



DIXONS
SIXTH FORM
ACADEMY

SUMMER WORK:

A LEVEL FURTHER MATHS

20

23

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About the Summer Work

This booklet contains a number of tasks that students are expected to complete to a good standard in order to be able to be enrolled in this subject.

Please complete these tasks on A4 paper and bring them with you to your first Maths lesson in September.

The work handed in should be:

- written in black or blue ink on A4 lined paper with pencil for graph drawing
- exercises labelled and question numbers included
- work should be self-marked and corrected for errors
- have students full names on each sheet
- multiple sheet should be connected together

This booklet also contains significant additional information. We would encourage you to complete all the tasks including the optional ones to fully prepare for Sixth Form study.

Calculators may be used to support your answer but working must be shown. All work is predominantly revision from GCSE.

Welcome to Mathematics

Subject outline

A-level further maths is a highly regarded second A-level in mathematics taken by students who wish to study a heavily mathematical subject at university. Further maths is the perfect subject for students who really enjoy the satisfaction gained from working through a difficult question in mathematics and requires students to love maths! Students look deeper at maths and cover a larger amount of content beyond the scope of the standard A Level Mathematics course into areas of maths that are used increasingly in fields of engineering, computer science and statistics. Students study further maths alongside maths a level and gain two qualifications and double the knowledge!

Further Mathematics is noted as extremely useful when students are considering degrees in engineering, computer science, mathematics and physics but also many more. Students who wish to apply to Oxford or Cambridge or other prestigious university may find that further mathematics also gives them an edge in their application as it is studied as a fourth a level.

Students will study the OCR MEI Specification for AS Level Further Mathematics, with three 75 minute papers at the end of year 1 to gain the AS qualification. Students can then choose to continue to complete the full A Level qualification.

Paper 1 – Pure Mathematics (concepts such as matrices, roots of polynomials, proof by induction, complex numbers and vectors)

Paper 2 – Modelling with algorithms (concepts such as networks and graphs, Dijkstra's algorithm, critical path analysis and formulating a linear programme)

Paper 3 – Statistics A (concepts such as probability distributions, hypothesis testing for correlation, regression lines and Chi-Squared tests)

Careers & Higher Education

A Level Further Mathematics is a very useful subject that universities value for highly numerical courses. Anyone who wants to study mathematics, engineering or computer science would be greatly advantaged by Further Maths A Level due to its demanding nature and the depth of mathematics it goes into. Many top universities such as Oxford, Cambridge, Imperial College London recommend that students take Further Maths A Level where possible to enhance their application for these types of courses.

An example of a highly mathematical career is an actuary. An actuary works in a business analysing risk, often within the financial sector. Actuaries use mathematical modelling techniques and statistical concepts to determine probability and assess risks, for example,

analysing pension scheme liabilities to price commercial insurance. Due to the challenging nature of the exams required to become a qualified actuary, the salary is usually very competitive. In order to become an actuary, students often choose to study Pure Maths or Actuarial Science at university, and so the extra A Level in mathematics sets them up well for this style of course.

Links to key information:

[AS and A Level - Further Mathematics B \(MEI\) - H635, H645 \(from 2017\) - OCR](https://www.ocr.org.uk/qualifications/as-and-a-level/further-mathematics-b-mei-h635-h645-from-2017/)
<https://www.ocr.org.uk/qualifications/as-and-a-level/further-mathematics-b-mei-h635-h645-from-2017/>

Summer work tasks

Task 1 – Starting the first topic

One of the key topics in Further Maths that threads through the course is the study of complex numbers.

Watch the two videos below:

<http://bit.ly/EddieWooComplex1>

<http://bit.ly/EddieWooComplex2>

Then work through some activities at the links below:

<http://nrich.maths.org/13173>

<http://nrich.maths.org/13400>

Task 2 – problem solving

Thinking about a problem, exploring it and then generalising is an important thing to practice. Give this problem below a go:

<http://bit.ly/UndergroundTriominoes>

Reading list

Suggested reading:

[The Codebook](https://www.amazon.com/Code-Book-Science-Secrecy-Cryptography/dp/0385495323/ref=sr_1_1?ie=UTF8&s=books&qid=1236286929&sr=1-1) by *Simon Singh*: https://www.amazon.com/Code-Book-Science-Secrecy-Cryptography/dp/0385495323/ref=sr_1_1?ie=UTF8&s=books&qid=1236286929&sr=1-1

[Infinity: The Quest to Think the Unthinkable](https://www.amazon.co.uk/Brief-History-Infinity-Quest-Unthinkable/dp/1841196509/ref=sr_1_2?ie=UTF8&s=books&qid=1236364081&sr=1-2) by *Brian Clegg*: [https://www.amazon.co.uk/Brief-History-Infinity-Quest-](https://www.amazon.co.uk/Brief-History-Infinity-Quest-Unthinkable/dp/1841196509/ref=sr_1_2?ie=UTF8&s=books&qid=1236364081&sr=1-2)

[Unthinkable/dp/1841196509/ref=sr_1_2?ie=UTF8&s=books&qid=1236364081&sr=1-2](https://www.amazon.co.uk/Brief-History-Infinity-Quest-Unthinkable/dp/1841196509/ref=sr_1_2?ie=UTF8&s=books&qid=1236364081&sr=1-2)

[The Man who knew Infinity](https://www.amazon.co.uk/Man-Who-Knew-Infinity-Ramanujan/dp/0349104522/ref=sr_1_1?ie=UTF8&s=books&qid=1236364308&sr=1-1) by *Robert Kanigel*: https://www.amazon.co.uk/Man-Who-Knew-Infinity-Ramanujan/dp/0349104522/ref=sr_1_1?ie=UTF8&s=books&qid=1236364308&sr=1-1

[Things to Make and Do in the Fourth Dimension](https://www.amazon.co.uk/Things-Make-Fourth-Dimension-Mathematicians/dp/0374535639/ref=asc_df_0374535639/?tag=googshopuk-21&linkCode=df0&hvadid=310848077451&hvpos=&hvnetw=g&hvrnd=8297674905619613808&hvpon=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1006864&hvtargid=pla-523745335347&psc=1&th=1&psc=1) by *Matt Parker*: https://www.amazon.co.uk/Things-Make-Fourth-Dimension-Mathematicians/dp/0374535639/ref=asc_df_0374535639/?tag=googshopuk-21&linkCode=df0&hvadid=310848077451&hvpos=&hvnetw=g&hvrnd=8297674905619613808&hvpon=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1006864&hvtargid=pla-523745335347&psc=1&th=1&psc=1

Suggested Viewing:

Watch any numberphile video <http://www.numberphile.com/>