Key Stage 3 Mathematics

Mathematics has developed over time as a means of solving problems and also as an academic discipline to be studied for its own sake. Mathematics can stimulate moments of pleasure and Wonder, when you solve a problem for the first time, discover a more elegant solution, or notice hidden connections.

General Aim of the subject

- Become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

- **Reason mathematically** by following a line of enquiry, conjecture relationships and generalisations, and developing an argument, justification or proof using mathematical language

- Can **solve problems** ab applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering ins seeking solutions

The expectation is that the majority of pupils will move through the programs of study at broadly the same pace. However, decision about when to progress should always be based on the security of pupils understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

	Year 7	Year 8	Year 9	
1	Stage 7	Stage 8	Stage 9	**Year 7: 8 lessons**
2	Stage 7	Stage 8	Stage 9	**Year 8: 9 lessons**
3	Stage 7	Stage 8	Stage 8	**Year 9: lessons**
4	Stage 6	Stage 7	Stage 8	**Per fortnight**
5	Stage 6	Stage 7		

Build a Mathematician Assessments:

Assessment tasks to support the process of building a picture of a mathematician. These BAM tasks are ideal to consolidate intended learning, support deliberate practice sessions and/ or use as homework tasks. The carefully crafted questions have been designed to assess fluency, reasoning, problem solving and a student's ability to apply their understanding. One further questions will always focus on a misconceptions.

Mathematics overview: Stage 6

Unit	Hours	Build a Mathematician Assessments	Essential knowledge
Numbers and the number system	8	Multiply and divide numbers with up to three decimal places by 10, 100, and 1000	Know percentage and decimal equivalents for fractions with a denominator of 2, 3, 4, 5, 8 and 10
Calculating	8	Use long division to divide numbers up to four digits by a two-digit number	
Calculating: division	8		Know the rough equivalence between miles and kilometres
Visualising and constructing	8	Use simple formulae expressed in words Generate and describe linear number sequences	Know that vertically opposite angles are equal
Investigating properties of shapes	8	Use simple ratio to compare quantities Write a fraction in its lowest terms by cancelling common factors	Know that the area of a triangle = base × height ÷ 2
Algebraic proficiency: using formulae	4	Add and subtract fractions and mixed numbers with different denominators	Know that the area of a parallelogram = base × height
Exploring fractions, decimals and percentages	8	Multiply pairs of fractions in simple cases Find percentages of quantities	Know that volume is measured in cubes Know the names of parts of a circle
Proportional reasoning	4	Solve missing angle problems involving triangles, quadrilaterals, angles at a point and angles on a straight line	Know that the diameter of a circle is twice the radius
Pattern sniffing	4	Calculate the volume of cubes and cuboids	Know the conventions for a 2D coordinate grid
Measuring space	4	Use coordinates in all four quadrants	Know that mean = sum of data ÷ number of pieces of data
Investigating angles	4	Calculate and interpret the mean as an average of a set of discrete data	
Calculating fractions, decimals and percentages	12	Stage 6 BAM Progress Tracker Sheet	
Solving equations and inequalities	4		
Calculating space	8		
Checking, approximating and estimating	4		
Mathematical movement	4		
Presentation of data	4		
Measuring data	4		

Mathematics overview: Stage 7

Unit	Hours	Build a Mathematician Assessments	Essential knowledge
Numbers and the number system	9	• Use positive integer powers and associated real roots	• Know the first 6 cube numbers
Counting and comparing	4	• Apply the four operations with decimal numbers	• Know the first 12 triangular numbers
Calculating	9	• Write a quantity as a fraction or percentage of another	• Know the symbols =, ≠, <, >, ≤, ≥
Visualising and constructing	5	• Use multiplicative reasoning to interpret percentage change	• Know the order of operations including brackets
Investigating properties of shapes	6	• Add, subtract, multiply and divide with fractions and mixed numbers	• Know basic algebraic notation
Algebraic proficiency: tinkering	9	• Check calculations using approximation, estimation or inverse operations	• Know that area of a rectangle = l × w
Exploring fractions, decimals and percentages	3	• Simplify and manipulate expressions by collecting like terms	• Know that area of a triangle = b × h ÷ 2
		• Simplify and manipulate expressions by multiplying a single term over a bracket	• Know that area of a parallelogram = b × h
Proportional reasoning	4	• Substitute numbers into formulae	• Know that area of a trapezium = ((a + b) ÷ 2) × h
Pattern sniffing	3	• Solve linear equations in one unknown	• Know that volume of a cuboid = l × w × h
Measuring space	5	• Understand and use lines parallel to the axes, y = x and y = -x	• Know the meaning of faces, edges and vertices
Investigating angles	3	• Calculate surface area of cubes and cuboids	• Know the names of special triangles and quadrilaterals
Calculating fractions, decimals and percentages	12	• Understand and use geometric notation for labelling angles, lengths, equal lengths and parallel lines	• Know how to work out measures of central tendency
Solving equations and inequalities	6	• Stage 7 BAM Progress Tracker Sheet	• Know how to calculate the range
Calculating space	6		
Checking, approximating and estimating	2		
Mathematical movement	8		
Presentation of data	6		
Measuring data	5		

Mathematics overview: Stage 8

Unit	Hours	Build a Mathematician Assessments	Essential knowledge
Numbers and the number system	9	• Apply the four operations with negative numbers	• Know how to write a number as a product of its prime factors
Calculating	9	• Convert numbers into standard form and vice versa	• Know how to round to significant figures
Visualising and constructing	8	• Apply the multiplication, division and power laws of indices	• Know the order of operations including powers
Understanding risk I	6	• Convert between terminating decimals and fractions	• Know how to enter negative numbers into a calculator
Algebraic proficiency: tinkering	10	• Find a relevant multiplier when solving problems involving proportion	• Know that $a^0 = 1$
Exploring fractions, decimals and percentages	3	• Solve problems involving percentage change, including original value problems	• Know percentage and decimal equivalents for fractions with a denominator of 3, 5, 8 and 10
Proportional reasoning	8	• Factorise an expression by taking out common factors	• Know the characteristic shape of a graph of a quadratic function
Pattern sniffing	4	• Change the subject of a formula when two steps are required	• Know how to measure and write bearings
Investigating angles	5	• Find and use the nth term for a linear sequence	• Know how to identify alternate angles
Calculating fractions, decimals and percentages	6	• Solve linear equations with unknowns on both sides	• Know how to identify corresponding angles
Solving equations and inequalities	4	• Plot and interpret graphs of linear functions	• Know how to find the angle sum of any polygon
Calculating space	9	• Apply the formulae for circumference and area of a circle	• Know that circumference = $2\pi r = \pi d$
Algebraic proficiency: visualising	9	• Calculate theoretical probabilities for single events	• Know that area of a circle = πr^2
Understanding risk II	5		• Know that volume of prism = area of cross-section × length
Presentation of data	4	• Stage 8 BAM Progress Tracker Sheet	• Know to use the midpoints of groups to estimate the mean of a set of grouped data
Measuring data	6		• Know that probability is measured on a 0-1 scale
			• Know that the sum of all probabilities for a single event is 1

Mathematics overview: Stage 9

Unit	Hours	Build a Mathematician Assessments	Essential knowledge
Calculating	12	• Calculate with roots and integer indices	• Know how to interpret the display on a scientific calculator when working with standard form
Visualising and constructing	10	• Manipulate algebraic expressions by expanding the product of two binomials	• Know the difference between direct and inverse proportion
Algebraic proficiency: tinkering	9	• Manipulate algebraic expressions by factorising a quadratic expression of the form $x^2 + bx + c$	• Know how to represent an inequality on a number line
Proportional reasoning	9	• Understand and use the gradient of a straight line to solve problems	• Know that the point of intersection of two lines represents the solution to the corresponding simultaneous equations
Pattern sniffing	8	• Solve two linear simultaneous equations algebraically and graphically	
Solving equations and inequalities I	5	• Plot and interpret graphs of quadratic functions	• Know the meaning of a quadratic sequence
Calculating space	13	• Change freely between compound units	• Know the characteristic shape of the graph of a cubic function
Conjecturing	6	• Use ruler and compass methods to construct the perpendicular bisector of a line segment and to bisect an angle	
Algebraic proficiency: visualising	12	• Solve problems involving similar shapes	• Know the characteristic shape of the graph of a reciprocal function
Solving equations and inequalities II	8	• Calculate exactly with multiples of π	• Know the definition of speed
Understanding risk	8	• Apply Pythagoras' theorem in two dimensions	• Know the definition of density
		• Use geometrical reasoning to construct simple proofs	• Know the definition of pressure
		• Use tree diagrams to list outcomes	• Know Pythagoras' theorem
Presentation of data	5	• Stage 9 BAM Progress Tracker Sheet	• Know the definitions of arc, sector, tangent and segment
			• Know the conditions for congruent triangles