Curriculum Overview – Maths

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.

Wolfreton Curriculum Intent

Our Maths curriculum is underpinned by our Intent statement:

The possibilities are infinite.

To spark numerical ingenuity, confidence and fluency by creating, challenging and championing your mathematical understanding.

Curriculum Aims

The Wolfreton curriculum for mathematics aims to ensure that all our students:

- Are equipped with the numeracy and mathematical skills they need for life
- Develop secure knowledge and understanding why methods work
- Develop transferable skills such as logical thinking, problem solving and constructing arguments
- Are inspired to develop a love and inquisitiveness of Mathematics, to progress onto further Mathematical study for their career.

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, **Rounding** To round answers to specified decimal places or significant figures and to use estimation to check if an answer seems sensible **Comparisons**	**Numeracy** The ability to understand, reason with and apply simple numerical concepts to various areas of maths. **Literacy** The knowledge, ability and confidence to use subject specific

	Conversion of units and currency, fractions and multiples, expressing quantities as a percentage of another, use standard units of mass, length, time, money.	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**
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	Working together to develop and share ideas, discuss misconceptions, and how topics relate to real-life situations
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	

Key subject skills

Assessment Objective 1	Assessment Objective 2	Assessment Objective 3
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.

Subject Knowledge Progression

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Number - addition, subtraction, multiplication and division	Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication	Use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers.	Rounding numbers and measures to an appropriate degree of accuracy	Write numbers of any size in standard form A x 10^n, where 1 <A<10 and n is an integer.	Converting between normal numbers and standard form. Calculate with numbers in standard form.	
	Divide numbers up to 4 digits by a two-digit number using the formal written method of long and short division where appropriate, interpreting remainders according to the context	Compare and order numbers. Use four operations with directed numbers. Ordering decimals.	Calculations with money	Apply and interpret limits of accuracy. Change freely between related standard units. Use compound units such as speed, rates of pay, unit pricing, density and pressure.	Plotting and interpreting graphs in real contexts to find approximate solutions to problems such as simple kinematic problems.	
		Explore powers, prime factorisation, Highest Common Factor (HCF) and Lowest Common Multiple (LCM).	Use positive integer powers and associated real roots. Recognise powers of 2, 3, 4, 5.	Use positive integer powers and associated real roots. Recognise powers of 2, 3, 4, 5. Estimate powers and roots of any given positive number.	Calculate exactly with surds. Simplify surd expressions involving squares.	Calculating with roots and with integer indices. Calculating with fractional indices.
	Identify common factors, common multiples and prime numbers	Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples property.	Divisibility, prime factors, including using product notation and the unique factorisation.	Fraction arithmetic including exact values.	Change recurring decimals into their corresponding fractions and vice versa.	Using inequality notation to specify simple error intervals.
	Use knowledge of the order of operations to carry out calculations involving the four operations	BIDMAS	Powers and roots			

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Number – fractions decimals and percentages	Use common factors to simplify fractions; use common multiples to express fractions in the same denomination	Represent any fraction as a diagram or on a number line.	Find the product of a pair of fractions.	Define percentage as 'number of parts per hundred'	Expressing one quantity as a fraction of another.	
	Compare and order fractions, including fractions > 1	Understand fractions as division. Identify and use simple equivalent fractions.		Compare two quantities using percentages.	Expressing a multiplicative relationship between two quantities as a ratio or a fraction.	
	Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions	Add and subtract fractions mixed numbers	Multiply and divide fractions and mixed numbers	Express one quantity as a percentage of another	Finding percentages and percentage changes	
	Multiply simple pairs of proper fractions, writing the answer in its simplest form	Represent tenths and hundreths on number lines and in diagrams. Interchange between fractional and decimal number lines	Multiply a fraction by an integer			
	Divide proper fractions by whole numbers	Convert between fractions and decimals - tenths and hundreths, fifths and quarters, eigths and thousandths	Divide an integer by a fraction/ a fraction by a unit fraction	Interpret percentages and percentage changes as a fraction or decimal and interpret these multiplicatively	Finding percentages and percentage changes multiplicatively using decimals	
	Associate a fraction with division and calculate decimal fraction equivalents	Convert fluently between fractions, decimals and percentages			Converting between fractions, decimals and percentages	
	Multiply one-digit numbers with up to two decimal places by whole numbers	Multiply and divide by powers 10.	Use index form			

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Number – fractions decimals and percentages	Solve problems which require answers to be rounded to specified degrees of accuracy	Round numbers and measures to an appropriate degree of accuracy.	Understand and use the reciprocal			
	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.	Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥				
	Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000.	Understand and use place value for decimals, measures and integers of any size	Use positive integer powers and associated real roots (square, cube and higher).	Estimate powers and roots of any given positive number.	Calculate exactly with surds. Simplify surd expressions involving squares.	Calculating with roots and with integer indices. Calculating with fractional indices.
Algebra	Use Simple Formulae	Use function Machines, form and solve one and two step equations.	Solve inequalities, form and solve equations with brackets. Simple inverse functions.	Form and solve equations and inequalities with unknowns on both sides	Solving two linear simultaneous equations algebraically by elimination. Solving two linear simultaneous equations graphically or algebraically by substitution.	Using inequality notation to specify simple error intervals. Function Notation. Inverse and composite functions.

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Algebra	Generate and describe linear number sequences	Recognise linear and non linear sequences, generate sequences	Find the nth term for a linear sequence	Testing conjectures about sequences. Representing sequences. Finding the rule for the nth term of a linear sequence	Recognise and use: sequences of triangular, square and cube numbers; simple arithmetic progression; Fibonacci type sequences; quadratic sequences, and simple geometric progressions	*Further Maths - Pascals triangle*
	Express missing number problems algebraically.	Substitute into expressions, collecting like terms, simple algebraic frations	Expanding brackets, simplify expressions			
	Find positions on a coordinates grid (positive quadrant)	Represent functions graphically. Generate and plot coordinates from a rule. Recognise, name and plot graphs parallel to the axes	Explore gradient, linear and non linear graphs. Plot a straight-line graph and work out its gradient.	Solve simultaneous equations by drawing graphs. Draw and interpret graphs showing inverse proportion.	Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions and the reciprocal function. Draw and interpret non-linear graphs	Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions and the reciprocal function. Plotting and interpreting graphs in real contexts to find approximate solutions to problems such as simple kinematic problems.
			Conversion graphs, direct proportion graphs, y=mx+c	Use the form y = mx + c to identify parallel and perpendicular lines , find the equation of the line through given points, or through one point with a given gradient.	Identify and interpret gradients and intercepts of linear functions graphically and algebraically.	Calculate or estimate the area under a graph. Interpreting gradients of graphs and areas under graphs.

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Algebra	Find pairs of numbers that satisfy and equation with two unknowns	Algebraic notation	Indentify formulae, expression, identities and equations	Change the subject of a formula.	Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation	Prove a result using algebra. Solve equations that involve algebraic fractions.
Geometry and measurements	Draw 2-D shapes using given dimensions and angles, recognise, describe and build simple 3-D shapes, including making nets.	Geometric notation	Translations and enlargement	Explore volumes of cones, spheres and compound shapes.	Standard ruler and compass constructions. Know that the perpendicular distance from a point to a line is the shortest distance to the line. Use these to construct given figures and solve loci problems.	Mixed loci problems
	Identify regular polygons, including equilateral triangles and squares, as those in which the side-lengths are equal and the angles are equal.	Simple angle proofs. Use scale diagrams.	Find and prove simple geometric facts. Solve geometric problems, showing reasoning.	Congruence criteria for triangles and other shapes.	Apply and use the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures	Geometric proofs. 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.
	Find the perimeter of regular and irregular polygons.	Determine the perimeters of composite shapes and polygons.		Recognise rotational symmetry, rotate points about a given point. Perform a series of transformations.		
	Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.	Draw lines, angles and simple shapes	Recognise line symmetry, reflect shapes in a given line			

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Geometry and measurements	Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.	Parallel and perpendicular lines	Interior and exterior angles of a polygon, angles in parallel lines. Solve problems involving angles by setting up equations. Know the formula for Pythagoras' Theorem. Apply it to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures.	Conventions for naming the sides of a right-angled triangle. The Tangent Ratio. The Sine Ratio. The Cosine Ratio. Use the trigonometric ratios to work out an unknown angle in a right-angled triangle.	Use trigonometric ratios to find lengths in a right-angled triangle. The sine rule. The cosine rule. Area of a triangle using sine. Use trigonometric ratios to solve problems.	Mixed problems using trigonometric formulas. Graphs of trigonometric functions.
	Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons.	Angles at a point, vertically opposite, quadrilaterals.		Apply angle facts, congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs.	Constructions, bearings, scale drawings, plans and elevations.	Vector Geometry. Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors Use vectors to construct geometric arguments and proofs.
	Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius	Know properties of triangles and quadrilaterals, name and construct polygons	Explore diagonals of quadrilaterals	Surface area of cuboids. Volume of cuboids and prisms. Surface area of prisms	Derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus.	Perimeter of polygons. Surface area of trapeziums.

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Geometry and measurements	Convert units of measure, using decimal notation up to three decimal places where appropriate.	Convert between metric units of length, mass and capacity.	Convert between different measures for area, volume and capacity. Know rough metric equivalents of imperial measures.	Find the lower and upper bounds for a measurement. Calculate percentage error intervals.	Surface area and volume cones, spheres and frustrums. Calculate exactly with multiples of `pi`.	Circle Theorems. Understand and use facts about tangents at a point and from a point. Understand, prove and use facts about angles subtended at the centre and the circumference of circles. Find the equation of the tangent to a circle at a given point.
	Recognise that shapes with the same areas can have different perimeters and vice verse.	Solve perimeter problems.	Circumference of a circle.	Solve problems involving the circumference and/or area of a circle.		
	Recognise when it is possible to use formulae for area and volume of shapes, inc. parallelograms and triangles.	Area rectangles, parallelograms, triangles, trapezium.	Area of circles and compound shapes.	Surface are and volume cylinders and prisms.		
Statistics	Construct line graphs and pie charts.	Solve problems with line charts, bar charts and pie charts.	Recognise different types of data. Construct and interprete frequency tables grouped and ungrouped and two way tables.	Interpret analyse and compare distributions of data sets from invariate empirical distributions through appropriate graphical representations involving discrete, continous and grouped data	Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling.	
	Calculate and interpret mean as an average.	Find median, range and mean. Determine mean from a frequency table.	Find the mode, identify outliers, find distribution using statistical measures.	Find the modal class. Compare distributions. Find the median and quartiles from cumulative frequency diagrams.	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency and spread.	Applying statistics to describe a population.

Strand	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Probability		Language of probability. Recording data. Calculate probabilities, probability scales. Estimate probability based on experimental data.	Construct sample space for more than one event and find probabilities. Construct and use two-way tables and venn diagrams.	exclusive outcomes and events. Calculate probabilities from two-way tables. Use set notation and Venn diagrams to solve conditional probability problems.	Compare experimental and theoretical probability. Draw and use frequency trees. Use probability tree diagrams to solve problems.	
Ratio and Proportion	Solve problems involving the relative sizes of two quantities where missing values can be found.	Solve simple problems involving direct proportion	Convert area and volume measurements.	Ratios in the context of area and volume; gradients as a rate of change.	Compare lengths using ratio notation; make links to trigonometric ratios.	Solve problems involving square and cubic proportionality.
	Solve problems involving the calculation of percentages and use percentages for comparison.	Convert metric units	Currency conversion	Solve direct proportion problems. Inverse proportion.	Repeated percentage change. Solve problems involving compound measures.	Write and use equations to solve problems involving inverse proportion. Use and recognise graphs showing inverse proportion.
	Solve problems involving similar shapes where the scale factor is known or can be found.	Use multiplicative relationships between known facts. Reduce a ratio to its simplest form.	Divide a quantity into two parts in a given ratio. Scale factors, scale diagrams, similar shapes.	Enlarge 2D shapes using positive or negative whole number scale factor. Scale drawings.	Solve growth and decay problems.	Recognise graphs of exponential functions. Sketch graphs of exponential functions.
	Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.	Use fractions to describe and compare proportions. Use percentages to compare simple proportions.	Ratio notation, divide into given ratio, work parts and whole, link gradient and ratio and 1:n.	Working with ratios and fractions. Reverse percentages. Financial maths - best-buy problems. Express one quantity as a percentage of another.	Interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively. Compare two quantities using percentages. Work with percentages greater than 100%.	Solve problems involving percentage change, including percentage increase / decrease and original value problems, and simple interest.

Curriculum Sequencing

Key Stage 3: Year 7 – Long Term Planning

	Autumn term	Spring term	Summer term
Declarative and Procedural Knowledge	<u>Analysing and Displaying Data</u> • 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 <u>Number Skills</u> • 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	<u>Fractions and Percentages</u> • 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 <u>Probability</u> • Use the language of probability • Use a probability scale with words	<u>Lines and Angles</u> • 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

	• 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 • 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 <u>Expressions, Functions and Formulae</u> • 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	• Understand the probability scale from 0 to 1 • Identify outcomes and equally likely outcomes • 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 <u>Ratio and Proportion</u> • 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	• Find missing terms in a sequence • 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

	• 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 • 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	• 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 • Use percentages to compare simple proportions • Understand and use the relationship between percentages, ratio and proportion	• 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 • 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

	• 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 • 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 – Long Term Planning

	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	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	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

	• 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 • 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	• 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 • 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	• 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 • 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

	• 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 • 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 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	• 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

	• Solve and write two-step equations using function machines • Solve problems using equations • Solve equations using the balancing method		

Key Stage 3: Year 9 – Long Term Planning

	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 **Expression and Formulae** • Write and solve equations with fractions • Write and solve equations with the unknown on both sides	**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 **Sequences, Inequalities, Equations and Proportion** • Use the nth term to generate an arithmetic sequence • Find and use the nth term of an arithmetic sequence	**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 • 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

	• 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 • Identify and suggest reasons for outliers in data • Identify further lines of enquiry • Draw line graphs to represent grouped data	• 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 • Find the lower and upper bounds for a measurement • Calculate percentage error intervals	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 • Work out the tangent ratio of any angle

	• 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		• 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 – Long Term Planning Edexcel GCSE Maths

	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.	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 $ax + by = c$.	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.

	• 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. • 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.	• 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. • 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.	• 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 • 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.

	• 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. • Solve problems involving ratios. • Use bar models to help solve problems.	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. • Rotate a 2D shape around a centre of rotation. • Describe reflections and rotations. • Carry out and describe combinations of reflections.	• 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. • Find the quartiles and the interquartile range from stem-and-leaf diagrams. • Draw and interpret box plots. • Understand frequency density. • Draw histograms. • Interpret histograms.

	• 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.	• 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. • Complete the square for a quadratic expression. • Solve quadratic equations by completing the square.	• 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.	• 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 – Long Term Planning Edexcel GCSE Maths

	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	Revision	Revision

	• 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 is the simplest. These are the words we use in everyday conversation, such as “put”, “get”, “walk”, etc. On the other side of the spectrum, Tier 3 vocabulary is 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. In the middle of these two tiers is Tier 2 vocabulary. Tier 2 vocabulary 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 and Key Terms – Definitions

- 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.

Key Stage 5: Year 12 – Long Term Planning AQA A Level Maths

	Autumn term	Spring term	Summer term
Declarative and	<u>Side A</u> Algebraic Manipulation • Surds	<u>Side A</u> Proof	<u>Statistics</u>

Procedural Knowledge	○ Simplifying surds ○ Understand how to carry out operations with surds ○ Rationalising the denominator • Indices ○ Simplifying expressions using the laws of indices • The discriminant ○ Understanding and applying the properties of the discriminant • Simultaneous equations ○ Solving linear and non-linear simultaneous equations ○ Interpreting the solutions of simultaneous equations as the points of intersection of graphs ○ Understanding the link between the discriminant and simultaneous equations • The factor theorem ○ Understand and apply the factor theorem to polynomials • Algebraic division ○ Understand and apply the method of algebraic division • Factorising ○ Understand and apply the method of comparing coefficients to factorise polynomials of degree 3 and above Graphs • Quadratic graphs ○ Understanding and applying the properties of quadratic graphs.	• Understanding and applying proof by exhaustion • Understand and applying proof by deduction • Understanding and applying direct proof • Understanding and applying proof by contradiction Vectors • Find the magnitude of a 2-dimensional vector • Working with position vectors in 2-dimensions <u>Side B</u> Exponentials and logarithms • Understanding and sketching the properties of exponential graphs • Understanding and applying the laws of logarithms to simplify expressions • Understanding and applying the laws of logarithms to solve equations • Using logarithms to linearise an exponential model and estimate parameters • Understanding the properties of y=e^x, including the graph • Understanding and using natural logarithms to solve equations	• Understanding mutually exclusive events and the implication for probability • Understanding independent events and the implication for probability • Working with the binomial distribution to calculate probabilities • Carrying out and interpreting hypothesis tests based on the binomial distribution • Understanding and applying different methods of sampling • Understanding and calculating measures of central tendency and measures of spread by hand and using technology • Drawing and analysing graphs arising from data

	• Inequalities
	  ○ Solving linear and quadratic inequalities
	• Sketching graphs
	  ○ Understanding and recognising the shape of graphs
	  ○ Sketching to include roots, turning points and intercepts
	• Transformations of graphs
	  ○ Describing and understanding transformations of graphs
	
	Trigonometry
	• Trigonometric graphs
	  ○ Recognising and using the graphs of y=sinx, y =cosx and y=tanx for various domains (degrees only)
	• Sine and cosine rules
	  ○ Recognising and applying the sine and cosine rules
	• Trigonometric equations
	  ○ Solving trigonometric equations in sin, cos and tan
	• Trigonometric identities
	  ○ Using and proving trigonometric identities involving sin, cos and tan
	  ○ Applying identities to solve equations
	
	Binomial expansion
	• Binomial expansion
	
	<u>Side B</u>
	
	Coordinate geometry
		• Understanding and using applications of exponential growth and decay
		
		<u>Mechanics (Side A and Side B)</u>
		
		• Understanding and using the language of mechanics. Understanding the difference between vector and scalar quantities.
		• Drawing and using displacement-time and velocity-time graphs
		• Calculating using the formulae for constant acceleration
		• Understanding and using calculus to deal with variable acceleration
		• Understanding and applying each of Newton's Laws	

	• Straight line graphs
	  ○ Finding and using equations of straight lines
	  ○ Finding and using parallel and perpendicular equations
	• Graphs of circles
	  ○ Recognising, sketching and using the equation of a circle
	  ○ Finding the equation of a tangent/ normal to a circle
	Differentiation
	• Using differentiation from first principles
	• Differentiating polynomials
	• Using differentiation to find the gradient at a point
	• Finding the equation of a tangent/ normal to curve
	• Finding local maxima/ minima using differentiation
	• Identifying where functions are increasing/ decreasing
	Integration
	• Understanding and using the Fundamental Theorem of Calculus
	• Integrating polynomials
	• Finding an area using definite integration of polynomials		

Key Stage 5: Year 13 – Long Term Planning AQA A Level Maths

	Autumn term	Spring term	Summer term
Declarative and	<u>Side A</u> Binomial Expansion	<u>Side A</u> Vectors	Revision

Procedural Knowledge	• Applying binomial expansion for fractional and negative powers Sequences and Series • Understanding and calculating with arithmetic sequences and series • Understanding and calculating with geometric sequences and series Trigonometry • Understanding radians as a unit of turn • Understanding and applying trigonometric identities involving secant, cosecant and cotangent • Understanding and applying the properties of arccos, arcsin and arctan • Understanding and applying the angle addition formuale Functions • Understanding and calculating the range and domain of a function • Understanding the modulus function, sketching graphs and solving equations involving the modulus • Understanding and applying a series of multiple graph transformations <u>Side B</u> Differentiation • Understanding and applying the chain rule • Understanding and apply the product rule	• Find the magnitude of a 3-dimensional vector • Working with position vectors in 3-dimensions Mechanics • Calculating using the formulae for constant acceleration in 2-dimensions • Understanding and using calculus to deal with variable acceleration in 2-dimensions • Understanding and applying each of Newton's Laws in 2-dimensions • Applications of mechanics in projectiles • Understanding and applying the coefficient of friction in 2-dimensions • Understanding and applying moments around a point Statistics • Understanding and calculating with conditional probability • Working with the normal distribution to calculate probabilities • Carrying out and interpreting hypothesis tests based on the normal distribution • Carrying out and interpreting hypothesis tests based on the product moment correlation coefficient <u>Side B</u>	

	• Understanding and applying the quotient rule Integration • Understanding and applying the fundamental theorem of calculus • Understand and applying integration by substitution • Understanding and applying integration by parts • Understanding and applying integration as the limit of a sum	Numerical Methods • Understanding and applying the process of locating roots in a given interval • Understanding and applying the Newton-Raphson method • Understanding and applying the trapezium rule Parametric Equations • Converting between cartesian and parametric forms • Understanding and applying implicit differentiation • Differentiating parametric equations • Understanding applications of parametric models Partial Fractions • Writing algebraic fractions as partial fractions • Integrating fractions by first writing as partial fractions Differential equations • Constructing differential equations from a worded context • Solving differential equations using separation of variables • Interpreting the solution of differential equations in the context of the model	