

Further Maths

OCR Further Maths A Level H245

This new A Level qualification builds on the skills, knowledge and understanding set out in the new GCSE (9-1) subject content for mathematics for 2015. The content is separated into three areas: Pure Mathematics, Statistics and Mechanics with all elements being assessed through a written examination. All pupils must study all three topic areas. Further Maths cannot be studied in its own right and must be taken in conjunction with the single A Level Maths course. (Resulting in 2 maths qualifications).

Pure Maths learners will extend and deepen their knowledge of proof, algebra, functions, calculus, vectors and differential equations studied in A Level Mathematics. They will also broaden their knowledge into other areas of pure mathematics that underpin the further study of mathematics and other numerate subjects with complex numbers, matrices, polar coordinates and hyperbolic functions. In Statistics learners will explore the theory which underlies the statistics content in A Level Mathematics, as well as extending their tool box of statistical concepts and techniques. This area covers combinatorics, probability distributions for discrete and continuous random variables, hypothesis tests and confidence intervals for a population mean, chi-squared tests, non-parametric tests, correlation and regression. In Mechanics learners extend their knowledge of particles, kinematics and forces from A Level Mathematics, using their extended pure mathematical knowledge to explore more complex physical systems. The area covers dimensional analysis, work, energy, power, impulse, momentum, centres of mass, circular motion and variable force.

Topics Studied per Year

Topics	Year 12
Conditional probability	<ul style="list-style-type: none">• Set notation and Venn Diagrams• Two-way Tables• Tree Diagrams
General Binomial Expansion	<ul style="list-style-type: none">• General Binomial Expansion• Binomial expansions of compound expressions
Calculus of exponential and trig functions	<ul style="list-style-type: none">• Differentiation• Integration
Further Differentiation	<ul style="list-style-type: none">• Chain Rule• Product Rule• Quotient Rule• Implicit Differentiation• Differentiating Inverse functions

Further integration	<ul style="list-style-type: none"> • Reversing second derivatives • Integration by substitution • Integration by parts • Using trig identities in integration • Integrating rational functions
Further applications of calculus	<ul style="list-style-type: none"> • Properties of curves • Parametric equations • Related rates of change • Area between curves
Further Hypothesis testing	<ul style="list-style-type: none"> • Distribution of Sample means • Hypothesis tests for the mean • Hypothesis tests for correlation
Differential Equations	<ul style="list-style-type: none"> • Introduction to differential equations • Separable differential equations • Modelling differential equations
Numerical solutions	<ul style="list-style-type: none"> • Integration as the limit of a sum • Trapezium rule
Numerical Methods	<ul style="list-style-type: none"> • Locating roots of a function • Newton-Raphson • Limitations of Newton-Raphson • Fixed point iteration • Limits of fixed-point iteration

Topics Studied per Year

Topics	Year 13
Functions	<ul style="list-style-type: none"> • Functions Mapping and Functions • Domain and range

	<ul style="list-style-type: none"> • Composite functions • Inverse functions
Rational functions	<ul style="list-style-type: none"> • Introducing radian measure • Inverse trig functions • Modelling with trig functions • Arcs and sectors • Triangles and circles • Small angle approximations
Further transformations	<ul style="list-style-type: none"> • Combined transformations • Modulus functions • Modulus equations and inequalities
Further Trigonometry	<ul style="list-style-type: none"> • Compound angle identities • Double angle identities • R Cos • Reciprocal trigonometrical functions
Applications of vectors	<ul style="list-style-type: none"> • Describing motion in two dimensions • Constant acceleration equations • Calculus with vectors • Vectors in three dimensions • Solving geometrical problems
Projectiles	<ul style="list-style-type: none"> • Modelling projectile motion • Trajectory of a projectile
Sequences	<ul style="list-style-type: none"> • General sequences • General series and sigma notation • Arithmetic sequences • Arithmetic series • Geometric sequences • Geometric series • Infinite geometric series

	<ul style="list-style-type: none"> • Using sequences and series to solve problems
Proof	<ul style="list-style-type: none"> • Proof by contradiction • Criticising proofs
Rational functions	<ul style="list-style-type: none"> • Review of factor theorem • Simplifying rational functions • Partial fractions with distinct factors • Partial fractions with a repeated factor
Forces in context	<ul style="list-style-type: none"> • Resolving forces • Coefficient of friction • Motion on a slope
Moments	<ul style="list-style-type: none"> • Turning effect of a force • Equilibrium • Non-uniform rods • Further equilibrium problems