The Island VI Form

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# Post-16 Curriculum - Maths

## Subject Curriculum Overview

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| Subject | Maths |
| Qualification / Specification | A Level Mathematics 7357 |
| Awarding Body | AQA |
| Level | 3 |
| Curriculum Lead | Kamelia Howells |
| Teaching Staff | Conal Howells, Elizabeth Berrimann, Catherine Jones |
| Guided Learning Hours | 10 hours a fortnight |
| Year(s) Delivered | 12 & 13 |
| Last Review Date | June 2026 |
| Next Review Date | June 2027 |

## 1. Curriculum Intent

A Level Mathematics develops learners' ability to think logically, analyse complex problems, and apply mathematical techniques to a wide range of real-world and theoretical situations. The subject builds confidence in mathematical reasoning, promotes precision and accuracy, and encourages learners to communicate mathematical ideas effectively.

The curriculum is designed to deepen understanding of key mathematical concepts including algebra, calculus, statistics, and mechanics, while fostering resilience, independent learning, and critical thinking. Mathematics provides learners with a powerful language for modelling and interpreting the world around them.

The A Level Mathematics curriculum provides a strong foundation for progression into higher education, apprenticeships, and employment. It equips learners with transferable skills valued across a broad range of disciplines and careers.

The curriculum supports progression to degree courses such as:

- Mathematics
- Engineering

- Physics
- Computer Science
- Economics
- Finance and Accounting
- Data Science
- Actuarial Science
- Architecture

It also develops the analytical and quantitative skills required for higher-level apprenticeships and technical careers. Learners gain experience in problem solving, modelling, data analysis, and decision making, preparing them for lifelong learning and professional development.

Universities and employers consistently identify mathematical competence as a key indicator of academic and professional success. The curriculum develops skills that are highly sought after in modern industries, including:

- Logical reasoning and critical thinking
- Data interpretation and statistical analysis
- Problem solving in unfamiliar contexts
- Quantitative decision making
- Accuracy, attention to detail, and resilience
- Digital and technological literacy through mathematical modelling

The inclusion of statistics reflects the growing importance of data analysis across sectors, while mechanics supports progression into engineering, physical sciences, and technical fields. The curriculum encourages learners to apply mathematical concepts to authentic contexts, mirroring the analytical demands of higher education and the workplace.

Successful learners:

- Demonstrate secure knowledge and understanding of mathematical concepts and methods.
- Apply mathematical techniques accurately and efficiently to solve routine and non-routine problems.
- Communicate mathematical reasoning clearly using appropriate notation, diagrams, and language.
- Make connections between different areas of mathematics and other subjects.
- Analyse, interpret, and evaluate data and mathematical models critically.
- Show resilience, independence, and confidence when tackling complex problems.
- Achieve strong outcomes that enable progression to their chosen next steps, whether university, apprenticeship, or employment.

- Develop a positive attitude towards mathematics and recognise its relevance in academic, professional, and everyday contexts.

Ultimately, success in A Level Mathematics is measured not only by examination performance but by learners' ability to think mathematically, solve problems independently, and use quantitative reasoning effectively in future study, employment, and life.

## 2. Foundational Knowledge

| Area | Essential Knowledge / Skills | Why It Matters |
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| Algebra and Functions | Manipulating expressions, solving equations and inequalities, working with functions, graph sketching, transformations, logarithms and exponentials. | Forms the foundation of advanced mathematics and underpins calculus, modelling, economics, engineering, and sciences. |
| Coordinate Geometry | Straight lines, circles, gradients, distances, intersections, and coordinate methods. | Develops spatial reasoning and mathematical modelling skills used in physics, engineering, architecture, and computer graphics. |
| Sequences and Series | Arithmetic and geometric sequences, sigma notation, recurrence relations. | Builds understanding of mathematical patterns, growth models, and prepares students for higher-level mathematical analysis. |
| Trigonometry | Trigonometric ratios, identities, equations, graphs, radians, and modelling periodic behaviour. | Essential for modelling waves, oscillations, engineering systems, navigation, and advanced mathematical study. |
| Calculus | Differentiation, integration, rates of change, gradients, areas under curves, optimisation. | Considered one of the most powerful mathematical tools for analysing change and modelling real-world phenomena. Critical for STEM progression. |
| Numerical Methods | Iterative methods, approximations, error analysis, and numerical solutions. | Supports problem-solving where exact solutions are not possible and reflects techniques used in industry and computing. |
| Mathematical Modelling | Translating real-world situations into mathematical representations and interpreting results. | Develops the ability to apply mathematics to practical contexts, a key skill valued by employers and universities. |
| Statistical Sampling and Data Presentation | Data collection, sampling methods, graphical representation, interpretation of data. | Enables learners to analyse evidence critically and make informed decisions using data. |
| Probability | Probability rules, conditional probability, independent events, probability distributions. | Provides tools for risk assessment, forecasting, decision-making, and statistical inference. |
| Statistical Distributions | Binomial and normal distributions, expected value, variance, hypothesis testing. | Underpins modern data science, research, finance, medicine, and social sciences. |
| Hypothesis Testing | Statistical testing, significance levels, interpreting results. | Develops critical evaluation skills and evidence-based reasoning used in academic research and industry. |
| Mechanics | Forces, motion, kinematics, Newton's laws, moments, and modelling physical systems. | Supports progression to engineering, physics, and technical disciplines while demonstrating practical applications of mathematics. |
| Problem Solving and Reasoning | Selecting appropriate methods, constructing arguments, evaluating solutions, communicating reasoning. | Develops independent thinking and resilience, which are essential for success in higher education and employment. |

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| Mathematical Communication | Using correct notation, terminology, diagrams, and structured solutions. | Ensures learners can communicate complex ideas accurately and effectively in academic and professional settings. |

## 3. Powerful Knowledge

| Powerful Knowledge Area | Why It Matters | Evidence of Understanding |
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| Mathematics as a Universal Language | Mathematics provides a precise way of describing patterns, relationships, and structures across disciplines. | Learners use mathematical notation accurately and communicate complex ideas clearly and logically. |
| Functions Model Real-World Relationships | Many real-world situations can be represented using mathematical functions and graphs. | Learners interpret, analyse, and construct functions to model practical situations and predict outcomes. |
| Calculus Describes Change | Calculus enables the analysis of rates of change and accumulation, forming the basis of modern science, engineering, and economics. | Learners apply differentiation and integration to solve optimisation, motion, and modelling problems. |
| Mathematical Models Simplify Reality | Models allow complex situations to be analysed, predicted, and evaluated. | Learners construct models, evaluate assumptions, and interpret the limitations of solutions. |
| Patterns and Generalisation Drive Mathematical Thinking | Recognising patterns allows mathematicians to develop rules, formulae, and broader theories. | Learners identify relationships, derive general results, and justify conclusions. |
| Probability Quantifies Uncertainty | Probability provides a framework for understanding risk, chance, and decision-making. | Learners calculate probabilities, interpret outcomes, and evaluate uncertainty in different contexts. |
| Statistics Supports Evidence-Based Conclusions | Statistical methods help distinguish between observation and reliable evidence. | Learners analyse data, conduct hypothesis tests, and draw justified conclusions from evidence. |
| Mathematical Proof Establishes Certainty | Proof allows mathematical statements to be verified beyond individual examples. | Learners construct logical arguments and justify mathematical conclusions rigorously. |
| Multiple Representations Deepen Understanding | Mathematical ideas can be represented algebraically, graphically, numerically, and verbally. | Learners move fluently between representations and select the most effective method for solving problems. |
| Abstraction Reveals Underlying Structure | Mathematics enables learners to identify common principles across different contexts. | Learners recognise connections between topics and apply concepts in unfamiliar situations. |
| Mechanics Uses Mathematics to Explain Physical Systems | Mathematical principles can describe and predict motion and forces in the real world. | Learners develop and apply mathematical models to analyse physical situations accurately. |
| Technology Enhances Mathematical Investigation | Digital tools support exploration, modelling, and analysis of complex mathematical problems. | Learners use technology appropriately to investigate, verify, and interpret mathematical results. |
| Mathematical Reasoning Supports Decision-Making | Logical and quantitative reasoning are essential for evaluating information and making informed decisions. | Learners justify methods, evaluate solutions, and critically assess mathematical arguments. |
| Mathematics Develops Transferable Problem-Solving Skills | The discipline develops resilience, logical thinking, and analytical skills applicable beyond mathematics. | Learners solve unfamiliar problems independently and reflect on the effectiveness of different approaches. |

## 4. Curriculum Implementation

| Term | Unit | Key Content | Foundational Knowledge | Powerful Knowledge | Assessment Opportunities |
|---|---|---|---|---|---|
| Yr 12 - Autumn 1 | Algebra and Functions | Surds, indices, algebraic manipulation, equations, inequalities, functions, graphs | Algebraic fluency, function notation, graph interpretation | Functions model relationships and behaviour in real-world contexts | Baseline assessment, topic tests, diagnostic questions, retrieval quizzes |
| Yr 12 - Autumn 2 | Coordinate Geometry and Sequences | Straight lines, circles, sequences, series, sigma notation | Coordinate methods, pattern recognition, arithmetic and geometric sequences | Patterns enable prediction and mathematical generalisation | End-of-unit assessment, exam-style questions |
| Yr 12 - Spring 1 | Trigonometry | Trigonometric ratios, graphs, identities, equations, radians | Understanding periodic functions and geometric relationships | Trigonometric models describe cyclical phenomena | Topic assessment, problem-solving activities |
| Yr 12 - Spring 2 | Calculus Introduction | Differentiation, gradients, stationary points, | Rules of differentiation and graph analysis | Calculus provides a framework for understanding change | Formal assessment, application tasks |

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| | | optimisation | | | |
| Yr 12 - Summer 1 | Integration and Applications | Integration, area under curves, numerical methods | Reverse processes, graphical interpretation | Integration measures accumulation and total change | End-of-unit test, modelling investigations |
| Yr 12 - Summer 2 | Statistics and Probability | Data presentation, probability, statistical distributions | Statistical calculations and probability rules | Probability quantifies uncertainty and risk | End-of-year examination, synoptic assessment |

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| Yr 13 - Autumn 1 | Advanced Calculus | Differentiation and integration techniques, parametric equations | Calculus fluency and algebraic manipulation | Mathematical models explain complex systems and change | Topic tests, exam-style questions |
| Yr 13 - Autumn 2 | Numerical Methods and Modelling | Iteration, numerical solutions, modelling assumptions | Approximation methods and interpretation | Models simplify reality but have limitations | Investigation tasks, modelling projects |

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| Yr 13 - Spring 1 | Advanced Statistics | Binomial distribution, normal distribution, hypothesis testing | Statistical distributions and inference | Data supports evidence-based decision making | Statistical investigations, formal assessment |
| Yr 13 - Spring 2 | Mechanics | Forces, motion, kinematics, Newton's laws, moments | Mathematical modelling of physical systems | Mathematics explains and predicts physical behaviour | Mechanics assessment, problem-solving tasks |
| Yr 13 - Summer 1 | Synoptic Mathematics | Integrated pure mathematics, statistics and mechanics | Connections across all curriculum areas | Mathematical ideas are interconnected and transferable | Full examination papers, mock examinations |
| Yr 13 - Summer 2 | Examination Preparation | Revision, exam technique, problem solving, reasoning | Consolidation of all prior learning | Independent mathematical thinking and evaluation | Final examinations, targeted intervention assessments |

## 5. Assessment Strategy

| Assessment Type | Purpose | Frequency |
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| Diagnostic | Establish learners' prior knowledge, identify strengths and gaps from GCSE Mathematics, and inform curriculum planning, intervention, and differentiation. | At the start of Year 12, prior to new units, and following significant periods of absence or intervention. |

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| Formative | Monitor ongoing learning, identify misconceptions, provide feedback, and adapt teaching to improve progress. Supports retrieval and long-term retention. | Daily through questioning, mini-whiteboard activities, homework, starters, and low-stakes assessments. |
| Summative | Measure attainment against curriculum expectations and examination standards. Provides evidence of progress over time. | Half-termly/termly formal assessments using examination-style questions and papers. |
| Synoptic | Assess learners' ability to connect knowledge across different areas of Pure Mathematics, Statistics, and Mechanics. Encourages transfer of learning. | Annually at the end of Year 12. Typically one mock examination series in Autumn Year 13 and one in Spring Year 13. |