

VI

Hartismere  
College



Mathematics



# **A STUDENT'S GUIDE TO THE AS/A LEVEL IN MATHEMATICS**

## **Pure Mathematics, Mechanics and Statistics (Edexcel)**

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

In order to study this subject you must have a grade 7 or above in GCSE Mathematics.

### **What will I learn on the AS level course?**

The AS course is an introductory course in the three major mathematical disciplines of pure mathematics, mechanics and statistics. It is a valuable qualification in its own right and provides a suitable foundation for future study at A level. Students develop a range of skills in mathematical modelling, logical reasoning and problem solving in a variety of contexts.

Assessment is by terminal examination at the end of year 12 for the AS in mathematics and at the end of year 13 for A level mathematics. The AS is a standalone qualification and it does not contribute to the final A level exam.

### **What kind of student is this course suitable for?**

Mathematics is a well-regarded subject in many careers, as well as providing foundations for further mathematical studies. It is useful in banking, economics, science, and engineering.

## Course structure and assessment.

### AS Mathematics

**Paper 1: Pure Mathematics**  
**Written examination: 2 hours**  
**66.6% of the qualification (100 marks)**

Content overview

Proof, Algebra and functions, Coordinate geometry in the (x, y) plane, Sequences and series, Trigonometry, Exponentials and logarithms, Differentiation, Integration, Vectors.

**Paper 2: Statistics and Mechanics**  
**Written examination: 1 hour 15 mins**  
**33.3% of the qualification (50 marks)**

Content overview

Section A: Statistics

Statistical sampling, Data presentation and interpretation, Probability, Statistical distributions, Statistical hypothesis testing,

Section B – Mechanics

Quantities and units in mechanics,  
Kinematics,  
Forces and Newton's laws.

## A level Mathematics

**Paper 1: Pure Mathematics 1**  
**Paper 2: Pure Mathematics 2**  
**Each paper is 2 hours written examination**  
**33.3% of the qualification (100 marks)**

Content overview

Proof, Algebra and functions, Coordinate geometry in the (x, y) plane, Sequences and series, Trigonometry, Exponentials and logarithms, Differentiation, Integration, Numerical methods, Vectors.

- Paper 1 and Paper 2 may contain questions on any topics from the Pure Mathematics content.
- Students must answer all questions.
- Calculators can be used in the assessment.

**Paper 3: Statistics and Mechanics**  
**2 hours written examination**  
**33.3% of the qualification (100 marks)**

Content overview

Section A: Statistics  
Statistical sampling,  
Data presentation and interpretation,  
Probability,  
Statistical distributions,  
Statistical hypothesis testing

Section B: Mechanics  
Quantities and units in mechanics,  
Kinematics,  
Forces and Newton's laws,  
Moments

- Students must answer all questions.
- Calculators can be used in the assessment.

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## **DESCRIPTION OF THE COURSE**

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### **PURE MATHEMATICS**

Pure mathematics deals with the theoretical aspects of the subject. At first, you will recognise topics from GCSE mathematics (such as algebra, graphs, trigonometry and probability) but it quickly develops into less familiar, more demanding (but more stimulating) themes. A large section of the course is devoted to calculus, which is one of the techniques used by mathematicians to analyse quantities that are continuously changing.

A knowledge of pure maths is a good foundation for further study in many disciplines and almost essential for the physical sciences. It is also more than worthwhile in itself as a training in developing powers of logical thought, reasoning and the analysis of problems. Maths is also an ideal subject to complement studies in the arts.

### **MECHANICS**

Mechanics is the study of structures (statics) and the study of moving objects (kinematics and dynamics).

In reality, a complete description of the motion of moving objects is very complex and so simplifications are introduced to solve problems - this simplification is achieved in the process of mathematical modelling. This is an important part of the course - you will spend some time learning how to be clear about which assumptions you can make in order to simplify a problem and then how to refine those assumptions to obtain increasingly accurate solutions to a problem.

A knowledge of mechanics is an especially good basis for further study of the physical sciences, engineering and related technologies.

### **STATISTICS**

Statistics introduces the mathematical processes required to collect, analyse and present statistical data. It has wide-ranging applications in almost every field of study, including computing, medicine, the physical and social sciences, economics and the arts. Statistics also depends on the application of suitable mathematical modelling techniques.

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## **WHY CHOOSE MATHEMATICS?**

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Probably the main reason for studying mathematics to Advanced level is that you find the subject interesting and enjoyable. People enjoy the challenge, the mental clarity, discipline, and the fact that you know when you are right. Solving a problem is both exciting and satisfying.

A knowledge of mathematics is also a good foundation for the further study of other disciplines including physics, biology, geography, psychology, business studies and economics, and more than worthwhile in its own right as a training in clear and logical thought, reasoning and the analysis of problems.

On a broader front, mathematics is advancing at a spectacular rate. In aerodynamics and accountancy, physics and population studies, chemistry and medicine, oceanography and astronomy, business, industry and commerce new applications arise constantly. The mathematics of music applies to squealing brakes as well as violins. Fractals show us how to compress data on discs and the theory of knots is being used to investigate the way in which DNA unknots itself before dividing. Other branches of the subject help us to design Underground maps, devise codes or program computers, and increasingly mathematics, in the form of statistics and modelling, informs decision making at all levels in industry, business and government.

The growing dependency of society on mathematics has ensured the demand for students of mathematics at university. An Advanced qualification in this subject is also a prerequisite for entry to many other higher education courses including astronomy, physics, computing sciences and engineering, and one of the options specified for the study of subjects from geology and optometry to pharmacy and medicine.

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## **SOME THOUGHTS ABOUT MATHEMATICS**

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"Mathematics, rightly viewed, possesses not only truth, but supreme beauty ... "

Bertrand Russell

A scientist, a logician and a mathematician were driving through a remote area when they saw a single sheep that was black. The scientist said, "The sheep round here are black". The logician said, "Some of the sheep round here are black". The mathematician said, "There is at least one sheep round here which is black on at least one side".

Anon

"In mathematics, you don't understand things, you just get used to them."

John von Neumann

A mathematician had a horseshoe over his office door. A colleague said that he thought the mathematician did not believe in such things. The mathematician replied that it was true, but he had been told that it would still work even if he did not believe in it.

Anon

"A mathematician is like a blind man in a dark room looking for a black cat that isn't there."

*Hardy*



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## **ADDITIONAL READING**

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Mathematics is unlike some other subjects studied at A level in that 'background reading' or 'reading around the subject' is not essential for examination success.

Such reading, however, is highly desirable for two reasons. Firstly, the very real enjoyment that can come from a study of maths is greatly enhanced by an appreciation of the scope of maths and the achievements of mathematicians.

Secondly, there are times for students, during their A level studies, when the relevance and the importance of a particular topic may seem obscure. It is often helpful for them to be able to see that single topic in a wider context. Moreover, an understanding of the ultimate reason for acquiring mastery over a point of detail frequently helps in the achievement of that skill.

So, extended reading about maths, beyond the recommended text books, will bring added pleasure as well as making the studying itself a little easier.

A good starting point for such reading would be a straightforward account of the history of mathematics and mathematicians. (Students struggling with A level algebra are amazed to find that much of the subject matter was developed by monks in the tenth century!). A selection of carefully selected popular maths books are available from the sixth form reading room.

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## **MATHEMATICS IN YOUR CAREER**

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A knowledge of mathematics is essential in a wide range of careers and a considerable advantage in many others.

Clearly, successful further education or employment in the sciences, engineering, computing, electronics, architecture, astronomy and a huge number of other subjects (not to mention mathematical research itself and its attendant disciplines) is dependent upon a good understanding of maths.

Traditionally, recruiting officers for careers in finance, accountancy, banking, insurance, the civil service, local government and teaching have all welcomed the mathematically trained. Increasingly, every aspect of business and management is becoming more mathematical and the opportunities for mathematicians in areas such as statistics and operational research are on the increase.

Even in careers where there is no direct application of mathematics, those who have studied maths are often valued, because their training enables them to think logically and analytically.

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## **FURTHER HELP**

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If you want any further help about mathematics in general or about the suitability of an A level course for you, talk to your present maths teacher or Mr Wanner

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## **The views of some of our students...**

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*I can honestly say that I genuinely enjoyed my maths lessons at Hartismere. The teachers were brilliant and eager to help not just with any problems we were having but also on an individual level, whether that be by giving us advice or finding some other way to go the extra mile. This may be an unusual thing to say, but I truly will remember my lessons with a smile on my face.*

Kai.W 3<sup>rd</sup> Year Computing student, Durham University

*Probably the most useful subject you could possibly study*

Benji. J 2<sup>nd</sup> Year Mathematics student, Warwick University

*Having a good background in mathematics is vital for a large proportion of subjects. Maths is fun.*

Chris. D

*Maths is one of the most fulfilling and interesting subjects out there, yes it is hard going, but it is TOTALLY worth it. Further Maths is even better.*

Cameron. M

*Definitely a challenge but it's worth it. It is very rewarding.*

Will. D

*Maths is a very stretching subject but it has opened up my mind to many things which I have been able to explore throughout the course. The teachers are very supportive. I would recommend taking maths if you like a challenge.*

Mollie. B

*Maths: the fundamental foundation to EVERYTHING. I have found that maths and physics have gone hand in hand together through the first term.*

George. W

*Maths is the hardest subject I have taken, but the knowledge that maths is fundamental to most careers motivates me to work hard and succeed.*

Ashley. H

## Contact

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