Key Stage 4 Mathematics Curriculum Map

	Year 10 FOUNDATION	Year 10 HIGHER	Year 11 (timing)	Year 11 FOUNDATION	Year 11 HIGHER
Assessment 1	Arithmetic, Multiples and Factors; Venn Diagrams	Ratio; Algebra and power equations, *Logarithms/polynomial division/Binomial Expansions*; Venn Diagrams	Before November Mock	Percentages, Decimal Multipliers, Compound & Simple Interest; Negative Numbers, Rounding and Estimating; Solving equations; Areas of polygons and circles, Pythagoras	Sine Rule and Cosine Rule, Trigonometric Graphs, *Solving Trig Equations*, *Formal Definition of Trig functions*, *Trig Identities and Solving Equations*; Quadratic Sequences and Iteration
Assessment 2	Negative Numbers; Algebraic simplification, Expanding and Factorising; Ratio and Proportion	Algebraic Expressions and Proof; Parallel lines, Internal and External angles, Pythagoras in 2d and 3d			
Assessment 3	Solving linear equations and linear inequalities, Sequences; Fraction Arithmetic; Percentages; Angles, Internal and External Angles	Right angled trigonometry (2d *and 3d*); Surds; Rearranging formulae, Solving linear equations, Simultaneous linear equations	Before March Mock	Standard Form; Plotting and using linear graphs, Expanding and Factorising, Solving a quadratic by Factorising, Rearranging Formula, Simultaneous equations; Constructions, Bearings, Scale diagrams, Internal and External angles in a polygon	Plotting and using non linear graphs to solve equations, Properties of Quadratic Graphs, *The discriminant*, *Properties of Cubic graphs and Factor Theorem & solving cubics*, Graph Transformations; Circle Theorems; The equation of a circle, *Complex coordinate geometry problems relating to the equation of a circle*; Vector Geometry; Percentage growth; Gradients of curves, Areas under curves, *Linearising graphs*
Assessment 4	Probability for single and combined events, Timetables, Time Series	Solving Quadratics, Completing the square, Simultaneous equations (quadratic), *Complex coordinate geometry problems*, *Simultaneous equations in multiple variables and Diophantine equations*; Area/Perimeter of circles/sectors, Volumes of solids & prisms, Area/volume scale factors	Before GCSE Exam	Congruence and Similarity, Transformations, Vectors, REVIEW FROM YEAR 10, Right Angled Trigonometry	Algebraic Fractions, *Differentiation*, *Applications to Max/Min*, *Integration*, *Applications to Area*, *Kinematics*, REVIEW FORM YEAR 9, Transformations, Constructions, Congruence
Assessment 5 Is an Holistic Assessment on the whole year	Standard Form; Straight line graphs and the equation of a straight line	Upper and Lower Bounds; Probability of Combined events, *Binomial Probabilities*; Linear Graphs, Linear and Quadratic inequalities, *Linear Programming*	Before GCSE Exam	FINAL REVISION	FINAL REVISION
Topics Taught After the end of Year Assessment	Area, Pythagoras, Congruency and Similar Shapes, Right angled trigonometry; Averages, Pie Charts, Stem and Leaf Diagrams, Scatter graphs	Formal Direct and Inverse Proportion; Averages, Range and IQR, Histograms, Cumulative Frequency Curves and Box Plots, Capture and Recapture			

The Key Stage 4 Curriculum is taught in a spiral using the same five themes common to both our KS 3 Curriculum and the National Curriculum

The teaching of the themes at KS4 is much less distinct as most topics span content from several different themes. Topics are therefore classified according to the main underpinning content following through from KS3.

NUMBER

ALGEBRA

RATIO AND PROPORTION

GEOMETRY AND SHAPE

PROBABILITY & STATISTICS

REVISION

Topics Highlighted in Red go beyond the KS4 National Curriculum and are taught as part of the Additional Maths programme

The Key Maths Skills:
Fluency and Recall
Reasoning and Proof
Application
Problem Solving
Mathematical Communication
are taught intrinsically within all themes and are developed across the year groups

Intent		What new knowledge/content do we introduce?				
By the end of KS4 students are able to…		**Year 10**		**Year 11**		**How does this curriculum incorporate the National Curriculum and go beyond? How does going beyond the NC ensure challenge?**
• **Achieve their potential target grade in the GCSE exam** • **Have the basic numeracy skills to equip them for life in the real world** • **Have the maths skills required to progress to the post 16 training and education programs of their choice** • **In addition students should have an appreciation of the importance of maths as a subject in the wider community**	**Autumn**	We review of non-calculator written methods and extend to problem solving GCSE style questions involving multiple steps and set in a variety of contexts. We review of prime factorisation to assist in finding HCF and LCM and link this to Venn diagrams. We introduce the formal notation for Venn diagrams and use them to solve word problems involving the mathematical concepts of union and intersection.	We review key ratio skills such as writing in a ratio, sharing (all 3 types of problem) and the link with fractions. We extend this to look at how to use algebra to solve more complex ratio problems and in particular to look at the property if a : b = c : d then a/b = c/d. We review index algebra with a focus on fractional and negative indices. We explore different ways to simplify algebraic fractions using index laws and fraction simplification and look at solving power equations. We introduce logarithms as a way to solve power equations and explore log algebra. We review expanding and factorising brackets with a focus on expanding multiple brackets with multiple terms and factorising quadratic expressions where the coefficient of x^2 is not 1.We look at Binomial expansions. We look at the formal notation connected with Venn diagrams and situations where Venn diagrams can be used to solve problems relating to HCF, LCM and probability including some conditional probability..	We review finding percentages and describing percentage change and extend to increasing and decreasing amounts by a percentage but with a focus on calculator methods and the use of decimal multipliers We review negative number arithmetic but in the context of substituting values into formulae. We review solving equations but with a focus on applying this to mixed GCSE questions, where the equation may be hidden or needs to be formed.	We review right angled trigonometry and extend the definitions of sine and cosine to include angles greater than 90 degrees. We introduce the superior formula for the area of a triangle and learn about the cosine rule and the sine rule (including the ambiguous case) We look at the graphs and properties of tru g functions and how to solve trigonometric equations involving one variable We extend our solving of trig equations to include the identities tan x = sinx/cosx and sin^2x + cos^2x = 1 and to solve quadratics in a trigonometric variable.	Both tiers encompass the full National Curriculum. In both tiers there are opportunities to see maths being applied in places outside of content of the National Curriculum (particularly in finance). For Higher students there are a number of topics that extend knowledge beyond the National Curriculum including UKMT maths challenge skills such as Diophantine equations, but also by studying the content for the FSMQ qualification in Additional Maths which about 15% of the cohort take alongside their GCSE qualification in Year 11. The content of the Additional Maths qualification is highlighted in red on the curriculum overview.
		We review negative number arithmetic. We review expanding and factorising expressions, We review ratio notation and sharing but focus on GCSE style questions that use ratio in unusual contexts or in ways that link to other themes	We extend the ideas of proof from Year 9 to look at GCSE style questions that require formulating an equation or justifying mathematical properties involving divisibility, odds, evens and squares. We review angle facts and focus on solving GCSE and UKMT maths challenge problems involving multiple angle facts	We review Pythagoras' theorem and area and perimeter of 2d shapes but with a focus on multi-stage GCSE problems where students need to identify the need for Pythagoras or the mathematics required to answer the question. We revise rounding to decimal places and significant figures before applying this to GCSE questions involving the area and perimeter of circles and sectors. We review index notation and writing and interpreting numbers in standard index form before extending to look at reciprocals and using S.I. numbers in the context of other topics.	We look at the concept of iteration, the notation and how we can use iteration to solve equations. We look at how solving a quadratic equation relates to its graph, including related equations and graph sketching using. We look at the relationship between the discriminant and the graph of a quadratic function. We look at function notation, compound functions and inverse functions and the relationship between the graphs of functions and their inverses. We look at graph transformations	

Spring	We review solving linear equations with a focus on solving equations with variables on both sides and brackets. We focus on more complex GCSE topics where students need to write an equation to solve a problem or to help them work backwards to find an answer by linking equation solving to geometry. We review fraction arithmetic focusing on mixed number fractions. We review non-calculator methods to find, increase and decrease amounts by a percentage. We introduce reverse percentage problems We review angles facts and extend knowledge into solving problems involving internal and external angles of polygons. There is a focus on GCSE style questions where multiple angle facts are needed with reasons.	We review Pythagroas' theorem in 2d and 3d with a particular focus on applications to GCSE style questions which involve distances, areas and perimeters where the use of Pythagroas' theorem is not obvious. We review right angled trigonometry and extend to GCSE problems where right angled trigonometry is required to solve problems relating to other themes in mathematics (especially area/perimeter and bearings). We introduce using right angled trigonometry to solve problems in 3d. We review exact values and simplifying square roots but extend to look at the laws of surd algebra and rationalising surds. We apply this knowledge to GCSE questions in other themes (mainly geometry) We review rearranging formulae with a focus on kore complex formulae involving fractions and situations where the new variable appears more than once. We review solving linear equations by rearranging focusing on complex equations that require multiplying through and expanding 'negative' brackets. We look at GCSE style questions that require the formulation and solving of equations across each theme. We review solving simultaneous equations by graph, substitution and elimination before extending to multiple variables and complex systems of simultaneous equations. We look at when systems will be 'solvable' the number of solutions and Diophantine equations.	We review expanding and factorising single brackets before extending to double brackets and looking at how to solve quadratic equations by factorising. We review plotting linear graphs and extend to quadratic graphs and using graphs to solve equations, especially simple quadratic equations. We look at rearranging formulae. We look at creating and solving simultaneous equations using the elimination method.	We look at circle theorems and their proofs, the equation of a circle and coordinate geometry problems involving tangents and where lines meet circles.	
Summer	We revise finding the probability of single events and combined events using sample space diagrams and extend to counting methods and tree diagrams including with and without replacement We look at time calculations and how to read timetables	We review area and volume from previous years and extend to looking at surface areas and volumes of frustums and cones. We review solving quadratic equations by factorising and extend to looking at how to solve quadratic equations by completing the square and the derivation of the quadratic formulae. We extend our wok on simultaneous equations to solve simultaneous equations involving quadratic equations. We combine the work on quadratics with the work on geometry to solve complex GCSE problems that involve forming and solving quadratic equations.	We review constructions and loci before extending to look at GCSE questions involving applications and accurate scale diagrams. We review angle facts and parallel lines and link this to work on bearings. We review transformations and similar shapes including ideas of congruence before extending the work on translations to include more general vector arithmetic.	We look at vector geometry and geometric proofs involving vectors. We review decimal multipliers before looking at exponential growth and estimating gradients using tangents and the area under a curve using the trapezium rule. We extend this to look at linearising a graph by using logarithms to determine an exponential relationship between two quantities.	
	We review standard form notation before extending to non-calculator and calculator methods of arithmetic in standard form	We review our knowledge of single event and combined event probability and extend this to enhance our knowledge of conditional probability through examples like the	We review right angled trigonometry	We look at differentiation from first principles and its applications to coordinate geometry and to find maxima and minima. We look at integration as	

We review plotting straight line graphs and extend to look at gradients and the relationship between a linear equation and its graph	Monty Hall problem. We look at GCSE probability questions that require use of algebra including quadratic equations to solve. We look at the characteristics of the Binomial distribution and solve probability problems using the Binomial distributions.		the reverse of differentiation and its applications to finding areas under and between curves. We apply differentiation and integration to non-linear kinematic systems.
We review finding the area and circumference of 2d shapes and circles and finding a third side in a right angled triangle using Pythagoras. We extend the work on Pythagoras' to look at uses of Pythagoras in area and perimeter style GCSE questions. Finally we introduce the concepts of similarity and congruence before applying this to right angled trigonometry.	We review solving linear inequalities and representing them on a number line and extend this to linear inequalities in two variables that represent regions. We look at soling linear programming problems using linear inequalities and a graphical approach. We look at solving quadratic inequalities.	Focused Revision	Focused Revision
We review average and pie charts and then introduce stem and leaf diagrams and scatter graphs	We look at formal approaches to direct and inverse proportion and link this to science.		
	We review cumulative frequency curves, measures of location and measures of spread, and box plots before focusing on the differences between bar charts, frequency charts and histograms. We study histograms and look at capture/recapture methods to estimate population size.		

Rationale for this sequence	The sequencing of content at KS4 is designed to build on the content at KS3 naturally so that students continue to recall knowledge from previous strands before extenign their knowledge in that strand. The Scheme of learning provides opportunities for revision of previous work in a strand to assist with recall and memory retention. Generally speaking the more complex mathematical concepts are delivered later in the scheme of learning because of the amount of priory knowledge required.	
How does the KS4 Curriculum build on previous learning at KS3?	Like the KS3 curriculum, the KS4 curriculum is designed around a spiral with each strand revisited multiple times across the year. For Foundation students there is a greater focus on the recall and fluency of number skills and theor are lots of opportunities sign posted in the scheme of learning to focus on developing fluency via review sessions. For Higher tier students each strand also has opportunities to recall key knowledge taught earlier for that strand but there is a much larger amount of new content to be delivered and a greater focus on algebraic skills. For both tiers, however, a distinguishing feature of the KS4 curriculum is a focus on enabling students to recall and apply knowledge from across different strands of the curriculum to answer more complex problems. The assessments have a more holistic approach in this regard compared to those at KS3 which focus more tightly on the acquiring of declarative and procedural knowledge from within a strand rather than conditional knowledge from across the strands.	