

Year 7

In this year we reinforce and build on the knowledge and skills students have developed in the primary curriculum, and begin to extend the big ideas from the Primary curriculum into our core concepts. In Autumn 1, we use **multiple representations** to build **conceptual understanding** of number and number properties in students schemas. Moving through to Autumn 2, for many students this is the first time they will be introduced to algebra formally. In their Primary education they will have seen and understood the idea of a “missing number” or “unknown”, and may have seen inequality signs, but tier 2 and tier 3 language like “co-efficient, variable, equation, inequality, expression, term, constant” will be new, so careful attention to modelling **mathematical language and notation**, and a focus on building **fluency** in basic algebra skills will be crucial. Moreover, a **conceptual understanding** of algebra as a generalised version of arithmetic will develop by building on the work done in Autumn 1. In Spring 1 and Spring 2 students learn about Geometry for the first time at Secondary. They build on their understanding of shape, space, and basic transformations to understand more formal ideas like the Cartesian plane. In this term students will properly encounter many of the of the higher-level core concepts like **mathematical reasoning** and **problem-solving**. In Summer 1, students build on the **conceptual understanding** that was built in Y7 Autumn 1 to develop **fluency** in operations on fractions. Finally, in Summer 2, students’ **mathematical thinking** is focused on, as students are required to **think proportionally** in different scenarios, and with different **mathematical language and notation**.

	<u>Learning Period 1:</u> <u>Autumn</u>	<u>Learning Period 2:</u> <u>Autumn</u>	<u>Learning Period 3: Spring</u>	<u>Learning Period 4: Spring</u>	<u>Learning Period 5:</u> <u>Summer</u>	<u>Learning Period 6:</u> <u>Summer</u>
Topic title	Making generalisations about the number system	Making generalisations about the number system 2	2D Geometry	2D geometry	Factors and fractions	Ratio and percentages
Relevant core concepts	Mathematical fluency	Mathematical representation, language, and notation Conceptual understanding	Mathematical representation, language, and notation. Mathematical thinking	Mathematical fluency Mathematical representation Conceptual understanding	Mathematical fluency	Mathematical fluency Problem-solving
Key questions	What number bases do we use on a daily basis? What is the relationship between multiplication and division? What is the difference between a factor and a multiple? What is BIDMAS and why is it important?	How do I calculate with negative numbers? How can I use algebra to generalise ideas? What is balancing and how do I use it to solve equations?	How do I use a protractor to measure and draw angles? How can I use angle facts to find missing angles? How can I use mathematical equipment to construct triangles and quadrilaterals accurately?	How can I use co-ordinates to identify points on a grid? How can I use mathematical formulae to calculate area of different shapes? How can I transform shapes around a grid?	How do I use a Venn diagram to find the HCF and LCM of two or more numbers? How can I use the equivalence of fractions to convert between different forms? How can I use equivalence to add and subtract fractions with different denominators?	What is ratio and how do I represent it using a diagram? How can I use the Singapore bar model to solve problems involving ratio? What is the relationship between fractions, decimals and percentages? How can I convert a percentage into a decimal multiplier?
Key knowledge/ concepts and skills	<u>Unit 1 - Numbers and numerals</u> Understanding of time as a different base system Understand how the decimal system works and how our numbers are formed Be able to use column method to add and subtract numbers including decimals. <u>Unit 2 - Recognising patterns with multiplication</u> Multiplication – introduction of the Napier’s bones grid as an alternative to long multiplication including decimals. Division methods including decimals. Understanding the relationship between multiplication and division <u>Unit 3 - Factors and multiples</u> Being able to identify different types of numbers, such as factors, multiples, squares and primes. Finding highest common factor and lowest common multiple of two numbers by listing. Writing a number as a product of primes <u>Unit 4 - Order of operations</u> Know the importance of BIDMAS and be able to apply it to different calculations.	<u>Unit 5 - Positive and negative numbers</u> Ordering positive and negative numbers. Performing the 4 operations with negative numbers. <u>Unit 6 - Introducing sequences, expressions and equations</u> Forming algebraic expressions. Simplifying algebraic expressions. Expanding single brackets. Solving one and two step equations	<u>Unit 7 - Angles</u> Estimating angles. Drawing angles using a protractor. Using basic angle fact such as angles in a triangle. Introduction to parallel and perpendicular lines. <u>Unit 8 - Classifying 2D shapes</u> Identifying quadrilaterals and their properties. Introduction to terms such as similar, congruent and symmetry. <u>Unit 9 - Constructing triangles and quadrilaterals</u> Drawing triangles and quadrilaterals using protractors and rulers.	<u>Unit 10 - Coordinates</u> Plotting and reading co-ordinates on a 2D plane. Finding midpoints between 2 co-ordinates. Drawing vertical and horizontal lines such as $x=4$ <u>Unit 11 - Area of 2D shapes</u> Calculating area of triangles, rectangles and squares. Developing into area of compound shapes. <u>Unit 12 - Transforming 2D figures</u> Identifying and performing transformations of 2D shape using rotation, reflection, translation and enlargement.	<u>Unit 13 - Prime factor decomposition</u> Developing understanding of index notation. Using Venn diagrams to find the HCF and LCM of two numbers <u>Unit 14 – Equivalent Fractions</u> Identifying equivalent fractions, simplifying fractions and converting between mixed numbers and improper fractions. <u>Unit 15 – All operations acting on fractions</u> Adding/subtracting fractions with the same and different denominators, to include mixed numbers	<u>Unit 16 - Ratio</u> Simplifying ratios. Using the Singapore bar method to enable students to share in given ratios. <u>Unit 17 - Percentages</u> Exploring the link between fractions, decimals and percentages. Calculating percentages of amounts both using non- calculator methods and multipliers.
Assessment / Educational Visit Opportunities	Autumn 1 assessment	Autumn 2 assessment	Spring 1 assessment	Spring 2 assessment Junior Maths Challenge	Summer 1 assessment	End of Year 7 Assessment

Year 8

In year 8, we build on the strong foundations of **fluency** and **conceptual understanding** built in Y7 to explore some of the more advanced core concepts, and brand-new mathematical ideas. In Autumn 1, students explore sequences, and develop their **conceptual understanding** of algebra as a generalised arithmetic, by understanding how to algebraically describe the number sequences they encountered in their Primary education. Later in the half term, students build on the fluency in algebra they built in Y7 Autumn 2 to *form* and solve equations and inequalities, and in doing so build their **mathematical reasoning**, and **problem-solving** abilities. In Autumn 2, students' schemas around algebra are extended to include geometric interpretations of the equations they have been solving so far. This unit is also an application of the knowledge they have about the cartesian plane from Y7 Spring 2. In teaching students how to link these ideas, **mathematical language, representation and notation** will be crucial, as will a **conceptual understanding** of graphs as an infinity of individual coordinates. In Spring 1, students revisit the core concept of **proportional thinking** (from Y7 Summer 2), and apply the knowledge about graphs they have just learned in Y8 Autumn 2, to come to develop their **mathematical reasoning** in the arena of direct and inverse proportion. As with many units concerning ratio and proportion, fluency in the fundamental skills will be an important 'barrier to entry'. To support with this, the use of **multiple representations**, a focus on **mathematical language**, to build **conceptual understanding** will be important to teaching. In Spring 2, students encounter the curriculum area of probability and statistics for the first time in their lives. This is no longer covered in the Primary curriculum, and therefore, an extreme clarity in the **mathematical language** we introduce will be crucial to developing strong foundational understanding. Finally, in Summer 1 and Summer 2, students build on the 2 half-terms of geometry they learned in Y7, deepening their **fluency** and **mathematical thinking**, and extending these ideas to yet more formal contexts. This term will be an important term in developing students **problem-solving** skills, and supporting students to present their work in a way that supports clarity in their **mathematical reasoning**.

	<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	Equations and inequalities	Graphs and ratio	Proportion and Estimation	Handling Data	Angles	Area, volume and surface area
Relevant core concepts	Mathematical fluency Mathematical representation, language, and notation Mathematical thinking Conceptual understanding	Mathematical fluency Mathematical representation, language, and notation Mathematical thinking Problem-solving Conceptual understanding	Mathematical fluency Mathematical representation, language, and notation Mathematical thinking Conceptual understanding	Mathematical fluency Mathematical representation, language, and notation Mathematical thinking Problem-solving	Mathematical fluency Mathematical representation, language, and notation Mathematical thinking Conceptual understanding	Mathematical fluency Mathematical representation, Mathematical thinking Problem-solving Conceptual understanding
Key questions	How do the numbers in a sequence link to their position in the sequence? How can I form an equation to solve problems? What are inequalities and how can I use them to define a range of numbers? How can I apply my understanding of balancing to able me to solve inequalities?	How can I describe the position of any point on a co-ordinate grid? How can I link an algebraic equation to a straight line graph? What is a ratio and how can it be linked to fractions? How can I use the bar method to solve ratio problems? What are compound measures and how can I calculate them?	What is proportion and how can I use it in recipes? Why is it necessary to round numbers to a given degree of accuracy? How can I use estimations of calculations to check my work?	How can I use graphs and charts to visually represent data? How can I use averages to allow me to compare different sets of data? How can I use scatter graphs to display a relationship between two variables?	What relationships exist between angles on parallel lines? How can I generalise the relationship between the number of sides of a polygon and the sum of its interior angles? How are bearings used to give accurate directions?	What is Pi? What is a formula and how can I use it? What is meant by area and volume?
Key knowledge/concepts and skills	Unit 1 - Sequences Generating terms for a sequence. Finding the nth term for a linear sequence Be able to identify a non-linear sequence Unit 2 - Forming and solving equations Solve equations with unknowns on both sides and fractions. Form an equation from a variety of different contexts Unit 3 - Forming and solving inequalities Form and solve inequalities with unknowns on both sides. Represent inequalities on a number line.	Unit 4 - Linear graphs Plot co-ordinates in 4 quadrants. Draw straight line graphs Identify the gradient and y-intercept of a line. Identify parallel lines. Unit 5 - Ratio, Use ratio notation to describe a relationship. Solve problems using ratio. Unit 6 - Real-life graphs and rate of change Explore speed and density in context of proportional reasoning. Explore how graphs can be used to represent real life scenarios	Unit 7 - Direct and inverse proportion Represent proportional relationships using tables, graphs and algebraically. Solve proportion problems including inverse proportion. Unit 8 - Accuracy and estimation Round numbers to a required number of decimal places/decimal places. Estimate sums by rounding. Understanding error intervals and truncation	Unit 9 - Charts and averages Be able to construct and read a variety of different charts such as bar charts, pictograms and line graphs. Be able to calculate the mean, median and mode from a variety of different contexts, including raw data, charts and discrete tables. Understand the difference between discrete and continuous data. Unit 10 - Scatter graphs Construct a scatter graph and understand it allows us to see the relationship between two variables. Be able to construct a line of best fit and use it interpolate and extrapolate.	Unit 11 - Angles in parallel lines and polygons Review of Y7 angle facts work, including parallel line angles Be able to calculate the interior angle sum of a polygon given the number of sides. Be able to use the sum of interior and exterior angles to be able to solve problems. Unit 12 - Bearings Be able to draw and read bearings using the standard conventions. Solve problems involving bearings using angle facts.	Unit 13 - Circles and composite shapes Know and use the formulas for area and circumference of a circle Be able to apply understanding of circle formulae to part circles and compound shapes involving circles. Unit 14 - Volume and surface area of prisms Be able to name different prisms and use the language associated with 3D shapes. Calculate the volume and surface area of cuboids, prisms (including cylinders) and composite shapes.

Assessment & Educational Visit Opportunities	Autumn 1 assessment	Autumn 2 assessment	Spring 1 assessment	Spring 2 assessment Junior Maths Challenge	Summer 1 assessment	End of Year 8 Assessment
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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
Relevant core concepts	Mathematical fluency Mathematical representation, language, and notation Mathematical thinking Problem-solving	Mathematical fluency Mathematical representation, language, and notation Conceptual understanding	Mathematical representation, language, and notation Mathematical fluency Conceptual understanding Problem-solving	Mathematical fluency Mathematical representation, language, and notation Conceptual understanding Problem-solving	Mathematical fluency Mathematical thinking Mathematical reasoning Problem-solving	Mathematical fluency Mathematical thinking Mathematical reasoning Conceptual understanding
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
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Y10 (Foundation)

In Y10, students enter the first year of formal study for their GCSE. In many schools, students have been tiered into foundation or higher according to how well they fared with the more advanced topics in Y9. For students on both tiers, but particularly those on the foundation tier, core knowledge and skills are revisited, to ensure that students have the **fluency** and **conceptual understanding** necessary to access the entire KS4 curriculum. Having revisited knowledge and skills from KS3, students are equipped to fully explore the core concepts of **mathematical thinking**, **mathematical reasoning**, and **problem-solving**. This is done in every half term, as students build up to answering exam-style questions, and teachers model **mathematical language and notation** which is suitably formal for KS4.

	Learning Period 1: Autumn	Learning Period 2: Autumn	Learning Period 3: Spring	Learning Period 4: Spring	Learning Period 5: Summer	Learning Period 6: Summer
Topic title	Number	Percentages and Probability	Algebra	Geometry	Similarity	Probability and Statistics
Relevant core concepts	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.
Key questions	<p>What is the difference between a factor and a multiple?</p> <p>What are prime numbers and how can I use them to find the HCF and LCM of two or more numbers?</p> <p>What is a power and root?</p> <p>What are indices and how can I evaluate them?</p> <p>How can I calculate with very large and very small numbers without a calculator?</p> <p>What is a sequence and how do I identify different types of sequences?</p>	<p>How can I use percentage and decimal conversions to allow me to calculate percentages?</p> <p>How are percentages used in everyday life?</p> <p>How can I calculate a probability for an event or using experimental data?</p> <p>How can I find all the possible outcomes of a situation using systematic listing?</p> <p>What is set notation and how can I use a Venn diagram to organise data?</p>	<p>What are the core rules of algebra and how can I use them to transform expressions from one format to another?</p> <p>What methods can I use to solve a quadratic equation?</p> <p>How can I link those solutions to a quadratic graph?</p> <p>How can I solve an equation with more than one variable?</p>	<p>How can shapes be transformed?</p> <p>What is the impact of rounding numbers and how can I use it?</p> <p>What is Pi and how can I use it to calculate area and circumference of a circle?</p> <p>How can I use formulas to calculate volume and surface area of 3D shapes?</p>	<p>How can I use ratio to solve problems?</p> <p>What is a compound measure and how can I use a formula to calculate it?</p> <p>How can I use proportion to solve problems?</p> <p>What is Pythagoras' theorem and how can I use it to find missing lengths on a right-angled triangle?</p> <p>What is similarity and how does it link to shapes together?</p> <p>How can I use right angled trigonometry to solve problems?</p>	<p>What is an average and how does it represent a data set?</p> <p>What is the benefit of tabulating data?</p> <p>How can I achieve a fair sample from a population?</p> <p>How can I represent data in a visual format?</p> <p>How can I make predictions from a data set?</p>
Key knowledge/concepts and skills	<p>Unit 1 - Factors, multiples, and primes Identify factors, multiples and primes Write a number as a product of prime factors Find the HCF and LCM of two number by listing and Venn diagram</p> <p>Unit 2 - Powers and Roots Understand what is meant by squaring, cubing and their inverses.</p> <p>Unit 3 - Indices Use the index laws to evaluate numerical indices (including fractional and negative) Use the index laws to simplify algebraic indices (including fractional and negative)</p> <p>Unit 4 - Standard form Convert between standard form and ordinary numbers Calculate with numbers in standard form using all 4 operations</p> <p>Unit 5 - Sequences Understand how the different types of sequences are generated including arithmetic, geometric, Fibonacci and triangular numbers Generate a sequence given the nth term Assess if a number appears in a sequence Find the nth term of a linear sequence.</p>	<p>Unit 6 - Fractions, Decimals and Percentages Convert between equivalent fractions and improper fractions to mixed numbers 4 operations with fractions Fractions of amounts Convert between fractions, decimals and percentages</p> <p>Unit 7 - Percentages Calculate percentage changes Work out the percentage of an amount Calculate compound interest/depreciation Solve problems with growth and decay</p> <p>Unit 8 - Probability, Sets and Venn diagrams Calculate basic probabilities and relative frequency Use sample space diagrams and the product rule for counting to systematically list outcomes Use and create tree diagrams with/without replacement I can use a Venn diagram to sort data and solve problems Use set notation for Venn diagrams</p>	<p>Unit 9 - Algebra (KS3 review) Simplify expressions by expanding single brackets and collecting like terms Rearrange and substitute into a formula Form and solve equations with variables on both sides Factorise into a single bracket</p> <p>Unit 10 - Quadratics Expand two brackets Factorise quadratics into two brackets including difference of two squares Use factorising to solve quadratics.</p> <p>Unit 11 - Quadratic graphs Be able to recognise and draw quadratic graphs Understand the link between solving quadratics and the roots of a graph Be able to use a quadratic graph to find solutions</p> <p>Unit 12 - Simultaneous Equations Solve linear simultaneous equations Form linear simultaneous equations from a variety of contexts.</p>	<p>Unit 13- Transformations Be able to perform the 4 transformations (rotation, reflection, translation and enlargement (including fractional) Be able to describe which transformation has taken place</p> <p>Unit 14 - 2D shapes including circle geometry Rounding and estimation of calculations Calculating area of triangles, quadrilaterals and composite shapes. Calculate the area and circumference of circles and part circles Calculate the area and perimeter of sectors</p> <p>Unit 15- Pythagoras' Theorem Use Pythagoras' theorem to be able to solve problems.</p> <p>Unit 16 - 3D shapes Recognise vocabulary linked to 3D shapes including plans and elevations</p> <p>Unit 17 - Volume and Surface Area Calculate the volume of 3D shapes including prisms, cones, spheres and pyramids, using a given formula where appropriate. Calculate the surface area of prisms including cylinders.</p>	<p>Ratio review Share in a given ratio Solve problems when given part of a ratio Write ratios as fractions and equations Combine ratios</p> <p>Unit 18 - Compound Measure and direct and indirect proportion Use compound measures such as density and speed to solve problems Solve direct and inverse proportion problems using graphs and algebra where appropriate Apply proportional logic to recipe questions</p> <p>Unit 19 - Similarity and Trigonometry Be able to use the principles of similarity to solve problems with similar shapes Use SOHCAHTOA to find missing lengths and angles in right angled triangles</p>	<p>Unit 20 - Averages and Spread Calculate the averages and measures of spread of a set of data Calculate averages from ungrouped and grouped data tables</p> <p>Unit 21- Data collection and Sampling Tabulate and classify data Identify different types of sampling Calculate group sizes for stratified sampling</p> <p>Unit 22 - Presenting Data including Scatter Graphs Construct and interpret pie charts Interpret time series graphs Plot scatter graphs and identify correlation/relationships Use a line of best fit to extrapolate/interpolate Construct and interpret frequency polygons</p>
Assessment & Educational Visit Opportunities		Assessment 1		Assessment 2		EOY 10 Assessment

Year 10 (Higher)

In Y10, students enter the first year of formal study for their GCSE. In many schools, students have been tiered into foundation or higher according to how well they fared with the more advanced topics in Y9. For students on both tiers, core knowledge and skills are revisited, to ensure that students have the **fluency** and **conceptual understanding** necessary to access the entire KS4 curriculum. Having revisited knowledge and skills from KS3, students are equipped to fully explore the core concepts of **mathematical thinking, mathematical reasoning, and problem-solving**. This is done in every half term, as students build up to answering exam-style questions, and teachers model **mathematical language and notation** which is suitably formal for KS4.

	<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	Number	Percentages and Probability	Algebra	Geometry	Similarity	Probability and Statistics
Relevant core concepts	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.	Mathematical thinking. Mathematical reasoning. Problem-solving. Mathematical language and notation.
Key questions	What is a power and root? How can I calculate with irrational numbers without a calculator? What are indices and how can I evaluate them? How can I calculate with very large and very small numbers without a calculator? What is a sequence and how do I identify different types of sequences?	How can I use percentage and decimal conversions to allow me to calculate percentages? How are percentages used in everyday life? How can I calculate a probability for an event or using experimental data? How can I find all the possible outcomes of a situation using systematic listing? What is set notation and how can I use a Venn diagram to organise data?	What methods can I use to solve a quadratic equation? How can I link those solutions to a quadratic graph? How can I solve an equation with more than one variable?	How can shapes be transformed? What is the error interval caused by rounding numbers and how can we overcome this? What is Pi and how can I use it to calculate area and circumference of a circle? What is the equation of a circle and how can I use this to find key points on a graph? How can I use formulas to calculate volume and surface area of 3D shapes?	How can I use ratio to solve problems? What is a compound measure and how can I use a formula to calculate it? How can I use formal notation to find a formula to link two variables that are in direct or inverse proportion of each other? What is Pythagoras' theorem and how can I use it to find missing lengths on a right-angled triangle? What is similarity and how does it link to shapes together? How can I use right angled and non-right angled trigonometry to solve problems?	What is an average and how does it represent a data set? What is the benefit of tabulating data? How can I achieve a fair sample from a population? How can I represent data in a visual format? How can I make predictions from a data set? How can I make comparisons between two data sets?
Key knowledge/concepts and skills	<p><u>Unit 1 - Powers and Roots</u> Understand what is meant by squaring, cubing and their inverses.</p> <p><u>Unit 2 - Surds and Irrational Numbers</u> Understand what a surd is. Be able to simplify surd using understanding of squared numbers. Expand brackets containing surds. Rationalise the denominator of a fraction with a surd.</p> <p><u>Unit 3 - Indices</u> Use the index laws to evaluate numerical indices (including fractional and negative) Use the index laws to simplify algebraic indices (including fractional and negative)</p> <p><u>Unit 4 - Standard form</u> Convert between standard form and ordinary numbers Calculate with numbers in standard form using all 4 operations</p> <p><u>Unit 5 - Sequences</u> Understand how the different types of sequences are generated including arithmetic, geometric, Fibonacci and triangular numbers Generate a sequence given the nth term (including quadratic) Assess if a number appears in a sequence Find the nth term of a given sequence including quadratic nth term.</p>	<p><u>Unit 6 - Fractions, Decimals and Percentages</u> Convert between fractions, decimals and percentages</p> <p><u>Unit 7 - Percentages</u> Calculate percentage changes Work out the percentage of an amount Calculate compound interest/depreciation Solve problems with growth and decay</p> <p><u>Unit 8 - Probability, Sets and Venn diagrams</u> Calculate basic probabilities and relative frequency Use sample space diagrams and the product rule for counting to systematically list outcomes Use and create tree diagrams with/without replacement I can use a Venn diagram to sort data and solve problems Use set notation for Venn diagrams</p>	<p><u>Unit 9 - Quadratics</u> Expand two or more brackets Factorise quadratics including those with a coefficient greater than 1 Use factorising to solve quadratics. Use the quadratic formula to solve quadratics Write a quadratic in the completing the square format</p> <p><u>Unit 10 - Quadratic graphs</u> Be able to recognise and draw quadratic graphs Understand the link between solving quadratics and the roots of a graph Be able to solve quadratic simultaneous equations graphically.</p> <p><u>Unit 11 - Algebraic Fractions</u> Simplify algebraic fractions using factorising Use the four operations with algebraic fractions. Solve equations with algebraic fractions</p> <p><u>Unit 12 - Simultaneous Equations</u> Solve linear simultaneous equations Form linear simultaneous equations from a variety of contexts including ratio. Solve quadratic simultaneous equations algebraically</p>	<p><u>Unit 13 - Transformations</u> Be able to perform the 4 transformations (rotation, reflection, translation and enlargement (including fractional and negative) Be able to describe which transformation has taken place</p> <p><u>Upper and Lower Bounds</u> 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</p> <p><u>Unit 14 - 2D shapes including circle geometry</u> Calculate the area and circumference of circles and part circles Calculate the area and perimeter of sectors Recognise and use the equation of a circle</p> <p><u>Unit 15 - Pythagoras' Theorem</u> Use Pythagoras' theorem to be able to solve problems including those in 3D</p> <p><u>Unit 16 - 3D shapes</u> Recognise vocabulary linked to 3D shapes including plans and elevations</p> <p><u>Unit 17 - Volume and Surface Area</u> Calculate the volume and surface area of 3D shapes including prisms, cones,</p>	<p><u>Ratio review</u> Share in a given ratio Solve problems when given part of a ratio Write ratios as fractions and equations Combine ratios</p> <p><u>Unit 18 - Compound Measure and Direct and Inverse Proportion</u> Use compound measures such as density and speed to solve problems Use formal notation to solve problems involving direct and inverse proportion including with powers and roots</p> <p><u>Unit 19 - Similarity and Trigonometry</u> Be able to use the principles of similarity to prove two shapes are similar and to solve problems with similar shapes Trigonometry in a 3D context</p> <p><u>Unit 20 - Further trigonometry</u> Use cosine rule, sine rule and $\frac{1}{2}ab\sin C$ in non right-angled triangles to solve problems</p>	<p><u>Unit 21 - Averages and Spread</u> Calculate the averages and measures of spread of a set of data Calculate averages from ungrouped and grouped data tables</p> <p><u>Unit 22- Data collection and Sampling</u> Tabulate and classify data Identify different types of sampling Calculate group sizes for stratified sampling</p> <p><u>Unit 23 - Presenting Data including Scatter Graphs</u> Construct and interpret pie charts Interpret time series graphs Plot scatter graphs and identify correlation/relationship Use a line of best fit to extrapolate/interpolate Construct and interpret frequency polygons</p> <p><u>Unit 24 - Further Statistical Diagrams</u> Construct histograms Plot and interpret cumulative frequency Construct and compare box plots</p>

				spheres and pyramids, using a given formula where appropriate.		
Assessment & Educational Visit Opportunities		Assessment 1	Intermediate maths challenge	Assessment 2		EOY 10 Assessment

Year 11 (Foundation)						
<p>In our students' final year of study, we begin by drawing on all of the knowledge and skills they have developed over their 4 years with us to introduce some of the most challenging GCSE content, including vectors, construction and loci, and geometric reasoning at foundation tier. Students are now refining and fully developing their problem-solving and mathematical reasoning skills in preparation for their exam. In the periods of revision that are scheduled, teachers identify gaps in knowledge and underdeveloped skills in their students, and revisit elements of the KS4 curriculum accordingly. Often, these areas of weakness will not be in fluency, but in students' ability to reason mathematically with the knowledge they have, or problem-solve in unseen situations. They will use this time to hone these core concepts fully.</p>						
	<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	Geometric reasoning and proof	Inequalities and graphs	Mock preparation			
Relevant core concepts	Mathematical fluency, Mathematical representation, language, and notation, Problem-solving	Mathematical fluency, Mathematical representation, language, and notation, Conceptual understanding	Mathematical representation, language, and notation Mathematical fluency Conceptual understanding Problem-solving			
Key questions	<p>What is a column vector?</p> <p>What is bearing and how can I use parallel line angle facts to find them?</p> <p>What is congruency and how can I use it to prove two shapes are congruent?</p> <p>How can I use a compass to construct loci?</p>	<p>How can I use my understanding of balancing to solve an inequality?</p> <p>How can I represent an inequality graphically?</p> <p>What is the relationship between the equation of a line and a parallel line?</p> <p>What are the different types of graphs I can generate?</p> <p>How can I apply my understanding of graphs to D-T and V-T graphs?</p> <p>What do trigonometric graphs look like and how can I use them to find multiple solutions?</p> <p>What is a Venn diagram and how can I use it to organise data?</p>	What do the exam papers look like and how can I apply my knowledge to answering exam style questions?			
Key knowledge/concepts and skills	<p><u>Unit 23 - Vectors</u> Use column vector notation and be able to add/subtract vectors</p> <p><u>Unit 24 - Geometric reasoning</u> Be able to calculate interior and exterior angles of polygons</p> <p><u>Unit 25 - Bearings</u> Understand the conventions involved in bearings Use parallel line angle facts to reason with bearings</p> <p><u>Unit 26 - Congruence</u> Identify congruency using the SAS, ASA, SSS and RHS rules</p> <p><u>Construction and loci</u> Construct angle bisectors and perpendicular bisectors using a compass Construct loci to solve problems</p>	<p><u>Unit 27- Linear inequalities</u> Solve linear inequalities Identify regions indicated by one or more inequality</p> <p><u>Unit 28 - Linear graphs</u> Understand the relationship between an equation of a line and the gradient and intercept of that line Be able to find the equation of a line between two given points</p> <p><u>Unit 29 - Non-linear graphs</u> Recognise quadratic, cubic and reciprocal graphs Plot and interpret distance-time and velocity-time graphs Conversion graphs</p>	<p>Bespoke revision lessons for each class based on previous mock exams</p> <p>Exam practise using past exam papers</p>			
Assessment & Educational Visit Opportunities		Y11 mocks		Y11 assessment	Y11 Assessments	Y11 Assessments

Year 11 (Higher)					
<p>In our students' final year of study, we begin by drawing on all of the knowledge and skills they have developed over their 4 years with us to introduce some of the most challenging GCSE content, including trigonometric graphs, algebraic proof, and functions at higher tier. Students are now refining and fully developing their problem-solving and mathematical reasoning skills in preparation for their exam. In the periods of revision that are scheduled, teachers identify gaps in knowledge and underdeveloped skills in their students, and revisit elements of the KS4 curriculum accordingly. Often, these areas of weakness will not be in fluency, but in students' ability to reason mathematically with the knowledge they have, or problem-solve in unseen situations. They will use this time to hone these core concepts fully.</p>					
	Learning Period 1: Autumn	Learning Period 2: Autumn	Learning Period 3: Spring	Learning Period 4-6: Spring/Summer	
Topic title	Geometric reasoning and proof	Inequalities and graphs	Algebra and graphs	Exam preparation	
Relevant core concepts	Mathematical fluency, Mathematical representation, language, and notation, Problem-solving	Mathematical fluency, Mathematical representation, language, and notation, Conceptual understanding	Mathematical representation, language, and notation, Mathematical fluency, Conceptual understanding, Problem-solving	Mathematical representation, language, and notation, Mathematical fluency, Conceptual understanding, Problem-solving	
Key questions	<p>What is a column vector?</p> <p>How can I use vectors to solve problems?</p> <p>How can I prove that two vectors exist on a straight line?</p> <p>How can I find interior and exterior angles of any sized polygon?</p> <p>How can I prove circle theorems using angle facts?</p> <p>What is bearing and how can I use parallel line angle facts to find them?</p> <p>What is congruency and how can I use it to prove two shapes are congruent?</p> <p>How can I use a compass to construct loci?</p>	<p>How can I use my understanding of balancing to solve an inequality?</p> <p>How can I represent an inequality graphically?</p> <p>What is the relationship between the equation of a line and a parallel or perpendicular line?</p> <p>What are the different types of graphs can I generate?</p> <p>How can I apply my understanding of graphs to D-T and V-T graphs?</p> <p>What do trigonometric graphs look like and how can I use them to find multiple solutions?</p>	<p>How can I prove number patterns using algebra?</p> <p>What is iteration and how can it be used to gain an approximate solution to a cubic?</p> <p>What is function notation?</p> <p>How do I use my understanding of function notation to transform functions graphically?</p>	<p>What do the exam papers look like and how can I apply my knowledge to answering exam style questions?</p>	
Key knowledge/concepts and skills	<p>Unit 25 - Vectors Use column vector notation and be able to add/subtract vectors Solve problems with vectors using ratios and fractions Prove that vectors are co-linear</p> <p>Unit 26 - Geometric reasoning Be able to calculate interior and exterior angles of polygons</p> <p>Unit 27 - Circle theorems Reason using the circle theorems Use circle theorems to derive proofs</p> <p>Unit 28 - Bearings Understand the conventions involved in bearings Use parallel line angle facts to reason with bearings</p> <p>Unit 29 - Congruence and similarity Identify congruency using the SAS, ASA, SSS and RHS rules Prove that two shapes are congruent Be able to use a scale factor to convert between lengths, area and volumes in similar shapes</p> <p>Construction and loci Construct angle bisectors and perpendicular bisectors using a compass Construct loci to solve problems</p>	<p>Unit 30 - Linear graphs Be able to find the equation of a line from two points Be able to find lines that are parallel or perpendicular to a line and that pass through a specified point</p> <p>Unit 31 - Inequalities Solve linear inequalities Identify regions indicated by one or more inequality Solve quadratic inequalities</p> <p>Unit 32 - Non-linear graphs Identify a variety of different graphs including quadratic, cubic, reciprocal and exponential graphs Identify the equation of circle and understand how to find the radius and centre point from the equation Plot and interpret distance-time and velocity-time graphs Calculate and interpret the area under D-T and V-T graphs Interpreting rate of change from a graph</p> <p>Unit 33 - Trigonometric graphs Identify the graphs of $y=\sin x$, $y=\cos x$ and $y=\tan x$ Be able to recall exact trigonometric values Be able to use the trigonometric graphs to find values</p>	<p>Unit 34 - Algebraic proof and reasoning Be able to represent odd, even and consecutive integers algebraically Derive proofs algebraically</p> <p>Unit 35 - Recurrence relations Use an iterative relationship to generate a solution Be able to rearrange a quadratic/cubic equation to derive an iteration formula</p> <p>Unit 36 - Functions Apply function notation Be able to calculate composite functions Be able to find an inverse function</p> <p>Unit 37 - Transformation of graphs Be able to transform graphs given an equation using standard function notation</p> <p>Unit 38 - Further graphs Interpret the meaning of the gradient of a graph in terms of a rate of change</p>	<p>Bespoke revision lessons for each class based on previous mock exams</p> <p>Exam practise using past exam papers</p>	
Assessment & Educational Visit Opportunities		Y11 mocks		Y11 assessment	