Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

Whole school curriculum intent Develop a broad and balanced curriculum that enables students to learn, recall and apply knowledge and skills across different contexts, supported by a robust and consistent approach to assessment. This will lead to successful and resilient lifelong learners who can cope in a range of changing contexts.
Key stage 3/4 subject curriculum intent We aim to inspire our pupils to appreciate the beauty of Mathematics and use its logic skilfully across all areas of the school curriculum and life.

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Year Group		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year Group		Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
Year 9	**Topic**						
	Core knowledge from this topic	Basic skills in Number, Algebra, Geometry and Statistics	Percentages, Indices and roots, Algebraic Manipulation, Straight-Line graphs, Angle Facts	Accuracy, Circles, Equations and Inequalities, Probability	Probability, Sequences, Constructions, Quadratics, Quadratics Graphs	Ratio and Compound Measures, Proportion, Pythagoras' Theorem, Trigonometry	Statistical Graphs and Measures, Transformations and Vectors, Volume and Surface Area
	Links to the national curriculum	N1, N2, N3, N4, N5, N6, N10, N12, A1, A2, A5, A8, G1, G3, G4, G11, G12, G14, G16, S2, S5	N7, N9, N12, N13, R9, R16, A3, A4, A7, A9, A10, A12, A17, R11, R14, G5, G6, G19	N14, N15, N16, G9, G16, G17, G18, N8, A17, A22, N1, P1, P2, P3, P4, P5	N1, P1, P2, P3, P4, P5, A23, A24, A25, G2, G13, G15, A4, A18, A11, A18	R1, R3, R4, R5, R6, R7, R8, R10, R11, N11, N13, R13, G20, G21, R12	S2, S4, G7, G24, G25, R2, G16, G17
	Previous content that this topic builds upon						
	Key vocabulary	Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd, inverse, fractions, mixed, improper, recurring, integer, decimal, terminating, percentage, Expression, identity, equation, formula, substitute, term, like terms, index, power, collect, substitute, simplify. Angle, polygon, interior, exterior, proof, tessellation, rotational symmetry, parallel, corresponding, alternate, co-interior, vertices, edge, face, sides, triangle, perpendicular, isosceles, scalene, clockwise, anticlockwise, triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, decagon, obtuse, acute, reflex, regular, irregular, two-dimensional, three-dimensional, measure, line, angle, order, intersecting, area, perimeter, formula, length, width, prism, compound, measurement, Mode, range, discrete, continuous, qualitative, quantitative, data, population, stem and leaf, frequency, table, sort, pie chart, estimate	Percentage, increase, decrease, multiplier, VAT, income, tax, profit, loss, repeated, simple, compound, inverse, Add, subtract, multiply, divide, indices, standard form, power, reciprocal, index, Expression, identity, equation, formula, substitute, term, like terms, index, power, collect, expand, bracket, factor, factorise, linear, simplify, Linear, graph, distance, time, coordinate, quadrant, real-life graph, gradient, intercept, equation, function, solution, parallel, Angle, polygon, regular, irregular, interior, exterior, proof, tessellation, parallel, vertices, sides, perpendicular, isosceles, scalene, triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, decagon, obtuse, acute, reflex, congruent	Rounding, accuracy, significant figures, decimal places, Area, perimeter, formula, length, measurement, circle, tangent, chord, arc, sector, circumference, radius, diameter, pi, segment, cylinder, surface area, volume, accuracy, Solve, inequality, represent, bracket, expand, linear, equation, balance, Probability, outcomes, theoretical, mutually exclusive, relative frequency, fairness, experimental.	Probability, outcomes, theoretical, mutually exclusive, relative frequency, fairness, experimental, Arithmetic, geometric, sequence, *n*th term, derive, quadratic, triangular, cube, square, odd, even, Construct, circle, arc, vertex, two-dimensional, three-dimensional, solid, elevations, congruent, angles, bearing, degree, bisect, perpendicular, loci, map, scale, plan, region, Quadratic, function, solve, expand, factorise, simplify, expression, factor, coefficient, bracket, Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket	Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, compound measure, density, mass, volume, speed, distance, time, pressure, acceleration, velocity, Ratio, proportion, best value, unitary, proportional change, compound measure, density, mass, volume, speed, distance, time, pressure, acceleration, velocity, direct proportion, inverse proportion, constant of proportionality, Triangle, right angle, angle, Pythagoras' theorem, opposite, hypotenuse, adjacent, length, accuracy, Triangle, right angle, angle, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy	Mean, median, mode, range, average, discrete, continuous, data, stem and leaf diagram, frequency, table, sort, estimate, Transformation, rotation, reflection, enlargement, translation, single, combination, scale factor, mirror line, centre of rotation, centre of enlargement, column vector, similarity, congruent, angle, direction, coordinate, describe, vector, scalar, multiple, parallel, Volume, formula, cuboid, prism, compound, cylinder, radius, diameter, pi, sphere, cone, hemisphere, accuracy, surface area
	Development of cultural capital						
	Development of reading	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –History of algebra Football Pitches	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –Health Inequalities Googol and googolplex	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –Taxing Billionaires Perceptions of probability	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –History of constructions Fibonacci numbers	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –History of Trigonometry salary ratios and inequality	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –3D Printing Opinion Polls

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

	Concepts –what will students be able to do at the end of the topic	By the end of the unit, students should be able to:
		Number
		• Use, order and compare positive and negative numbers (integers), decimals, fractions and percentages; use the symbols <, > and understand the ≠ symbol;
		• Add, subtract, multiply and divide positive and negative numbers (integers), decimals (including money), and fractions; multiply or divide any number by powers of 10;
		• Recall all multiplication facts to 10 × 10, and use them to derive corresponding division facts;
		• Use brackets and the hierarchy of operations (including positive integer powers);
		• Round numbers to a given power of 10, nearest integer or to a given number of decimal places or significant figures;
		• Express a given number as a percentage of another number;
		• Convert between fractions, decimals and percentages;
		• Use index notation for powers of 10, including negative powers;
		• Find the prime factor decomposition of positive integers and write as a product using index notation;
		• Find the LCM and HCF of two numbers
		• Solve simple problems using HCF, LCM and prime numbers.
		Algebra
		• Manipulate and simplify algebraic expressions by collecting like terms;
		• Multiply together two simple algebraic expressions, e.g. $2a \times 3b$;
		• Simplify expressions by cancelling, e.g. $\frac{4x}{2} = 2x$;
		• Use index notation and the laws of indices when multiplying or dividing algebraic terms;
		• Substitute numbers into algebraic expressions;
		Geometry and Measures
		• Estimate sizes of angles and measure angles using a protractor;
		• Identify a line perpendicular to a given line on a diagram and use their properties;
		• Identify parallel lines on a diagram and use their properties;
		• Find missing angles using properties of corresponding and alternate angles;
		• Understand and use the angle properties of quadrilaterals;
		• Use the fact that angle sum of a quadrilateral is 360°;
			By the end of the unit, students should be able to:
			Percentages
			• Express a given number as a percentage of another number;
			• Find a percentage of a quantity without a calculator: 50%, 25% and multiples of 10% and 5%;
			• Find a percentage of a quantity or measurement;
			• Calculate amount of increase/decrease;
			• Use percentages in real-life situations, including percentages greater than 100%:
			  • Price after VAT (not price before VAT);
			  • Value of profit or loss;
			  • Simple interest;
			  • Compound interest;
			  • Income tax calculations;
			• Find a percentage of a quantity, including using a multiplier;
			• Find the original amount given the final amount after a percentage increase or decrease;
			Indices and Roots
			• Use index notation for powers of 10, including negative powers;
			• Understand the difference between positive and negative square roots;
			• Use the laws of indices to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractions and powers of a power;
			• Use numbers raised to the power zero, including the zero power of 10;
			• Convert large and small numbers into standard form and vice versa;
			• Add, subtract, multiply and divide numbers in standard form;
			• Interpret a calculator display using standard form and know how to enter numbers in standard form.
			Algebraic Manipulation
			• Multiply a single number term over a bracket;
			• Multiply together two algebraic expressions with brackets;
			• Square a linear expression, e.g. $(x + 1)^2$;
			• Rearrange simple equations;
			• Factorise algebraic expressions by taking out common factors.
			Straight-line Graphs
			• Find the coordinates of the midpoint of a line segment;
			• Read values from straight-line graphs for real-life situations;
			• Draw straight-line graphs for real-life situations, including ready reckoner
				By the end of the unit, students should be able to:
				Accuracy
				• Estimate answers; check calculations using approximation and estimation;
				• Round answers to a given degree of accuracy;
				• Use inequality notation to specify simple error intervals due to truncation or rounding.
				Circles
				• Recall the definition of a circle and identify, name and draw parts of a circle including tangent, chord and segment;
				• Recall and use formulae for the circumference of a circle and the area enclosed by a circle; circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2;
				• Use $\pi \approx 3.142$ or use the π button on a calculator;
				• Find the perimeters and areas of semicircles and quarter-circles;
				• Calculate perimeters and areas of composite shapes made from circles and parts of circles;
				Equations and Inequalities
				• Solve simple equations with integers, unknown on both sides, brackets and negative numbers
				• Write down whole number values that satisfy an inequality;
				• Solve an inequality such as $-3 < 2x + 1 < 7$ and show the solution set on a number line;
				• Use the correct notation to show inclusive and exclusive inequalities;
				• Construct inequalities to represent a set shown on a number line.
				Probability
				• Mark events and/or probabilities on a probability scale of 0 to 1;
				• Write probabilities in words or fractions, decimals and percentages;
				• Find the probability of an event happening using theoretical probability;
				• Use theoretical models to include outcomes using dice, spinners, coins;
				• List all outcomes for single events systematically;
				• Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1;
				• Find the probability of an event happening using relative frequency;
				• Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities.
					By the end of the unit, students should be able to:
					Probability
					• Mark events and/or probabilities on a probability scale of 0 to 1;
					• Write probabilities in words or fractions, decimals and percentages;
					• Find the probability of an event happening using theoretical probability;
					• Use theoretical models to include outcomes using dice, spinners, coins;
					• List all outcomes for single events systematically;
					• Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1;
					• Find the probability of an event happening using relative frequency;
					• Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities.
					Sequences
					• Recognise sequences of odd and even numbers, and other sequences including Fibonacci sequences;
					• Write the term-to-term definition of a sequence in words;
					• Find a specific term in the sequence using position-to-term or term-to-term rules;
					• Find the next term in a sequence,
					• Find the *n*th term
					  • for a pattern sequence;
					  • of a linear sequence;
					• Use the *n*th term of an arithmetic sequence to
					  • generate terms;
					Constructions
					• Understand congruence, as two shapes that are the same size and shape;
					• Understand and draw front and side elevations and plans of shapes made from simple solids;
					• Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid;
					• Use a straight edge and a pair of compasses to do standard constructions: construct the perpendicular bisector, the perpendicular from a point to a line, construct the bisector of a given angle, construct angles of 90°, 45°
					• Draw and construct diagrams from given instructions,
					• Find and describe regions satisfying a combination of loci;
					• Use and interpret maps and scale drawings;
						By the end of the unit, students should be able to:
						Ratio and Compound
						• Write ratios in their simplest form;
						• Write/interpret a ratio to describe a situation;
						• Share a quantity in a given ratio including three-part ratios;
						• Solve a ratio problem in context;
						• Write ratios in form 1 : *m* or *m* : 1;
						• Write a ratio as a fraction or as a linear function;
						• Write lengths, areas and volumes of two shapes as ratios in simplest form;
						• Express a multiplicative relationship between two quantities as a ratio or a fraction;
						• Understand and use compound measures: density, pressure, speed
						• Convert between metric speed measures;
						• calculate average speed, distance, time – in miles per hour as well as metric measures;
						• use kinematics formulae to calculate speed, acceleration (with formula provided and variables defined in the question);
						• change d/t in m/s to a formula in km/h, i.e. d/t × (60 × 60)/1000 – with support.
						Measures and Proportion
						• Express a multiplicative relationship between two quantities as a ratio or a fraction,
						• Solve proportion problems using the unitary method;
						• Work out which product offers best value and consider rates of pay;
						• Work out the multiplier for repeated proportional change as a single decimal number;
						• Understand and use compound measures
						• Calculate an unknown quantity from quantities that vary in direct or inverse proportion;
						• Recognise when values are in direct proportion by reference to the graph form, and use a graph to find the value of *k* in $y = kx$;
						Pythagoras' Theorem
						• Understand, recall and use Pythagoras' theorem in 2D, including leaving answers in surd form and being able to justify if a triangle is right-angled or not;
						• Calculate the length of the hypotenuse and of a shorter side in a right-angled triangle, including decimal lengths and a range of units;
						• Apply Pythagoras' theorem with a triangle drawn on a coordinate grid;
						Trigonometry
							By the end of the unit, students should be able to:
							Statistical Graphs and Measures
							• Recognise the advantages and disadvantages between measures of average;
							• find the mode, median, range, as well as the greatest and least values from stem and leaf diagrams, and compare two distributions from stem and leaf diagrams (mode, median, range);
							• Calculate the mean, mode, median and range from a frequency table (discrete data);
							• Construct and interpret grouped frequency tables for continuous data:
							Transformations and Vectors
							• Find the centre of rotation, angle and direction of rotation and describe rotations fully using the angle, direction of turn and centre;
							• Rotate and draw the position of a shape after rotation about the origin or any other point including rotations on a coordinate grid;
							• Translate a given shape by a vector;
							• Use column vectors to describe and transform 2D shapes using single translations on a coordinate grid;
							• Identify two column vectors which are parallel;
							• Calculate using column vectors, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector;
							• Understand that reflections are specified by a mirror line;
							• Identify the equation of a line of symmetry;
							• Transform 2D shapes using single reflections (including those not on coordinate grids) with vertical, horizontal and diagonal mirror lines;
							• Describe reflections on a coordinate grid;
							• Enlarge a given shape using (0, 0) as the centre of enlargement, and enlarge shapes with a centre other than (0, 0);
							• Find the centre of enlargement by drawing;
							• Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides, simple integer scale factors, or simple fractions;
							Volume and Surface Area
							• Recall and use the formula for the volume of a cuboid;
							• Find the volume of a prism, including a triangular prism, cube and cuboid;
							• Calculate volumes of right prisms and shapes made from cubes and cuboids;

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

		• Recall and use properties of angles at a point, angles at a point on a straight line, right angles, and vertically opposite angles; • Give reasons for angle calculations and show step-by-step deduction when solving problems; • Calculate area and perimeter **Statistics** • Design and use data-collection sheets for grouped, discrete and continuous data, use inequalities for grouped data, and introduce ≤ and ≥ signs; • Design, complete and use two-way tables for discrete and grouped data; • Calculate the total frequency from a frequency table; • Recognise simple patterns, characteristics and relationships in bar charts and line graphs; • Calculate the averages and range for a set of data as well as for grouped frequency	graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit; • Draw distance–time graphs and velocity–time graphs; • Find the gradient of a straight line, and interpret as a rate of change; • Recognise straight-line graphs parallel to the axes; • Identify and interpret gradient from an equation $y = mx + c$; • Find approximate solutions to a linear equation from a graph. **Angle properties in shapes** • Understand "regular" and "irregular" as applied to polygons; • Use the sum of the interior angles of an n-sided polygon; • Use the sum of the exterior angles of any polygon is 360°; • Use the sum of the interior angle and the exterior angle is 180°;		• Use three-figure bearings to specify direction; • Give a bearing between the points on a map or scaled plan; **Quadratics** • Multiply together two algebraic expressions with brackets; • Square a linear expression, e.g. $(x + 1)^2$; • Factorise quadratic expressions of the form $x^2 + bx + c$; • Factorise a quadratic expression of the form $x^2 – a^2$ using the difference of two squares; • Solve quadratic equations by factorising; • Find the roots of a quadratic function algebraically. **Quadratics Graphs** • Generate points and plot graphs of simple quadratic functions, then more general quadratic functions; • Identify the line of symmetry of a quadratic graph; • Find approximate solutions to quadratic equations using a graph;	• Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in right-angled triangles in 2D figures; • Use the trigonometric ratios to solve 2D problems including angles of elevation and depression; • Know the exact values of sin ϑ and cos ϑ for $\vartheta = 0°, 30°, 45°, 60°$ and 90°; know the exact value of tan ϑ for $\vartheta = 0°, 30°, 45°$ and 60°.	• Find the surface area and volume of a cylinder; • Find the surface area and volume of spheres, pyramids, cones and composite solids.
Year Group		**Autumn Term 1**	**Autumn Term 2**	**Spring Term 1**	**Spring Term 2**	**Summer Term 1**	**Summer Term 2**
Year 11 Foundation	**Topic**						
	Core knowledge from this topic (click for knowledge organisers)	Probability Volume Algebra (quadratics, rearranging formulae and identities) Scatter graphs	Inequalities Pythagoras' Theorem Simultaneous equations Algebra and graphs	Sketching graphs Direct and inverse proportion Basic Trigonometry	Solving Quadratic Equations Quadratic Graphs Growth and decay Vectors		
	Links to the national curriculum (if applicable)	P2, P3, P5, P6, P8, P9, R12, G16, G17, N8, A4, A5, A6, A7, S6	A16, A17, A18, A12, A11, A19, A21, A12, R10, R13, R14	A22, G20, G21, G6, R12, R16, G25, A13	G22, G23, G10, R15, R14, A15		
	Previous content that this topic builds upon	Students need to be able to convert between fractions, decimals and percentages. It is likely that students will be familiar with basic probability ideas from Key Stage 3, but they can access the materials in this topic without any prior knowledge. How to multiply a single term over a bracket. How to factorise a linear expression. How to collect like terms. How to calculate area and perimeter of rectangles or compound shapes made up of rectangles.	Students should be able to use inequality signs between numbers. Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations. Students should be able to deal with decimals and negatives on a calculator. Students should be able to use index laws numerically. Students should be able to draw a number line.	Students should be able to plot coordinates and read scales Students should be able to substitute into a formula. Students should be able to square negative numbers. Students should be able to substitute into formulae. Students should be able to plot points on a coordinate grid. Students should be able to expand single brackets and collect 'like' terms Students should be able to rearrange simple formulae and equations, as preparation for rearranging trigonometric formulae. Students should recall	Students will have used column vectors when dealing with translations. Students can recall and apply Pythagoras' Theorem on a coordinate grid. Students should be able to find a percentage of an amount and relate percentages to decimals.	NA	NA

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

		Students will hopefully have seen the skill of substitution before but might need a recap. How to and why you can simplify a fraction.		basic angle facts. Students should understand when to leave an answer in surd form. Students can plot coordinates in all four quadrants and draw axes.			
	Key vocabulary	Probability, dependent, independent, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, fairness, experimental, Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, symmetry, vertices, edge, face, units, conversion Area, perimeter, formula, length, width, measurement, volume, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, sphere, cone, hemisphere, segment, accuracy, surface area	solve, inequality, represent, substitute, linear, accuracy, Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy, Rearrange, simultaneous, substitution, elimination, subject, rearrange, simultaneous, substitution, elimination	Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, graphical, linear, compare, Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy,	Compound interest, growth, decay, depreciation, multiplier, Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket, Reciprocal, linear, gradient, functions, direct, indirect, estimate, cubic, subject, rearrange, simultaneous, substitution, elimination, proof,		
	Development of cultural capital	Many positions that fall under the umbrella term of management use Pythagoras' Theorem regularly. Computer and information systems managers, construction managers, engineering and natural sciences managers use this in their day-to-day business of their respective fields.	Astronomers use trigonometry to calculate how far stars and planets are from Earth, Even though we know the distances between planets and stars, this mathematical technique is also used by NASA scientist today when they design and launch space shuttles and rockets.	People who regularly include exponents (growth and decay) are economists, bankers, biologist, engineers, computer programmers and risk assessors. This topics has a vast number of real-life links to ensure that pupils can have real-life concepts to cement their understanding too.	Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and "real-life" mathematical problems.		
	Development of reading	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – 3D shapes	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Pythagoras'	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Trigonometry	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Vectors		
	Concepts –what will students be able to do at the end of the topic	Probability ➢ Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments ➢ Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 to 1 probability scale	Inequalities ➢ Solve linear inequalities in one variable ➢ Represent the solution set on a number line Pythagoras' Theorem ➢ Know the formula for Pythagoras' Theorem $a2 + b2 = c2$ ➢ Apply it to find lengths in right angled triangles in two dimensional figures	Sketching graphs ➢ Recognise, sketch and interpret graphs of linear functions, quadratic functions ➢ Simple cubic functions and the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$ Direct and inverse proportion ➢ Solve problems involving direct and inverse proportion, including	Solving Quadratic equations ➢ Solve quadratic equations algebraically by factorising ➢ Find approximate solutions using a graph Quadratic graphs ➢ Recognise, sketch and interpret graphs of quadratic functions ➢ Identify and interpret roots, intercepts and turning points of quadratic functions graphically ➢ Deduce roots algebraically Growth and decay		

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

		➢ Understand that empirical unbiased samples tend towards theoretical probability distributions with increasing sample size ➢ Enumerate sets and combinations of sets systematically using tables, grids, Venn diagrams and tree diagrams ➢ Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions Volume ➢ Compare lengths, areas and volumes using ratio notation ➢ Scale factors ➢ Make links to similarity a) Know and apply formulae to calculate the volume of cuboids and other right prisms (including cylinders) b) Calculate the volume of spheres, pyramids, cones and composite solids c) Calculate exactly with multiples of π Algebra (quadratics, rearranging formulae and identities) • Simplify and manipulate algebraic expressions (including those involving surds) by: • simplifying expressions involving sums, products and powers, including the laws of indices • expanding products of two binomials • factorising quadratic expressions of the form $x2 + bx + c$ including the difference of two squares • Understand and use standard mathematical formulae • Rearrange formulae to change the subject • Know the difference between an equation and an identity • Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments • Where appropriate, interpret simple expressions as	Simultaneous equations ➢ Solve two simultaneous equations in two variables (linear/linear) algebraically ➢ Find approximate solutions using a graph ➢ Translate simple situations or procedures into algebraic expressions or formulae ➢ Derive two simultaneous equations, solve the equations and interpret the solution Algebra and graphs ➢ Solve linear equations in one unknown algebraically ➢ Including those with the unknown on both sides of the equation ➢ Find approximate solutions using a graph ➢ Translate simple situations or procedures into algebraic expressions or formulae ➢ Derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution	graphical and algebraic representations ➢ Understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$ ➢ Interpret equations that describe direct and inverse proportion ➢ Recognise and interpret graphs that illustrate direct and inverse proportion Basic Trigonometry ➢ Know and use the trigonometric ratios $\sin\theta = \frac{opposite}{hypotenuse}$, $cos\,\theta = \frac{adjacent}{hypotenuse}$, $tan\,\theta =$ ➢ Apply them to find angles and lengths in right-angled triangles in two dimensional figures ➢ Know the exact values of sinϑ and cosϑ for $\vartheta = 0^0, 30^0, 45^0, 60^0$ and 90^0 ➢ Know the exact value of tanϑ for $\vartheta = 0^0, 30^0, 45^0, 60^0$ ➢ Compare lengths using ratio notation ➢ Make links to trigonometric ratios	➢ Set up, solve and interpret the answers in growth and decay problems, including compound interest Vectors ➢ Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors		

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

		functions with inputs and outputs Scatter graphs • Use and interpret scatter graphs of bivariate data • Recognise correlation and know that it does not indicate causation • Draw estimated lines of best fit • Make predictions • Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so					
Year Group		**Autumn Term 1**	**Autumn Term 2**	**Spring Term 1**	**Spring Term 2**	**Summer Term 1**	**Summer Term 2**
Year 11 Higher	**Topic**						
	Core knowledge from this topic	Probability Volume Algebra (quadratics, rearranging formulae and identities) Scatter graphs Numerical methods	Equations of circles Further equations and graphs Simultaneous equations Sketching graphs Diverse and inverse proportion	Inequalities Pythagoras' Theorem Basic Trigonometry Growth and decay Vectors Transforming functions	Sine and Cosine Circle Theorems Gradients and rate of change Pre-calculus and area under a curve Algebraic fractions		
	Links to the national curriculum (if applicable)	P2, P3, P5, P6, P8, P9, R12, G16, G17, N8, A4, A5, A6, A7, S6, N20	A16, A17, A18, A12, A11, A19, A21, A12, R10, R13, R14	A22, G20, G21, G6, R12, R16, G25, A13	G22, G23, G10, R15, R14, A15	NA	NA
	Previous content that this topic builds upon	Students need to be able to convert between fractions, decimals and percentages. It is likely that students will be familiar with basic probability ideas from Key Stage 3, but they can access the materials in this topic without any prior knowledge. How to multiply a single term over a bracket. How to factorise a linear expression. How to collect like terms. How to calculate area and perimeter of rectangles or compound shapes made up of rectangles. Students will hopefully have seen the skill of substitution before but might need a recap. How to and why you can simplify a fraction.	Students should be able to use inequality signs between numbers. Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations. Students should be able to deal with decimals and negatives on a calculator. Students should be able to use index laws numerically. Students should be able to draw a number line.	Students should be able to plot coordinates and read scales Students should be able to substitute into a formula. Students should be able to square negative numbers. Students should be able to substitute into formulae. Students should be able to plot points on a coordinate grid. Students should be able to expand single brackets and collect 'like' terms Students should be able to rearrange simple formulae and equations, as preparation for rearranging trigonometric formulae. Students should recall basic angle facts. Students should understand when to leave an answer in surd form. Students can plot coordinates in all four quadrants and draw axes.	Students will have used column vectors when dealing with translations. Students can recall and apply Pythagoras' Theorem on a coordinate grid. Students should be able to find a percentage of an amount and relate percentages to decimals.		
	Key vocabulary	Probability, dependent, independent, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, fairness,	solve, inequality, represent, substitute, linear, accuracy, Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry,	Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, graphical, linear, compare, Triangle, right angle, angle,	Compound interest, growth, decay, depreciation, multiplier, Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector,		

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

			experimental, Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, symmetry, vertices, edge, face, units, conversion Area, perimeter, formula, length, width, measurement, volume, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, sphere, cone, hemisphere, segment, accuracy, surface area	opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy, Rearrange, simultaneous, substitution, elimination, subject, rearrange, simultaneous, substitution, elimination	Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy,	Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket, Reciprocal, linear, gradient, functions, direct, indirect, estimate, cubic, subject, rearrange, simultaneous, substitution, elimination, proof,		
	Development of cultural capital	**lessons**	Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and "real-life" mathematical problems.	Many positions that fall under the umbrella term of management use Pythagoras' Theorem regularly. Computer and information systems managers, construction managers, engineering and natural sciences managers use this in their day-to-day business of their respective fields.	Astronomers use trigonometry to calculate how far stars and planets are from Earth, Even though we know the distances between planets and stars, this mathematical technique is also used by NASA scientist today when they design and launch space shuttles and rockets.	People who regularly include exponents (growth and decay) are economists, bankers, biologist, engineers, computer programmers and risk assessors. This topics has a vast number of real-life links to ensure that pupils can have real-life concepts to cement their understanding too.		
		Jobs	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice		
	Development of reading		The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice		
	Concepts –what will students be able to do at the end of the topic		Probability ➢ Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments ➢ Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale ➢ Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size ➢ Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams ➢ Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions ➢ Calculate and interpret conditional probabilities through	Equations of circles ➢ Recognise and use the equation of a circle with centre at the origin ➢ Find the equation of a tangent to a circle at a given point Further equations and graphs ➢ Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation) ➢ Find approximate solutions using a graph ➢ Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula ➢ Find approximate solutions using a graph ➢ Recognise, sketch and interpret graphs of linear and quadratic functions ➢ Identify and interpret roots, intercepts and turning points of quadratic functions graphically	Inequalities ➢ Solve linear inequalities in one or two variable(s) and quadratic inequalities in one variable ➢ Represent the solution set on a number line, using set notation and on a graph Pythagoras' Theorem and Basic Trigonometry ➢ Know the formula for Pythagoras' Theorem $a2 + b2 = c2$ and the trigonometric ratios $\sin\theta = \frac{opposite}{hypotenuse}$, $cos\,\theta = \frac{adjacent}{hypotenuse}$, $tan\,\theta = \frac{opp}{adj}$ ➢ Apply them to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures ➢ Know the exact values of $\sin\theta$ and cos θ for $\theta = 0^0, 30^0, 45^0, 60^0$ and 90^0 ➢ Know the exact value of tan θ for $0^0, 30^0, 45^0, 60^0$ ➢ Apply angle facts, triangle congruence, similarity and	Sine and Cosine ➢ Know and apply the Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ and cosine rule $a^2 = b^2 + c^2 - 2bc\,cos\,A$ to find unknown lengths and angles Know and apply $Area = \frac{1}{2}absinC$ to calculate the area, sides or angles of any triangle Circle Theorems ➢ Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results Gradients and rate of change ➢ Interpret the gradient at a point on a curve as the instantaneous rate of change ➢ Apply the concepts of average and instantaneous rates of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts		

Maths Curriculum Overview Plan (1 year catch up plan 2021 – 2022)

		representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams Volume ➢ Compare lengths, areas and volumes using ratio notation ➢ Scale factors ➢ Make links to similarity ➢ Know and apply the formulae to calculate volume of cuboids and other right prisms (including cylinders) ➢ Calculate the volume of spheres, pyramids, cones and composite solids ➢ Calculate exactly with multiples of π Algebra (quadratics, rearranging formulae and identities) ➢ Simplify and manipulate algebraic expressions (including those involving surds) by: – expanding products of two or more binomials – factorising quadratic expressions of the form $x2 + bx + c$ including the difference of two squares – factorising quadratic expressions of the form $ax2 + bx + c$ – simplifying expressions involving sums, products and powers, including the laws of indices ➢ Understand and use standard mathematical formulae ➢ Rearrange formulae to change the subject ➢ Know the difference between an equation and an identity ➢ Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs ➢ Where appropriate, interpret simple expressions as functions with inputs and outputs ➢ Interpret the reverse process as the 'inverse function' ➢ Interpret the succession of two functions as a 'composite function Scatter graphs ➢ Use and interpret scatter graphs of bivariate data ➢ Recognise correlation and know that it does not indicate causation ➢ Draw estimated lines of best fit ➢ Make predictions ➢ Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so Numerical methods ➢ Find approximate solutions to equations numerically using iteration including the use of suffix notation	➢ Deduce roots algebraically ➢ Deduce turning points by completing the square ➢ Translate simple situations or procedures into algebraic expressions or formulae ➢ Derive an equation, solve the equation and interpret the solution Simultaneous equations ➢ Solve two simultaneous equations in two variables (linear/linear or linear/ quadratic) algebraically ➢ Find approximate solutions using a graph ➢ Translate simple situations or procedures into algebraic expressions or formulae ➢ Derive an equation (or two simultaneous equations), solve the equations and interpret the solution Sketching graphs ➢ Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, and the reciprocal function $y = \frac{1}{x}$ for x ≠ 0, exponential functions $y = kx$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = sinx$, $y = cosx$ and $y = tanx$ for angles of any size Diverse and inverse proportion ➢ Solve problems involving direct and inverse proportion, including graphical and algebraic representations ➢ Understand that *X* is inversely proportional to *Y* is equivalent to *X* is proportional to $\frac{1}{Y}$ ➢ Construct and interpret equations that describe direct and inverse proportion ➢ Recognise and interpret graphs that illustrate direct and inverse proportion	properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras Theorem, and use known results to obtain simple proofs ➢ Compare lengths using ratio notation and make links to trigonometric ratios Growth and decay ➢ Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes Vectors ➢ 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 Transforming functions ➢ Sketch translations and reflections of a given function	➢ Interpret the gradient of a straight-line graph as a rate of change Pre-calculus and area under a curve ➢ Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs) ➢ Interpret the results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts Algebraic fractions ➢ Simplify and manipulate algebraic expressions involving algebraic fractions		