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 <u>error interval</u> uses inequalities to show the range of values a number could be. We can show it with inequalities *and* on a number line.
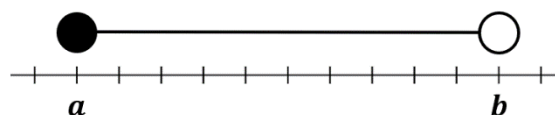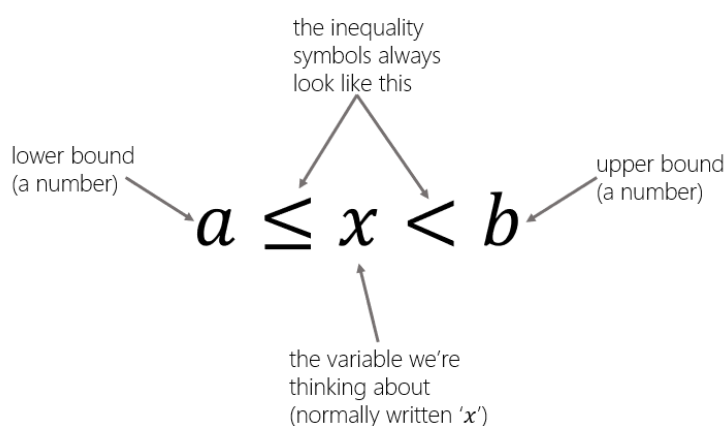
- A <u>surd</u> is a root that does not have an integer or fraction answer, such as $\sqrt{2}$ or $\sqrt[3]{10}$.

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

My mathematical journey

What do I need to remember from before?
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)
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 when we do not know its value
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	Right	Obtuse	Straight	Reflex	Full turn
$0° < \theta < 90°$	$90° = \theta$	$90° < \theta < 180°$	$180° = \theta$	$180° < \theta < 360°$	$360° = \theta$

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?	What will I learn about in this unit?	Where does this lead?
Area models for multiplication (NP3) Collecting like terms (A2)	Expanding expressions with brackets Factorising expressions as the opposite of expanding Expanding two brackets	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 when we do not know its value
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?	What will I learn about in this unit?	Where does this lead?
Equality & inverse operations (NP2, NP3, NP4) Solving equations (A1) Simplifying expressions (A2) Expanding brackets (A3)	Mathematical equality Balancing an equation Solving all types of linear equations	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).
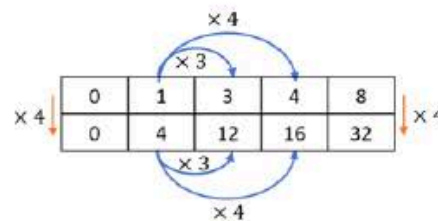- If one is 0, the other is 0.

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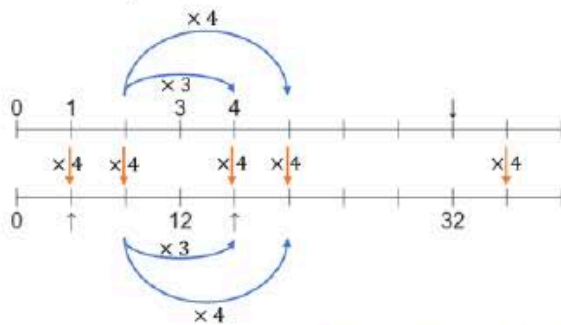
A **ratio table** shows a multiplicative relationship, like a double number line but without the scale.

(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 <u>on a straight line</u> sum to 180°.
- Angles <u>around a point</u> sum to 360°.
- <u>Vertically opposite</u> angles are equal.
- Angles in parallel lines on <u>adjacent</u> or <u>corresponding</u> 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

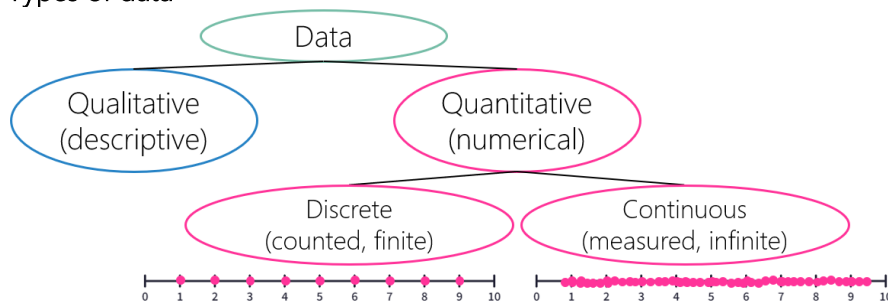Knowing the ways statistics can be used to tell a story

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

Data

Qualitative (descriptive)

Quantitative (numerical)

Discrete (counted, finite)

Continuous (measured, infinite)

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

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

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

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

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

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

$\frac{2}{3} \approx 66.7\%$
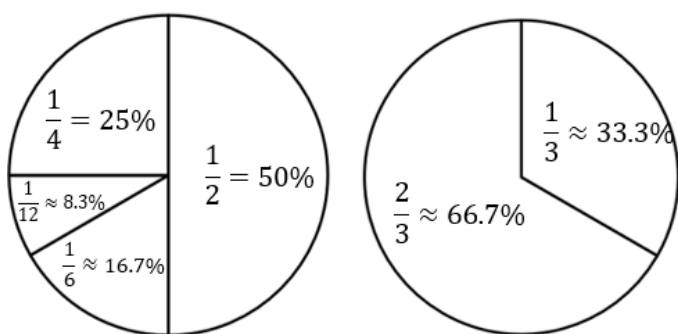
The statistical enquiry cycle

Ask a question

Collect some data

Analyse the data

Interpret the data