LAUDE
THE LADY ELIZABETH SCHOOL

AS/A2 Mathematics

What do I need to know or be able to do before taking this course?

To study Mathematics at Advanced GCE level, it is recommended that you have attained an A or above at GCSE. To study Mathematics at AS level, it is recommended that you have attained a grade B or above at GCSE. You will find that the AS/Advanced GCE course will build on some of the knowledge and skills you have already developed. It is equally important that you have an interest in, and are enthusiastic about the study of Mathematics.

What will I learn on this Advanced GCE course?

- You will develop your understanding of mathematics and mathematical processes, giving you more confidence and enjoyment of the subject.
- You will develop the ability to reason logically, to generalise and to construct mathematical proofs.
- The course will extend your range of mathematical skills and techniques and you will learn to use them in more difficult, unstructured problems.
- You will learn about the different areas of mathematics, how they are connected and how they are used in the real world.

What examinations will I have to take to get my qualification?

You may decide to study for **Advanced Subsidiary in Mathematics**. This is the first half of the Advanced GCE course. It is a stepping-stone to the full Advanced GCE qualification. You can take the AS on its own over one or two years. However, it is recommended that you have attained an A at GCSE if you intend to attempt the qualification in one year. Your teacher will advise you as to the best option. You will need to take the three AS modules for this qualification.

The full **Advanced GCE in Mathematics** is made up of the AS modules plus three more modules, called A2 modules. You can decide whether to do the full Advanced GCE at the end of your AS course. If you decide to start the full Advanced GCE course and change your mind, you can stop after you have covered the AS modules and get an AS qualification.

What is covered in each module?

AS Modules

Compulsory Units: Pure Mathematics C1 and C2
plus choose one from: Statistics S1, Mechanics M1 or Decision Mathematics D1 (see A2)

Pure Mathematics (C1)

The areas covered in this module are:

- Proof by direct methods
- Algebra: Laws of indices; Use and manipulation of surds and polynomials; Quadratic functions and their graphs; Solutions of quadratics; Identities; Division; Solution of simultaneous equations; Solution of linear and quadratic inequalities.
- Trigonometry: Radian measure; Trigonometric functions, their graphs, symmetries and periodicity; Trigonometric identities and solutions
- Coordinate geometry in the (x,y) plane: Linear equations; Parallel and perpendicular lines; Coordinates of the mid-point
- Sequences and series: Arithmetic and Geometric series
- Differentiation: First and second order derivatives; Application to gradient of a straight line and interpreting rates of change
- Integration: Indefinite and definite integration; Area under a curve

Pure Mathematics (C2)

The areas covered in this module are:

- Algebra and functions: Simplification of rational functions; Domain and range; Composition of functions; Inverse functions; Curve sketching and transformations; Modulus function; Geometrical interpretation of algebraic solution of equations
- Sequences and series; recurrence relationships; Binomial expansion
- Trigonometry; Introduction to secant, cosecant and arctan; Further identities
- Exponentials and logarithms: Application of the laws of logarithms
- Differentiation: Exponential and logarithmic functions; Applications to tangents and normals to a curve
- Integration: Exponential and logarithmic functions; Evaluation of volume of revolution about one of the coordinate axes

- Numerical methods: Locating roots; Iterative methods; Numerical integration.

A2 Modules

Compulsory units: Pure Mathematics C3 and C4

The areas covered in these modules are:

- Algebra: Rational functions; Partial fractions; The remainder theorem
- Coordinate geometry in the (x,y) plane: The circle; Cartesian and parametric equations of curves and conversion between the two forms
- Series: Further Binomial expansion
- Differentiation: Trigonometric functions, The product and quotient rules; Exponential growth and decay; Differentiation of implicit or parametric functions, Formation of simple differential equations
- Integration: Trigonometric functions; By substitution and by parts; The area under the curve; Integration using partial fractions or trigonometric identities
- Vectors: Magnitude; Orthogonal unit vectors; Position vectors; Distance between two points; Vector equations of lines; The scalar product; Calculating the angle between two lines

Plus one further Applications module from:-

Mechanics (M1)

The areas covered in this module are:

- Mathematical models in mechanics
- Vectors: Magnitude and direction of vectors; Resultant vector; Application of vectors to displacements, velocities, accelerations and forces in a plane
- Kinematics of a particle moving in a straight line; motion of a particle in a straight line with constant acceleration
- Statics of a particle; Resolution of forces
- Dynamics of a particle moving in a straight line or plane; Newton's laws of motion and simple application; Momentum and impulse; Coefficient of friction
- Moments

Statistics (S1)

The areas covered in this module are:

- Mathematical models in probability and statistics

- Representation and summary of data: Histograms, stem and leaf diagrams, box plots; Measures of location; Measures of dispersion; Skewness
- Probability: Elementary probability; Independence of two events; Sum and product laws
- Correlation and regression: Scatter diagrams; Linear regression; Independent and dependent variables; Applications and interpretations; The product moment correlation coefficient
- Discrete random variables: Probability function and the cumulative distribution function; Mean and variance; The discrete uniform distribution; The Normal distribution

Decision Mathematics (D1)

The areas studied in this module are:

- Algorithms: bin packing, bubble sort, quick sort, binary search
- Algorithms on graphs: Prim's and Kruskal's algorithm
- The route inspection problem
- Critical Path Analysis
- Linear programming
- Matchings

Assessment method: All units consist of one 1½ hr written examination

Which subjects should I study with Mathematics?

For entry to university in some countries mathematics beyond GCSE level is compulsory. Mathematics combines well with all other subjects but is particularly helpful for students taking physics and chemistry. Humanities subjects such as business studies and geography contain many concepts that are easier to cope with for mathematics students. Many degree courses require a high level of mathematics for example economics. For scientific research or psychology competency in the analysis of statistics is essential. However for many students the choice of mathematics is simply for fun and it combines with anything!

For further information speak to:

Mrs Wickman and Mrs Telfer in the mathematics department.