Maricourt Catholic High School

Mathematics Department

A-Level Information Booklet

What is mathematics?

In education systems across the globe, from primary to higher education learning institutions, there is one constant subject, a language universally spoken: mathematics.

A basic definition of mathematics (or maths) is that it is an education in numeric sciences, using a range of different approaches including algebra, calculus and basic arithmetic. While mathematics is a key element of subjects ranging from economics to physics, maths as a university subject often focuses on understanding and testing theories in mathematical and scientific discourse - or so-called "pure mathematics".

Mathematicians can come to both an understanding of the universe's building blocks in fields such as quantum mechanics, and have the chance to be educated in fascinating theorems and abstract concepts, which teach students a number of applicable skills that are transferable across a number of professional fields.

Why study A-level Mathematics at Maricourt

Just look around. Some of civilization's most prized and proud achievements are wholly reliant on mathematics. Planes flying seamlessly through the air, high availability of complex medicines, even the computer you are using: all of these increasingly vital commodities rely on the use and study of numbers.

If you stop and think for just a few minutes it becomes inescapably clear that mathematics is pretty well inseparable from life as we know it.

A mathematician's skillset is not exhausted once they move out of the realm of the numerical. The facets of a student which are developed in studying maths are easily extrapolated to other situations and areas. For example, rational and logical thought is something which is required in many areas, whether it is in a moral or career capacity. Furthermore the high level of cognition required to comprehend complex mathematical theories and rules is an asset which will benefit an individual in many ways.

In the Graduate salary table (Complete University Guide 2016) mathematics falls in 10th place with £25,840 the mean starting salary, well above average. As a main motive for many students to study certain subjects, the potential pay is a definite bonus factor with mathematics, helped by the versatile nature of the skills involved.

An Interesting Course

A-level Mathematics is an interesting and challenging course which extends the methods you learned at GCSE and includes applications of mathematics such as statistics and mechanics.
Statistics – Collecting and analysing data and using this to make predictions about future events. Many subjects make use of statistical information and techniques. An understanding of probability and risk is important in careers like insurance, medicine, engineering and the sciences.
Mechanics – Modelling and analysing the physical world around us, including the study of forces and motion. Mechanics is particular useful to students studying physics and engineering.

Facilitating Other Subjects

The mathematical skills you learn in A level Mathematics are of great benefit in other A level subjects such as physics, chemistry, biology, computing, geography, psychology, economics and business studies.

Career Opportunities and Employability Skills

Mathematics is a versatile qualification, well-respected by employers and is a "facilitating" subject for entry to higher education. Careers for men and women with good mathematics skills and qualifications are not only well paid, but they are also often interesting and rewarding. Employers highly value mathematics qualifications because students become better at thinking logically and analytically. Through solving problems you develop resilience and are able to think creatively and strategically. The writing of structured solutions, proof and justification of results help you to formulate reasoned arguments. And importantly you will have excellent numeracy skills and the ability to process and interpret data.

Preparation for Higher Education

For progression to many courses at university it is important to have strong mathematical skills. For most financial, science, technology, engineering and mathematics (STEM) degree courses A-level Mathematics is a requirement.

Course Structure

What are the entry requirements to study A-level maths?

Any pupil wanting to study A-level maths must achieve a good grade 7 or above in their GCSE Mathematics exam and have teacher recommendation. The ability to study independently and meet deadlines is essential.

How will the course be taught?

The A-level course will be taught over 2 years, with 3 external 2 hour examinations in the summer term of the final year.

There is an opportunity to sit a set of 2 AS exams at the end of the first year, but these will not count towards the final A-level grade as the course is linear.

What content will be covered?

All pupils will study: Pure mathematics, Statistics and Mechanics. Assessment weightings are 66.66% Pure and 33.33% statistics and Mechanics. See content and assessment overview.

How does this differ to previous years?

Previously pupils studied decision maths in year 12 and had the choice of either statistics or mechanics in year 13. Pupils will now study **both** statistics and mechanics in year 12 and 13 and no longer study decision maths.

Do I need any special equipment?

All pupils who want to be accepted on the course will need to purchase a specific calculator recommended by the mathematics department which will have:

- the ability to compute summary statistics and access probabilities from statistical distributions

- an iterative function

As-level Mathematics

Examinations

The Pearson Edexcel Level 3 Advanced Subsidiary GCE in Mathematics consists of two externally-examined papers.

Students must complete all assessment in May/June in any single year.

Paper 1: Pure Mathematics (*Paper code: 8MA0/01)
Written examination: 2 hours
66.66% of the qualification
100 marks
Content overview
• Topic 1 – Proof
• Topic 2 – Algebra and functions
• Topic 3 – Coordinate geometry in the (x, y) plane
• Topic 4 – Sequences and series
• Topic 5 – Trigonometry
• Topic 6 – Exponentials and logarithms
• Topic 7 – Differentiation
• Topic 8 – Integration
• Topic 9 – Vectors
Assessment overview
• Students must answer all questions.
• Calculators can be used in the assessment.

Paper 2: Statistics and Mechanics (*Paper code: 8MA0/02)

Written examination: 1 hour

33.33% of the qualification

50 marks

Content overview

Section A: Statistics

- Topic 1 – Statistical sampling
- Topic 2 – Data presentation and interpretation
- Topic 3 – Probability
- Topic 4 – Statistical distributions
- Topic 5 – Statistical hypothesis testing

Section B: Mechanics

- Topic 6 – Quantities and units in mechanics
- Topic 7 – Kinematics
- Topic 8 – Forces and Newton's laws

Assessment overview

- The assessment comprises two sections: Section A – Statistics and Section B – Mechanics.
- Students must answer all questions.
- Calculators can be used in the assessment.

Objectives

Students must:		% in GCE AS Level
AO1	**Use and apply standard techniques** Learners should be able to: • select and correctly carry out routine procedures; and • accurately recall facts, terminology and definitions	58-62
AO2	**Reason, interpret and communicate mathematically** Learners should be able to: • construct rigorous mathematical arguments (including proofs); • make deductions and inferences; • assess the validity of mathematical arguments; • explain their reasoning; and • use mathematical language and notation correctly.	18-22
AO3	**Solve problems within mathematics and in other contexts** Learners should be able to: • translate problems in mathematical and non-mathematical contexts into mathematical processes; • interpret solutions to problems in their original context, and, where appropriate, evaluate their accuracy and limitations; • translate situations in context into mathematical models; • Use mathematical models; and • evaluate the outcomes of modelling in context, recognise the limitations of models and, where appropriate, explain how to refine them.	18-22
	Total	**100%**

A-level Mathematics

Examinations

Content and assessment overview

The Pearson Edexcel Level 3 Advanced GCE in Mathematics consists of three externally-examined papers.

Students must complete all assessment in May/June in any single year.

Paper 1: Pure Mathematics 1 (*Paper code: 9MA0/01)
Written examination: 2 hours *33.33% of the qualification* *100 marks*
Content overview • Topic 1 – Proof • Topic 2 – Algebra and functions • Topic 3 – Coordinate geometry in the (x,y) plane • Topic 4 – Sequences and series • Topic 5 – Trigonometry • Topic 6 – Exponentials and logarithms • Topic 7 – Differentiation • Topic 8 – Integration • Topic 9 – Vectors
Assessment overview • Students must answer all questions. • Calculators can be used in the assessment.

Paper 2: Pure Mathematics 2 (*Paper code: 9MA0/02)

Written examination: 2 hours

33.33% of the qualification

100 marks

Content overview

- Topic 1 – Proof
- Topic 2 – Algebra and functions
- Topic 3 – Coordinate geometry in the (x,y) plane
- Topic 4 – Sequences and series
- Topic 5 – Trigonometry
- Topic 6 – Differentiation
- Topic 7 – Integration
- Topic 8 – Numerical methods

Assessment overview

All the content of the specification for Paper 1 is assumed knowledge for Paper 2 and may also be tested within parts of questions.

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

Paper 3: Statistics and Mechanics (*Paper code: 9MA0/03)

Written examination: 2 hours

33.33% of the qualification

100 marks

Content overview

Section A: Statistics

- Topic 1 – Statistical sampling
- Topic 2 – Data presentation and interpretation
- Topic 3 – Probability
- Topic 4 – Statistical distributions
- Topic 5 – Statistical hypothesis testing

Section B: Mechanics

- Topic 6 – Quantities and units in mechanics
- Topic 7 – Kinematics
- Topic 8 – Forces and Newton's laws
- Topic 9 – Moments

Assessment overview

- The assessment comprises two sections: Section A – Statistics and Section B – Mechanics.
- Students must answer all questions.
- Calculators can be used in the assessment.

Objectives

Students must:		% in GCE A Level
AO1	**Use and apply standard techniques** Learners should be able to: • select and correctly carry out routine procedures; and • accurately recall facts, terminology and definitions	48-52
AO2	**Reason, interpret and communicate mathematically** Learners should be able to: • construct rigorous mathematical arguments (including proofs); • make deductions and inferences; • assess the validity of mathematical arguments; • explain their reasoning; and • use mathematical language and notation correctly.	23-27
AO3	**Solve problems within mathematics and in other contexts** Learners should be able to: • translate problems in mathematical and non-mathematical contexts into mathematical processes; • interpret solutions to problems in their original context, and, where appropriate, evaluate their accuracy and limitations; • translate situations in context into mathematical models; • Use mathematical models; and • evaluate the outcomes of modelling in context, recognise the limitations of models and, where appropriate, explain how to refine them.	23-27
	Total	**100%**

What do people who study mathematics do after graduation?

While a maths graduate may spend a career exploring and teaching others theoretical mathematical knowledge, a qualification in the subject can also open doors to a wide range of professional fields.

Employers appreciate the skills of data analysis and the innovative, original thinking that can be taught in a maths degree, and understand that this can make for an intelligent, well-rounded student who would be a valuable asset to their business. Maths graduates are often headhunted by the finance sector before they have even completed their studies, due to their known developed aptitude for financial mathematics and computational analysis that makes them ideal for positions such as an investment analyst or tax advisor.

In a prestigious position such as an actuary or chartered accountant, a mathematics degree is only a first step, as qualification for these professions require years of further training and examination.

Maths is also a subject closely interlinked to statistical analysis. This presents job opportunities in social research such as the compilation of survey and polling data, as well as in scientific studies in fields such as geography and medical statistics. While this work can

be a source of full time employment following a bachelor's degree, many institutes also offer postdoctoral positions as a research fellow or equivalent.

There is also a clear pathway from the computer based skills learned in a mathematics degree to an IT or software development based career. Many video games programmers come from a maths background, combining creativity with technical aptitude to develop products in one of the fastest growing industries today. Security agencies will also employ a team of trained mathematicians, who will be using some of the most powerful computers in the world to develop cryptography and internet security.

Among the most well-known people ever to take a maths degree is Albert Einstein, who at the age of seventeen was already on a mathematics teaching programme at Zurich Polytechnic.

A Maths degree can also be a springboard to entrepreneurial success, such as Sergey Brin who co-founding Google, and co-founder of Netflix, Reed Hastings.

A-level mathematics is a very demanding but rewarding course. You need to be prepared to work hard both in lessons and at home to ensure you reach your potential.

If you have any questions or need any advice please don't hesitate to ask Mrs Grieco the Curriculum Leader of mathematics or any member of the mathematics department.