Curriculum Overview

Maths

Cottingham High School

THE CONSORTIUM ACADEMY TRUST

Shaping Positive Futures

Introduction

This document outlines the curriculum and key considerations including:

- Aims and purpose
- Alignment with the whole school provision and curriculum intent
- A summary programme of study which includes sequencing of taught content

We use the National Curriculum as our statutory foundation and broadly share its principles and aims including:

- 'To provide students with an introduction to the essential knowledge that they need to be educated citizens. To introduce students to the best that has been thought and said; and help engender an appreciation of human creativity and achievement'.
- To prepare students to be confident in themselves, to have a fulfilled and successful life beyond our school – one where they contribute positively to society.
- Our statutory curriculum is just one element in the education of every child. There is time and space in the school day and in each week, term and year to range beyond statutory specifications.
- Provision of a framework of core knowledge around which teachers can develop exciting and stimulating lessons to promote the development of students' knowledge, understanding and skills as part of the wider school curriculum.
- The wider school curriculum includes an extensive range of opportunities and activities that are routinely available to students, are inclusive and reflect our diverse community.

Numeracy and Literacy

Teachers should take opportunities to develop students' mathematical fluency, spoken language, reading, writing and vocabulary within their specific discipline and in line with the expectations laid out in our school curriculum statement.

Purpose of study

'Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.' Adapted from National Curriculum, DfE, 2021.

Curriculum Aims

Everything we do in Maths will help shape a positive future for life beyond school.

- Embed a spiral curriculum that revisits and deepens key concepts over time, ensuring learners build secure, connected knowledge that strengthens with each encounter.
- Use regular in-class checks for understanding to identify misconceptions early, address gaps efficiently, and ensure every learner progresses with confidence.
- Cultivate a positive mathematical mindset, normalising errors and misconceptions as essential parts of learning. Learners are encouraged to be resilient, brave, and reflective as they recognise that mistakes help them grow.
- Develop learners' confidence by consistently acknowledging their strengths, celebrating progress, and supporting them to set realistic, achievable, and ambitious goals.
- Design carefully sequenced lessons that actively engage learners and support them in becoming numerate, critical thinkers who can apply mathematical ideas with increasing independence.
- Provide frequent opportunities for retrieval practice, enabling learners to draw knowledge from long-term memory into working memory through varied strategies that strengthen retention and fluency.
- Ensure structured independent practice so learners can consolidate key skills, deepen understanding, and work towards personal and academic goals with increasing autonomy.
- Promote determination and sustained effort as core drivers of mathematical success, helping learners understand that numeracy extends beyond procedural competence and is essential for life beyond the classroom.
- Strengthen learners' ability to connect mathematical concepts with real-world contexts, ensuring they can apply their knowledge confidently in wider society and future pathways.
- Equip learners with financial awareness and safeguarding skills, including understanding mortgages, interest rates, high-risk loans, payday lenders, and other potentially exploitative financial products, empowering them to make informed, safe decisions in adult life.

Through instilling love of Maths, we are helping our learners acquire the skills to become numerate members of society.

Curriculum Structure

Mathematics is an interconnected subject in which students need to be able to move fluently between representations of mathematical ideas. Although the programme of study is organised into distinct domains, students are taught to make connections across mathematical ideas to develop fluency, mathematical reasoning and competence to solve increasingly sophisticated problems.

Disciplinary Strand	Knowledge Domains	Subject Skills
Number	**Operations** Place value, using the 4 operations, ordering positive and negative integers. Using prime numbers, factors, multiples, HCF and LCM. BIDMAS, inverse operations, Integer Powers, Standard Form **Fractions, Decimals and Percentages** Converting between Mixed Numbers and Improper Fractions, Ordering Fractions and Decimals, Finding Percentages, Increasing or decreasing by a Percentage,	**Numeracy** The ability to understand, reason with and apply simple numerical concepts to various areas of maths.

	Rounding To round answers to specified decimal places or significant figures and to use estimation to check if an answer seems sensible **Comparisons** Conversion of units and currency, fractions and multiples, expressing quantities as a percentage of another, use standard units of mass, length, time, money.	**Literacy** The knowledge, ability and confidence to use subject specific language to acquire, construct and communicate meaning in all aspects of daily living. **Problem Solving** The use of maths and everyday life - students must be able to apply their knowledge to come up with sensible solutions to problems **Experimental and Investigative Skills** Understanding how to apply previous knowledge to new problems **Written Communication** The ability to communicate via the written words is essential, students need to be able to sure clear, coherent workings to problems **Resilience** The ability to keep going and not give up will serve students well in both maths lessons and their futures **Collaboration** Working together to develop and share ideas, discuss misconceptions, and how topics relate to real-life situations
Algebra	**Use and interpret algebraic notation** Use the vocabulary of expressions, equations, inequalities, terms and factors **Simplify and manipulate algebra** Collecting like terms, expand brackets, take common factors Rearrange formulae to change the subject **Solving** Form equations, Solve equations **Substitution** Substitute numbers into expressions and formulae Work with coordinates, recognise, sketch and produce graphs, y = mx + c, Simultaneous Equations **Sequences** term-to-term rules or position-to-term rules, arithmetic sequences and the nth term, geometric and other sequences	
Geometry & Measures	**Angles** Find missing angles, properties of shapes, transects and other angle facts **Volume, Area and Perimeter** Find volumes, areas and perimeters of shapes and composite shapes **Transformations** To reflect, rotate, translate and enlarge shapes **Constructions** Standard ruler and compass constructions, draw and measure line segments and angles, interpreting scale drawings Symmetry, Congruence **Pythagoras' Theorem**	
Statistics	**Averages** Find Mean, Mode, Median and Range from a list of numbers, a frequency table and a grouped data table **Charts and Graphs** Describe, interpret and compare with appropriate graphical representation involving discrete, continuous and grouped data; Bivariate data Plot and Interpret Bar Charts, Scatter Graphs, Pie Charts and Line Graphs	

Probability	**Probability** Understanding that probability sums to 1, and using this to find missing probabilities, Venn diagrams, frequency and probability trees, probability experiments, tables, grids and Venn diagrams, sample space, mutually exclusive events	
Ratio & Proportion	**Ratio and Proportion** Convert Units, Multiplicative change, similar shapes, scale drawing, map scales, direct and indirect proportion Ratio and fractions, Compound measures	

Assessment Objectives

Assessment Objective 1 : FLUENCY	Assessment Objective 2: REASONING	Assessment Objective 3 : PROBLEM SOLVING
Use and apply standard techniques Students should be able to: • accurately recall facts, terminology and definitions • use and interpret notation correctly • accurately carry out routine procedures or set tasks requiring multi-step solutions.	Reason, interpret and communicate mathematically Students should be able to: • make deductions, inferences and draw conclusions from mathematical information • construct chains of reasoning to achieve a given result • interpret and communicate information accurately • present arguments and proofs • assess the validity of an argument and critically evaluate a given way of presenting information.	Solve problems within mathematics and in other contexts Students should be able to: • translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes • make and use connections between different parts of mathematics • interpret results in the context of the given problem • evaluate methods used and results obtained • evaluate solutions to identify how they may have been affected by assumptions made.

Pearson 5-year Maths Curriculum
(3-year KS3 and 2-year KS4)

The Edexcel GCSE Maths curriculum builds on prior knowledge by introducing new concepts that extend previously learnt material. The curriculum spirals topics, meaning that key concepts are revisited and expanded over time, allowing pupils to deepen their understanding and retain information more effectively. Regular retrieval practices are incorporated through frequent assessments which help reinforce learning and improve long-term retention. Long Term Retention strategies within Curriculum include Spacing/ Interleaving/ feedback. The curriculum includes differentiated resources and support to address individual pupil's needs, 3-year KS3 (Support/ Core/ Depth) and 2-year KS4 (Foundation and Higher). This ensures that all learners can progress confidently.

Curriculum Sequencing

Order of Topics by Year Group

Term	Year 7	Year 8	Year 9	Year 10F	Year 10H	Year 11F	Year 11H
Autumn Term	Autumn Term	Autumn Term	Autumn Term	Autumn Term	Autumn Term	Autumn Term	Autumn Term
Half Term 1	Analysing and displaying data	Number	Indices and standard form	Number	Number	Multiplicative reasoning	Further statistics
	Number skills	Area and volume	Expressions and formulae	Algebra	Algebra	Constructions, loci and bearings	Equations and graphs
				Graphs, tables and charts	Interpreting and representing data	Quadratic equations and graphs	Circle theorems
Half Term 2	Expressions, functions and formulae	Statistics, graphs and charts	Dealing with data	Fractions and percentages	Fractions, ratio and proportion	Perimeter, area and volume 2	More algebra
	Decimals and measures	Expressions and equations	Multiplicative reasoning	Equations, inequalities and sequences	Angles and trigonometry	Fractions, indices and standard form	
Spring Term	Spring Term	Spring Term	Spring Term	Spring Term	Spring Term	Spring Term	Spring Term
Half Term 3	Fractions and percentages	Real-life graphs	Constructions	Angles	Graphs	Congruence, similarity and vectors	Vectors and geometric proof
	Probability	Decimals and ratio	Sequences, inequalities, equations and proportion	Averages and range	Area and volume	More algebra	Proportion and graphs
				Perimeter, area and volume 1	Transformations and constructions		
Half Term 4	Ratio and proportion	Lines and angles	Circles, Pythagoras and prisms	Graphs	Equations and inequalities	Revision and practice	Revision and practice
				Transformations	Probability		
Summer Term	Summer Term	Summer Term	Summer Term	Summer Term	Summer Term	Summer Term	Summer Term
Half Term 5	Lines and angles	Calculating with fractions	Graphs	Ratio and proportion	Multiplicative reasoning	Revision, practice and exams	Revision, practice and exams
	Sequences and graphs	Straight-line graphs	Probability	Right-angled triangles	Similarity and congruence		
Half Term 6	Transformations	Percentages, decimals and fractions	Comparing shapes	Probability	More trigonometry		

Topic Progression

Year 7	Year 8	Year 9	Year 10F	Year 10H	Year 11F	Year 11H
Number skills	Number	Indices and standard form	Number	Number	Fractions, indices and standard form	More algebra
Decimals and measures; Fractions and percentages	Decimals and ratio; Calculating with fractions; Percentages, decimals and fractions	Multiplicative reasoning	Number; Fractions and percentages; Multiplicative reasoning	Fractions, ratio and proportion	Fractions, indices and standard form	
Expressions, functions and formulae; Sequences and graphs	Expressions and equations	Expressions and formulae; Sequences, inequalities, equations and proportion	Algebra; Equations, inequalities and sequences	Algebra; Equations and inequalities	Quadratic equations and graphs; More algebra	More algebra
Sequences and graphs	Real-life graphs; Straight-line graphs	Graphs	Graphs; Ratio and proportion	Graphs; More trigonometry; Equations and graphs	Quadratic equations and graphs; More algebra	Proportion and graphs
Ratio and proportion	Decimals and ratio	Multiplicative reasoning; Sequences, inequalities, equations and proportion	Ratio and proportion; Multiplicative reasoning	Fractions, ratio and proportion; Multiplicative reasoning		Proportion and graphs
Decimals and measures; Lines and angles; Transformations	Area and volume; Lines and angles	Multiplicative reasoning; Constructions; Circles, Pythagoras and prisms; Comparing shapes	Angles; Perimeter, area and volume 1; Transformations; Right-angled triangles; Constructions, loci and bearings	Angles and trigonometry; Area and volume; Transformations and constructions; Similarity and congruence; More trigonometry	Perimeter, area and volume 2; Congruence, similarity and vectors	Circle theorems; Vectors and geometric proof
Analysing and displaying data	Statistics, graphs and charts	Dealing with data	Graphs, tables and charts, Averages and range	Interpreting and representing data, Further statistics		
Probability		Probability	Probability	Probability		

Key Stage 3: Year 7

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	**Analysing and Displaying Data** • Find the mode, median and range for a set of data • Find information from tables and diagrams • Display data using tally charts, tables, bar charts and bar-line charts • Interpret simple charts for grouped data • Find the modal class for grouped data • Calculate the mean of a set of data • Compare sets of data using their ranges and averages • Understand and draw line graphs • Understand and draw dual and compound bar charts **Number Skills** • Use the priority of operations, including brackets (BIDMAS) • Use multiplication facts up to 10 x 10 and the laws of arithmetic to do mental multiplication and division • Multiply by multiples of 10, 100 and 1000 • Make an estimate to check an answer • Use inverse operations to check an answer • Use a written method to add and subtract whole numbers of any size • Round whole numbers to the neared 10,000, 100,000 and 1,000,000 • Use an estimate to check an answer to a multiplication • Use a written method to multiply whole numbers • Use a written method to divide whole numbers • Use inverse operations to check an answer • Round money to the nearest pound or penny	**Fractions and Percentages** • Use fraction notation to describe parts of a shape • Compare simple fractions • Use a diagram to compare two or more simple fractions • Order fractions • Change an improper fraction to a mixed number • Identify equivalent fractions • Simplify fractions by dividing numerator and denominator by common factors • Add and subtract simple fractions • Calculate simple fractions of quantities • Understand inverse operations relating to fractions • Work with equivalent fractions and decimals • Write one quantity as a fraction of another • Understand percentage as 'the number of parts per 100' • Convert a percentage to a fraction or decimal • Work with equivalent percentages, fractions and decimals • Use different strategies to calculate with percentages • Express one quantity as a percentage of another **Probability** • Use the language of probability • Use a probability scale with words • Understand the probability scale from 0 to 1 • Identify outcomes and equally likely outcomes	**Lines and Angles** • Use a protractor to measure and draw angles • Recognise acute, obtuse and reflex angles • Estimate the size of angles • Describe and label lines, angles and triangles • Identify angle and side properties of triangles • Use a ruler and protractor to draw triangles accurately • Use the rules for angles on a straight line, angles around a point and vertically opposite angles • Solve problems involving angles • Use the rule for the sum of angles in a triangle • Calculate interior and exterior angles • Solve angle problems involving triangles • Use angles in triangles to solve problems involving other shapes made up of triangles • Identify and name types of quadrilaterals • Use the rule for the sum of angles in a quadrilateral • Solve angle problems involving quadrilaterals • Use angles in quadrilaterals to solve problems involving other shapes made up of quadrilaterals **Sequences and Graphs** • Recognise, describe and continue number sequences • Generate terms of a sequence using a one-step term-to-term rule • Find missing terms in a sequence

	• Interpret the display on a calculator in different contexts • Use a calculator to solve problems involving money and time • Order positive and negative numbers • Add and subtract positive and negative numbers • Find all the factor pairs for any whole number • Identify common factors, the highest common factor (HCF) and the lowest common multiple (LCM) • Recognise prime numbers • Recognise square numbers • Use a calculator to find squares and square roots • Use index form for powers • Do mental calculations with squares and square roots **Expressions, Functions and Formulae** • Find outputs of simple functions written in words and using symbols • Describe simple functions in words • Use letters to represent unknowns in algebraic expressions • Simplify linear algebraic expressions by collecting like terms • Multiply and divide algebraic terms • Use brackets with numbers and letters • Write expressions from word descriptions using addition, subtraction, multiplication and division • Write expressions to represent function machines • Substitute positive whole numbers into simple formulae written in words • Substitute positive whole numbers into formulae written with letters • Write simple formulae in words	• Calculate probabilities • Use a probability scale from 0 to 1 • Calculate more complex probabilities • Calculate the probability of an event not happening • Record data from a simple experiment • Estimate probability based on experimental data • Make conclusions based on the results of an experiment • Use probability to estimate the expected number of times an outcome will occur • Apply probabilities from experimental data in simple situations **Ratio and Proportion** • Use direct proportion in simple contexts • Solve simple problems involving direct proportion • Use the unitary method to solve simple word problems involving direct proportion • Use ratio notation • Reduce a ratio to its simplest form • Reduce a three-part ratio to its simplest form by cancelling • Understand how to use ratios to make comparisons • Find equivalent ratios • Divide a quantity into two parts in a given ratio • Solve word problems involving ratio • Use ratios and measures • Use fractions to describe and compare proportions • Understand that a ratio is simply another way of comparing parts – and how this relates to comparing parts written in fraction form • Use percentages to describe proportions	• Find patterns and rules in sequences • Describe how a pattern sequence grows • Write and use number sequences to model real-life problems • Generate and plot coordinates from a rule • Solve problems and spot patterns in coordinates • Find the midpoint of a line segment • Describe and continue special sequences • Use the term-to-term rule to work out more terms in a sequence • Recognise an arithmetic sequence and a geometric sequence • Recognise, name and plot graphs parallel to the axes • Recognise, name and plot the graphs of $y = x$ and $y = -x$ • Plot straight-line graphs using a table of values • Draw graphs to represent relationships • Generate terms of a sequence using a position-to-term rule • Use linear expressions to describe the nth term of simple sequences **Transformations** • Identify congruent shapes • Use the language of enlargement • Enlarge shapes using given scale factors • Work out the scale factor given an object and its image • Recognise reflection and rotational symmetry in 2D shapes • Solve problems using line symmetry • Identify all the symmetries of 2D shapes • Identify reflection symmetry in 3D shapes • Recognise and carry out reflections in a mirror line • Reflect a shape on a coordinate grid • Describe a reflection on a coordinate grid

	• Write simple formulae using letter symbols • Identify formulae and functions • Identify the unknowns in a formula and a function **<u>Decimals and Measures</u>** • Measure and draw lines to the nearest millimetre • Write decimals in order of size • Round decimals to the nearest whole number and to 1 decimal place • Round decimals to make estimates and approximations of calculations • Convert measurements into the same units to compare them • Solve simple problems involving units of measurement in the context of length, mass and capacity • Convert between metric units of length, mass and capacity • Use scale diagrams and read scales • Write decimal measures as two related units of measure • Interpret metric measures displayed on a calculator • Multiply decimals mentally • Check a result by considering whether it is of the right order of magnitude • Understand where to position the decimal point by considering equivalent calculations • Add and subtract decimals • Multiply and divide decimals by single-digit whole numbers • Divide numbers that give decimal answers • Work out the perimeters of composite shapes and polygons • Solve perimeter problems • Understand how to deduce formulae for perimeters of different shapes	• Use percentages to compare simple proportions • Understand and use the relationship between percentages, ratio and proportion	• Identify patterns/rules in coordinates of vertices when a shape is reflected in different straight lines on a coordinate grid • Describe and carry out rotations on a coordinate grid • Identify patterns/rules in coordinates of vertices when a shape is rotated by different angles and in different directions on a coordinate grid • Translate 2D shapes • Transform 2D shapes by combinations of rotations, reflections and translations • Understand that combined transformations can be equivalent to a single transformation

	• Find areas of irregular shapes by counting squares • Calculate the areas of shapes made from rectangles • Solve problems involving area • Choose suitable units to measure length and area • Use units of measure to solve problems • Use metric and imperial units		

Key Stage 3: Year 8

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	**Number** • Use written methods to add and subtract more than two numbers (including decimals) • Use mental calculation for multiplication • Estimate answers to calculations • Know and use divisibility rules • Use a written method to divide decimal numbers by integers • Add, subtract, multiply and divide positive and negative numbers, including larger numbers and decimals • Calculate using squares, square roots, cubes and cube roots • Identify which integers a square root lies between • Calculate combinations of squares, square roots, cubes, cube roots and brackets • Use index form • Write a number as the product of its prime factors • Use prime factor decomposition to find the highest common factor (HCF) and lowest common multiple (LCM) **Area and Volume**	**Real-life Graphs** • Draw, use and interpret conversion graphs • Interpret a distance–time graph • Draw a simple distance–time graph • Draw and use graphs to solve distance–time problems • Draw and interpret line graphs • Draw and interpret line graphs and identify trends • Draw and interpret linear and non-linear graphs from a range of sources • Draw and interpret curved graphs from a range of sources **Decimals and Ratio** • Round decimals to 2 or 3 decimal places • Round numbers to a given number of significant figures • Round numbers to an appropriate degree of accuracy • Order decimals of any size, including positive and negative decimals • Multiply any number by 0.1 and 0.01 • Multiply larger numbers	**Calculating with Fractions** • Identify fractions as more than 1/2 or less than 1/2 • Order fractions • Add and subtract fractions with any size denominator • Multiply integers and fractions by a fraction • Use appropriate methods for multiplying fractions • Find the reciprocal of a number • Divide integers and fractions by a fraction • Use strategies for dividing fractions • Write a mixed number as an improper fraction • Use the four operations with mixed numbers **Straight Line Graphs** • Recognise when values are in direct proportion with or without a graph • Plot graphs and read values to solve problems • Plot a straight-line graph and work out its gradient

	• Derive and use the formula for the area of a triangle • Calculate the area of compound shapes made from rectangles and triangles • Derive and use the formula for the area of a parallelogram • Use the formula for the area of a trapezium • Generalise understanding that all areas are product of perpendicular lengths • Calculate the volume of cubes and cuboids • Calculate the volume of 3D solids made from cuboids • Solve volume problems • Sketch nets of 3D solids • Draw 3D solids on isometric paper • Draw plans and elevations of 3D solids • Calculate the surface area of cubes and cuboids • Solve problems in everyday contexts involving measures • Convert between different measures for area, volume and capacity • Use tonnes and hectares • Know rough metric equivalents of imperial measures **Statistics, Graphs and Charts** • Interpret pie charts • Draw pie charts • Calculate the mean from a frequency table • Use two-way tables • Use tables for grouped data • Draw stem and leaf diagrams for data • Interpret stem and leaf diagrams • Compare two sets of data using statistics or the shape of the graph • Construct line graphs • Choose the most appropriate average to use • Draw a scatter graph • Draw a line of best fit on a scatter graph	• Multiply decimals with up to and including 2 decimal places • Apply the inverse relationship of multiplication and division to decimal calculations • Divide by 0.1 and 0.01 • Multiply and divide by decimals • Solve problems involving decimals and all four operations • Divide a quantity into three or more parts in a given ratio • Use ratios involving decimals • Solve ratio and proportion problems • Use unit ratios **Lines and Angles** • Classify quadrilaterals by their geometric properties • Solve geometric problems using side and angle properties of special quadrilaterals • Identify alternate angles on a diagram • Understand proofs of angle facts • Identify corresponding angles • Solve problems using properties of angles in parallel and intersecting lines • Calculate the sum of the interior and exterior angles of a polygon • Work out the sizes of interior and exterior angles of a polygon • Solve geometric problems, showing reasoning • Solve problems involving angles by setting up equations	• Plot the graphs of linear equations • Write the equations of straight-line graphs in the form $y = mx + c$ **Percentages, Decimals and Fractions** • Change time to decimal hours • Recall equivalent fractions and decimals • Recognise recurring and terminating decimals • Order fractions by converting them to decimals or equivalent fractions • Recall equivalent fractions, decimals and percentages • Use different methods to find equivalent fractions, decimals and percentages • Use the equivalence of fractions, decimals and percentages to compare two proportions • Compare and interpret more than two proportions • Express one number as a percentage of another when the units are different • Work out an amount increased or decreased by a percentage • Use mental strategies to solve percentage problems • Use a multiplier to calculate amounts increased or decreased by a percentage • Use the unitary method to solve percentage problems

	• Describe types of correlation • Interpret graphs and charts • Explain why a graph or chart could be misleading **Expression and Equations** • Understand and simplify algebraic powers • Write and use expressions involving powers • Expand brackets • Write and simplify algebraic expressions and formulae using brackets and division • Factorise expressions • Find the inverse of a simple function • Write and solve one-step equations using function machines • Solve and write two-step equations using function machines • Solve problems using equations • Solve equations using the balancing method		

Key Stage 3: Year 9

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	**Indices and Standard form** • Calculate combinations of indices and brackets, including nested brackets • Use index laws to simplify expressions • Calculate combinations of powers, roots, fractions and brackets • Estimate answers to calculations • Understand numbers written in index form that are raised to a power • Understand negative and zero indices • Use powers of 10 and their prefixes • Write large and small numbers using standard form • Enter and read standard form numbers on a calculator • Order numbers written in standard form	**Constructions** • Use scales on maps and diagrams • Draw diagrams to scale • Make accurate constructions using drawing equipment • Construct accurate triangles • Construct accurate nets of solids involving triangles • Construct accurate angles of 45°, 30°, 60° based on known constructions of perpendicular bisector, angle bisector and equilateral triangle • Construct and draw accurate scale diagrams • Use scale diagrams to solve problems	**Graphs** • Draw a graph from its equation, without working out points • Write the equation of a line parallel to another line • Compare graph lines using their equations • Draw graphs with equations in the form $ax+ by = c$ • Rearrange equations of graphs into the form $y = mx + c$ • Find the equation of a line between two points • Solve simultaneous equations by drawing graphs • Solve problems using simultaneous equations

	Expression and Formulae • Write and solve equations with fractions • Write and solve equations with the unknown on both sides • Use the priority of operations when substituting into algebraic expressions • Substitute values into expressions involving powers and roots • Write and use formulae • Substitute into formulae and then solve equations to find unknown values • Change the subject of a formula • Use the rules for indices for multiplying and dividing • Simplify expressions involving brackets • Factorise an expression by taking out an algebraic common factor • When you raise a number in index form to a power, you multiply the powers • Multiply out double brackets and collect like terms **Dealing with Data** • Identify sources of primary and secondary data • Choose a suitable sample size and what data to collect • Identify factors that might affect data collection and plan to reduce bias • Design and use data collection sheets and tables • Design a good questionnaire • Find the median from a frequency table • Estimate the mean from a large set of grouped data • Calculate a mean using an assumed mean • Construct and use a line of best fit to estimate missing values	**Sequences, Inequalities, Equations and Proportion** • Use the nth term to generate an arithmetic sequence • Find and use the nth term of an arithmetic sequence • Recognise and continue geometric sequences • Recognise and continue quadratic sequences • Represent inequalities on a number line • Find integer values that satisfy an inequality • Construct and solve equations including fractions or powers • Write formulae connecting variables in direct or inverse proportion • Use algebra to solve problems involving direct or inverse proportion **Circles, Pythagoras and Prisms** • Calculate the circumference of a circle • Estimate calculations involving pi (π • Solve problems involving the circumference of a circle • Solve problems involving arcs of circles • Calculate the area of a circle • Solve problems involving the area of a circle • Solve problems involving sectors of circles • Find the length of an unknown side of a right-angled triangle • Solve problems involving right-angled triangles • Calculate the volume and surface area of a right prism • Calculate the volume and surface area of a cylinder • Convert between m3, cm3 and mm3	• Draw graphs with quadratic equations in the form $y = x2$ • Interpret graphs of quadratic functions • Draw and interpret graphs showing inverse proportion • Draw and interpret non-linear graphs **Probability** • Identify mutually exclusive outcomes and events • Work out the probabilities of mutually exclusive outcomes and events • Calculate estimates of probability from experiments • Determine whether a dice or spinner is unbiased • List all the possible outcomes of one or two events in a sample space diagram • Decide if a game is fair • Show all the possible outcomes of two events in a two-way table • Calculate probabilities from two-way tables • Draw Venn diagrams • Calculate probabilities from Venn diagrams **Comparing Shapes** • Use congruent shapes to solve problems about triangles and other polygons • Work out whether shapes are similar, congruent or neither • Use congruent shapes to solve problems about shapes other than triangles and quadrilaterals • Identify where shapes are similar, congruent or neither, when descriptions only (no diagrams) are given • Solve problems involving similar triangles • Solve problems involving similar shapes other than triangles • Use conventions for naming the sides of a right-angled triangle

	• Identify and suggest reasons for outliers in data • Identify further lines of enquiry • Draw line graphs to represent grouped data • Draw back-to-back stem and leaf diagrams • Write a report to show survey results **Multiplicative Reasoning** • Enlarge 2D shapes using a positive whole number scale factor and centre of enlargement • Find the centre of enlargement by drawing lines on a grid • Understand that the scale factor is the ratio of corresponding lengths • Enlarge 2D shapes using a negative whole number scale factor • Enlarge 2D shapes using a fractional scale factor • Describe enlargements that involve negative and fractional scale factors (by finding the centre of enlargement) • Find an original value using inverse operations • Calculate percentage change • Solve problems using compound measures • Solve problems using constant rates and related formulae • Solve best-buy problems • Solve problems involving inverse proportion	• Find the lower and upper bounds for a measurement • Calculate percentage error intervals	• Work out the tangent ratio of any angle • Use the tangent ratio to work out an unknown side of a right-angled triangle • Work out the sine ratio of any angle • Use the sine ratio to work out an unknown side of a right-angled triangle • Use the tangent or sine ratio to find lengths in shapes made up of right-angled triangles • Work out the cosine ratio of any angle • Use the cosine ratio to work out an unknown side of a right-angled triangle • Use the trigonometric ratios to work out an unknown angle in a right-angled triangle

Key Stage 4 Year 10 **Foundation**

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	**Number** • Apply systematic listing strategies. • Use priority of operations with positive and negative numbers.	**Angles** • Solve geometric problems using side and angle properties of quadrilaterals. • Identify congruent shapes.	**Ratio and Proportion** • Use ratio notation. • Write a ratio in its simplest form. • Solve simple problems using ratios.

	• Simplifying calculations by cancelling. • Use inverse operations. • Round to a given number of decimal places. • Multiply and divide decimal numbers. • Use pictures to help you solve problems. • Convert metric measures. • Write decimal numbers of millions. • Round to a given number of significant figures. • Estimate answers to calculations. • Use one calculation to find the answer to another. • Recognise 2-digit prime numbers. • Find factors and multiples of numbers. • Find common factors and common multiples of two numbers. • Find the HCF and LCM of two numbers by listing. • Find square roots and cube roots. • Recognise powers of 2, 3, 4 and 5. • Understand surd notation on a calculator. • Use index notation for powers of 10. • Use index notation in calculations. • Use the laws of indices. • Write a number as the product of its prime factors. • Use prime factor decomposition and Venn diagrams to find the HCF and LCM. **Algebra** • Use correct algebraic notation. • Write and simplify expressions. • Use the index laws. • Multiply and divide expressions. • Substitute numbers into expressions. • Write more complex expressions. • Recognise the difference between a formula and an expression. • Write and use formulae. • Use smaller numbers to help you see a pattern.	• Understand and use the angle properties of parallel lines. • Find missing angles using corresponding and alternate angles. • Solve angle problems in triangles. • Understand angle proofs about triangles. • Calculate the interior and exterior angles of regular polygons. • Calculate the interior and exterior angles of polygons. • Explain why some polygons fit together and others do not. • Solve angle problems using equations. • Solve geometrical problems showing reasoning. • Use x for the unknown to help you solve problems. **Averages and Range** • Calculate the mean from a list and from a frequency table. • Compare sets of data using the mean and range. • Find the mode, median and range from a stem and leaf diagram. • Identify outliers. • Estimate the range from a grouped frequency table. • Recognise the advantages and disadvantages of each type of average. • Find the mode, modal class and median from a frequency table. • Estimate the mean of grouped data. • Understand the need for sampling. • Understand how to avoid bias. **Perimeter, Area and Volume 1** • Calculate the perimeter and area of rectangles, parallelograms and triangles.	• Solve simple problems using ratios. • Use ratios involving decimals. • Write and use ratios for shapes and their enlargements. • Use ratios to convert between units. • Divide a quantity into 2 parts in a given ratio. • Divide a quantity into 3 parts in a given ratio. • Solve word problems using ratios. • Use bar models to help solve ratio problems. • Compare ratios. • Write ratios in the form $1:n$ or $n:1$. • Solve ratio and proportion problems. • Use the unitary method to solve proportion problems. • Solve proportion problems in words. • Work out which product is better value for money. • Recognise and use direct proportion on a graph. • Understand the link between the unit ratio and the gradient. • Recognise different types of proportion. • Solve word problems involving direct and inverse proportion. **Right-angles triangles** • Understand Pythagoras' theorem. • Calculate the length of the hypotenuse in a right-angled triangle. • Solve problems using Pythagoras' theorem. • Calculate the length of a line segment AB. • Calculate the length of a shorter side in a right-angled triangle. • Solve problems using Pythagoras' theorem.

	• Expand brackets. • Simplify expressions with brackets. • Write and use formulae with brackets. • Factorise algebraic expressions. • Use the identity symbol ≡ and the not equal to symbol ≠. • Write expressions and simple formulae. • Use maths and science formulae. **Graphs, Tables and Charts** • Designing tables and data collection sheets. • Reading data from tables. • Use data from tables. • Design and use two-way tables. • Draw and interpret comparative and composite bar charts. • Interpret and compare data shown in bar charts, line graphs and histograms. • Plot and interpret time series graphs. • Use trends to predict what might happen in the future. • Construct and interpret stem and leaf and back-to-back stem and leaf diagrams. • Draw and interpret pie charts. • Plot and interpret scatter graphs. • Determine whether or not there is a relationship between sets of data. • Draw a line of best fit on a scatter graph. • Use the line of best fit to predict values. **Fractions and Percentages** • Compare fractions. • Add and subtract fractions. • Use fractions to solve problems. • Find a fraction of a quantity or measurement. • Use fractions to solve problems. • Use bar models to help you solve problems. • Multiply whole numbers, fractions and mixed numbers.	• Calculate a missing length, given the area. • Calculate the area and perimeter of trapezia. • Find the height of a trapezium given its area. • Convert between area measures. • Calculate the perimeter and area of shapes made from triangles and rectangles. • Calculate areas in hectares, and convert between ha and m^2. • Calculate the surface area of a cuboid. • Calculate the surface area of a prism. • Calculate the volume of a cuboid. • Calculate the volume of a prism. • Use a flow diagram to help solve problems. • Convert between measures of volume. • Solve problems involving surface area and volume. **Graphs** • Find the midpoint of a line segment. • Recognise, name and plot straight-line graphs parallel to the axes. • Recognise, name and plot the graphs of $y = x$ and $y = -x$. • Generate and plot coordinates from a rule. • Plot straight-line graphs from tables of values. • Draw graphs to represent relationships. • Find the gradient of a line. • Identify and interpret the gradient from an equation. • Understand that parallel lines have the same gradient. • Understand what m and c represent in $y = mx + c$.	• Understand and recall the sine ratio in right-angled triangles. • Use the sine ratio to calculate the length of a side in a right-angled triangle. • Use the sine ratio to solve problems. • Use the sine ratio to calculate an angle in a right-angled triangle. • Use the sine ratio to solve problems. • Understand and recall the cosine ratio in right-angled triangles. • Use the cosine ratio to calculate the length of a side in a right-angled triangle. • Use the cosine ratio to calculate an angle in a right-angled triangle. • Use the cosine ratio to solve problems. • Understand and recall the tangent ratio in right-angled triangles. • Use the tangent ratio to calculate the length of a side in a right-angled triangle • Use the tangent ratio to calculate an angle in a right-angled triangle. • Solve problems using an angle of elevation or angle of depression. • Understand and recall trigonometric ratios in right-angled triangles. • Use trigonometric ratios to solve problems. • Know the exact values of the sine, cosine and tangent of some angles. **Probability** • Calculate probabilities from equally likely events. • Calculate probabilities of mutually exclusive and exhaustive events. • Solve probability problems. • Work out probabilities from sample space diagrams. • Draw and use sample space diagrams to solve probability problems.

	• Simplify calculations by cancelling. • Divide a whole number by a fraction. • Divide a fraction by a whole number or a fraction. • Convert fractions to decimals and vice versa. • Use decimals to find quantities. • Work out divisions with decimal answers. • Write one number as a fraction of another. • Convert percentages to fractions and vice versa. • Write one number as a percentage of another. • Convert percentages to decimals and vice versa. • Find a percentage of a quantity. • Use percentages to solve problems. • Calculate simple interest. • Calculate percentage increases and decreases. • Use percentages in real-life situations. • Calculate VAT (value added tax). **Equations, Inequalities and Sequences** • Understand and use inverse operations. • Solve simple linear equations. • Solve two-step equations. • Solve linear equations with brackets. • Solve equations with unknowns on both sides. • Use correct notation to show inclusive and exclusive inequalities. • Show inequalities on a number line. • Write down whole numbers which satisfy an inequality. • Solve simple linear inequalities. • Solve two-sided inequalities. • Substitute values into formulae and solve equations. • Change the subject of a formula. • Know the difference between an expression, an equation and a formula. • Recognise and extend sequences.	• Find the equations of straight-line graphs. • Sketch graphs given the values of m and c. • Draw and interpret graphs from real data. • Use distance–time graphs to solve problems. • Draw distance–time graphs. • Interpret rate of change graphs. • Draw and interpret a range of graphs. • Understand when predictions are reliable. **Transformations** • Translate a shape on a coordinate grid. • Use a column vector to describe a translation. • Draw a reflection of a shape in a mirror line. • Draw reflections on a coordinate grid. • Describe reflections on a coordinate grid. • Rotate a shape on a coordinate grid. • Describe a rotation. • Enlarge a shape by a scale factor. • Enlarge a shape using a centre of enlargement. • Identify the scale factor of an enlargement. • Find the centre of enlargement. • Describe an enlargement. • Transform shapes using more than one transformation. • Describe combined transformations of shapes on a grid.	• Estimate and interpret probabilities based on experimental data. • Make predictions from experimental data. • Understand the language of sets and Venn diagrams. • Use Venn diagrams to solve probability problems. • Solve problems using frequency trees and tree diagrams. • Work out probabilities using tree diagrams. • Understand independent events. • Understand when events are not independent. • Solve probability problems involving events that are not independent. **Multiplicative Reasoning** • Calculate a percentage profit or loss. • Express a given number as a percentage of another in more complex situations. • Find the original amount given the final amount after a percentage increase or decrease. • Find an amount after repeated percentage changes. • Solve growth and decay problems. • Solve problems involving compound measures. • Convert between metric measures of speed. • Calculate average speed, distance and time. • Use formulae to calculate speed and acceleration. • Use ratio and proportion in measures and conversions. • Use inverse proportion. **Constructions, Loci and Bearings** • Recognise 3D shapes and their properties.

	• Use the nth term to generate terms of a sequence. • Find the nth term of an arithmetic sequence.		• Describe 3D shapes using the correct mathematical words. • Understand the 2D shapes that make up 3D objects. • Identify and sketch planes of symmetry of 3D shapes. • Draw and interpret plans and elevations of 3D shapes. • Make accurate drawings of triangles using a ruler, protractor and compasses. • Identify SSS, ASA, SAS and RHS triangles as unique from a given description. • Identify congruent triangles. • Draw diagrams to scale. • Use scales on maps and diagrams to work out lengths and distances. • Solve problems involving scales. • Accurately draw angles and 2D shapes using a ruler, protractor and compasses. • Construct a polygon inside a circle. • Draw accurate nets. • Bisect angles and lines using rulers and compasses. • Find the shortest distance from a point to a line. • Draw loci for the path of points that follow a given rule. • Identify regions bounded by loci to solve practical problems. • Find and use three-figure bearings. • Use angles on parallel lines to work out bearings. • Solve problems involving bearings and scale diagrams.

Key Stage 4 Year 10 **Higher**

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	**Number** • Use pictures or lists to help you to solve problems. • Work out the total number of ways of performing a series of tasks. • Estimate an answer. • Use place value to answer questions. • Write a number as the product of its prime factors. • Find the HCF and LCM of two numbers. • Use powers and roots in calculations. • Multiply and divide using index laws. • Work out a power raised to a power. • Use negative indices. • Use fractional indices. • Write a number in standard form. • Calculate with numbers in standard form. • Understand the difference between rational and irrational numbers. • Simplify a surd. • Rationalise a denominator. **Algebra** • Use the rules of indices to simplify algebraic expressions. • Expand brackets. • Factorise algebraic expressions. • Solve equations involving brackets and numerical fractions. • Use equations to solve problems. • Substitute numbers into formulae. • Rearrange formulae. • Distinguish between expressions, equations, formulae and identities. • Find the general term or nth term of an arithmetic sequence.	**Graphs** • Find the gradient and y-intercept from a linear equation. • Rearrange an equation into the form $y = mx + c$. • Compare two graphs from their equations. • Plot graphs with equations $ax + by = c$. • Sketch graphs using the gradient and intercepts. • Find the equation of a line, given its gradient and one point on the line. • Find the gradient of a line through two points. • Draw and interpret distance–time graphs. • Calculate average speed from a distance–time graph. • Understand velocity–time graphs. • Find acceleration and distance from velocity–time graphs. • Draw and interpret real-life linear graphs. • Recognise direct proportion. • Draw and use a line of best fit. • Find the coordinates of the midpoint of a line segment. • Find the gradient and length of a line segment. • Find the equations of lines parallel or perpendicular to a given line. • Draw quadratic graphs. • Solve quadratic equations using graphs. • Identify the line of symmetry of a quadratic graph. • Interpret quadratic graphs relating to real-life situations.	**Multiplicative Reasoning** • Find an amount after repeated percentage changes. • Solve growth and decay problems. • Solve problems using an iterative process. • Calculate rates. • Convert between metric speed measures. • Use a formula to calculate speed and acceleration. • Solve problems involving compound measures. • Use relationships involving ratio. • Use direct and indirect proportion. **Similarity and Congruence** • Show that two triangles are congruent. • Know the conditions of congruence. • Prove shapes are congruent. • Solve problems involving congruence. • Use geometric sketching to help solve congruency problems. • Use the ratio of corresponding sides to work out scale factors. • Find missing lengths on similar shapes. • Use geometric sketching to help solve similarity problems. • Use similar triangles to work out lengths in real life. • Use the link between linear scale factor and area scale factor to solve problems. • Use the links between scale factors for length, area and volume to solve problems. **More Trigonometry**

	• Determine whether a particular number is a term of a given arithmetic sequence. • Solve problems using geometric sequences. • Work out terms in Fibonacci sequences. • Find the nth term of a quadratic sequence. • Expand the product of two brackets. • Use the difference of two squares. • Factorise quadratics expressions of the form x^2 + bx + c. **Interpreting and Representing Data** • Construct and use back-to-back stem and leaf diagrams. • Construct and use frequency polygons and pie charts. • Plot and interpret time series graphs. • Use trends to predict what might happen in the future. • Plot and interpret scatter graphs. • Determine whether or not there is a linear relationship between two variables. • Draw a line of best fit on a scatter graph. • Use the line of best fit to predict values. • Decide which average is best for a set of data. • Estimate the mean and range from a grouped frequency table. • Find the modal class and the class containing the median. • Construct and use two-way tables. • Choose appropriate diagrams to display data. • Recognise misleading graphs. **Fractions, Ratio and Percentages** • Add, subtract, multiply and divide fractions and mixed numbers. • Find the reciprocal of an integer, decimal or fraction. • Write ratios in the form 1 : n or n : 1. • Compare ratios. • Find quantities using ratios.	• Draw graphs of cubic functions. • Solve cubic equations using graphs. • Draw graphs of reciprocal functions. • Recognise a graph from its shape. • Interpret linear and non-linear real-life graphs. • Draw the graph of a circle. **Area and Volume** • Find the area and perimeter of compound shapes. • Recall and use the formula for the area of a trapezium. • Convert between metric units of area. • Write error intervals for rounded values. • Calculate upper and lower bounds. • Convert between metric units of volume. • Calculate volumes and surface areas of prisms. • Calculate the area and circumference of a circle. • Calculate area and circumference in terms of π. • Calculate the perimeter and area of semicircles and quarter circles. • Calculate arc lengths, angles and areas of sectors of circles. • Calculate volume and surface area of a cylinder and a sphere. • Solve problems involving volumes and surface areas. • Calculate volume and surface area of pyramids and cones. • Use a flow diagram to help you solve problems. **Transformations and Constructions** • Draw plans and elevations of 3D solids. • Reflect a 2D shape in a mirror line.	• Understand and use upper and lower bounds in calculations, especially involving trigonometry. • Understand how to find the sine of any angle. • Know the graph of the sine function and use it to solve equations. • Understand how to find the cosine of any angle. • Know the graph of the cosine function and use it to solve equations. • Understand how to find the tangent of any angle. • Know the graph of the tangent function and use it to solve equations. • Find the area of a triangle and a segment of a circle. • Use the sine rule to solve 2D problems. • Use the cosine rule to solve 2D problems. • Solve bearings problems using trigonometry. • Use Pythagoras' theorem in 3D. • Use trigonometry in 3D. • Recognise how changes in a function affect trigonometric graphs. • Recognise how changes in a function affect trigonometric graphs. **Further Statistics** • Use random numbers to select a random sample. • Understand the assumptions made when using a sample to predict results for a population. • Use the Petersen capture–recapture method. • Draw and interpret cumulative frequency tables and graphs. • Work out the median, quartiles and interquartile range from a cumulative frequency graph.

	• Solve problems involving ratios. • Use bar models to help solve problems. • Convert between currencies and measures. • Recognise and use direct proportion. • Solve problems involving ratios and proportion. • Calculate using percentages and ratios. • Work out percentage increases and decreases. • Solve real-life problems involving percentages. • Calculate using fractions, decimals and percentages. • Convert a recurring decimal to a fraction. **Angles and Trigonometry** • Derive and use the sum of angles in a triangle and in a quadrilateral. • Derive and use the fact that the exterior angle of a triangle is equal to the sum of the two opposite interior angles. • Calculate the sum of the interior angles of a polygon. • Use the interior angles of polygons to solve problems. • Use x for the unknown to help you solve problems. • Know the sum of the exterior angles of a polygon. • Use the angles of polygons to solve problems. • Calculate the length of the hypotenuse in a right-angled triangle. • Solve problems using Pythagoras' theorem. • Calculate the length of a shorter side in a right-angled triangle. • Solve problems using Pythagoras' theorem. • Use trigonometric ratios to find lengths in a right-angled triangle. • Use trigonometric ratios to solve problems. • Find angles of elevation and angles of depression.	• Rotate a 2D shape around a centre of rotation. • Describe reflections and rotations. • Carry out and describe combinations of reflections. • Enlarge shapes by fractional and negative scale factors about a centre of enlargement. • Translate a shape using a vector. • Carry out and describe combinations of different transformations. • Draw and use scales on maps and scale drawings. • Solve problems involving bearings. • Construct triangles using a ruler and compasses. • Construct the perpendicular bisector of a line. • Construct the shortest distance from a point to a line using a ruler and compasses. • Bisect an angle using a ruler and compasses. • Construct angles using a ruler and compasses. • Construct shapes made from triangles using a ruler and compasses. • Draw a locus. • Use loci to solve problems. **Equations and Inequalities** • Solve inequalities and show the solution on a number line and using set notation. • Rearrange and solve quadratic equations. • Find the roots of quadratic equations. • Solve more complex quadratic equations. • Use the quadratic formula to solve a quadratic equation.	• Find the quartiles and the interquartile range from stem-and-leaf diagrams. • Draw and interpret box plots. • Understand frequency density. • Draw histograms. • Interpret histograms. • Solve problems by comparing distributions. **Equations and Graphs** • Solve simultaneous equations graphically. • Represent inequalities on graphs. • Interpret graphs of inequalities. • Find roots of equations. • Sketch quadratic graphs. • Find roots of quadratic equations. • Solve quadratic inequalities. • Expand triple brackets. • Find the roots of cubic equations. • Sketch graphs of cubic equations. • Solve quadratic and cubic equations using an iterative process.

	• Use trigonometric ratios to calculate an angle in a right-angled triangle. • Use trigonometric ratios to solve problems. • Know the exact values of the sine, cosine and tangent of some angles.	• Complete the square for a quadratic expression. • Solve quadratic equations by completing the square. • Solve simple simultaneous equations. • Solve simultaneous equations for real-life situations. • Use simultaneous equations to find the equation of a straight line. • Solve linear simultaneous equations where both equations are multiplied. • Write equations involving two unknowns to describe real-life situations, and then solve them. • Solve simultaneous equations with one quadratic equation. **Probability** • Use the product rule for finding the number of outcomes for two or more events. • Use two-way tables and sample space diagrams to solve probability problems. • Identify mutually exclusive outcomes and events. • Find the probabilities of mutually exclusive outcomes and events. • Solve probability problems. • Estimate the expected results for experimental and theoretical probabilities. • Compare real results with theoretical expected values to decide if a game is fair. • Draw and use frequency trees. • Calculate probabilities of independent events. • Use probability tree diagrams to solve problems. • Decide if two events are independent.	

		• Draw and use tree diagrams to solve conditional probability problems. • Use two-way tables to calculate conditional probability. • Use set notation. • Use Venn diagrams to solve conditional probability problems.	

Key Stage 4 Year 11 **Foundation**

	Autumn term	**Spring term**	**Summer term**
Declarative and Procedural Knowledge	**Quadratic Equations and Graphs** • Multiply double brackets. • Recognise quadratic expressions. • Square single brackets. • Plot graphs of quadratic functions. • Recognise a quadratic function. • Use quadratic graphs to solve problems. • Solve quadratic equations a x^2 + bx + c = 0 using a graph. • Solve quadratic equations a x^2 + bx + c = k using a graph. • Factorise quadratic expressions. • Solve quadratic functions algebraically. **Perimeter, Area and Volume 2** • Calculate the circumference of a circle. • Solve problems involving the circumference of a circle. • Calculate the circumference and radius of a circle. • Write error intervals for rounded and truncated values. • Work out the area of a circle. • Work out the radius or diameter of a circle. • Solve problems involving the area of a circle. • Give answers in terms of π. • Understand and use maths language for circles and perimeters.		

	• Work out areas and perimeters of sectors of circles. • Solve problems involving areas and perimeters of 2D shapes. • Work out the volume and surface area of cylinders. • Work out the volume of a pyramid. • Work out the surface area of a pyramid. • Work out the volume of a cone. • Work out the surface area of a cone. • Work out the volume and surface area of a sphere. • Work out the volume and surface area of composite solids. **Fractions, Indices and Standard Form** • Multiply and divide mixed numbers and fractions. • To know and use the laws of indices. • Write large numbers in standard form. • Convert numbers from standard form into ordinary numbers. • Write small numbers in standard form. • Convert numbers from standard form with negative powers into ordinary numbers. • To multiply and divide numbers in standard form. • To add and subtract numbers in standard form. **Congruence, Similarity and Vectors** • Understand similarity. • Use similarity to solve angle problems. • Find the scale factor of an enlargement. • Use similarity to solve problems. • Determine when two shapes are definitely not (or may not be) similar. • Understand the similarity of regular polygons. • Calculate perimeters of similar shapes. • Recognise congruent shapes. • Use congruence to work out unknown angles.		

	• Use congruence to work out unknown sides and angles in triangles and shapes made of triangles. • Add vectors. • Find the resultant of two vectors. • Subtract vectors. • Find multiples of a vector. • Identify two column vectors that are parallel. • Solve problems using vectors. **More Algebra** • Draw and interpret graphs of cubic functions. • Draw and interpret graphs of $y=1/x$ • Draw and interpret non-linear graphs to solve problems. • Solve simultaneous equations by drawing a graph. • Write and solve simultaneous equations. • Solve simultaneous equations algebraically. • Change the subject of a formula. • Identify expressions, equations, formulae and identities. • Prove results using algebra.		

Key Stage 4: Year 11 **Higher**

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	**Circle Theorems** • Solve problems involving angles, triangles and circles. • Understand and use facts about chords and their distance from the centre of a circle. • Solve problems involving chords and radii. • Understand and use facts about tangents at a point and from a point. • Solve angle and length problems involving circles and tangents.		

	• Understand, prove and use facts about angles subtended at the centre and the circumference of circles. • Understand, prove and use facts about the angle in a semicircle. • Understand, prove and use facts about angles subtended at the circumference of a circle. • Understand, prove and use facts about cyclic quadrilaterals. • Prove the alternate segment theorem. • Solve angle problems using circle theorems. • Find the equation of the tangent to a circle at a given point. **More Algebra** • Change the subject of a formula where the power or root of the subject appears. • Change the subject of a formula where the subject appears twice. • Add and subtract algebraic fractions. • Multiply and divide algebraic fractions. • Change the subject of a formula involving fractions where all the variables are in the denominators. • Simplify algebraic fractions. • Add and subtract more complex algebraic fractions. • Multiply and divide more complex algebraic fractions. • Prove a result using algebra. • Simplify expressions involving surds. • Expand expressions involving surds. • Rationalise the denominator of a fraction. • Solve equations that involve algebraic fractions. • Use function notation. • Find composite functions. • Find inverse functions.		

	Vectors and Geometric Proof • Understand and use vector notation. • Work out the magnitude of a vector. • Calculate using vectors and represent the solutions graphically. • Identify when vectors are parallel. • Calculate the resultant of two vectors. • Solve problems using vectors. • Use the resultant of two vectors to solve vector problems. • Express points as position vectors. • Prove lines are parallel. • Prove points are collinear. • Solve geometric problems in two dimensions using vector methods, including where vectors are divided in a given ratio. • Apply vector methods for simple geometric proofs. **Proportion and Graphs** • Write and use equations to solve problems involving direct proportion. • Write and use equations to solve problems involving direct proportion. • Solve problems involving square and cubic proportionality. • Write and use equations to solve problems involving inverse proportion. • Use and recognise graphs showing inverse proportion. • Recognise graphs of exponential functions. • Sketch graphs of exponential functions. • Match equations to graphs. • Calculate the gradient of a tangent at a point. • Estimate the area under a non-linear graph. • Understand the relationship between translating a graph and the change in its function notation.		

	• Understand the effect reflecting a curve in one of the axes has on its function form.		

Appendix – Vocabulary

Having a rich, ambitious, broad vocabulary is vital for learners to succeed, both in school and throughout their lives.

Tier 1 vocabulary

The words we use in everyday conversation, such as “put”, “get”, “walk”, etc.

Tier 2 vocabulary

These are challenging, ambitious words that don’t usually crop up in day-to-day conversation. These are the words that allow us to access academic texts, such as high-level literature, newspaper articles and exam papers.

Tier 3 vocabulary

The subject-specific vocabulary of a particular discipline. These are words that aren’t used outside of the context of a specific subject or have a different meaning in one subject versus another.

ALGEBRA - A branch of mathematics that substitutes numbers for letters

AVERAGE - The sums of data divided by the number of items in the data will give an average

ACUTE ANGLE - An angle less than 90°

AREA - The amount of space inside the boundary of a flat shape (2-dimensional) object

APPROXIMATE - An Approximation is close to a value, but not completely accurate or exact

ASYMMETRICAL - A shape which has no lines of symmetry

ARC - Part of the circumference (edge) of a circle

AVERAGE - A value to best represent a set of data. There are three type of average – the mean, the median and the mode

AXIS - An axis is one of the lines used to locate a point in a coordinate system

BEARING - A three-digit angle measured from north in a clockwise direction

BIDMAS - The order in which calculations should be carried out :(B)rackets (I)ndices (D)ivision (M)ultiplication (A)ddition (S)ubtraction

BRACKETS - A pair of symbols used to enclose sections of a mathematical expression

BISECT - To divide an angle or shape exactly in half.

CALCULATE - To work out an answer, usually by adding, dividing, subtracting or adding.

COEFFICIENT - The number in front of an algebraic symbol. The coefficient of 6x is 6.

CONSTANT - A letter or symbol whose value always stays the same. Example: in “x + 6 = 8”, 6 and 8 are constants x is variable.

CONGRUENT - Two shapes are congruent when you can Turn, Flip and/or Slide one so it fits exactly on the other.

CHORDA straight line drawn from one point on the edge of a circle to another.

CIRCUMFERENCE - The perimeter, around, of a circle.

CROSS SECTION - The end section created when you slice a 3D shape along its length.

CUBE NUMBER - The product when an integer is multiplied by itself three times. For example, 2 cubed = 2 x 2 x 2 = 16

CUBOID - A 3D shape with all sides made from rectangles. Like a cereal box.

CUMULATIVE FREQUENCY - A running total of the frequencies, added up as you go along

DENOMINATOR - The Downstairs part of a fraction (bottom) part of a fraction.

DECAGON - A ten-sided polygon.

DIAMETER - The distance across a circle which passes through the centre.

DIFFERENCE - Subtract the smaller value from the larger value to find the difference between two numbers.

DISTRIBUTION - How data is shared or spread out.

ESTIMATE - Roughly calculate or judge the value, number, quantity, or extent of a quantity.

EXPAND - To multiply out brackets in an expression. For example, 2(4x + 10) = 8x + 20

EXPRESSION - Numbers, symbols and operators (such as + and ×) grouped together that show the value of something. Example: 2×3 is an expression

FORMULA - An equation used to describe a relationship between two or more variables.

FACTORISE - To put an expression into brackets by taking out a common factor. For example, 2y+6 = 2(y+3)

FACTOR - A number that divides (fits) into another number exactly. E.g. 5 is a factor of 20.

FREQUENCY - How many often something happens.

FREQUENCY DENSITY - The frequency divided by the class width.

GRADIENT - How steep a line is. Found by Rise divided by Run.

HISTOGRAM - A diagram drawn with rectangles where the area is proportional to the frequency and the width is equal to the class interval.

HYPOTENUSE - The longest side on a right-angled triangle.

INDICES - Another name for powers such as ^{2} or ^{3}.

INTEGER - A whole number.

INTER-QUARTILE RANGE (IQR) - The difference between the upper and lower quartile.

IRRATIONAL - A decimal which is never ending. It must also not be a recurring decimal.

JUSTIFY - This just means that you have to explain step by step.

LOCI - The plural of locus.

LOCUS - A collection of points which are the same distance from another point or line.

MEAN - A type of average found by adding up a list of numbers and dividing by how many numbers are in the list.

MEDIAN - The middle value when a list of numbers is put in order from smallest to largest. A type of average.

MODE - The most common value. For example, 5, 6, 7,7, 4, 7, 3. This most common value is 7.

MULTIPLE - Found at the end of the times table. For example, 6 x 3 = 18. So 18 is the multiple.

NUMERATOR - The top part of a fraction.

OBTUSE ANGLE - An angle between 90 and 180.

OPERATION - An operation is an action or procedure which produces a new value. For example, addition, subtraction, division and multiplication are all operations.

PARALLEL - Two or more lines which are always the same distance apart.

PARALLELOGRAM - A quadrilateral with two pairs of parallel sides.

PERIMETER - The distance around a shape.

PERPENDICULAR - Two or more lines which meet at right angles.

PI (Π) - An irrational constant used when calculating the area and circumference of circles. It is approximately equal to 3.14.

POLYGON - A many-sided figure, with sides that are line segments. Examples are, triangles, pentagon and hexagon.

PRIME - number which has exactly two factors. The number one and itself. Such as 5, 13, 23

PRISM - 3D shape with the same cross section all along its length.

PROBABILITY - A measure of how likely an event is to occur.

PRODUCT - The answer when two values are multiplied together.

RADIUS - The distance from the centre of a circle to its circumference.

RANGE - The largest number take away the smallest value in a set of data.

RATIONAL - A decimal number which ends or is recurring.

RECIPROCAL - The reciprocal of any number is 1 divided by the number. E.g. the reciprocal of 3 is 1/3, the reciprocal of 3/4 is 4/3.

RECURRING - A decimal number that has digits that repeat forever. Examples: 1/3 = 0.333… 1/7 = 0.142857142857…

REFLEX ANGLE - An angle greater than 180.

REGULAR - A shape with all sides and angles the same size.

ROTATION - To turn a shape using an angle, direction and centre of rotation.

SEGMENT - An area of a circle enclosed by a chord.

SEQUENCE - A list of numbers which follows a pattern. For example, 5, 7, 9, 11, …

SIMPLIFY - Simplify means to make simpler by cancellation of common factors, regrouping of terms in the same variable

SOLVE - To find the missing value in an equation.

SQUARE NUMBER - The product when an integer is multiplied by itself. For example, 2×2 =4, 3×3 =6

SUM -The answer when two or more values are added together.

SURFACE AREA - To total area of all sides on a 3D shape.

SYMMETRICAL - A shape which has at least one line of symmetry.

TANGENT - A straight line that just touches a point on a curve. A tangent to a circle is perpendicular to the radius which meets the tangent.

TERM - A number, variable or combination of both which forms part of an expression.

TRANSFORMATION - The name for reflections, rotations, translations and enlargements.

TRANSLATION - To move a shape from one position to another by sliding in the x-axis followed by the y-axis.

TRIANGULAR NUMBER - A sequence of numbers generated by adding one more than was added to find the previous term. For example, 1, 3, 6, 10, 15, 21, …

VALUE - A numerical amount or quantity.

VARIABLE - A letter which we don't know the value of.

WIDTH - The measurement or extent of something from side to side

Y-INTERCEPT - The value of the y-coordinate when a graph crosses the y-axis.