Bridging the Gap
from School to College

Warlingham
Sixth Form College

Year 11 > Year 12 Transition

Summer Term

A Level Further Mathematics

MATHEMATICS

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COURSE OVERVIEW

To study Further Mathematics you must also study A level Mathematics as many of the topics build on prior knowledge from the Mathematics course.

The Further Mathematics course is split as follows:

Paper 1 and 2 (Compulsory Pure 1 and Pure 2): Complex numbers, proof by induction, further algebra and functions, further vectors, further calculus, polar coordinates, differential equations, matrices and hyperbolic functions.

Paper 3 (Further Maths Option 1): A choice of Further Pure Mathematics 1, Further Statistics 1, Further Mechanics 1 or Decision Mathematics 1.

Paper 4 (Further Maths Option 2): A choice of Further Pure Mathematics 2, Further Statistics 1, Further Mechanics 1, Decision Mathematics 1, Further Statistics 2, Further Mechanics 2, Decision Mathematics 2.

Further Pure Mathematics includes further trigonometry, further vectors, further calculus, coordinate systems, further differential equations, inequalities, further numerical methods, groups, matrix algebra, further complex numbers, number theory and further sequences and series.

Decision Mathematics includes algorithms, networks, paths, flows, linear programming, critical path analysis, dynamic programming, recurrence relations, decision analysis, graph and game theory.

Further Mechanics includes momentum and impulse, work energy and power, elasticity, centres of mass, further kinematics, further dynamics and circulation motion.

Further Statistics includes probability, Poisson, binomial and geometric distributions, hypothesis testing, Chi squared tests, linear regression, correlation, normal distribution and confidence intervals.

College Expectations for Academic Success

The College will work closely with all students and parents to create a purposeful, creative and stimulating environment in which students are encouraged to fully develop - both academically and personally.

We will expect you to take responsibility for your own behaviour and learning. The current College Committee along with the student body have discussed and agreed that students should commit to:

- Ensuring academic success through regular attendance and punctuality at all required registrations, lessons, supervised study lessons and Inspire Periods. Attendance which drops below 95% reduces Key Stage 5 performance by at least one grade, so it is taken very seriously.

- Completing all set tasks on time to the best of your ability, making full use of study periods and homework to enable you to meet all deadlines.

- Using study time effectively by bringing all required equipment and resources with you and making full and regular use of the College study rooms and LRC, respecting the need for silent studying conditions.

- Working closely with all your teachers to develop an effective working relationship based on mutual respect and discussing your work with them on a regular basis and meeting targets set.

- Developing your skills as an independent, self-evaluative learner and work closely with your tutor in monitoring and discussing your academic progress. As an independent learner, if you miss a lesson, it is your own responsibility to find the teacher and catch up with the work missed.

- Organising your work efficiently and effectively into folders for each subject, making full use of individual subject expectations and using Cornell Notes daily to ensure work in your folders is relevant and meaningful.

- Keeping mobile phones out-of-sight in all classrooms and during assemblies so that lessons are not disturbed and/or important information is missed.

- Attending all parents' evenings and arrange appointments with your teachers to discuss your progress and work.

Course-specific Expectations for Academic Success

- Arrive at lessons on time.

- If you are not able to attend the lesson, then please see the teacher in advance and collect the work from the teacher.

- If you are off sick or miss the lesson unexpectedly, you must email the class teacher to explain, apologise and request the work you have missed.

OUR EXPECTATIONS

- Complete the assessed work each week. Copies of all homeworks are available in the student resources folder and on SharePoint. Your homework book must be handed in each week without fail. If you do not hand your work in, you will need to stay behind on a Monday or Wednesday after school to complete it.

- If your test scores are below your target grade, you will be required to repeat the work.

- In addition to your set homework, you should also aim to complete additional questions from the exercises covered in the lessons. This will ensure your understanding of the topics.

- Green pen any areas for development weekly.

- Use mathsgenie / drfrostmaths / mymaths / tlmaths.com to improve your understanding of the topics taught and attend after-school sessions for additional help as required.

Failure to complete these expectations will lead to letters being sent home and telephone calls made.

- Bring all equipment to lessons (including a calculator and your textbook).

The Cornell Notes system is a note-taking system devised by Walter Pauk, an education professor at Cornell University. It is a proven method that establishes a more effective learning process.

It is designed to help the user think and reflect upon the notes they have made as well as making them more useful for revision purposes.

Please click here to watch a video that explains how to take Cornell Notes properly.

There is an additional video that shows how Cornell Notes can be applied to Further Mathematics. Please click here for additional information and to watch it.

Try to use this method when making revision notes on the topics on the next page. See my example below.

Negative and fractional indices   28/4/20

$a^{\frac{1}{m}} = \sqrt[m]{a}$	Example $5^{\frac{1}{3}} = \sqrt[3]{5}$ $x^{\frac{1}{4}} = \sqrt[4]{x}$ If a power is a fraction, the denominator determines the root
$a^{\frac{n}{m}} = (\sqrt[m]{a})^n$	Example $64^{\frac{2}{3}} = (\sqrt[3]{64})^2 = 4^2 = 16$ $x^{\frac{3}{4}} = (\sqrt[4]{x})^3$ If a power is a fraction, the denominator determines the root and the numerator becomes the power. It is usually easier to deal with the root first, but they can be done in any order eg $\sqrt[3]{64^2} = \sqrt[3]{4096} = 16$
$a^{-m} = \frac{1}{a^m}$	Example $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$ $x^{-4} = \frac{1}{x^4}$ Cover up method: cover up the – sign. What is left goes as the denominator.

Summary: - means 1 over, top number of the fraction is the power, bottom number of fraction is the root.

A level Further Mathematics requires a sound understanding of the same topics as Mathematics. However you may find it useful to work on the following topics in addition to those listed in the Mathematics transition document:

- Binomial Expansion
- Differentiation
- Inequalities
- Logarithms
- Matrices
- Trigonometry
- The Factor Theorem
- Surds

Please click on the links above for worked examples of all the topics listed above, along with questions for you to attempt. Answers are also provided so you can check your work.

Of course, you can also use hegartymaths or mathsgenie to watch videos or to do additional work on these topics. You should try to make Cornell notes to help you revise.

Suggested viewing to prepare for A level Further Mathematics

Hegarty maths clips – preparing for A level Further Maths:

These clips introduce us to some of the topics we cover in Further Maths. Try making Cornell notes while watching these videos.

Hegarty Maths

Arithmetic Sequences and Series clips 919—926

Matrices clips 928—940

Linear Programming clips 941—943

Enrichment viewing to enhance your understanding of Further Mathematics

These videos are purely to satisfy your mathematical curiosity!

The Golden Ratio

Click here

Euler's Konigsberg Bridge Problem

Click here

Gauss - Child prodigy

Click here

The most beautiful equation

Click here
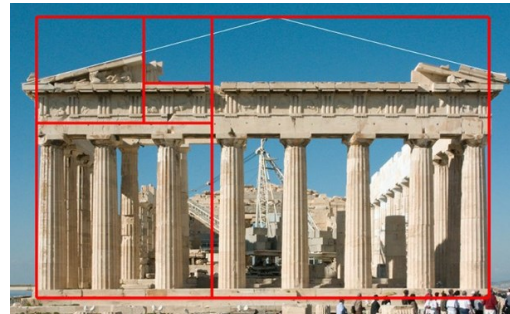
$$e^{i\pi} + 1 = 0$$

Below are links to podcasts about the history of mathematics as well as interviews with mathematicians. I hope you enjoy listening to some of these. These are enrichment activities and not essential to the A level Further Mathematics course, but they may help you to decide on whether you might like to study Mathematics at University and give you an idea as to potential careers for Mathematicians.

BBC podcasts—A brief history of mathematics (10 episodes in all)

Click here
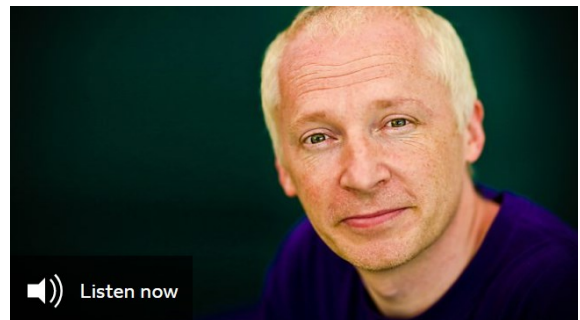
My favourite theorem podcasts (50+ episodes)

Click here

Additional resources that may help you to prepare for A level Mathematics (not compulsory)

New AS & A-Level Further Maths for Edexcel: Complete Revision & Practice with Online Edition (CGP)

Below are some interesting reads around Mathematics. These are enrichment opportunities, and though not compulsory, I would recommend everyone has a look at at least one.

Alex's Adventures in Numberland by Alex Bellos

Cabinet of Mathematical Curiosities by Ian Stewart

The Num8er My5teries by Marcus du Sautoy

How Many Socks Make a Pair?: Surprisingly Interesting Maths by Rob Eastway

The Curious Incident of the Dog in the Night-time by Mark Haddon

The Penguin Dictionary of Curious & Interesting Numbers by David Wells

The Calculus Wars by Jason Socrates Bardi

The Code Book by Simon Singh

50 Mathematical Ideas You Really Need to Know by Tony Crilly

Fermat's Last Theorem by Simon Singh

The Golden Ratio: The Story of Phi, the World's Most Astonishing Number by Mario Livio
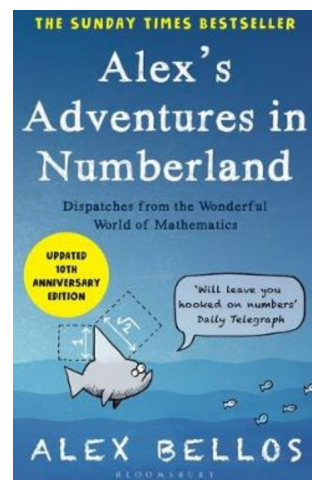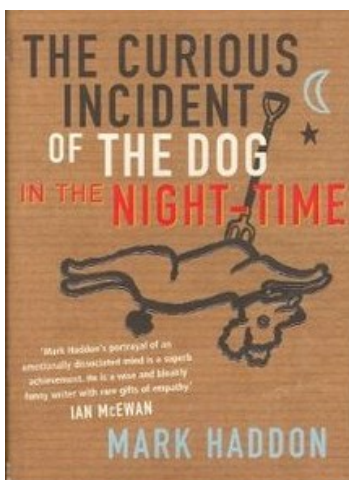
Why not enrol on one of these online courses?

Flexagons

Recreational Maths

Introduction to probability

Graph Algorithms

Compulsory

Please make sure you have looked at the relevant links on page 5 and have had a go at the worksheets to test your understanding.

When you have completed the worksheets on page 5, please have a go at this worksheet.

An introduction to Decision Maths. Please click here and work through this PowerPoint presentation, having a go at the activities.
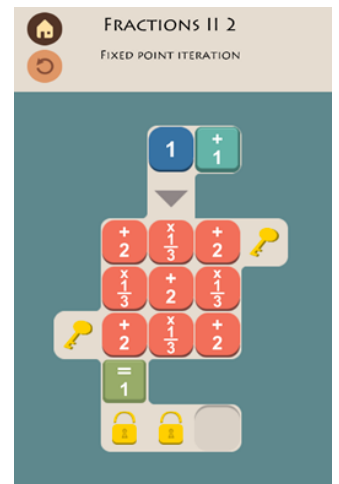
Enrichment

Why not download a game to test your mathematical skills?
Sumaze 2

You could attempt some Senior Maths Challenge questions: Click here

Class Textbooks

Pearson Edexcel AS and A level Further Mathematics Core Pure Mathematics Book1 — AS

Pearson Edexcel AS and A level Further Mathematics Further Statistics 1

Pearson Edexcel AS and A level Further Mathematics Further Mechanics 1

Pearson Edexcel AS and A level Further Mathematics Decision Mathematics 1

Pearson Edexcel AS and A level Further Mathematics Decision Mathematics 2
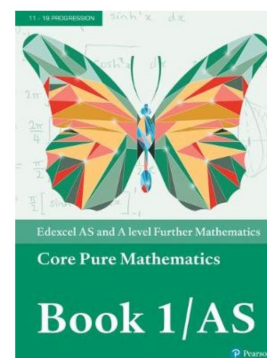
These will be available to borrow from the school for a small deposit.

They are also available online for free through the pearsonactivelearn website.

Recommended Calculator

Casio FX CG50

Casio FX-991EX (Calculator with statistics functions required at A level)

Any of these two calculators are suitable for A level Further Maths. As a minimum you will need a calculator with statistical functions, but a graphical calculator is highly desirable. If you can stretch to the CG50 you will find it does have better features such as surd form, but it is more expensive.