







Year 11 Higher Mathematics Curriculum


Unit:	Core knowledge/skill development:	Sequence:	Assessment:	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development:	Home learning and enrichment
Algebraic Reasoning (2 weeks)	Fluency and reasoning skills: National Curriculum content covered includes: Simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by: <ul style="list-style-type: none"> collecting like terms multiplying a single term over a bracket taking out common factors expanding products of two or more binomials factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; factorising quadratic expressions of the form $ax^2 + bx + c$ 	This block reviews expanding and factorising with a single bracket before moving onto quadratics. Students consolidate and build on their study of changing the subject in year 9. Solving equations and inequalities is reviewed before moving on to rearrangement of both familiar and unfamiliar formulae. Formal function notation is covered whilst bringing together and building on quadratic functions.	End of unit assessment	Key words: Expand Factorise Coefficient Bracket Identity Binomial Simplify Quadratic Difference of two squares	 Precision: The ability to work effectively within the rules of the domain. Complex and multi-step problem Solving: The ability to break down a task, decide on a suitable approach, and then act.  Agile learners; Working with an enquiring mind.	Mathswatch lesson and homework tasks:



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	<ul style="list-style-type: none"> simplifying expressions involving sums, products and powers, including the laws of indices <p>Understand and use standard mathematical formulae; rearrange formulae to change the subject.</p> <p>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</p> <p>Where appropriate, interpret simple expressions as functions with inputs and outputs; interpret the reverse process</p>					



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	as the 'inverse function'; interpret the succession of two functions as a 'composite function'					
Pythagoras and trigonometry: (2 weeks)	Fluency and reasoning skills: National curriculum content covered: <ul style="list-style-type: none"> • extend and formalise their knowledge of ratio and proportion, including trigonometric ratios • apply Pythagoras' Theorem and trigonometric ratios 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 $\sin \theta$, $\cos \theta$, 	Previous knowledge of trigonometry is revisited and built upon. Emphasis is placed throughout the steps on linking the trig functions to ratios, rather than just functions as introduced in Year 10.	End of unit assessment	Tangent Opposite Adjacent Hypotenuse Formula Rearrange Subject Sine Cosine	 Strategy planning: The ability to approach new learning experiences by actively attempting to connect it to existing knowledge or concepts and hence determine an appropriate way to think about the work.  Complex and multi-step problem solving: The ability to break down a task, decide on a suitable approach, and then act.	Mathswatch lesson and homework tasks:



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	<p>$\tan \theta$ for required angles</p> <ul style="list-style-type: none"> • {know and apply the sine rule and cosine rule to find unknown lengths and angles} • {know and apply to calculate the area, sides or angles of any triangle} • develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems • make and use connections between different parts of mathematics to solve problems • model situations mathematically and express the results using a range of formal mathematical 				 <p>Agile learners; Working with an enquiring mind.</p>	




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	representations, reflecting on how their solutions may have been affected by any modelling assumptions <ul style="list-style-type: none"> • select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem 					
Sine and Cosine rule including area of a triangle (1 week)	Fluency and reasoning skills: <ul style="list-style-type: none"> • {know and apply the sine rule and cosine rule to find unknown lengths and angles} • {know and apply to calculate the area, sides or angles of any triangle} 	Building on trigonometry previously covered, emphasis is again placed throughout the steps on linking the trig functions to ratios, rather than just functions.	End of unit assessment	Sine Rule Cosine Rule Area Perpendicular Expression Formula Non-right-angled Rearrange Subject of the formula Inverse	 Strategy planning: The ability to approach new learning experiences by actively attempting to connect it to existing knowledge or concepts and hence determine an appropriate way to think about the work.	Mathswatch lesson and homework tasks:




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	<ul style="list-style-type: none"> • develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems • make and use connections between different parts of mathematics to solve problems • model situations mathematically and express the results using a range of formal mathematical representations, reflecting on how their solutions may have been affected by any modelling assumptions • select appropriate concepts, methods and techniques to apply to unfamiliar 				 <p>Agile learners; Working with an enquiring mind.</p>	


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	and non-routine problems; interpret their solution in the context of the given problem					
Powers, roots and indices: (2 weeks)	Fluency and reasoning skills: Use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 estimate powers and roots of any given positive number. Calculate with roots and with integer and fractional indices. Calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer.	This block consolidates the previous learning and focuses on understanding powers generally, particularly in standard form. Negative and fractional indices are explored in detail. Again, much of this content will be familiar from KS3 and year 10, allowing more time for general non-calculator and problem-solving practice. To consolidate the index laws, these can be revisited in	End of unit assessment	Root Power Index/Indices Fourth root Estimate Exponent Standard form	 Precision: The ability to work effectively within the rules of the domain.  Agile learners; Working with an enquiring mind.	Mathswatch lesson and homework tasks:


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		the next block when simplifying algebraic expressions.				
LINEAR GRAPHS: (1 week)	Fluency and reasoning skills: Plot graphs of equations that correspond to straight-line graphs in the coordinate plane, use the form $y = mx + c$ to identify parallel lines and perpendicular lines, find the equation of the line through two given points, or through one point with a given gradient, graphs of such linear equations, numerically, graphically and algebraically.	This block builds on earlier study of straight-line graphs in years 9 and 10. Students plot straight lines from a given equation, and find and interpret the equation of a straight line from a variety of situations and given information.	End of unit assessment	Parallel Horizontal Vertical Straight line Axis Equation Graph Intercept Linear Table of Values Gradient	 Precision: The ability to work effectively within the rules of the domain. Complex and multi-step problem solving: The ability to break down a task, decide on a suitable approach, and then act.  Agile learners; Working with an enquiring mind.	Mathswatch lesson and homework tasks:


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	Identify and interpret gradients and intercepts of linear functions graphically and algebraically.					
Transformations (1 week)	<p>Fluency and reasoning skills:</p> <p>Transformations - identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors)</p> <p>Describe the changes and invariance achieved by combinations of rotations, reflections and translations.</p>	<p>Students revise and extend their learning from Key Stage 3, exploring all the transformations and constructions, relating these to symmetry and properties of shapes when appropriate. There is an emphasis on describing as well as performing transformations as using the language promotes deeper thinking and understanding. Higher tier students extend their learning</p>	End of unit assessment	<p>Line symmetry Reflection Diagonal Vertex Side Mirror Line Rotate Clockwise Anticlockwise Centre Order of rotational symmetry Translation Vector Axes Scale Congruent Vertex Enlargement Scale Factor Multiplier Similar Centre of enlargement Ray</p>	 <p>Strategy planning: The ability to approach new learning experiences by actively attempting to connect it to existing knowledge or concepts and hence determine an appropriate way to think about the work.</p>  <p>Agile learners; Working with an enquiring mind.</p>	Mathswatch lesson and homework tasks:



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		to explore the idea of invariance and look at trigonometric graphs as a vehicle for exploring graph transformations				
Probability (2 lessons)	Fluency and reasoning skills: Probability - Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams	This block is another vehicle for revision as the examinations draw closer. Students look at organisation information, with Higher tier students extending this to include the product rule for counting. Links are made to probability and other aspects of Data Handling such as describing and comparing distributions,	End of unit assessment	Event Complement Venn diagram Intersect Union Relative frequency Estimate Expectation Expected value Frequency trees Universal set Exhaustive Replacement	 Meta-cognition: The ability to knowingly use a wide range of thinking approaches and to transfer knowledge from one circumstance to another.  Connection finding: The ability to use connections from the past experiences to seek possible generalisations. 	Mathswatch lesson and homework tasks:




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Representations and interpretations of data (2 weeks)	Fluency and reasoning skills: Construct and interpret diagrams for grouped discrete and continuous data, ie histograms with equal and unequal class intervals and cumulative frequency graphs and know their appropriate use. Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: <ul style="list-style-type: none"> •appropriate graphical representation involving discrete, 	This block builds on KS3 and year 10 work on the collection, representation and use of summary statistics to describe data. Much of the content is familiar, both from previous study within and beyond mathematics (including Geography and Science) and from everyday life. The steps have been chosen to balance consolidation of existing knowledge with extending and deepening,	End of unit assessment	Locus Path Equidistant Construction lines Point Arc Perpendicular Bisector	 Meta-cognition: The ability to knowingly use a wide range of thinking approaches and to transfer knowledge from one circumstance to another.  Connection finding: The ability to use connections from the past experiences to seek possible generalisations.  The ability to deduct hypothesise, reason, seek supporting evidence.	Mathswatch lesson and homework tasks:



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	<p>continuous and grouped data, including box plots</p> <ul style="list-style-type: none"> •appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, quartiles and inter-quartile range) 	<p>particularly in terms of interpretation of results and evaluating and criticising statistical methods and diagrams. For students following Higher tier, there is additional content relating to continuous data including histograms, cumulative frequency diagrams, box plots and associated measures such as quartiles and the interquartile range. Again the emphasis with these topics should be on interpretation (particularly in making comparisons) and not just</p>			 <p>Agile learners; Working with an enquiring mind.</p>	

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		construction. A possible approach to teaching this unit would be project-based, where students collect primary data (or select samples from secondary data) from which they make and test hypotheses, thus giving a purpose to the creation and analysis of the diagrams and measures involved.				
ANGLE PROPERTIES: (2 weeks)	Fluency and reasoning skills: Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions and the reciprocal function, $y = 1/x$ with	This block builds on earlier study of straight-line graphs. Students now develop their knowledge of non-linear graphs in this block, looking at the different shapes of graphs. They find	End of unit assessment	Quadratic Parabola Curve Substitute Reciprocal Asymptote Cubic Roots Solution Exponential	 Meta-cognition: The ability to knowingly use a wide range of thinking approaches and to transfer knowledge from one circumstance to another.	Mathswatch lesson and homework tasks:

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	$x \neq 0$ exponential functions $y = kx$ for positive values of k , and the trigonometrical functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size Sketch translations and reflections of a given function. Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration. Calculate or estimate gradients of graphs	roots of quadratics graphically and will revisit this when looking at algebraic methods in functions. Students look at exponential graphs, real life graphs and the area under a curve.			 Agile learners; Working with an enquiring mind.	

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	and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts.					
Vectors: (1 week)	Fluency and reasoning skills: Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; use vectors to construct geometric arguments and proofs)	Students will have met vectors to describe translations during Key Stage 3 and year 10. This will be revisited and used as the basis for looking more formally at vectors, recapping the meaning of $-a$ compared to a to make sense of operations such as addition, subtraction and multiplication of vectors. This will connect to exploring	End of unit assessment	Column vector Direction Scalar Size Magnitude Parallel Resultant	 <p>Meta-cognition: The ability to knowingly use a wide range of thinking approaches and to transfer knowledge from one circumstance to another.</p>  <p>Connection finding: The ability to use connections from the past experiences to seek possible generalisations.</p>	Mathswatch lesson and homework tasks:

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		'journeys' within shapes linking the notation AB with \mathbf{b} – \mathbf{a} etc. Higher tier students will then use this understanding as the basis for developing geometric proof, making links to their knowledge of properties of shape and parallel lines.			 <p>Agile learners; Working with an enquiring mind.</p>	
Solving Equations. (1 week)	<p>Fluency and reasoning skills:</p> <p>Find approximate solutions to equations numerically using iteration.</p>	Students develop their algebraic reasoning by looking at more complex situations. They use their knowledge of sequences and rules to make inferences. Forming and solving complex equations, including simultaneous	End of unit assessment	Coefficient Linear Simultaneous Eliminate Substitute	 <p>Complex and multi-step problem solving:</p> <p>The ability to break down a task, decide on a suitable approach and then act.</p>  <p>Agile learners;</p>	Mathswatch lesson and homework tasks:

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		equations, is revisited.			Working with an enquiring mind.	
(1 weeks)	Fluency and reasoning skills: 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'	As well as introducing formal function notation, this block brings together and builds on recent study of quadratic functions and graphs. This is also an opportunity to revisit trigonometric functions studied in year 10.	End of unit assessment	Input Output Function Operation Inverse Variable Composite substitute	 Complex and multi-step problem solving: The ability to break down a task, decide on a suitable approach, and then act.  Agile learners; Working with an enquiring mind.	Mathswatch lesson and homework tasks:
Until the summer assessment	FOCUS ON AREAS FOR YOUR SPECIFIC CLASS		GCSE paper			Mathswatch lesson and homework tasks: