

RMGS CURRICULUM MAP - MATHEMATICS DEPARTMENT

Curriculum Intent - Mathematics

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The Programme of Study is, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the Programme of Study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Mathematics at RMGS

As a department we have identified that the skills and content that we teach our students from their arrival at RMGS are relevant and important to their ability to solve the problems and overcome the mathematical challenges they will face at GCSE and beyond. We have therefore designed our curriculum from Years 7 to 11 based on a five year GCSE Programme of Study. The examination board for GCSE Mathematics is Edexcel, and for Level 2 Further Mathematics we use AQA.

GCSE

Our GCSE curriculum follows a spiral approach that is designed to interleave and revisit concepts throughout the five year journey; this approach promotes retention and allows numerous opportunities for students to gain a deep understanding. The AQA Level 2 Further Mathematics curriculum enables our more able students to broaden and enrich their understanding by beginning to explore topics that are traditionally not taught until A'Level Mathematics or Further Mathematics (e.g. Calculus, Matrices) whilst remaining a Level 2 course.

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A2 Mathematics/Further Mathematics

The OCR A'Level Mathematics B (MEI) course has been developed in partnership with Mathematics in Education and Industry (MEI), subject and teaching experts, and in close consultation with teachers from learned societies, industry and representatives from Higher Education. MEI is a long-established, independent curriculum development body who provide resources, advice and CPD relating to curriculum and teaching aspects of the course.

The course supports the mathematical needs of students across a broad range of topics at this level and provides a basis for subsequent quantitative work in a very wide range of higher education courses, apprenticeships and employment. It also supports the study of AS and A2 Further Mathematics.

OCR A Level in Mathematics B (MEI) builds from GCSE (9–1) level mathematics and introduces calculus and its applications. It emphasises how mathematical ideas are interconnected and how mathematics can be applied to model situations using algebra and other representations, to help make sense of data, to understand the physical world and to solve problems in a variety of contexts, including social sciences and business. It prepares students for further study and employment in a wide range of disciplines involving the use of mathematics.

AS Core Mathematics

Core Mathematics, also from MEI, is designed for students who have achieved a standard pass in GCSE Mathematics, but who do not intend to take AS/A Level Mathematics. It enables learners to strengthen and develop the mathematical knowledge and skills they have learned at GCSE so that they can apply them to the problems they will encounter in their other Level 3 courses, further study, life and employment. Specification B (MEI) is particularly suitable for future students of psychology, geography and other subjects that make extensive use of statistical techniques. Core Mathematics is particularly useful for students studying subjects such as geography, business, chemistry, biology, sociology, and health and social care, giving learners the mathematical skills to tackle problems in a variety of authentic situations.

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Termly	Curriculum	Overview			
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Year Group	Autumn 1	Autumn 2	Spring 3	Spring 4	Summer 5	Summer 6
7	Calculations with integers, fractions, decimals. Properties and areas of shapes. Volume of cuboids.	Representations of statistical data. Linear algebraic manipulation. Inverse and composite functions. Standard units of measure.	Introduction to probability. Estimation and orders of magnitude. Linear equations. Properties of circles.	Area and circumference of circles. Scale factors and ratios. Percentages. Powers roots and reciprocals.	Prime factorisation. Measures of central tendency and spread. Coordinates and straight line graphs. Gradient as rate of change.	nth term of a linear sequence. Systematic listing strategies. Review and consolidation.
		Test	Test			End of Year Exam
8	Properties of polygons. Angles in parallel lines. Similarity and congruence. Pythagoras' theorem. Statistical representation. Expand and factorise double brackets. Substitute into formulae. Change subject of formula. Composite functions.	Area and perimeter of circles and composite shapes. Standard and compound units. Solve linear equations with unknowns on both sides.	Solve quadratic equations by factorising; approximate solutions graphically. Derive equations, solve (simultaneously), interpret solutions. Probability: possibility spaces, combined events, conditional probability.	Constructions and loci. Calculations with integers, fractions, decimals. Conversion comparison and ratios. Direct and inverse proportion algebraically and graphically. Percentage change, simple interest.	Find equations of straight lines given two points, or given one point and gradient. Interpret gradient as rate of change. Plans and elevations. Scatter graphs, correlation, lines of best fit, interpolation, extrapolation. Pythagoras' theorem. Trigonometry with right-angled triangles.	Standard form. Rounding to degree of accuracy. Inequalities, approximation, rounding, truncating, estimation, error intervals. Term rules for sequences. Triangular, squared, cubed numbers. Arithmetic progressions, Fibonacci and quadratic sequences. Review and consolidation.
		Test			Test	End of Year Exam

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9	<p>Algebraic manipulation and expressions. Index laws. Equations and identities. Construct arguments and proofs. Change the subject. Algebraic fractions. Expanding and factorising double brackets. Calculations with integers, fractions, decimals, mixed and negative numbers.</p>	<p>Properties of angles at a point and in parallel lines. Sum of triangle interior angles. Triangle congruence. Similarity for length, area, volume. Construct, reflect, rotate, translate, enlarge drawings of 2D shapes. Solve imultaneous linear equations graphically and algebraically. Quadratic equations. Derive, solve and interpret equations.</p>	<p>Plot and find equations of straight lines. Number lines. Surface area and volume of right prisms. Surface area and volume of pyramids, cones, spheres and composite shapes. Arc length, area and perimeter of sectors. Standard form.</p>	<p>Calculations to an appropriate degree of accuracy. Pythagoras' theorem. Trigonometry of right angled triangles, exact values of sin, cos, tan. Statistical representation; quartiles and box plots. Time series. Scatter graphs, correlation, causation, interpolation, extrapolation.</p>	<p>Properties of 3D shapes; plans and elevations. Roots, integer and fractional indices, surds. Review and consolidation.</p>	<p>Functions, inverse functions, composite functions. Proportion as equality of ratios. Percentage change and simple interest. Scale factors, scale diagrams and maps.</p>
		Test				End of Year Exam

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10	<p>Solve quadratic equations by factorising, completing the square, quadratic formula, graphically. Gradients and intercepts of linear functions. Geometrical problems on coordinate axes. Recognise shapes of graphs. Gradients of graphs, areas under graphs. Relate ratios to fractions and linear functions. Systematic listing strategies.</p>	<p>Limits of accuracy, upper and lower bounds. Calculate with fractions, surds, multiples of pi. Solve simultaneous equations, linear and quadratic inequalities. Apply and prove circle theorems. Approximate solutions to equations via iteration.</p>	<p>Statistical representation of grouped discrete data, continuous data, including histograms, cumulative frequency graphs. Compare distributions. Pythagoras' theorem. Trigonometry of right angled triangles, exact values of sin, cos, tan. Sine and cosine rules. Area of triangle without perpendicular height. Introduction to vectors.</p>	<p>Representation, addition, subtraction of vectors; geometric proofs with vectors. Surface area and volume of spheres, pyramids, cones and composite solids. Set notation, Venn diagrams, tree diagrams, conditional probability. Linear and quadratic sequences. Roots, intercepts and turning points of quadratic functions; solve by completing the square.</p>	<p>Recognise shapes of graphs. Equation of a circle; equation of a tangent. Growth and decay, compound interest, iterative processes. Constructions and loci. Direct and inverse proportion. Review and consolidation.</p>	<p>Construct and interpret equations for direct and inverse proportion. Properties of angles in parallel lines, sum of interior angles of a triangle and any polygon. Congruence and similarity. Compound units.</p>
	Test		Test		End of Year Exam	
11	<p>Circle theorems. Algebraic proof. Iterative solutions. Counting strategies, combinations, permutations, capture/recapture method. Vectors. Constructions and loci. Review and consolidation.</p>	<p>Review and consolidation.</p>	<p>Level 2 Further Mathematics for Sets 1. Review and consolidation.</p>	<p>Level 2 Further Mathematics for Sets 1. Review and consolidation.</p>	<p>Review and consolidation.</p>	<p>Review and consolidation.</p>
		November PQE				GCSE

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12	Problem solving. Surds and indices. Quadratic functions. Equations and inequalities. Coordinate geometry. Differentiation.	Integration. Trigonometry. Vectors. Polynomials. Exponentials and logarithms. Graphs and transformations.	Binomial expansion. Data collection, processing, presentation and interpretation. Large Data Set essay. Probability. Kinematics. Forces.	Forces. Variable acceleration. Probability. Binomial probability distribution. Statistical hypothesis testing.	Review and consolidation.	A2. Proof. Trigonometry. Sequences and series. Functions. Differentiation.
	Algebra Test	Pure 1/2 Tests	Pure Test	Mechanics and Statistics Tests	End of Year Exam	
13	Further algebra. Trigonometric functions. Further differentiation. Trigonometric identities. Parametric equations. Integration.	Parametric equations. Integration. Vectors. Differential equations. Numerical methods. Kinematics,	Forces and motion. Moments of forces. Projectiles. Probability. Statistical distributions.	Projectiles. Friction. Hypothesis testing.	Review and consolidation.	Review and consolidation.
	Pure 1 Test	Pure 2 Test	January PQE			A2