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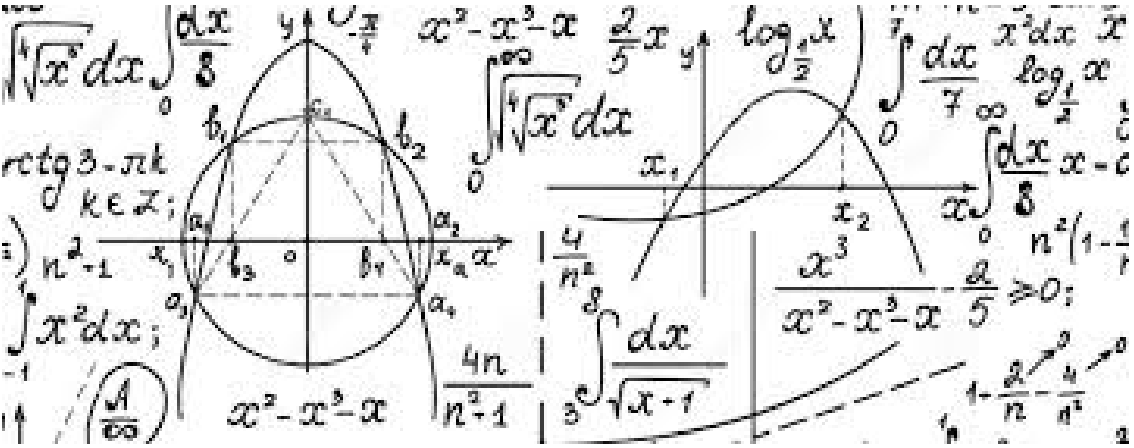
Cardinal Newman CATHOLIC SCHOOL



Further Maths A level...

opening the door to your future!

NEW A-LEVEL FURTHER MATHS

EXAM BOARD: EDEXCEL PEARSON

Head of Key Stage: Mr H FANYO (*hfanyo@cardinalnewmanschool.net*)

This syllabus is intended for high ability candidates who have achieved, or are likely to achieve, a high grade in the A Level Mathematics examination. The A Level Further Mathematics syllabus enables students to extend the mathematical skills, knowledge and understanding developed in the A Level Mathematics course. The content of the syllabus covers the areas of Pure Mathematics, Mechanics and Statistics. Knowledge of the whole content of the A Level Mathematics syllabus is assumed.

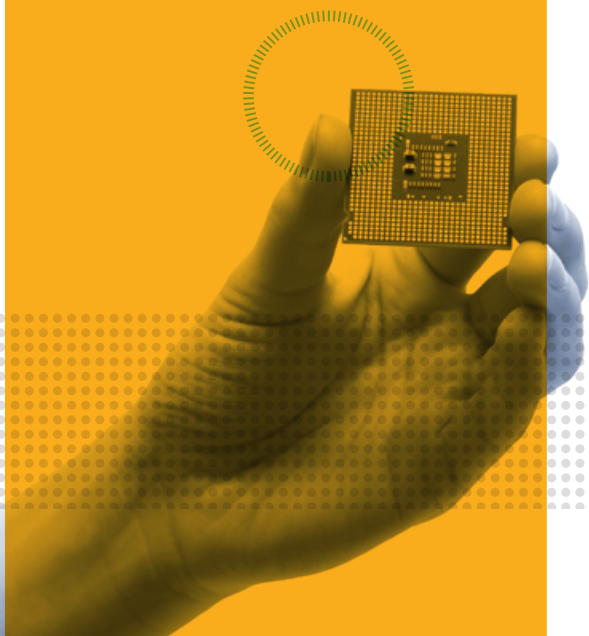
Any student who wishes to follow this course should have studied the Higher Tier GCSE and obtained at least a grade 7/8

Year 1 Further Mathematics Options	
Paper 1:Further Pure Mathematics 1 ***Written examination: 1 hour and 30 minutes*** ***50% of the qualification*** ***75 marks***	***Content overview*** ***Proof, Complex numbers, Matrices, Further algebra and functions, Further calculus, Further vectors***
Paper 2: Further Mathematics Options: **Decision Maths 1** ***Written examination: 1 hour and 30 minutes*** ***50% of the qualification*** ***75 marks***	***Content overview*** ***2D: Decision Mathematics - Algorithms and graph theory, Algorithms on graphs, Algorithms on graphs II, Critical path analysis, Linear programming***
A level Further Mathematics Options	
Paper 1: Further Pure Mathematics 1 ***Written examination: 1 hour and 30 minutes*** ***25% of the qualification*** ***75 marks***	***Content overview*** ***Proof, Complex numbers, Matrices, Further algebra and functions, Further calculus, Further vectors***
Paper 2: Further Pure Mathematics 2 ***Written examination: 1 hour and 30 minutes*** ***25% of the qualification*** ***75 marks***	***Content overview*** ***Complex numbers, Further algebra and functions, Further calculus, Polar coordinates, Hyperbolic functions, Differential equations***
Paper 3: Further Mathematics Option: **Decision Maths 1 & Further Mechanics** ***Written examination: 1 hour and 30 minutes*** ***25% of the qualification*** ***75 marks***	***Content overview*** ***3C: Further Mechanics 1 - Momentum and impulse, Collisions, Centres of mass, Work and energy, Elastic strings and springs*** ***3D: Decision Mathematics 1 - Algorithms and graph theory, Algorithms on graphs, Algorithms on graphs II, Critical path analysis, Linear programming***

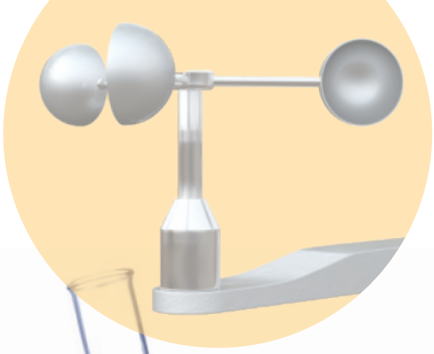
Why study maths?

The skills developed through the study of maths are in high demand from employers and universities. In addition to developing the ability to solve problems and think logically, the study of maths provides opportunities to develop team-working skills, resilience, effective communication of complex ideas and the ability to use your own initiative.

Whatever maths means to you, the breadth of applications is immense. Maths underpins most of science, technology and engineering and is also important in areas as diverse as business, law, nutrition, sports science and psychology. There are many opportunities to use maths to make a difference in society, for example through the analysis involved in medical research, developing new technology, modelling epidemics or in the study of patterns of criminal activity to identify trends.



Which maths qualification is suitable for me?



Continuing to study maths is a fantastic choice because of the wide range of applications of the subject. If you gain a good pass in GCSE Mathematics by the end of Year 11 you should consider taking maths further.

Your options are:

- **Core Maths.**
- **A level Mathematics.**
- **A level Further Mathematics.**

Core Maths is a new Level 3 qualification which develops the mathematical skills gained at GCSE. It focuses on using and applying maths to solve problems drawn from other subjects, work and real life. The Core Maths course includes new content such as statistics, financial maths and using algebra. Core Maths helps with the maths needed for a broad range of other subjects.

A level Mathematics supports the study of a wide range of other AS/A level subjects. Physics, Chemistry and Biology rely on good algebraic and graphical skills, statistical techniques and the use of a range of functions including logarithms and trigonometry. In addition, Economics, Psychology, Business, Computing and Geography all benefit from students having fluent and confident numerical, algebraic, graphical and statistical skills.

Many students take A level Mathematics in conjunction with non-related subjects in order to maintain a broad range of subject choices until they make decisions about their future study and career plans.

Mathematics is a qualification that is highly valued by employers and universities and is one of the most popular subjects for both boys and girls. The vast range of degree courses and careers that require solid mathematical skills ensures that taking maths to AS level or beyond will open doors to a world of opportunities!

Further Mathematics provides a great opportunity for enthusiastic mathematicians to broaden and deepen their subject knowledge. If you plan to apply for a STEM (Science, Technology, Engineering and Mathematics) degree you should consider taking Further Mathematics. Further Mathematics is also a fantastic qualification for those students who love maths and want to devote more time to the studying wider aspects of the subject.

If you are thinking of applying for a medical degree, consult individual university websites to check for any special rules relating to Further Mathematics.

NOTE:
YOU CAN ONLY STUDY FURTHER MATHS IF YOU ARE STUDYING MATHS.

A level Further Mathematics

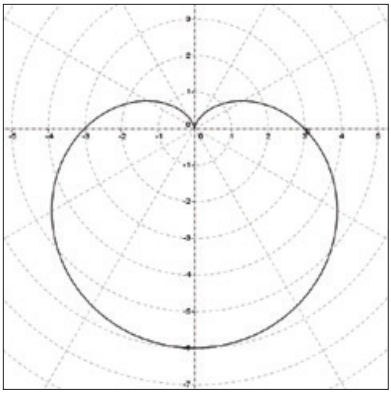
$$\begin{pmatrix} 2 & 3 & -1 \\ 0 & 1 & 1 \\ 3 & -2 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 5 \\ 9 \end{pmatrix}$$

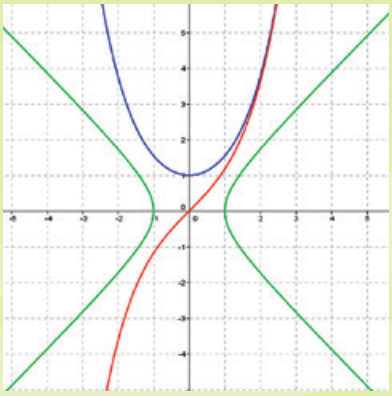
Further Mathematics can only be taken at A level. It is a second qualification that can be taken in addition to Further Mathematics.

All students study the same pure maths content, which makes up 50% of the content for A level Further Mathematics. There is some choice over the remaining content of each course, however, at Cardinal Newman Catholic School we have chosen to include Decision Mathematics 1 and Further Mechanics 1 as the Applied content for the course.

In Year 12, topic areas studied include **complex numbers**, which allow the solution of a range of equations that would otherwise have no solutions, through the introduction of 'imaginary' numbers, and **matrices** which consist of grids of numbers that can be used to represent transformations and are used to solve simultaneous equations amongst many other uses.

In Year 13, other areas of pure maths are covered such as **polar co-ordinates, differential equations** and **hyperbolic functions**. Each of these builds on earlier topics and encourages the development of a wider understanding of the ways in which mathematical topics are interconnected.





Stevie Gosling Project Manager

"I completed an undergraduate MEng in Automotive Engineering. Doing Further Mathematics really benefited me in my degree especially in the first year as it meant I was ahead of most of my peers who were only being introduced to some topics for the first time. Probably the most interesting element of my degree was a competition called 'Formula Student', which pretty much took over my life for two years! As a University team we built a single seat race car from scratch that was raced around Silverstone. Within the team I designed, stress tested on computer systems, mathematically modelled and built the car's steering system – which I then spray painted with glitter!

Jennifer Lannon
Principal Statistician NHS Blood & Transplant

"My aim has always been to enjoy what I do for a living and to make a difference. I can't imagine a better place to do this than at NHS Blood and Transplant (NHSBT). It is important to me to be genuinely interested in the data I am analysing and in my job as Principal Statistician I analyse transplantation data. The results of the analyses performed at NHSBT can really make a difference. There is a great deal of job satisfaction because through our work we are helping to save and improve lives. The range of work is great and you learn something new every day – 'Understanding the data' for us means working closely with transplant surgeons and meeting patients which is a huge privilege.

James Bennett Actuary

"Mathematics is appreciated massively in the business world. Even very simple things can be considered complex to those who haven't got a mathematical background. In addition, it is the interpretation of mathematics and statistics that is incredibly useful in a business environment.

David Lee Mathematics Teacher

"I enjoy working with students and building relationships with them, but most of all I enjoy helping students with mathematics. Every year I teach, I see links between topics that I have not seen before. Part of me wishes I could do my whole degree again, because I would see so many things I missed the first time round! The logical skills I've acquired mean I am quite adept programming in software like Excel and Geogebra to do fancy mathematical things. I also use a lot of statistics: to analyse and interpret student data and to look critically at the wealth of data that is available in schools and the conclusions drawn from it.

Want to know more?

If you are unsure about whether A level Further Mathematics is suitable for you, talk to your maths teacher. If you have a career in mind, research the entry requirements to ensure you are choosing the best subject combinations. Some degrees require or prefer A level Mathematics and/or Further Mathematics.

Advanced Mathematics Support Programme

The **Advanced Mathematics Support Programme (AMSP)** provides a range of support for students including:

- mathematical articles, challenges and puzzles
- Information about university courses
- enrichment and revision materials

The AMSP can also help provide tuition support for Further Mathematics if your school or college does not offer it.

See ***amsp.org.uk*** for more information.

Other websites where you will find useful information are:

- **Mathscareers** – detailed information about careers that are available for students who have taken A level Mathematics and Further Mathematics and Mathematics degrees ***mathscareers.org.uk***
- **NRICH** – interesting resources to help you develop your problem solving skills, and information on preparing for university ***nrich.maths.org/secondary-upper***
- **+ plus magazine** – articles, podcasts and puzzles designed to introduce readers to the beauty and applications of mathematics ***plus.maths.org***
- **Future Morph** – outlines career opportunities from science and mathematics for 14-16 and 16+ age groups ***futuremorph.org***
- **STEM Learning** – information about STEM (Science, Technology, Engineering and Mathematics) Ambassadors and STEM Clubs ***stem.org.uk***