KS4 Curriculum Overview

Maths

Curriculum Intent

By the end of Key Stage 4, students will be able to:

- Achieve their target grade in the GCSE examination.
- Demonstrate the numeracy skills needed for everyday life.
- Apply the mathematical skills required to progress to post-16 training and education programmes of their choice
- Appreciate the importance of mathematics as a subject within the wider community

How does the KS4 curriculum build on that from KS3?

Like the Key Stage 3 curriculum, the Key Stage 4 curriculum is designed around a spiral structure, with each strand revisited multiple times throughout the year. For Foundation students, there is a greater emphasis on the recall and fluency of number skills, and the scheme of learning clearly signposts opportunities to develop fluency through review sessions.

For Higher tier students, each strand also includes opportunities to recall key knowledge taught earlier; however, there is a significantly larger volume of new content to cover, with a stronger focus on developing algebraic skills.

For both tiers, a distinguishing feature of the Key Stage 4 curriculum is the emphasis on enabling students to recall and apply knowledge from across different strands to solve more complex problems. Assessments at this stage take a more holistic approach compared to those at Key Stage 3, which focus more narrowly on the acquisition of declarative and procedural knowledge within individual strands.

What do students *do* with this knowledge or these skills?

Students use this knowledge and these skills to approach unfamiliar problems with confidence, drawing on a broad and interconnected understanding of mathematics. They learn to reason logically, apply multiple methods to find solutions, and justify their thinking using appropriate mathematical language. These skills not only prepare them for success in their GCSE examinations but also lay the foundation for further study in mathematics and related disciplines. Beyond the classroom, students develop the mathematical fluency and problem-solving ability needed to navigate real-life situations, such as managing personal finances, interpreting data, or engaging with technical aspects of vocational and academic pathways post-16.

How does the KS4 curriculum align to the National Curriculum?

Both tiers cover the full National Curriculum. In each tier, there are opportunities to see how mathematics is applied beyond the scope of the curriculum, particularly in areas such as finance.

For Higher tier students, several topics extend beyond the National Curriculum. These include problem-solving skills drawn from the UKMT Maths Challenge, such as Diophantine equations, as well as content from the FSMQ Additional Maths qualification. Around 15% of the cohort study this qualification alongside their GCSE in Year 11. The content of the Additional Maths course is highlighted within the scheme of learning to support planning and stretch high-attaining students beyond the standard GCSE curriculum.

	What new knowledge or skills are students taught?	
Term	**Year 10**	**Year 11**

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 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 theme.	• 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 x2 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 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 topic	• 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 trig 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 sin2x + cos2x = 1 and to solve quadratics in a trigonometric variable. • 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 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 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 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 circle theorems and their proofs, the equation of a circle and coordinate geometry problems involving tangents and where lines meet circles. • 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 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.		
Summer	• We review standard form notation before extending to non-calculator and calculator methods of arithmetic in standard form. • We review plotting straight line graphs and extend to look at gradients and the relationship between a linear equation and its graph. • 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 average and pie charts and then introduce	• 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 Monty Hall problem. We look at GCSE probability questions that require use of algebra including quadratic equations to solve. • 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. • 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.	• We review right angled trigonometry. • Focused Revision	• We look at differentiation from first principles and its applications to coordinate geometry and to find maxima and minima. We look at integration as the reverse of differentiation and its applications to finding areas under and between curves. We apply differentiation and integration to non-linear kinematic systems. • Focused Revision

	stem and leaf diagrams and scatter graphs.			
Rationale for this sequencing	The sequencing of **content** at Key Stage 4 is designed to build naturally on the content covered at Key Stage 3, ensuring that students regularly recall knowledge from previous strands before extending their understanding within those strands. The scheme of learning provides opportunities to revisit prior work, supporting both recall and long-term memory retention. In general, more complex mathematical concepts are introduced later in the scheme, as they require a greater amount of prior knowledge.			

Additional support at home	
Online resources to practice, consolidate and revise	• **Mathsgenie website**: Worksheets and past papers with answers. • **Dr Frost website:** Practice questions and videos. • **1st Class Maths website:** Worksheets for each topic with practice papers.