6
100% = 60

Simple and compound interest

Simple Interest

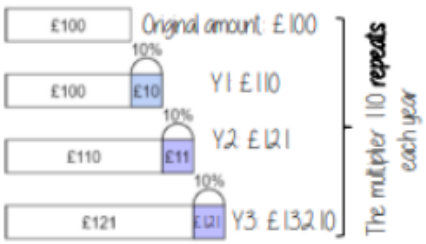
James invests £2000 at 5% simple interest



The original value increases by this amount every year

Compound Interest

Tess invests £100 at 10% compound interest for 3 years



The multiplier 110 repeats each year

Repeated percentage change

Compound Interest

Tess invests £100 at 10% compound interest for 3 years

£100 × 110 × 110 × 110

£100 × 110 ³

Original amount / Repeated multiplier / Number of occurrences

Depreciation

Depreciation calculations use multipliers **less than** 1

Multipliers are commutative – an overall multiplier effect can be calculated by combining the multipliers separately

e.g. Increase of 10% then a reduction of 10%

× 110 × 0.9 = × 0.99 The multiplier

Growth and decay

Compound growth | Compound decay

Compound growth and compound decay are exponential graphs

Decay – the values get closer to 0
The constant multiplier is less than one

Growth – the values increase exponentially
The constant multiplier is more than one

Year 9 - Mathematics . . .

Milestone Assessment 2

Speak Like a Mathematician

Frequency - The number of times a data value occurs

Sector - Part of a circle made by two radii touching the centre

Protractor - Equipment used to measure angles

Fraction - Represents how many parts of a whole.

Ratio - A statement of how two numbers compare

Equal Parts - All parts in the same proportion, or a whole shared equally

Scale - The comparison of something drawn to its actual size.

Enlarge - To make a shape bigger (or smaller) by a given multiplier

Scale Factor - The multiplier of enlargement

Centre of enlargement - The point the shape is enlarged from

Similar - When one shape can become another with a reflection, rotation, enlargement or translation.

Congruent - The same size and shape

Bearing - The angle in degrees measured clockwise from North.

Simple pie charts

A pie chart has 360° so all FDP calculations are out of 360

Split into 10 parts = 10% = 36°

Split into 2 parts = 50% = 180°

Split into 5 parts = 20% = 72°

Ratio and scale (R)

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

The car image is 10cm

Image	Real life
1cm	30cm
10cm	300cm

(×10 / ×10)

Ratios and fraction (R)

Trees: Flowers

3 : 7

Ratio

Fraction of trees

$$\frac{\text{Number of parts of in group}}{\text{Total number of parts}} \quad \frac{3}{10}$$

Fraction

Draw and interpret Pie Charts (R)

Remember a circle has 360°

Type of pet	Dog	Cat	Hamster
Frequency	32	25	3

There were 60 people asked in this survey (Total frequency)

$\frac{32}{60}$ "32 out of 60 people had a dog"

This fraction of the 360 degrees represents dogs

$\frac{32}{60} \times 360 = 192°$

Use a protractor to draw This is 192°

Multiple method

Ds 60 goes into 360 – 6 times

Each frequency can be multiplied by 6 to find the degrees (proportion of 360)

Represents quantitative, discrete data

Best buys

	4 pens costs £2.60	10 pens costs £6.00
"1 pen costs..."	£2.60 ÷ 4 = **£0.65**	£6.00 ÷ 10 = **£0.60**
"1 pound buys..."	4 ÷ 2.60 = **1.54 pens**	10 ÷ 6 = **1.67 pens**

You could work out how much 40 pens are and then compare

Compare the solution in the context of the question

The best value has the lowest cost "per pen"

The best value means £1 buys you more pens

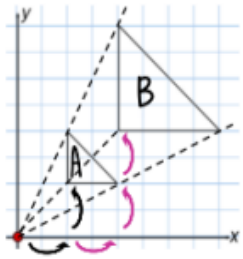
Positive scale factors (R)

Enlargement from a point

Enlarge shape A by SF 2 from (0,0)

The shape is enlarged by 2

The distance from the point enlarges by 2



Standard form

Any integer

Any number between 1 and less than 10

$$A \times 10^{n}$$

0.001
1 x $\frac{1}{1000}$
1 x 10^{-3}

10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
10^{1}	10^{0}	10^{-1}	10^{-2}	10^{-3}
10	1	0.1	0.01	0.001

Any value to the power 0 always = 1

Negative powers do not indicate negative solutions

Example

3.2 x 10^{4}
= 3.2 x 10 x 10 x 10 x 10
= 32000

Non-example

0.8 x 10^{4}

5.3 x 10^{07}

Numbers in standard form with negative powers will be less than 1

3.2 x 10^{-4} = 3.2 x $\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$ = 0.00032

Scale drawings

1 : 20

For every 1cm on the model there are 20cm in real life

Remember: Scale drawings ONLY change lengths and distances. Angles remain the same

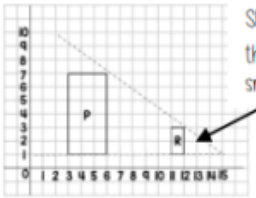
Directions

Clockwise Anti-Clockwise

Fractional scale factors

Fractions less than 1 make a shape SMALLER

R is an enlargement of P by a scale factor $\frac{1}{3}$ from centre of enlargement (15, 1)

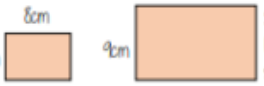


SF $\frac{1}{3}$ - R is three times smaller than P

Identify similar shapes

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

Similar shapes



Scale Factor
Both sides on the bigger shape are 1.5 times bigger

Compare sides: 6 : 9 = **2 : 3** 8 : 12 = **2 : 3**

Both sets of sides are in the same ratio

Standard form calculations

Addition and Subtraction

Tip: Convert into ordinary numbers first and back to standard from at the end

$$6 \times 10^{5} + 8 \times 10^{5}$$

Method 1

= 600000 + 800000
= 1400000
= **1.4 x 10^{6}**

This is not the final answer

Method 2

= (6 + 8) x 10^{5}
= 14 x 10^{5}
= 1.4 x 10^{1} x 10^{5}
= **1.4 x 10^{6}**

Multiplication and division

$\frac{1.5 \times 10^{5}}{0.3 \times 10^{3}}$ Division questions can look like this

(1.5 x 10^{5}) ÷ (0.3 x 10^{3})

(1.5 - 0.3) x 10^{5} - 10^{3}

= **5 x 10^{2}**

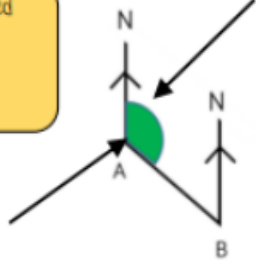
For multiplication and division you can look at the values for A and the powers of 10 as two separate calculations

Understand and represent bearings

- A bearing is always measured from **NORTH**
- It is always given as three figures

The angle indicated starts from the North line at A and joins the path connecting A to B

This angle shows the bearing of **B from A**



The bearing of B from A is calculated by measuring the highlighted angle

Using **estimation** it is clear this angle is between 090° and 180°

The sentence... "Bearing of ____ from _____" is really important in identifying the bearing being represented

Measure and read bearings

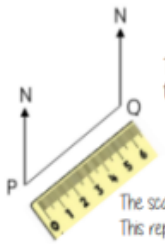
The bearing of the cow to the barn

This angle is measured from **NORTH**
It is measured in a clockwise direction
Estimation indicates this angle is between 180° and 270°
Use a protractor to measure accurately
Remember bearings are written as three figures

The auxiliary line is drawn to help you measure and draw the angle that is measured to represent the bearing

Scale drawings using bearings

Remember – angles **DO NOT** change size in scaled drawings



The bearing measurements do not change from "real life" to images

The units in the ratio scale are the same

The scale may need to be calculated from the image
This represents 30km from P to Q

6cm - 30km
1:3,000,000