Year 10 DEVELOPING ALGEBRA...

What do I need to be able to do:

By the end of this unit, you will:

- Form and solve linear equations
- Solve two-step equations
- Solve inequalities and equations with unknowns on one/both sides
- Plot and interpret straight line graphs
- Understand and use y=mx+c

Keywords:

Equation: A mathematical statement that two things are equal

Solution: The set or value that satisfies the equation

Inverse: The operation that undoes what was done by the previous operation (the opposite operation)

Term: A single number or variable

Gradient: The steepness of a line

Intercept: Where two lines meet. The y-intercept is where a line crosses the y-axis

Inequality: an inequality compares values, showing if one is greater than, less than or equal to another

y = mx + c

The **coefficient** of x (the number in front of x) tells us the gradient of the line

$y = mx + c$

The value of **c** is the point at which the line crosses the y-axis **Y intercept**

y and x are **coordinates**

The equation of a line can be rearranged. E.g

$y = c + mx$

$c = y - mx$

Identify which coefficient you are identifying or comparing

Inequalities with unknown on both sides

Solving inequalities has the same method as equations

$5(x + 4) < 3(x + 2)$

$5x + 20 < 3x + 6$

$2x + 20 < 6$

$2x < -14$

$x < -7$

Check it!

$5(-8 + 4) < 3(-8 + 2)$

$5(-4) < 3(-6)$

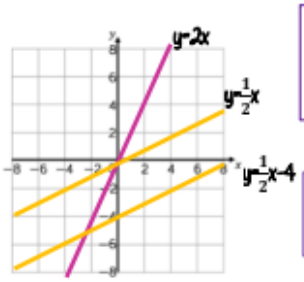
$-20 < -18$

✓ -20 IS smaller than -18

Compare Gradients

$y = mx + c$

The **coefficient** of x (the number in front of x) tells us the gradient of the line



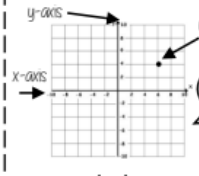
The **greater** the gradient – the **steeper** the line

Parallel lines have the **same** gradient

Positive gradients

Negative gradients

Coordinates in four quadrants



Coordinate (x, y) (6, 4)

From the origin this coordinate is 6 places along the positive x axis and 4 places up the positive y axis

(x, y)

Always the position on the x axis first

Always the position on the y axis second

(0, a) Will be always be a point on the y axis (a can be any number)

(a, 0) Will be always be a point on the x axis (a can be any number)

Equations with unknown on both sides

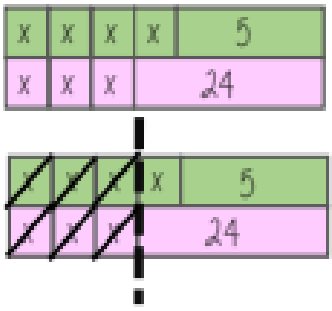
$4x + 5 = 3x + 24$

$-3x \quad -3x$

$x + 5 = 24$

$-5 \quad -5$

$x = 19$



Solve one step equations (x/+)

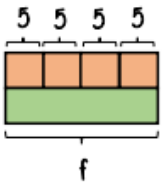
$\frac{f}{4} = 5$

$f \div 4 = 5$

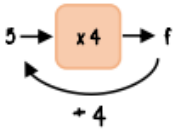
$f - 5 = 4$

$5 \times 4 = f$

$4 \times 5 = f$



Don't forget you know how to use function machines



Solve one step equations (+/-)

There is more to this than just spotting the answer

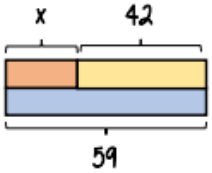
$x + 42 = 59$

$x + 42 = 59$

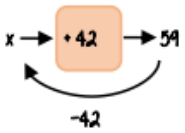
$42 + x = 59$

$59 - x = 42$

$59 - 42 = x$



Don't forget you know how to use function machines



Year 10 DEVELOPING NUMBER...

What do I need to be able to do:

By the end of this unit, you will:

- Write numbers in standard form and as ordinary numbers
- Use the four operations for integers and decimals.
- Rounding to significant figures and decimal places
- Calculating in standard form

Keywords:

Standard (index) Form: A system of writing very big or very small numbers

Base: The number that gets multiplied by a power

Power: The exponent – or the number that tells you how many times to use the number in the multiplication

Integer: A whole number that is positive or negative

Factor: Integers that multiply together to get another number

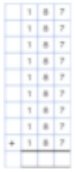
Multiple: Found my multiplying any number by positive integers

Square Root: A number that can be multiplied by itself to give a square number

Multiplication methods

Long multiplication (column)

Grid method



Repeated addition

Less effective method especially for bigger multiplication

Multiplication with decimals

Perform multiplications as integers
eg 0.2 x 0.3 → 2 x 3

Make **adjustments** to your answer to match the question: 0.2 x 10 = 2
0.3 x 10 = 3
Therefore 6 ÷ 100 = **0.06**

Estimations: Using estimations allows a 'check' if your answer is reasonable

Division methods

3584 ÷ 7 = **512**

Short division

$$7\overline{)3\,^{3}5\;8\;^{1}4} \quad 5\;1\;2$$

Complex division

÷ 24 = ÷ **6** ÷ **4**

Break up the divisor using factors

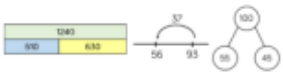
Division with decimals

The placeholder in division methods is essential – the decimal lines up on the dividend and the quotient

24 ÷ 0.02 → 24 ÷ 0.2 → 240 ÷ 2

All give the same solution as represent the same proportion
Multiply the values in proportion until the divisor becomes an integer

Addition/ Subtraction with integers



Modelling methods for addition/ subtraction
- Bar models
- Number lines
- Part/ Whole diagrams

Addition is commutative

6 + 3 = 3 + 6

The order of addition does not change the result

Subtraction the order has to stay the same

360 – 147 = 360 – 100 – 40 – 7

- Number lines help for addition and subtraction
- Working in 10's first aids mental addition/ subtraction
- Show your relationships by writing fact families

Formal written methods

	H	T	O
	1	8	7
+	5	4	2

	H	T	O
	4	2	7
−	2	4	9

Remember the place value of each column
You may need to move 10 ones to the ones column to be able to subtract

Addition/ Subtraction with decimals

4	.	3	8	
7	.	9	0	+

0 can be used to fill empty places with value

The decimal place acts as the placeholder and aligns the other values

If ▢ represents 1 instead of 100

$5.43 + \frac{8}{10}$

Revisit Fraction – Decimal equivalence
5.43 + 0.8

Using a calculator

14 x 10^5 x 3.9 x 10^3

Use a calculator to work out this question to a suitable degree of accuracy

Input 14 and press [×10^x] Then press 5 (for the power)
Press [×]
Input 3.9 and press [×10^x] Then press 3 (for the power)
Press [=]

This gives you the solution

Click calculator for video tutorial

To put into standard form and a suitable degree of accuracy

Press [SHIFT] [SETUP] and then press 7 for sci mode
Choose a degree of accuracy so in most cases press 2

Answer: 5.5 x 10^8

Standard form with numbers > 1

Any number between 1 and less than 10 — $A \times 10^n$ — Any integer

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 $10^{0.7}$

Negative powers of 10

0.001	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
$1 \times \frac{1}{1000}$	10^1	10^0	10^{-1}	10^{-2}	10^{-3}
1×10^{-3}	0	0	0	0	1

Any value to the power 0 always = 1

Negative powers do not indicate negative solutions

Rounding R

2.46192 (to 2dp) – Is this closer to 2.46 or 2.47

2.46 | 192

2.46 | 2.47

This shows the number is closer to 2.46

Significant Figures

370 to 1 significant figure is 400
37 to 1 significant figure is 40
3.7 to 1 significant figure is 4
0.37 to 1 significant figure is 0.4
0.00000037 to 1 significant figure is 0.00000004

SF: Round to the first nonzero number

Year 10 PROPORTIONAL REASONING...

What do I need to be able to do:

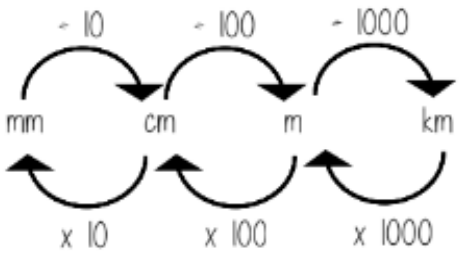
By the end of this unit, you will:

- Interpret scales using maps
- Convert between different currencies
- Use and Interpret conversion
- Calculate Speed, Distance & Time

Keywords:

Convert: change
Scale Factor: the multiple that increases/decreases a shape in size
Currency: the system of money used in a particular country
Scale: the comparison of something drawn to its actual scale
Substitute: putting numbers where letters are – numbers into a formula

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

Conversion between currencies

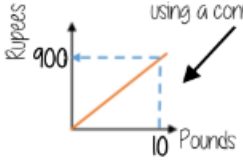
£1 = 90 Rupees ← Currency is directly proportional

For every £1 I have 90 Rupees

£1 = 90 Rupees (x 10 / x 10)

£10 = 900 Rupees

Currency can be converted using a conversion graph



Convert 630 Rupees into Pounds

£1 = 90 Rupees (x 7 / x 7)

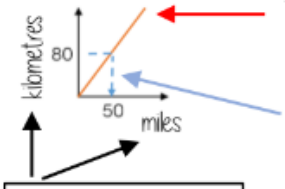
630 ÷ 90 = 7

£7 = 630 Rupees

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

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

Speed, Distance, Time

minutes ÷ 60 hours × 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

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

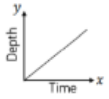
$$\text{distance} = \text{speed} \times \text{time}$$

Substitute in the variables given

Flow problems & graphs

This will fill at a constant rate, then as the space decreases it will speed up and the neck of the bottle fill at a faster constant speed

The cylinder will fill at a constant speed



Units are important
Ensure any volume calculations are the same unit as the rate of flow