



# MATHEMATICS AND FURTHER MATHEMATICS

**Entry Requirement:** Grade 7, 8 or 9 in the Higher Level GCSE paper. Students wishing to study Further Mathematics must have a good 8 or 9 grade at GCSE. All potential students will be required to sit a test based on the GCSE syllabus and the summer work in the September registration week. A satisfactory standard must be achieved on this test to embark on the course.

## GCE Advanced Mathematics

**Examination Board:** PEARSON EDEXCEL 9MA0

### Course Content and Assessment

The course will be examined by three papers, each 2 hours long.

Papers 1 and 2 will be assessing the Pure Mathematics content and Paper 3 will assess the Statistics and Mechanics parts of the course.

All students will follow the same course content.

Paper 1: Pure Mathematics 1	Paper 2: Pure Mathematics 2
<ul style="list-style-type: none"> <li>• Proof</li> <li>• Algebra and functions – indices and surds, quadratics, simultaneous equations, inequalities, functions</li> <li>• Coordinate geometry in the (x,y) plane – straight lines, the circle</li> <li>• Sequences and series – binomial expansion</li> <li>• Trigonometry – simple identities and equations</li> <li>• Exponentials and logarithms</li> <li>• Differentiation – first and second derivatives, tangents and normals</li> <li>• Integration – definite and indefinite integration</li> <li>• Vectors</li> </ul>	<ul style="list-style-type: none"> <li>• Proof</li> <li>• Algebra and functions – algebraic division, composite and inverse functions, partial fractions</li> <li>• Coordinate geometry in the (x,y) plane – parametric equations</li> <li>• Sequences and series – binomial expansion for rational powers, sigma notation, arithmetic and geometric series</li> <li>• Trigonometry – radian measure, exact values, reciprocal ratios, further identities and equations</li> <li>• Differentiation – trigonometric functions, product and quotient rules, parametric differentiation</li> <li>• Integration – area under a curve, substitution and integration by parts, simple first order DE</li> <li>• Numerical methods – roots of an equation, iterative methods, trapezium rule</li> <li>• Vectors – three dimensions</li> </ul>
Paper 3: Statistics and Mechanics	
<p><b>Section A: Statistics</b></p> <ul style="list-style-type: none"> <li>• Statistical sampling</li> <li>• Data presentation and interpretation</li> <li>• Probability</li> <li>• Statistical distributions</li> <li>• Statistical hypothesis testing</li> </ul>	<p><b>Section B: Mechanics</b></p> <ul style="list-style-type: none"> <li>• Quantities and units in Mechanics</li> <li>• Kinematics</li> <li>• Forces and Newton’s laws</li> <li>• Moments</li> </ul>

## Assessment

All examinations are taken at the end of Year 13. The three papers are of equal weighting, each marked out of 100. Students must answer all the questions. Calculators can be used in all papers but there will be questions in which appropriate working must be shown to gain marks.

## GCE Advanced Further Mathematics

**Examination Board:** PEARSON EDEXCEL 9FM0

Students who choose to take Further Mathematics will study both A Level Mathematics and A Level Further Mathematics. The course is designed so that the A Level Mathematics content is studied in Year 12 and the A Level Further Mathematics course is studied in Year 13. To ensure sufficient lesson time, the course runs across two of the option blocks. Students can therefore choose two further subjects from the remaining two option blocks.

Students who choose to study Further Mathematics will complete the Mathematics course, as described above in addition to the following Further Mathematics content.

Paper 1: Further Pure Mathematics 1	Paper 2: Further Pure Mathematics 2
<ul style="list-style-type: none"><li>• Proof</li><li>• Complex numbers – modulus and argument, conjugates, Argand diagrams, simple loci</li><li>• Matrices – add, subtract and multiply, transformations, determinants, inverse matrices</li><li>• Further algebra and functions – roots of polynomials, series formulae</li><li>• Further calculus – volumes of revolution</li><li>• Further vectors – equation of a straight line and plane, scalar product</li></ul>	<ul style="list-style-type: none"><li>• Complex numbers – de Moivre’s theorem, exponential form, complex roots</li><li>• Further algebra and functions – method of differences, Maclaurin series</li><li>• Further calculus – improper integrals, mean value of a function, inverse trigonometric functions</li><li>• Polar coordinates</li><li>• Hyperbolic functions</li><li>• Differential equations – first and second order, simple harmonic motion, damped harmonic motion</li></ul>
Paper 3: Further Statistics	Paper 4: Further Mechanics
<ul style="list-style-type: none"><li>• Linear regression</li><li>• Discrete distributions</li><li>• Continuous distributions</li><li>• Correlation</li><li>• Hypothesis testing</li><li>• Chi squared tests</li></ul>	<ul style="list-style-type: none"><li>• Momentum and impulse</li><li>• Collisions</li><li>• Centres of mass</li><li>• Work and energy</li><li>• Elastic strings and springs</li></ul>

## Assessment

All public examinations in both A Level Mathematics and A Level Further Mathematics will be taken at the end of Year 13. These will be comprised of:

- Mathematics A level: three 2 hour papers each worth 100 marks (see description above)
- Further mathematics A level: four 1.5 hour papers each worth 75 marks with 50% pure content and 50% applied.

## Teaching and Learning Methods

Students are required to purchase textbooks for each of the courses and these are an integral part of the teaching process. Staff use a range of teaching styles, both traditional and involving the use of technology when appropriate. Students will require an advanced scientific calculator (for example Casio FX-991EX Classwiz). There is no coursework involved in either course.

## Homework

A homework assessment is set at the end of most lessons to be completed for the next lesson. On some occasions, a longer piece of work may be given but an extended time period would be allocated for this.

Regular assessment tests are given to further assess the students' progress.

## Complementary Subjects

### Mathematics:

This course combines well with all the Science subjects as well as other disciplines such as Geography, Economics, Sociology and Psychology.

### Further Mathematics:

This course is beneficial for those students intending to progress to University to read Mathematical or Engineering related degrees and advantageous to other studies, particularly Sciences.

## Trips and Visits

All students studying Mathematics or Further Mathematics are invited to participate in the Individual Senior Mathematics Challenge and a team is selected for the Senior Team Challenge.

A Study Day is offered for Year 12 and 13 students in London featuring talks from a variety of renowned Mathematicians.

## Why study Mathematics?

Some of you may be attracted to Mathematics because of its intrinsic interest, others because you have a talent for the subject and wish to apply it to the physical sciences or to economics, management, etc.

GCE Advanced Mathematics is considered by many employers, Universities and Colleges as a vital subject. It is compatible with virtually any other GCE Advanced subject. If you intend to read Mathematics, Statistics, Computing Science, Physics, Engineering or Pure Science, GCE Advanced Mathematics is a likely pre-requisite. It is also an asset for any other Higher Education Course.

## Careers

Mathematicians are employed in accounting, banking, insurance and the various branches of engineering. Many work for British Rail, the Aircraft Industry, the Meteorological Office and other Government Departments and most industrial firms, e.g. those producing photographic and electrical equipment, oil products, glass and food, all employ mathematicians. Good teachers of Mathematics, Computing Science and Statistics are sought after. Since the subject is fundamental to technology, a good mathematician will always have positive career prospects.