



AS/A2 Mathematics and Further Mathematics Course Outline

Overview

Mathematics and Further Mathematics AS and A levels are essentially an expanding package of Mathematical modules. There are 18 modules covering the subjects Pure (Modules Core 1 to 4), Further Pure Mathematics (Further Pure 1 to 3), Mechanics (Mechanics 1 to 5), Statistics (Statistics 1 to 4) and Decision Mathematics (Decision 1 and 2). Each module is equally weighted and is tested entirely by written examination. Different combinations of modules can be taken. An AS level is achieved after 3 modules; an A level is achieved after 6 modules; Maths and Further Maths A levels are achieved after 12 modules. The modules are increasingly challenging and allow students to gain fluency in the use of Algebra; knowledge of Differentiation and Integration; Trigonometry and other core topics before applying learnt knowledge to Application subjects based on solving real world problems such as the minimum amount of material needed to create the largest volume container or the most effective route for a postman to deliver mail.

Course Structure & Summary of Unit Content

Core Mathematics

- C1** Algebra and functions; coordinate geometry in the (x, y) plane; sequences and series; differentiation; integration
- C2** Algebra and functions; coordinate geometry in the (x, y) plane; sequences and series; trigonometry; exponentials and logarithms; differentiation; integration
- C3** Algebra and functions; trigonometry; exponentials and logarithms; differentiation; numerical methods
- C4** Algebra and functions; coordinate geometry in the (x, y) plane; sequences and series; differentiation; integration; vectors

Further Pure Mathematics

- FP1** Series; complex numbers; numerical solution of equations; coordinate systems, matrix algebra, proof
- FP2** Inequalities; series, first order differential equations; second order differential equations; further complex numbers, Maclaurin and Taylor series
- FP3** Further matrix algebra; vectors, hyperbolic functions; differentiation; integration, further coordinate systems

Mechanics

- M1** Mathematical models in mechanics; vectors in mechanics; kinematics of a particle moving in a straight line; dynamics of a particle moving in a straight line or plane; statics of a particle; moments
- M2** Kinematics of a particle moving in a straight line or plane; centres of mass; work and energy; collisions; statics of rigid bodies

- M3** Further kinematics; elastic strings and springs; further dynamics; motion in a circle; statics of rigid bodies
- M4** Relative motion; elastic collisions in two dimensions; further motion of particles in one dimension; stability
- M5** Applications of vectors in mechanics; variable mass; moments of inertia of a rigid body; rotation of a rigid body about a fixed smooth axis

Statistics

- S1** Mathematical models in probability and statistics; representation and summary of data; probability; correlation and regression; discrete random variables; discrete distributions; the Normal distribution
- S2** The Binomial and Poisson distributions; continuous random variables; continuous distributions; samples; hypothesis tests
- S3** Combinations of random variables; sampling; estimation, confidence intervals and tests; goodness of fit and contingency tables; regression and correlation
- S4** Quality of tests and estimators; one-sample procedures; two-sample procedures

Decision Mathematics

- D1** Algorithms; algorithms on graphs; the route inspection problem; critical path analysis; linear programming; matchings
- D2** Transportation problems; allocation (assignment) problems; the travelling salesman; game theory; further linear programming, dynamic programming; flows in networks

Assessment:

Each of the 18 modules is assessed entirely by a final examination. Modules will be taken throughout the 2 year course at Christmas, Spring and Summer, depending on the progress of the group and the individual. There will be limited opportunity to resit weak modules. Module results will then be cashed in at the end of Year 12 and 13 to achieve AS, A2 or Further Maths A level - AS equates to 3 modules; A2 to 6 modules and Further A2 to 12 modules. Some modules have compulsory items for example Core 1 and 2 for AS and Core 1 – 4 for A2. Choice of other modules is flexible and will be agreed after discussion with the group and the teaching staff.

Entry qualifications

Students will require a minimum of a grade B at GCSE to undertake AS and A2 Mathematics. For Further Mathematics students will require Grade A or A* at GCSE.

Career Prospects

Mathematicians are highly employable in a wide range of fields. They are valued for their problem solving and analytical skills. AS, A and Further A Levels in Mathematics are acceptable as entry qualifications for the vast majority of college and university courses in just about any subject. Mathematics study is also an excellent preparation for science and other analytical subjects.