Welcome to

Further Maths

At
St Francis of Assisi
Catholic College

Teachers of Further Mathematics

Mr Henley, Miss Malcolm,
Mr Mitchell
&
Mrs Wells

What is Further Mathematics?

Further Mathematics is designed to stretch and challenge able mathematicians and prepare them for university courses in mathematics, engineering and related quantitative and scientific subjects. Universities LOVE this qualification. For example students have had lower offers to gain a place on courses.

> "You are ahead in all subjects that require any maths at University"
> – former Further Maths Student

Recent past students have gone on to study Mathematics, English Literature, Law, History, French, Philosophy and Engineering.

Results in Further Mathematics

Further Mathematics results in the last four years…

50% A*
50% A

It is suggested that Further Mathematics is a very hard A-Level. But no other subject achieves 100% A*-A.

If you can achieve a grade 8 at GCSE and are willing to work then Further Mathematics is a course you can be very successful in.

What is covered in Further Mathematics?

- Pure mathematics content – an extension of A Level Maths but with some topics that are completely new.

- Decision mathematics – a completely new area of maths.

Exam Board – Edexcel.

Complex Numbers

Series

Roots of Polynomials

Argand Diagrams

Complex numbers can be used to model electromagnetic waves. Rosalind Franklin helped discover DNA by using complex numbers to analyse the diffraction patterns of X-rays passing through crystals of DNA.

Matrices

Matrices can be used to describe transformations in two and three dimensions. Computer graphics artists use matrices to control the motion of characters in video games and CGI films.

Linear Transformations

Proof

Volumes of Revolution

Woodworkers use lathes to create solid objects that have circular cross-sections. Solids such as this are called volumes of revolution, and you can find their volumes using calculus.

Vectors

Vectors can be used to describe points, lines and planes in 3D. Computer graphics artists use **3D vectors** to define shapes based on polygons. By creating a shape from thousands of polygons you can create the illusion of a smoothly curved surface.

Polar Coordinates

Hyperbolic Functions

Differential Equations

SFA

Pure Maths

Pure Maths

Example:

1. Given that $\arg(z + 3 + 2i) = \frac{3\pi}{4}$,
   a) sketch the locus of z on an Argand diagram
   b) find the Cartesian equation of the locus
   c) find the complex number z that satisfies both $|z + 3 + 2i| = 10$ and $\arg(z + 3 + 2i) = \frac{3\pi}{4}$

Algorithms, Graphs and Networks

Efficient sorting algorithms such as the **quick sort** allow software, controlling self-drive cars, to prioritise input information and react quickly and safely.

Route Inspection

Travelling Salesman Problem

Linear Programming

Transportation Problems

The efficient transportation of goods from suppliers to customers requires knowledge of storage constraints and costs. This information can be stored and processed in matrix form, or formulated as a linear programming problem.

Critical Path Analysis

Allocation Problems

Flows in Networks

Dynamic Programming

Game Theory

Games such as rock-paper-scissors, and noughts and crosses can be analysed mathematically to determine the best possible strategy.

Recurrence Relations

Decision Analysis

SFA

Decision Maths

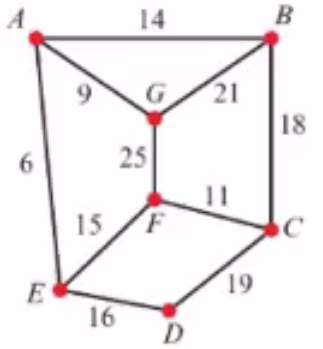
Decision Maths

Example

A night watchman has to patrol a network of paths as shown in the diagram. The number shown on each arc represents the time taken, in minutes, to walk between the labelled points.

a)Use the route inspection algorithm, starting at A and finishing at C, to find the minimum time taken to traverse each arc at least once.

b)State a possible route.



(Total weight of network is 154)

An extra path s added joining B and F directly. After he addition of this path, the minimum time needed to traverse all the paths, starting at A and finishing at C, is reduced by twice the length of time needed to traverse this path.

c) Calculate the time needed to traverse the new path, BF.

Subject Requirements

To study A level Further Mathematics you need:

- A minimum **grade 8** at GCSE.

- You **must also** be studying A Level Mathematics.

- You can take it as one of 3 or 4 A Levels.

What do our past students say?

"The best kind of maths".

"You cover topics that build on everything you've learnt to create some fun maths".

"Some actually interesting Maths".

"You are ahead in all subjects that require any maths at University".

Any Questions?

If you have any questions email…

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Further Mathematics Teachers