My mathematical journey

What do I need to remember from before?
Number lines (NP1, 2, 3, and 6)
Decimals (NP1, 2, and 3)
Fractions (NP7)
Finding a fraction of a number (NP7)

What will I learn about in this unit?
Equivalent fractions, decimals and percentages
Terminating and recurring decimals
Working with percentages

Where does this lead?
Proportional reasoning (NP10)
Contextual graphs (A9)
Percentage change (NP10, NP13)
Recurring decimals to fractions (NP14)

Key words and symbols: what I need to say and write accurately

$$32\% \text{ means } \frac{32}{100}$$

"percent" means "out of 100"

A **terminating decimal** has a finite (fixed) number of decimal places, e.g. **0.215** e.g. **0.3**

A **recurring decimal** has an infinite number of decimal places and its digits have a repeating pattern. The **repetend** is the repeating part. We use dots to show the start and end of the repetend.
e.g. $0.333333333 \ldots = 0.\dot{3}$
e.g. $0.804804804 \ldots = 0.\dot{8}0\dot{4}$

Fingertip facts: what I need to learn by heart

Tenths and fifths:

Fraction	$\frac{1}{10}$	$\frac{2}{10} = \frac{1}{5}$	$\frac{3}{10}$	$\frac{4}{10} = \frac{2}{5}$	$\frac{5}{10} = \frac{1}{2}$	$\frac{6}{10} = \frac{3}{5}$	$\frac{7}{10}$	$\frac{8}{10} = \frac{4}{5}$	$\frac{9}{10}$	$\frac{10}{10} = 1$
Decimal	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Percentage	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Eighths and quarters:

Fraction	$\frac{1}{8}$	$\frac{2}{8} = \frac{1}{4}$	$\frac{3}{8}$	$\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$	$\frac{5}{8}$	$\frac{6}{8} = \frac{3}{4}$	$\frac{7}{8}$	$\frac{8}{8} = \frac{4}{4} = \frac{2}{2} = 1$
Decimal	0.125	0.25	0.375	0.5	0.625	0.75	0.875	1
Percentage	12.5%	25%	37.5%	50%	62.5%	75%	87.5%	100%

Ninths and thirds:

Fraction	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9} = \frac{1}{3}$	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9} = \frac{2}{3}$	$\frac{7}{9}$	$\frac{8}{9}$	$\frac{9}{9} = 1$
Decimal	$0.\dot{1}$	$0.\dot{2}$	$0.\dot{3}$	$0.\dot{4}$	$0.\dot{5}$	$0.\dot{6}$	$0.\dot{7}$	$0.\dot{8}$	$0.\dot{9} = 1$
Percentage	$11.\dot{1}\%$	$22.\dot{2}\%$	$33.\dot{3}\%$	$44.\dot{4}\%$	$55.\dot{5}\%$	$66.\dot{6}\%$	$77.\dot{7}\%$	$88.\dot{8}\%$	$99.\dot{9}\% = 100\%$

My mathematical journey

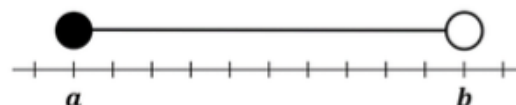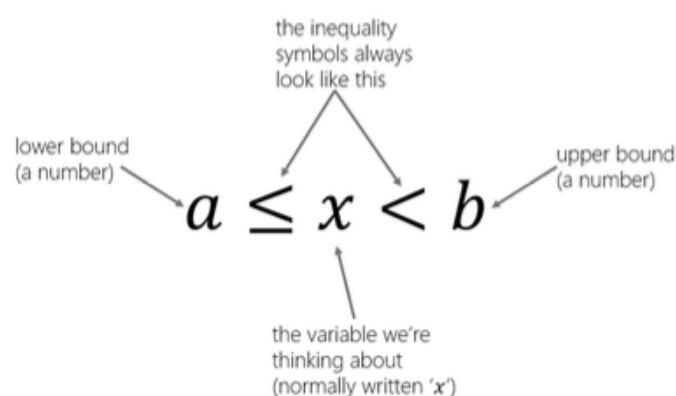| What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Number lines: single and double (NP1 – NP8) Approximating numbers (NP1 – NP7) Inequalities (NP1) Fractions (NP7) Directed numbers (NP6)	Using my calculator accurately and efficiently Approximating numbers Estimating answers to calculations Error intervals for rounding Truncation	Solving complex problems using the calculator (all future units) Checking answers by estimating (all future units) Problems with bounds (NP14)

Key words and symbols: what I need to say and write accurately

- An **error interval** uses inequalities to show the range of values a number could be. We can show it with inequalities *and* on a number line.

the inequality symbols always look like this

lower bound (a number)

upper bound (a number)

$$a \leq x < b$$

the variable we're thinking about (normally written 'x')

- A **surd** is a root that does not have an integer or fraction answer, such as $\sqrt{2}$ or $\sqrt[3]{10}$.

Symbol	≈	<	≤	>	≥
How to read it	is approximately equal to	is less than	is less than or equal to	is greater than	is greater than or equal to

Fingertip facts: what I need to learn by heart

Time frame conversions		Days in the months	
1 minute = 60 seconds		January:	31 days
1 hour	= 60 minutes	February:	28 days (and 29 days in a leap year)
1 day	= 24 hours	March:	31 days
1 week	= 7 days	April:	30 days
		May:	31 days
1 year	= 52 weeks	June:	30 days
		July:	31 days
1 year	= 365 days	August:	31 days
		September:	30 days
1 leap year	= 366 days	October:	31 days
		November:	30 days
		December:	31 days

My mathematical journey

What do I need to remember from before?
Repeated multiplications and exponents (NP4)
Directed numbers (NP6)
Expressions (A1)

What will I learn about in this unit?
Adding and subtracting expressions
Multiplying and dividing expressions
Index laws
Forming expressions

Where does this lead?
Expanding and factorising brackets (A3)
Solving equations (A4)
Sequences (A7)
Quadratic expressions (A11)
Indices and surds (NP15)

Key words and symbols: what I need to say and write accurately

Word	Explanation
variable	a number that can change its value, represented by a letter such as x or a green tile
constant	a number that does not change, is fixed
operation	something that takes input numbers and turns them into output numbers, such as addition (including subtraction), multiplication (including division), exponentiation (including roots)
expression	a collection of constants, variables and operations e.g. $4x$, $2p - 5$ and $x^2 + 3x + 6$ are all expressions
term	the parts of an expression separated by $+$ or $-$. e.g. in the expression $4x - \frac{1}{2}y$, the terms are $4x$ and $\frac{1}{2}y$

Fingertip facts: what I need to learn by heart
The index laws

1. When we <u>multiply</u> powers with the <u>same base</u>, we can <u>add their exponents</u>.

$$x^7 \cdot x^3 = x^{10}$$

2. When we <u>divide</u> powers with the <u>same base</u>, we can <u>subtract their exponents</u>.

$$\frac{x^7}{x^3} = x^4$$

3. When we find a <u>power of a power</u>, we can <u>multiply the exponents together</u>.

$$(x^2)^3 = x^6$$

My mathematical journey

What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Lines and angles (KS2) Measuring (KS2)	Labelling lines and angles Drawing and measuring lines and angles Using compasses and a protractor Constructions and loci	Polygons and angles (GM2) Congruence and similarity (GM4) Advanced drawing, measuring and constructing (GM7)

Key words and symbols: what I need to say and write accurately

Word	Explanation
point	A point has no length or width (it exists in no dimensions, or 0D)
line	A line has infinite length and no width (it exists in one dimension, or 1D). We use arrows to show its infinity in both directions.
ray	A ray is a section of a line with a starting point that continues infinitely in one direction. We use an arrow to show its infinity in one direction.
line segment	A line segment is a section of a line with a starting point and an end point.
construct	We construct when we only uses our compasses and straight edge (like a ruler).
bisector	'Bisect' means 'cut in half'. A bisector is a line that cuts another in half.
perpendicular	Perpendicular lines meet at a right angle.
equidistant	Equidistant means an equal distance from two points or lines.
locus (pl. loci)	The path of all points that fit a condition.

Angle types:

Acute $0° < \theta < 90°$	Right $90° = \theta$	Obtuse $90° < \theta < 180°$	Straight $180° = \theta$	Reflex $180° < \theta < 360°$	Full turn $360° = \theta$

Greek letters:

α (alpha)　　　　β (beta)　　　　γ (gamma)　　　　θ (theta)

Fingertip facts: what I need to learn by heart

You will need to learn the constructions for:

1. a perpendicular bisector
2. an angle bisector
3. a perpendicular from a point on a line
4. a perpendicular from a point near a line

My mathematical journey

What do I need to remember from before?
Area models for multiplication (NP3)
Collecting like terms (A2)

What will I learn about in this unit?
Expanding expressions with brackets
Factorising expressions as the opposite of expanding
Expanding two brackets

Where does this lead?
Solving equations (A4)
Formulae (A5)
Inequalities (A8)
Quadratic expressions (A11)

Key words and symbols: what I need to say and write accurately

Word	Explanation
variable	a number that can change its value, represented by a letter such as x or a green tile
constant	a number that does not change, is fixed
operation	something that takes input numbers and turns them into output numbers, such as addition (including subtraction), multiplication (including division), exponentiation (including roots)
expression	a collection of constants, variables and operations e.g. $4x$, $2p - 5$ and $x^2 + 3x + 6$ are all expressions
term	the parts of an expression separated by $+$ or $-$. e.g. in the expression $4x - \frac{1}{2}y$, the terms are $4x$ and $\frac{1}{2}y$
expand	write an expression containing brackets *without* the brackets, by multiplying e.g. $2(x - 5) = 2x - 10$
factorise	write an expression without brackets as a multiplication *with* brackets e.g. $2x - 10 = 2(x - 5)$

My mathematical journey

What do I need to remember from before?

Equality & inverse operations (NP2, NP3, NP4)

Solving equations (A1)

Simplifying expressions (A2)

Expanding brackets (A3)

What will I learn about in this unit?

Mathematical equality

Balancing an equation

Solving all types of linear equations

Where does this lead?

Rearranging formulae (A5)

Equations of a line (A6)

Quadratic equations (A12)

Using equations to solve geometry and probability problems (GM2 – GM11, SP7)

Key words and symbols: what I need to say and write accurately

Word	Explanation
unknown	a number that we do not know, represented by a letter
expression	a collection of constants, variables and operations e.g. $4x$, $2p - 5$ and $x^2 + 3x + 6$ are all expressions
equation	when we write two expressions equal to one another e.g. $2 + 3 = 5$, $2x + 3 = 5$ and $2x + 3 = 5x - 6$ are all equations
term	the parts of an expression separated by $+$ or $-$ e.g. in the expression $4x - \frac{1}{2}y$, the terms are $4x$ and $\frac{1}{2}y$
solve	when we solve an equation, we find out what the value of the unknown is

Fingertip facts: what I need to learn by heart

An equation must always be balanced: whatever we do to one side we must also do to the other.

My mathematical journey

What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Multiplicative reasoning (NP3) Fractions (NP7) Double number lines and ratio tables (NP8) Percentages (NP8)	Direct and inverse proportion Proportional reasoning in various contexts Percentage changes and decimal multipliers	Ratio (NP11) Advanced proportion and rates of change (NP13) Contextual graphs (A9) Probability (SP3)

Key words and symbols: what I need to say and write accurately

If two quantities are in **direct proportion**, the following two facts are true:

- There is a multiplicative relationship between them (e.g. if one doubles, the other doubles).
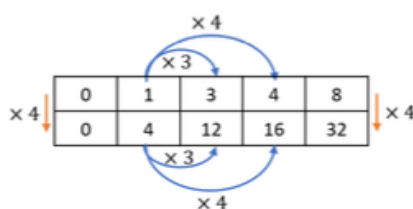- If one is 0, the other is 0.

If two quantities are in **inverse proportion**, the following fact is true:

- There is an inverse multiplicative relationship between them (e.g. if one doubles, the other halves).

A **double number line** shows a multiplicative relationship.
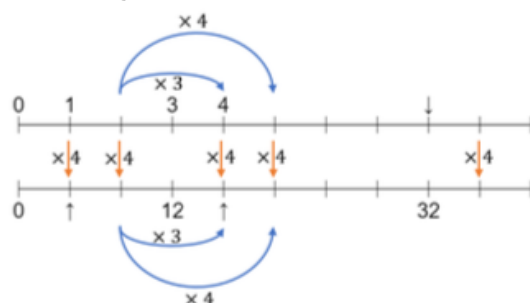
A **ratio table** shows a multiplicative relationship, like a double number line but without the scale.

(Notice how both these diagrams show the same information.)

Fingertip facts: what I need to learn by heart

- When working with direct or inverse proportion, I can only multiply or divide.

- To increase a quantity by a percentage, I add the percentage onto 100%, convert this to a decimal and multiply.
  - e.g. To increase £40 by 12%, I find 100% + 12% = 112% = 1.12 and calculate £40 × 1.12

- To decrease a quantity by a percentage, I subtract the percentage from 100%, convert this to a decimal and multiply.
  - e.g. To decrease £40 by 12%, I find 100% − 12% = 88% = 0.88 and calculate £40 × 0.88

My mathematical journey

What do I need to remember from before?

Measuring and drawing angles (Key Stage 2, GM1)

Basic angle facts (NP2)

What will I learn about in this unit?

Angle facts about lines and polygons

Types of quadrilaterals and other polygons

Bearings

Where does this lead?

Congruence and similarity (GM4)

Trigonometry (GM5, GM9)

Solving geometric problems, including circle theorems (GM6, GM7, GM11)

Key words and symbols: what I need to say and write accurately

A vertex (plural, vertices) is made when two lines meet. Sometimes called a corner.

Lines: vertical, horizontal, parallel, perpendicular, oblique

Angles: acute, obtuse, reflex, alternate, corresponding, interior

Triangles: scalene, isosceles, equilateral

Quadrilaterals: square, rectangle, parallelogram, rhombus, (isosceles) trapezium, kite, arrowhead

Polygons: triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon

Symmetry can be reflective or rotational

Fingertip facts: what I need to learn by heart

Polygon	Number of sides	Interior angle sum
Triangle	3	180°
Quadrilateral	4	360°
Pentagon	5	540°
Hexagon	6	720°
Heptagon	7	900°
Octagon	8	1080°
Nonagon	9	1260°
Decagon	10	1440°

Notice that the interior angle sum increases by 180° each time.

Angle facts

- Adjacent angles on a straight line sum to 180°.
- Angles around a point sum to 360°.
- Vertically opposite angles are equal.
- Angles in parallel lines on alternate or corresponding sides of the transversal are equal.
- Three-figure bearings are measured clockwise starting from north.

My mathematical journey

What do I need to remember from before?

Bar charts and pictograms (KS2)

Median (NP1)

Mean (NP2)

Range (NP2)

What will I learn about in this unit?

Presenting and analysing sets of discrete data using charts and summary statistics – mean, mode, median, and range

Comparing data sets through charts and summary statistics

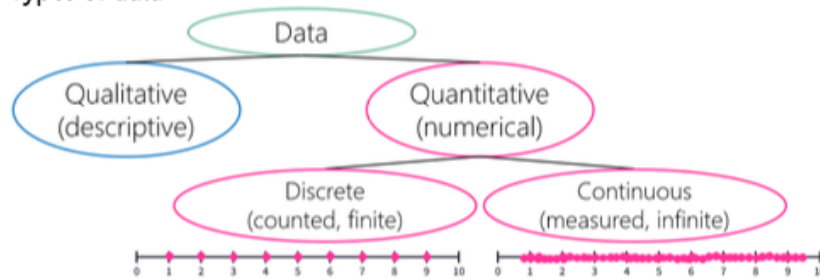Knowing the ways statistics can be used to tell a story

Where does this lead?

Presenting, analysing and comparing sets of continuous data, or bivariate data using charts and summary statistics (SP2, SP4, SP6)

Advanced statistical analysis (GCSE Statistics; A Level Statistics)

Key words and symbols: what I need to say and write accurately

Types of data

Bias: when one answer is more likely than another because of the people we ask

Set notation: a set of numbers can be written inside curly brackets, e.g. $\{1, 3, 3, 5\}$

$\bar{x}$ is a symbol for the mean of a data set

Measures of location
(trying to capture where the data set is)

Mean
total shared equally

Median
middle data point

Mode
most frequent data point

Measures of spread
(trying to capture how wide the data set it)

Range
spread of all data points

Fingertip facts: what I need to learn by heart
Common fractions of a circle

$\frac{1}{4} = 25\%$

$\frac{1}{12} \approx 8.3\%$

$\frac{1}{6} \approx 16.7\%$

$\frac{1}{2} = 50\%$

$\frac{1}{3} \approx 33.3\%$

$\frac{2}{3} \approx 66.7\%$

The statistical enquiry cycle

Ask a question

Collect some data

Analyse the data

Interpret the data

My mathematical journey

What do I need to remember from before?

Multiplication and division; multiples and factors (NP3)

Writing values as a fraction; equivalent fractions (NP7)

Ratio tables (NP10)

What will I learn about in this unit?

Using ratio notation

Equivalent ratios and simplifying

Ratios and fractions

Finding values from parts or the whole

Where does this lead?

Combining ratios (NP13)
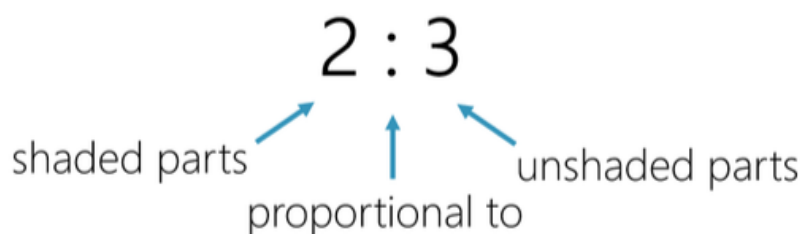
Similar area and volume (GM8)

Geometric sequences (A13)

Advanced ratio (NP16)

Vectors (GM10)

## Key words and symbols: what I need to say and write accurately

A <u>ratio</u> describes the <u>multiplicative relationship</u> between two quantities.

$$2 : 3$$

shaded parts — proportional to — unshaded parts

We use a <u>colon</u> : to separate parts of a ratio.

Key representations

We can use <u>bar models</u> and <u>ratio tables</u> to help us solve ratio problems. These two diagrams represent the same situation.
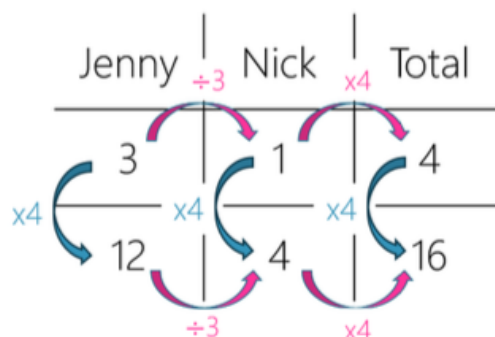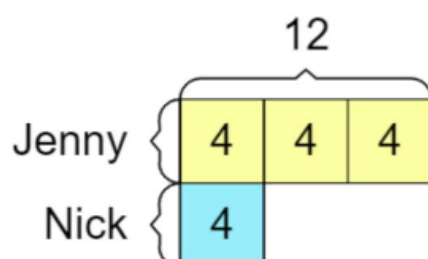
My mathematical journey

<table>
<tr><td>

What do I need to remember from before?

Arithmetic strategies (NP1, 2, 3, 4)

Order of operations (NP5)

Negative numbers (NP6)

Algebraic expressions (A1, 2, 3)

Solving equations (A4)

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What will I learn about in this unit?

Substituting numbers into expressions and formulae

Writing and using formulae

Rearranging formulae to change the subject

</td><td>

Where does this lead?

All further algebra units

Using formulae in geometry (GM3 onwards)

Advanced proportion (NP13)

Advanced probability and statistics (A Level)

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Key words and symbols: what I need to say and write accurately

Word	Explanation
variable	A letter that represents many numbers (a letter whose value can vary) e.g. x, y, θ
constant	A fixed number e.g. 2, -1.8, π
expression	A collection of any variables, constants and operations e.g. $2x + 5$, $a - b$, $3p$, $\frac{n+5}{7}$, $3 \times 4 - 2^3$
substitute	Replace a variable with a constant e.g. When $x = 3$, the value of $2x - 1$ is $2 \times 3 - 1$, or 5.
evaluate	Work out the value of a calculation. e.g. "Evaluate 2 + 3" means "Work out the value of 2 + 3."
formula (pl. formulae or formulas)	A set of instructions to work something out. A formula can be written in words, as an expression or as an equation. Here is a formula in words: Area = length × width Here is the formula as an expression: lw Here is the formula as an equation: $A = lw$
subject	The subject of a formula is the variable that is 'on its own' on one side of the equation. e.g. In the formula $A = lw$, the subject is A.
rearrange	Rearranging a formula means changing its subject. e.g. $A = lw$ can be rearranged to make l the subject: $l = \frac{A}{w}$

My mathematical journey

What do I need to remember from before?

Reading tables (SP1)

Interpreting graphs and charts (SP1)

Mean (SP1)

What will I learn about in this unit?

Drawing and reading scatter graphs

Identifying and interpreting correlations

Drawing and using lines of best fit

Drawing and reading time series graphs

Where does this lead?

Advanced data analysis (SP4, SP5)

Data analysis in geography, science, psychology, business, economics and more

Correlation and regression analysis (A Level Maths)

Key words and symbols: what I need to say and write accurately

Word	Explanation
variable	a quantity that can change in value
univariate data	data with one variable
bivariate	data with two variables
correlation	a mutual relationship between two variables, e.g. if one increases, so does the other
outlier	a value on a scatter graph that doesn't fit with the pattern of the others
line of best fit	a line on a scatter graph that shows the direction of increase/decrease and goes through the middle of the points
interpolation	making a prediction by reading values from a line of best fit inside the range of known data
extrapolation	making a prediction by reading values from a line of best fit outside the range of known data
trend	a general pattern in some data (e.g. a general decrease over time)

Fingertip facts: what I need to learn by heart

Types of linear correlation

negative correlation   no correlation   positive correlation

stronger ← → weaker   weaker ← → stronger
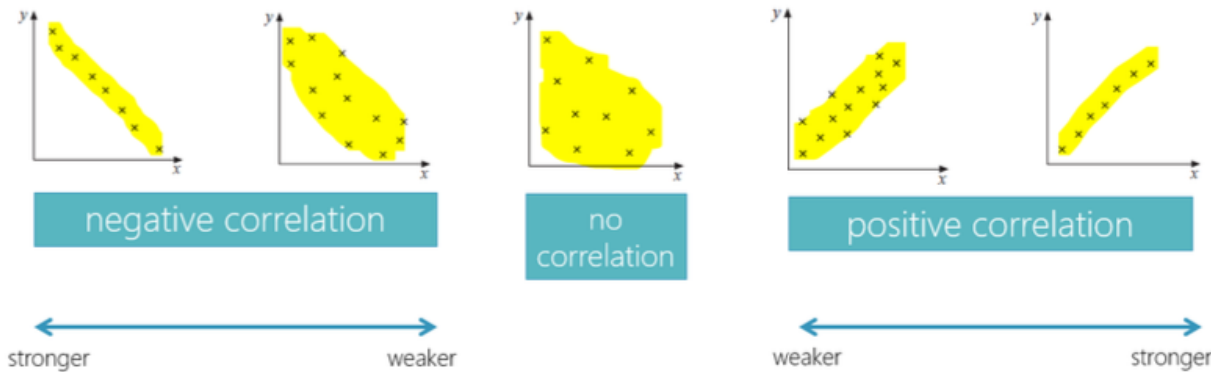
My mathematical journey

What do I need to remember from before?

Number lines (NP1, 2, 3, and 6)

Substitution (A1 and A5)

Writing expressions, equations and formulae
(A2, A3, A4 and A5)

What will I learn about in this unit?

Plotting and using coordinates

The links between graphical and algebraic representations of equations

Gradient as a measure of steepness

Where does this lead?

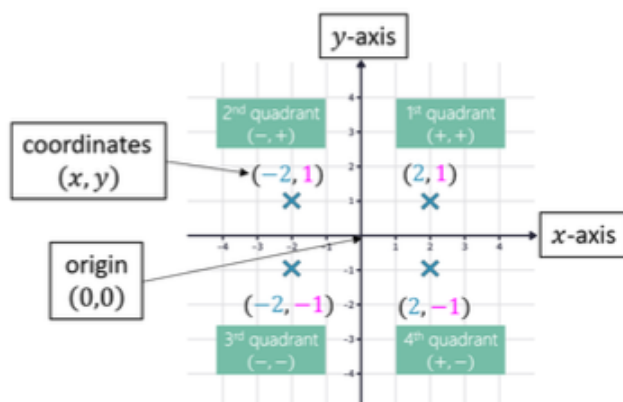Sequences (A7)

Inequalities on graphs (A8, A10)

Advanced equations of lines (A10)

Quadratic graphs (A12)

Advanced graphs (A14, A15)

Key words and symbols: what I need to say and write accurately

Word	Explanation
midpoint	the point exactly in the middle of two others
gradient	the steepness of a line
y-intercept	where a graph crosses the y-axis
x-intercept	where a graph crosses the x-axis
parallel	describing two lines that have the same gradient so will never intersect
to intersect	to cross – we say two lines intersect
simultaneously	at the same time
parabola	the name of the shape of a quadratic graph
vertex	the turning point of a quadratic graph

y-axis

2nd quadrant (−, +)   1st quadrant (+, +)

coordinates (x, y)

$(-2, 1)$ $(2, 1)$

origin $(0, 0)$

x-axis

$(-2, -1)$ $(2, -1)$

3rd quadrant (−, −)   4th quadrant (+, −)

Fingertip facts: what I need to learn by heart

The equation of any straight line can be written in the form $y = mx + c$.

The <u>coefficient</u> of x gives the <u>gradient</u>

$$y = mx + c$$

The <u>constant</u> gives the y <u>intercept</u>

The steepness of a line is its gradient.

The value of the gradient is the number of units moved vertically for every unit moved horizontally. In other words: 1 right, ____ up/down.

This line goes 1 right, 3 up, so its gradient is 3.

3

1

3

1

3

1