

Mathematics

Advanced Higher

Purpose and aims of the Course

Mathematics helps us to make sense of the world around us. It is the study of relationships, patterns, proofs and the properties of numbers. Mathematics takes a reasoned approach to thinking and is characterised by order and the use of carefully designed terms and processes. Mathematics can be used to model real-life situations and can equip us with the skills we need to interpret and analyse information, simplify and solve problems, assess risk, and make informed decisions. Mathematics at Advanced Higher provides the foundation for many developments in the sciences and in technology as well as having its own intrinsic value.

This Course is designed to enthuse, motivate, and challenge learners by enabling them to:

- ◆ select and apply complex mathematical techniques in a variety of mathematical situations, both practical and abstract
- ◆ extend and apply skills in problem solving and logical thinking
- ◆ extending skills in interpreting, analysing, communicating and managing information in mathematical form, while exploring more advanced techniques
- ◆ clarify their thinking through the process of rigorous proof

The Course develops and expands a range of mathematical skills. It allows the learner to develop further skills in calculus and algebra. Areas such as number theory (which helps keep the internet secure), complex numbers (the uses of which are ubiquitous, ranging from the solution of equations to the description of electronic circuits) and matrices (used in game theory and economics) are introduced. The learner's mathematical thinking will also benefit from examples of rigorous proof.

Recommended entry

This Course is suitable for learners who are secure in their attainment of the Higher Mathematics Course or an equivalent qualification.

Course structure

The course consists of three units:

Methods in Algebra and Calculus: The general aim of the Unit is to develop advanced knowledge and skills in algebra and calculus that can be used in practical and abstract situations to manage information in mathematical form. The Outcomes cover partial fractions, standard procedures for both differential calculus and integral calculus, as well as methods for solving both first order and second order differential equations. The importance of logical thinking and proof is emphasised throughout.

Applications of Algebra and Calculus: The general aim of the Unit is to develop advanced knowledge and skills that involve the application of algebra and calculus to real life and mathematical situations, including applications to geometry. Learners will acquire skills in interpreting and analysing problem situations where these skills can be used. The Outcomes cover the binomial theorem, the algebra of complex numbers, properties of functions, and rates of change. Aspects of sequences and series are introduced, including summations, proved by induction.

Geometry, Proof and Systems of Equations: The general aim of the Unit is to develop advanced knowledge and skills that involve geometry, number and algebra, and to examine the close relationship between them. Learners will develop skills in logical thinking. The Outcomes cover matrices, vectors, solving systems of equations, the geometry of complex numbers, as well as processes of rigorous proof.

Course assessment: The learner will draw on and apply the skills they have learned during the Course. This will be assessed within an examination, requiring demonstration of the knowledge, skills and understanding acquired from across the Units and how they can be applied in unfamiliar contexts and/or integrated ways.