

Year 9

In year 9, students have spent 2 years developing a **conceptual understanding** of many of the central ideas in number, algebra, and ratio, as well as **fluency** in many of the skills necessary to achieve at KS4. This year, this knowledge and these skills are utilised to explore more advanced and 'exotic' areas of Mathematics, as students prepare to begin studying the formal Mathematics of GCSE Maths next year. In Autumn 1, students are exposed to a variety of curriculum areas which cement their **fluency** and **conceptual understanding** in preparation for the more advanced ideas in the rest of Y9. In Autumn 2, students' understanding of algebra is deepened and extended as they reason with purely abstract ideas, including changing the subject, and algebraic factorisation. In this half term, **mathematical thinking** and **mathematical reasoning** feature prominently. These algebraic ideas are built on in Spring 2, when graphs are studied as an alternative **representation** of the equations and inequalities they have come to manipulate **fluently**. In Spring 1, and Summer 1, students' build on the large maps of geometry knowledge they have built over their education to encounter more nuanced **problem-solving** in spring 1, including forming and solving equations, before brand new ideas are introduced in Trigonometry. Students need to **reason mathematically** and have a **fluent, conceptual understanding** of many previous areas of the curriculum to access this well – including congruence and similarity from Y9 Spring 1, equations and algebraic manipulation from Y9 Autumn 2, and on all occasions before that as their algebraic skills developed, and number skills from across Y7 and Y8. Finally, in Summer 2, students' meet mathematical Probability for the first time. They build on their understanding of data from Y8 Spring 2 to develop a **conceptual understanding** of the difference between experimental and theoretical probability, and develop **fluency** in using the different tables and graphs which **represent** the data.

	<u>Learning Period 1: Autumn</u>	<u>Learning Period 2: Autumn</u>	<u>Learning Period 3: Spring</u>	<u>Learning Period 4: Spring</u>	<u>Learning Period 5: Summer</u>	<u>Learning Period 6: Summer</u>
Topic title	Coordinates, Linear Graphs, Proportion and Standard form	Algebraic expressions	2D Geometry	Equations and Inequalities	Pythagoras and Trigonometry	Statistics
Key questions	How can I use co-ordinate patterns to solve problems? What is $y=mx+c$ and how does it link to straight line graphs? How can I represent proportion graphically and use it to help solve problems? Why do we write numbers in standard form? What are scales and how can we use them to represent real life problems?	What are the basic rules of algebra? How do I solve equations using balancing? How do I convert between brackets and factorised forms? How can I represent real life situations algebraically to help me solve problems? What is the probability scale and how can I represent probabilities through fractions, decimals and percentages? What is relative frequency and how can I use it to predict the outcomes of experiments?	How can I use a compass to construct a perpendicular lines and angle bisectors? What is congruency and how can I use the rules of congruency to find identical shapes? What is similarity and how can I use it to solve problems? What are the properties of key shapes including quadrilaterals?	How can I apply my balancing skills to solving inequalities? How can I solve equations with two different variables? How can I use a graph to solve equations with two variables? What different types of graph are there? What shape is a quadratic graph and how do I use my knowledge of linear graphs to enable me to draw a quadratic graph?	How does Pythagoras' theorem link the 3 sides of a right-angled triangle? How can I use Pythagoras' theorem to solve problems in contexts such as bearings? What is SOHCAHTOA and how does it link 2 sides and an angles together in a right angled triangle? How can I use properties of shapes to prove some geometrically?	How can I use a Venn diagram or frequency tree to organise data in a systematic way? What is grouped data and why would we choose to group data together? How can I compare two or more data sets? What are cumulative frequency curves and box plots and how do they link together?
Key knowledge/concepts and skills	Unit 1 - Coordinates Plot coordinates in all four quadrants Find the midpoint of a line segment joining two points Find an endpoint of a line segment, given the midpoint and one endpoint Solve problems using coordinate grids Unit 2 - Linear Graphs Identify the equations of horizontal and vertical lines Plot coordinates from a rule to generate a straight line Identify key features of a linear graph Make links between the graphical and the algebraic representation Identify parallel lines from algebraic equations Unit 3 - Direct and Inverse Proportion Recognise when two quantities are directly or inversely proportional to each other Recognise the graphical representation of a proportional relationship Solve proportion problems Interpret and use conversion graphs and other graphs of proportional relationships Unit 4 - Standard Form Use standard form to express very large and small numbers Convert between standard form and ordinary numbers Order large and small numbers Use standard form to solve simple problems Use scales to solve distance and area problems in context	Unit 5 - Expanding and Factorising Multiply a term over a single bracket Expand products of two or more binomials Factorise expressions into a single bracket Factorise quadratic expressions where the coefficient of x^2 is equal to one Recap of nth term Unit 6 – Linear equations Solve linear equations using the balancing method including unknowns on both sides and equations with fractions Unit 7 - Algebraic manipulation Write expressions, equations and formulae to represent relationships Use substitution to find the value of one variable given other values Make links between solving linear equations and rearranging formulae Apply "changing the subject" to equations of straight lines Manipulate familiar formulae such as formulae for area and perimeter Unit 8 - Probability Understand and use the probability scale from 0 to 1 Understand and use the language associated with probability Understand the relationship between relative frequency and theoretical probability Understand that different trials of an experiment may produce different outcomes Systematically list outcomes using a variety of representations Use Venn diagrams and understand the meaning of union and intersection Frequency tree diagrams	Unit 9 - Constructions Use the standard ruler and compass constructions for: perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle Understand and use the perpendicular distance from a point to a line as the shortest distance to the line Unit 10 - Congruence and Similarity Know the criteria for congruence of triangles Apply properties of plane figures, and the criteria for congruence, using appropriate language Enlarge shapes from a given centre, with and without coordinate grids Understand that the corresponding angles of similar shapes are equal Solve problems involving similar triangles Unit 11 - Triangles and Quadrilaterals Appreciate the symmetry properties of triangles and special quadrilaterals Investigate the properties of the diagonals of quadrilaterals and the angles formed when they cross Unit 12 - Upper and Lower Bounds Be able to write down the error interval for a given degree of accuracy Work out the upper and lower bound of a given value Find the upper and lower bound of a given calculation	Unit 13 - Inequalities Form and solve linear inequalities with one unknown, including those where the unknown appears on both sides. Rearrange and solve linear inequalities given in any form, including those involving fractions and brackets. Unit 14 - Simultaneous Equations Use linear and quadratic graphs to estimate values of y for given values of x Use linear graphs to find approximate solutions of simultaneous linear equations Solve linear-linear simultaneous equations algebraically Find approximate solutions to contextual problems from given graphs of a variety of functions including: Piecewise linear (e.g. real-life linear graphs), exponential graphs, reciprocal graphs Unit 15 - Quadratics and other graphs Plot quadratic graphs Solve problems using given quadratic graphs Solve problems using given reciprocal graphs Solve problems using given piece-wise linear graphs Solve problems using given exponential graphs	Unit 16 - Pythagoras Use Pythagoras' theorem to find missing sides in right-angled triangles Solve associated problems in other shapes where right-angled triangles exist Deduce whether a triangle is right-angled by considering its sides Unit 17 - Trigonometry Develop an understanding of the trigonometric ratios Solve problems using trigonometric ratios in right-angled triangles Unit 18 -Proof Appreciate the symmetry properties of triangles and special quadrilaterals Investigate the properties of the diagonals of quadrilaterals and the angles formed when they cross	Unit 19 - Mean from grouped data Appreciate the difference between discrete and continuous data Understand why the exact mean cannot be found from grouped data Find an estimate of the mean from grouped data and continuous data Describe, interpret and compare distributions, involving appropriate measures of central tendency and spread Unit 20 - Cumulative frequency and Box plots Construct and interpret cumulative frequency diagrams Construct and interpret box plot
Assessment & Educational Visit Opportunities		Assessment 1	Intermediate maths challenge	Assessment 2		EOY 9 Assessment