

A Level Mathematics

Long Term Plan	
Curriculum Vision: Mathematics develops resilience, logical reasoning, and confidence in problem solving, equipping students with essential analytical and quantitative skills to tackle real-world challenges such as managing finances, interpreting data, and understanding technology. It supports informed decision-making and enables learners to engage with global issues including climate change, public health, and economic inequality. Through analysing and interpreting data, students are empowered to recognise and challenge societal inequities, fostering fairness and equity. At the same time, mathematics inspires curiosity by revealing patterns and structures that underpin the modern world. Ultimately, it combines practical relevance with intellectual depth, preparing learners to contribute meaningfully to their communities and wider society.	
Domains of knowledge: • Algebra and Functions • Trigonometry • Coordinate Geometry and Vectors • Calculus • Mechanics • Statistics and Probability • Mathematical Reasoning, Proof and Modelling	Key concepts: Algebra and Functions – This domain develops students’ fluency in algebraic manipulation and their understanding of mathematical structure. Students study indices and surds, algebraic simplification, quadratics, simultaneous equations and inequalities, and algebraic fractions. They explore polynomials, including dividing polynomials, the factor theorem and algebraic proof. The domain also includes functions and function notation, transformations of functions, and algebraic modelling. Exponential and logarithmic functions, including the laws of logarithms, are introduced to support later applications in calculus, mechanics and statistics. Trigonometry – In this domain, students develop a secure understanding of trigonometric relationships and their applications. They study trigonometric ratios, exact values and angles in all four quadrants, leading to the use of trigonometric identities and the solution of trigonometric equations. Students apply trigonometry to triangles using the sine rule, cosine rule and area formula, and solve increasingly complex triangle problems. The domain also includes the study of trigonometric graphs and their transformations, as well as work with radians, reciprocal trigonometric functions and inverse trigonometric functions. Coordinate Geometry and Vectors – This domain focuses on the connection between algebra and geometry. Students study straight line graphs, including gradient, intercept, and the conditions for parallel and perpendicular lines. They explore distance, midpoint and the equations of circles, including intersections with straight lines and the use of tangent and chord properties. Vector work includes vector notation, magnitude and direction, position vectors and vector equations of lines. Students apply vectors to geometric and algebraic modelling problems. Calculus – Calculus introduces students to the mathematics of change and accumulation. Students learn to differentiate polynomials and composite expressions, building from the concept of gradient of a curve to the use of tangents and normals. They explore increasing and decreasing functions, second derivatives, stationary points and curve sketching. Integration is introduced through indefinite and definite integrals, including finding functions from derivatives. Students apply integration to calculate areas under and between curves, including areas below the x-axis, and use calculus to model mathematical situations. Mechanics – In the mechanics domain, students apply mathematical techniques to physical contexts. They begin by constructing mathematical models using assumptions, quantities and units, and distinguishing between scalars and vectors. Students analyse displacement–time and velocity–time graphs and apply the equations of constant acceleration, including motion under gravity. Forces are represented using free-body diagrams and Newton’s laws of motion are applied to solve problems involving resultant forces, motion in two dimensions, connected particles and pulleys. The domain also includes variable acceleration, using differentiation and integration to model motion. Statistics and Probability – This domain develops students’ ability to analyse data and reason about uncertainty. Students study populations and samples, sampling methods, types of data and the large data set. They calculate and interpret measures of central tendency, quartiles, percentiles and measures of spread, including variance and standard deviation. Data is represented using box plots, cumulative frequency diagrams and histograms, and distributions are compared. Students explore correlation and linear regression, apply probability rules including conditional probability, and use Venn and tree diagrams. The domain also includes probability distributions, the binomial distribution, cumulative probabilities and hypothesis testing, including one- and two-tailed tests. Mathematical Reasoning, Proof and Modelling – Mathematical reasoning, proof and modelling run throughout all areas of the curriculum. Students develop logical reasoning and problem-solving strategies, construct mathematical proofs and communicate arguments clearly. They learn to make and evaluate assumptions, interpret results in context and assess the validity of mathematical models. This domain ensures students can justify methods, explain conclusions and apply mathematics independently and confidently.

Year Group: 12		
Autumn Term	Spring Term	Summer Term
Unit length: 16 Weeks	Unit length: 12 Weeks	Unit length: 11 Weeks
Domains of knowledge: - Algebra and Functions - Trigonometry - Coordinate Geometry and Vectors - Calculus - Mathematical Reasoning, Proof and Modelling	Domains of knowledge: - Calculus (applied to mechanics) - Statistics and Probability - Algebra and Functions (exponentials and logarithms) - Mathematical Modelling	Domains of knowledge: - Statistics and Probability - Algebra and Functions (advanced/transition) - Trigonometry (radians, reciprocal and inverse functions) - Mathematical Reasoning and Problem Solving
Key concepts: - Algebraic manipulation and fluency - Solving equations and inequalities - Trigonometric reasoning, identities and equations - Graphical interpretation and transformation - Coordinate geometry and proof - Differentiation and integration techniques - Applying calculus to curves and models - Mathematical communication and notation	Key concepts: - Mathematical modelling of motion - Interpreting kinematic graphs - Applying calculus to mechanics problems - Using vectors in mechanics - Statistical data collection and interpretation - Measures of location and spread - Probabilistic reasoning, including conditional probability - Mathematical reasoning and problem solving	Key concepts: - Statistical inference and evaluation - Interpreting distributions and test outcomes - Hypothesis testing and conclusions in context - Advanced algebraic manipulation - Trigonometry using radians - Problem solving and exam technique - Mathematical reasoning and justification
Relevant end points covered: - Algebraic manipulation and simplification - Quadratics, simultaneous equations and inequalities - Use of trigonometric ratios, identities and equations - Application of trigonometry to triangles and graphs - Use of straight line and circle equations in coordinate geometry - Correct use of the binomial expansion - Application of vectors to geometric problems - Construction of algebraic proofs - Differentiation of polynomial functions - Integration of polynomial functions - Use of calculus for gradients, stationary points, curve sketching and areas	Relevant end points covered: - Mathematical modelling using assumptions and quantities - Interpretation and use of displacement–time and velocity–time graphs - Application of constant acceleration formulae - Modelling motion under gravity - Application of Newton’s laws to forces and motion - Solving problems involving connected particles and motion in two dimensions - Modelling variable acceleration using calculus - Use of exponential and logarithmic functions and laws - Understanding of sampling methods and large data sets - Calculation and interpretation of measures of location and spread - Representation and interpretation of data - Application of probability, including conditional probability - Use of probability distributions - Introduction to hypothesis testing	Relevant end points covered: - Completion and consolidation of hypothesis testing - Interpretation of statistical inference in context - Secure understanding of statistical distributions - Integration of Pure, Mechanics and Statistics knowledge - Application of exam technique across all strands - Use of advanced algebraic methods - Understanding and use of functions - Use of radians in trigonometry - Application of reciprocal and inverse trigonometric functions - Readiness for progression to Year 13 A Level Mathematics
Broken down knowledge covered: Algebra and Functions - Laws of indices and surds - Algebraic expansion, factorisation and simplification - Quadratic expressions, equations and graphs - The discriminant and modelling with quadratics	Broken down knowledge covered: Calculus (applied to mechanics) - Acceleration as rate of change - Constant acceleration formulae (SUVAT) - Motion under gravity - Variable acceleration	Broken down knowledge covered: Statistics and Probability - Completion of hypothesis testing - Interpretation of test statistics and significance - Integration of probability and inference - Review and consolidation of statistical methods

• Simultaneous equations and inequalities • Graphs of polynomial and reciprocal functions • Transformations of graphs • Binomial expansion and Pascal's triangle • Binomial estimation • Algebraic fractions and polynomials • Dividing polynomials and the factor theorem Trigonometry • Trigonometric ratios and exact values • Angles in all four quadrants • Trigonometric identities • Solving trigonometric equations • Sine rule, cosine rule and area of a triangle • Trigonometric graphs and transformations Coordinate Geometry and Vectors • Straight line graphs and equations • Parallel and perpendicular lines • Distance, midpoint and area in coordinate geometry • Equations of circles and circle properties • Vector notation and representation • Magnitude and direction of vectors • Position vectors and vector modelling Calculus • Concept of gradient of a curve • Differentiation of powers of x • Differentiation of polynomials • Tangents and normals • Increasing and decreasing functions • Second derivatives and stationary points • Curve sketching • Indefinite integration of powers of x • Definite integration • Areas under and between curves Mathematical Reasoning, Proof and Modelling • Algebraic proof and methods of proof	• Using differentiation in kinematics • Using integration in kinematics Statistics and Probability • Populations and samples • Random and non-random sampling • Types of data • The large data set • Measures of central tendency • Quartiles and percentiles • Interpolation • Measures of spread • Variance and standard deviation • Coding • Data representation (tables and diagrams) • Probability rules • Mutually exclusive and independent events • Conditional probability • Venn diagrams and tree diagrams • Probability distributions • Binomial distribution • Cumulative probabilities • Hypothesis testing terminology • Critical values • One-tailed and two-tailed tests (introduced) Algebra and Functions (exponentials and logarithms) • Exponential functions • Exponential growth and decay • Natural logarithms • Laws of logarithms • Solving exponential and logarithmic equations Mathematical Modelling • Mathematical modelling and modelling assumptions • Scalars and vectors in mechanics • Physical quantities and units • Displacement–time graphs • Velocity–time graphs • Force diagrams and resolving forces • Newton's laws of motion • Resultant force and acceleration • Motion in two dimensions • Connected particles and pulleys	• Algebra and Functions (advanced/transition) • Algebraic methods for Year 13 transition • Advanced algebraic manipulation • Function notation and interpretation • Domain and range of functions • Composite functions • Inverse functions (introductory) Trigonometry (radians, reciprocal and inverse functions) • Radians and arc length (conceptual understanding) • Trigonometric functions in radians • Reciprocal trigonometric functions • Inverse trigonometric functions Mathematical Reasoning and Problem Solving • Drawing conclusions in context
Assessments:		

After each unit, students complete a topic test which assesses the knowledge and understanding from the unit just taught, alongside one question from a previously studied topic to support retrieval practice and long-term retention. In lessons, students regularly complete “weeklies”, which are exam-style questions sat and marked in class. These provide immediate feedback, allowing misconceptions to be identified and addressed promptly. Students who require further practice, identified through performance in weeklies and topic tests, are set additional targeted work using the online platforms Dr Frost Maths and Up Learn, ensuring gaps in knowledge are addressed and learning is consolidated.

From the start of the Spring, students begin completing past examination paper questions to help them identify areas for improvement and to develop familiarity with exam structure, command words and mark schemes. In the Summer term, students sit a full AS examination, which is used to summatively assess their progress while also providing valuable formative feedback. The outcomes of this assessment inform final consolidation, targeted intervention and preparation for progression into Year 13.

Year Group: 13		
Autumn Term	Spring Term	Summer Term
Unit length: 16 Weeks	Unit length: 12 Weeks	Unit length: 5 Weeks
Domains of knowledge: • Trigonometry • Calculus • Algebra and Functions • Coordinate Geometry and Vectors • Mechanics • Mathematical Reasoning, Proof and Modelling	Domains of knowledge: • Calculus • Algebra and Functions • Trigonometry • Mechanics • Statistics and Probability • Mathematical Reasoning, Proof and Modelling	Domains of knowledge: • Statistics and Probability • Mechanics • Algebra and Functions • Coordinate Geometry and Vectors • Mathematical Reasoning and Problem Solving
Key concepts: • Radian measure, arc length and sector area • Solving trigonometric equations and identities • Small angle approximations • Parametric equations and curve sketching • Differentiation of trigonometric, exponential and logarithmic functions • Chain, product and quotient rules • Implicit and parametric differentiation • Second derivatives and rates of change • Integration of standard functions and substitutions • Forces, moments, equilibrium and centres of mass	Key concepts: • Integration by parts and partial fractions • Areas and numerical integration (trapezium rule) • Differential equations and modelling • Binomial expansion for rational powers • Sequences and series • Kinematics and dynamics • Conditional probability • Normal distribution and approximations	Key concepts: • Hypothesis testing with the normal distribution • Interpretation of statistical results in context • Projectile motion and vector kinematics • Variable acceleration using vectors • Consolidation of sequences and series • Full integration of Pure, Mechanics and Statistics content
Relevant end points covered: • Confident use of radians in solving equations and modelling • Application of identities, inverse functions and approximations • Secure differentiation of advanced functions • Application of calculus to rates of change and motion • Integration using substitution and identities • Use of parametric equations to model curves • Manipulation of complex algebraic expressions • Solving geometric problems using vectors • Application of vectors in mechanics • Modelling equilibrium, moments and statics • Solving problems involving forces and rigid bodies	Relevant end points covered: • Ability to solve problems using advanced integration techniques • Use of differential equations to model real-world situations • Expansion and manipulation of expressions of the form $(1 + x)^n$ • Understanding and application of sequences and series • Application of conditional probability and correlation • Use of the normal distribution, including approximations	Relevant end points covered: • Completion of hypothesis testing • Interpretation of significance and conclusions in context • Solving projectile motion problems • Application of vectors to motion and acceleration • Secure understanding of advanced algebraic structures • Readiness for final A Level examination demands • Mathematical Reasoning and Problem Solving • Independent selection of methods • Justification of solutions and evaluation of models
Broken down knowledge covered: Algebra and Functions • Parametric equations • Algebraic manipulation within parametric forms • Modelling using parametric equations Trigonometry • Radian measure	Broken down knowledge covered: Algebra and Functions • Binomial expansion for positive, negative and fractional powers • Expansion of $(1 + x)^n$ and $(a + bx)^n$ • Partial fractions • Sequences and series (arithmetic and geometric) • Sigma notation	Broken down knowledge covered: Statistics and Probability • Normal distribution • Finding probabilities using tables and calculators • Standard normal distribution • Inverse normal distribution • Finding mean and standard deviation • Interpreting real-life scenarios using the normal distribution

• Arc length • Area of a sector • Solving trigonometric equations in radians • Reciprocal trigonometric functions (sec, cosec, cot) • Graphs of secant, cosecant and cotangent • Trigonometric identities • Inverse trigonometric functions • Addition formulae • Double angle formulae • R–alpha (compound angle) formulae • Proving trigonometric identities • Small angle approximations • Modelling with trigonometric functions Calculus • Differentiation of trigonometric functions • Differentiation of exponential functions • Differentiation of logarithmic functions • Chain rule • Product rule • Quotient rule • Implicit differentiation • Differentiation of parametric equations • Use of second derivatives • Rates of change Coordinate Geometry and Vectors • Vectors in three dimensions • Vector magnitude and direction in 3D • Vector equations of lines • Solving geometric problems using vectors • Applications of vectors to mechanics Mechanics • Forces as vectors • Resolving forces • Moments • Resultant moments • Equilibrium of particles • Equilibrium of rigid bodies • Centres of mass • Tilting and stability • Modelling assumptions in mechanics Mathematical Reasoning, Proof and Modelling • Selection of appropriate trigonometric and calculus methods • Construction of proofs using trigonometric identities	• Calculus - Integration of standard functions • Integration of functions of the form $f(ax + b)$ • Integration using trigonometric identities • Reverse chain rule • Integration by substitution • Integration by parts • Integration using partial fractions • Definite integration and finding areas • Numerical integration using the trapezium rule • Differential equations • Modelling using differential equations Coordinate Geometry and Vectors • Vector kinematics • Differentiating vectors • Integrating vectors Mechanics • Resolving forces on inclined planes • Friction • Static particles • Modelling with statics • Static rigid bodies (ladders, pegs) • Dynamics of particles • Connected particles • Projectile motion • Horizontal and vertical projection • Projection at any angle • Variable acceleration Statistics and Probability • Change of variables • Exponential models • Measuring correlation • Hypothesis testing for zero correlation • Set notation • Conditional probability using tables • Conditional probability using Venn diagrams • Conditional probability using tree diagrams • Questioning assumptions in probability models Mathematical Reasoning, Proof and Modelling • Selection and justification of integration techniques • Interpretation of solutions to differential equations • Evaluation of statistical models and assumptions	• Approximating a binomial distribution using the normal distribution • Continuity corrections • Hypothesis testing using the normal distribution • Interpretation of test statistics and significance • Drawing conclusions in context Algebra and Functions • Consolidation of binomial expansion • Consolidation of sequences and series • Advanced algebraic manipulation for exam contexts Calculus • Consolidation of differentiation techniques • Consolidation of integration techniques • Linking calculus across algebraic, trigonometric and mechanical contexts Mechanics • Consolidation of statics, dynamics and kinematics • Integration of vector methods in mechanics • Multi-step problem solving Mathematical Reasoning, Proof and Modelling • Synoptic problem solving • Independent selection of methods • Justification and evaluation of solutions
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• Interpretation of solutions in context • Evaluation of modelling assumptions		
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Assessment

After each unit, students complete a topic test which assesses the knowledge and understanding from the unit just taught, alongside one question from a previously studied topic to support retrieval practice and long-term retention. In lessons, students regularly complete “weeklies”, which are exam-style questions sat and marked in class. These provide immediate feedback, allowing misconceptions to be identified and addressed promptly. Students who require further practice, identified through performance in weeklies and topic tests, are set additional targeted work using the online platforms Dr Frost Maths and Up Learn, ensuring gaps in knowledge are addressed and learning is consolidated.

Students sit a PPE in October, comprising an AS-level paper and a second paper containing A-level (A2) content. The results of these assessments are used to generate predicted grades for UCAS. Students sit a second PPE in February, which consists of a full A-level paper. Both PPEs support students in identifying areas for improvement and developing familiarity with exam structure, command words and mark schemes.

Throughout Year 13, students also complete past examination papers to help them identify areas requiring further revision and to support independent exam preparation.