

Year 11 GCSE Mathematics Higher tier Curriculum Sequence

Subject Intent: For every learner to be confident and fluent mathematicians who enjoy and succeed in mathematics, leaving school with a solid foundation of mathematical skills, knowledge and understanding, primed for their chosen fields in the 21st century.

	Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
Big idea/Theme	<p>Investigating properties of shapes</p> <ul style="list-style-type: none"> • Explore three-dimensional shapes • Apply Pythagoras' theorem in three dimensions • Apply trigonometry in three dimensions • Know and use the sine rule • Know and use the cosine rule 	<p>Algebra: manipulation</p> <ul style="list-style-type: none"> • Solve problems involving functions 	<p>Algebra: visualising I</p> <ul style="list-style-type: none"> • Explore graphs of exponential functions • Explore graphs of trigonometric functions • Investigate the connections between graphs of functions and their translations 	<p>Focused revision and exam preparation</p>	<p>Focused revision and exam preparation</p>	
Big Idea/Theme	<p>Calculating</p> <ul style="list-style-type: none"> • Manipulate expressions by simplifying surds 	<p>Proportional reasoning</p> <ul style="list-style-type: none"> • Explore differences between direct and inverse proportion 	<p>Analysing statistics</p> <ul style="list-style-type: none"> • Construct and interpret histograms • Analyse distributions of data sets 			

		<ul style="list-style-type: none"> • Solve problems involving proportion 	<ul style="list-style-type: none"> • Solve problems involving histograms 			
Big Idea/Theme	Solving equations and inequalities I <ul style="list-style-type: none"> • Solve quadratic equations • Solve practical problems involving quadratic equations • Understand and use iterative processes 	Patterns <ul style="list-style-type: none"> • investigate geometric progressions 	Algebra: visualising II <ul style="list-style-type: none"> • Manipulate quadratic functions • Solve problems involving graphs of quadratic functions • Explore rates of change 			
Big idea/Theme	Mathematical movement I <ul style="list-style-type: none"> • Explore enlargement of 2D shapes 	Solving equations and inequalities II <ul style="list-style-type: none"> • Solve inequalities • Solve simultaneous equations 	Mathematical movement II <ul style="list-style-type: none"> • Use vectors to create geometric arguments and proofs 			
Knowledge that needs to stick	<ul style="list-style-type: none"> • Know that $\sqrt{a \pm b} \neq \sqrt{a} \pm \sqrt{b}$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ and $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ 	<ul style="list-style-type: none"> • Know function notation • Know how to solve quadratic 	<ul style="list-style-type: none"> • Know graphs of exponential and trigonometric functions 			

	<ul style="list-style-type: none"> • Know the formula for solving quadratic equations • Know the sine rule, $a/\sin A = b/\sin B = c/\sin C$ • Know the cosine rule, $a^2 = b^2 + c^2 - 2bc \cos A$ • Know area of triangle = $\frac{1}{2}ab \sin C$ 	<p>inequalities in one variable</p> <ul style="list-style-type: none"> • Know how to solve problems involving direct and inverse proportion 	<ul style="list-style-type: none"> • Know that histograms should be plotted using frequency density when groups are of unequal widths • Know how to complete the square for a quadratic function 			
Demonstration of Knowledge (Assessment)	<ul style="list-style-type: none"> • Live assessment in the classroom • Analysis of students' written work and verbal responses • Spaced retrieval • Stage and age appropriate exam questions 	<ul style="list-style-type: none"> • Live assessment in the classroom • Analysis of students' written work and verbal responses • Spaced retrieval • Stage and age appropriate exam questions 	<ul style="list-style-type: none"> • Live assessment in the classroom • Analysis of students' written work and verbal responses • Spaced retrieval • Stage and age appropriate exam questions 			

	<ul style="list-style-type: none"> • Strategic questioning • Misconception checks 	<ul style="list-style-type: none"> • Strategic questioning • Misconception checks 	<ul style="list-style-type: none"> • Strategic questioning • Misconception checks 			
Links to key stage 3/ prior knowledge needed	<ul style="list-style-type: none"> • Apply Pythagoras' theorem in two dimensions • Know the trigonometric ratios, $\sin\theta = \text{opp/hyp}$, $\cos\theta = \text{adj/hyp}$, $\tan\theta = \text{opp/adj}$ • Choose an appropriate trigonometric ratio that can be used in a given two-dimensional situation • Set up and solve a trigonometric equation to find a missing side or angle in a right-angled triangle • Calculate exactly with surds 	<ul style="list-style-type: none"> • Given a function, establish outputs from given inputs • Given a function, establish inputs from given outputs • Use a mapping diagram (function machine) to represent a function • Use an expression to represent a function • Recognise a graph that illustrates direct or inverse proportion • Interpret equations that describe direct 	<ul style="list-style-type: none"> • Recognise, plot and interpret exponential graphs • Plot graphs of linear, quadratic, cubic and reciprocal functions • Find sines, cosines and tangents of given angles • Know the meaning of continuous data • Understand and use grouped frequency tables • Interpret histograms for grouped data with equal class intervals • Complete the square for a 			

	<ul style="list-style-type: none"> • Use the functionality of a scientific calculator when calculating with roots and powers • Solve a quadratic equation by rearranging and factorising • Identify when a quadratic equation cannot be solved by factorising • Calculate fluently with negative numbers • Rearrange algebraic expressions and equations • Understand and use interval bisection • Rearrange an equation to form an iterative formula • Use the centre and scale factor 	<p>or inverse proportion</p> <ul style="list-style-type: none"> • Understand that X is inversely proportional to Y is equivalent to X is proportional to $1/Y$ • Solve problems which include finding the multiplier in a situation involving direct or inverse proportion • Understand the difference between an arithmetic progression, a quadratic sequence and a geometric progression • Recognise a simple geometric progression • Find the next three terms in a geometric progression 	<p>given quadratic expression</p> <ul style="list-style-type: none"> • Know the meaning of roots, intercepts and turning points • Identify and interpret roots, intercepts, turning points of quadratic functions graphically • Interpret the gradient at a point on a curve as the instantaneous rate of change • Know the effects of transforming the graph $y = f(x)$: $f(x) + a$ and $f(x + a)$ • Understand the concept of a vector • Use diagrammatic representation of vectors 			
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	<p>to carry out an enlargement of a 2D shape with a positive scale factor</p>	<ul style="list-style-type: none"> • Find a given term in a simple geometric progression • Describe a geometric progression • Use set notation to list a set of integers • Use a formal method to solve a linear inequality • Show a range of values that solve an inequality on a number line • Sketch a graph of a quadratic functions • Find the roots of a quadratic function • Solve two linear simultaneous equations in two variables by substitution • Solve two linear simultaneous equations in two variables by 	<ul style="list-style-type: none"> • Know and use different notations for vectors • Add and subtract vectors • Multiply a vector by a scalar 			
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		elimination (multiplication of both equations required)				
Skill set development	Problem solving Mathematical reasoning Quantitative reasoning Ability to manipulate Communication Number sense Representation Spatial sense Independence Teamwork	Problem solving Mathematical reasoning Quantitative reasoning Ability to manipulate Communication Patterns Representation Independence Teamwork	Problem solving Mathematical reasoning Quantitative reasoning Ability to manipulate Communication Spatial sense Independence Teamwork			
Key Vocabulary (Tier 2/ Tier 3)	Diagonal (Face Diagonal, Space Diagonal) Plane Opposite, Adjacent, Hypotenuse Trigonometry Sine, Cosine, Tangent Angle of elevation, angle of depression Power, Root Index, Indices Surd Simplify Rationalise	Mapping Function Inverse function Composite function Direct proportion Inverse proportion Multiplier Term nth term First (second) difference Geometric Progression Surd Unknown	Exponential Function, equation Linear, non-linear Quadratic, cubic, reciprocal, exponential Parabola Asymptote Maximum, minimum, period Gradient, y- intercept, x- intercept, root Sketch, plot Arguments			

	(Quadratic) equation Factorise Rearrange Complete the square Unknown Manipulate Maximum, minimum Parabola Recurrence relation Interval bisection Scale Factor Similar Transformation Enlargement	(Quadratic) inequality Variable Manipulate Solve Solution set Simultaneous equations Substitution Elimination	Continuous data, Grouped data Table, Frequency table Frequency Frequency density Histogram Scale, Graph Axis, axes Function Complete the square Deduce Root Turning point, minimum, maximum Rate of change Chord Tangent Average rate of change Instantaneous rate of change Vector Scalar Constant Magnitude Collinear			
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Reading and Oracy	<p>Students need to be able read, speak and think in mathematical language, identifying key concepts and processes of the wordier questions. Teachers will improve students’ verbal communication skills, to enable them to show their understanding of mathematics accurately. Common strategies within lessons are:</p> <ul style="list-style-type: none"> - giving students sufficient time to read and process information from wordier questions - asking open questions - expanding and justifying answers - repetition of a correctly modelled sentence, to practice oracy skills - using the correct vocabulary and terms within discussions - referring to definitions and meanings when using tier 2 and 3 mathematical vocabulary - addressing common misconceptions. 					
Numeracy	Algebra Geometry Numbers Quadratic equations Ratio and proportion Trigonometry	Algebra Quadratic equations Quadratic inequalities Ratio and proportion Symbols	Algebra Data, graphs and charts Geometry Statistical analysis Transformations			
Opportunities						
Careers	Surveyors Engineers Astronauts Landscape architects Manufacturing	Computer programmers Business managers Scientists Engineers Economists	Engineers Scientists Industrial managers Financial advisors Biologists Geologists			
SMSC including British Values, Culture and Diversity	<p>The mathematics curriculum helps prepare pupils for life in a modern Britain by developing their personal qualities and social skills with the chance to discuss, argue and challenge other people’s ideas in a safe environment. Everyone is encouraged to express their own personal views on the mathematical topics. Alongside everyone learning how to be accepting of other people’s views, students gain realisation that there is not always one route to an answer but several different ways.</p> <p>Spiritual - pupils are encouraged to use their imagination and creativity to break problems down and solve them by thinking out side of the box.</p>					

	<p>Moral – pupils look at consequences and what happens if rules are not followed. Will an action to one number apply to all numbers?</p> <p>Social – developing personal qualities and social skills. Being able to work with others, show perseverance, being able to ask for help and not being afraid to try something new.</p> <p>Cultural – understanding others students’ views and being able to express their own views. Exploring problems from a range of cultures.</p>
Relationship and Sex Education and Health Education	<p>The mathematics curriculum aims to provide pupils with the knowledge and understanding that will enable them to lead a happy, healthy and successful adult life. All pupils are supported to develop resilience, to know how and when to ask for help, and to know where to access support. This develops their capacity to make sound decisions when facing risks, challenges and complex contexts in their lives. Character traits such as perseverance and self-belief, together with personal attributes such as honesty, integrity, tolerance and kindness, will be actively cultivated and celebrated.</p>