Welcome to Maths and Further Maths A-level

Now that you've decided to study Mathematics at A level, you'll need to do a bit of preparation. This pack contains a programme of information sheets, activities and resources to prepare you to start your A level in September. It is aimed to be used after you complete your GCSE throughout the rest of the summer term and over the summer holidays to ensure you are ready to start your course in September.

The resources include:

- Key pre-knowledge topics that are required for you to be successful in your course with activities associated with the topics, which test your key knowledge and understanding of the building blocks required to be successful in this subject.

- Suggested reading and associated websites where you can research the topics you will be exploring in your A level course.

- Suggested visits and activities over the summer holidays including places of interest that will generate enthusiasm and engagement.

Pre-requisite knowledge

It is important that before you start A-level Maths or Further Maths that you are fluent with GCSE level maths in pretty much all respects. There will be things you are good at, and unless you are very exceptional, other topics you are less good at. You need to plug as many of these gaps as you can before starting A-level.

Even if you are confident with everything, practising key skills over the summer will keep you up to date and ready to go in September.

You should subscribe to the Google Classroom:

"Maths GCSE to A-level Transition 2021"   (class code "izuolry")

that has been set up to support you.

Here will be posted a series of assignments to practise important skills, over the weeks between you finishing school and starting A-level. You may wish to hand these in to show you have done them, and we may be able to provide limited support if you need it, but they will not, in general, be marked.

If you cannot wait for them to appear you can download them yourself here:

https://tinyurl.com/GCSEtransition

The topics are these – you can use this as a checklist if you like.

Task	Topic	Done	Notes
1a (i)	Expanding brackets and simplifying expressions		
1a (ii)	Surds		
1a (iii)	Rules of Indices		
1b (i)	Factorising expressions		
1b (ii)	Completing the square		
1b (iii)	Solving quadratic equations		
1b (iv)	Sketching quadratic graphs		
1c (i)	Solving linear simultaneous equations		
1c (ii)	Solving linear and quadratic simultaneous equations		
1d (i)	Linear inequalities		
1d (ii)	Quadratic inequalities		
1e	Sketchng cubic and reciprocal graphs		
1f	Translating graphs		
2a (i)	Graphs of linear equations		
2a (ii)	Equations of parallel and perpendicular lines		
2a (iii)	Pythagoras Theorem		
2a (iv)	Proportion		
2b	Circle Theorems		
4a	Trigonometry		
6a	Rearranging equations		
6b	Volume and surface area of 3D shapes		
7b	Area under a graph		

We will require you to hand in a single brief piece of "holiday work" on your first maths lesson which will be posted to the google classroom. This will be marked and returned to you. There will also be an in-class assessment of key skills very close to the start of term to help identify any gaps in your knowledge.

Other similar resources to help you with pre-requisite skills are:

"Head Start to A-level Maths" (CGP books) ISBN   978-1782947929

- A workbook with examples and questions on important topics

The AMSP (Additional Maths Support Programme) website on A-level transition:

https://amsp.org.uk/resource/gcse-alevel-transition-resources

where there are a set of examples and activities to complete on transition topics.

Pre-requisite equipment

For A-level maths you need a more advanced calculator than for GCSE. The main reason is that the calculator needs to be able to do statistical calculations that the GCSE calculator cannot do. But it has other features that will prove useful.

The recommended calculator is the Casio fx-991EX , which costs around £20-25 .

Some students buy a graphical calculator such as the Casio fx-9750Gii , Casio fx-9860Gii or Casio fx-CG50 , which are all suitable for A-level and offer additional features. Think carefully before buying these as they are expensive and not quite as easy to use for some routine tasks, so you must commit to learning how to use them efficiently.

Here is a Casio calculator comparison:

https://education.casio.co.uk/comparison-chart

Suggested wider reading or research.

These books and websites might give you some inspiration about maths in the wider world! They are <u>not</u> pre-requisite reading for the course.

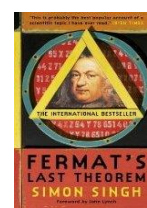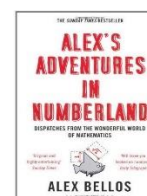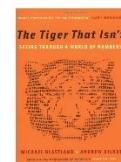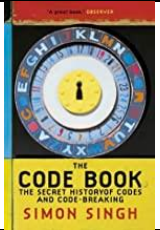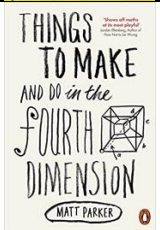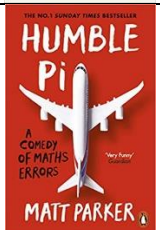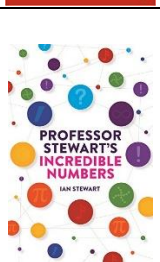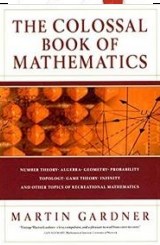|	
Why Do Buses Come in Threes?: The Hidden Mathematics of Everyday Life (Rob Eastaway & Jeremy Wyndham)	
Fermat's Last Theorem: The story of a riddle that confounded the world's greatest minds for 358 years (Simon Singh) The story of how an English Mathematician, Andrew Wiles, proved one of the most famous problems in mathematics. There is also lots of interesting information on the associated website.	
Alex's Adventures in Numberland (Alex Bellos) A very accessible and well-written introduction to mathematics written in the style of a travelogue that demonstrates how useful, universal, interesting and beautiful mathematics is.	
The Tiger That Isn't: Seeing Through a World of Numbers (Andrew Dilnot and Michael Blastland) The creator of radio 4's More or Less programme uses stories from the news and encourages critical thinking about statistical stories. Good for the general reader – no mathematics is needed.	
Mathematician's Delight (Dover Science Books) (W.W. Sawyer) Written in the style of a novel, this book starts from simple arithmetic and builds to calculus, providing insight and understanding throughout. The sections on logarithms and trigonometry are especially good.	
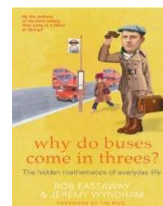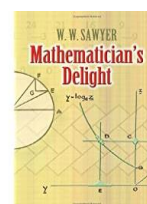
With thanks to MEI for their descriptions.

Other recommendations from the Maths department include:

The Code Book (Simon Singh) The Code Book is a history of man's urge to uncover the secrets of codes, from Egyptian puzzles to modern day computer encryptions.	
Things to Make and Do in the Fourth Dimension (Matt Parker) Matt Parker uses bizarre Klein Bottles, unimaginably small pizza slices, knots no one can un-tie and computers built from dominoes to reveal some of the most exotic and fascinating ideas in mathematics	
Humble Pi (Matt Parker) Our modern lives are built on maths: computer programmes, finance, engineering. And most of the time this maths works quietly behind the scenes, until ... it doesn't.	
Professor Stewart's Incredible Numbers (Ian Stewert) A more-or-less random choice from Prof. Stewart's excellent portfolio of books on maths. Here, he looks at every kind of number you can think of -- real, imaginary, rational, irrational, positive and negative -- along with several you might have thought you couldn't think of.	
The Colossal Book of Mathematics (or any of his other many books!) (Martin Gardner) Gardner's array of absorbing puzzles and mind-twisting paradoxes opens mathematics up to the world at large, inspiring people to see past numbers and formulas and experience the application of mathematical principles to the mysterious world around them.	

There is a wealth of video material "out there" that can enhance your understanding and enjoyment of mathematics. Some recommendatons for you are:

- YouTube channels:
    - Numberphile – light-hearted and short videos on a wide range of mathematical snippets by many of the same team who do the Maths Inspiration shows.
    - 3blue1brown – beautifully created and imagined videos by Grant Sanderson which explain mathematical concepts in a very visual way. His series on "The Essesnce of Calculus" is good. A lot of it is quite advanced.
    - Stand-up maths – Matt Parker's (Maths Insiration, Numberphile) own channel .
    - Up and Atom – videos covering a wide range of topics from maths, computer science and physics.
    - The Royal Institution – they have a Mathematics playlist of talks and lectures on a range of topics – generally quite substantial .

- Ted Talks
  Ted Talks have a playlist called "Math talks to blow your mind" which has a variety of talks about maths, generally around 15 mins long
    - https://www.ted.com/playlists/189/math_talks_to_blow_your_mind
- Oxford University Public Lectures
    - - http://www.maths.ox.ac.uk/events/public-lectures-events .
      Quite substantial public lectures on a wide variety of topics.

If you enjoy problem solving, some resources for you are:

N-rich http://nrich.maths.org/students

Investigative activities linked to the school curriculum.

Cut-The-Knot http://www.cut-the-knot.org

A wealth of mathematical curiosities and puzzles to keep you occupied over the summer.

St John's College, Oxford – maths problems

- https://sjcinspire.com/category/maths+questions/

Apps for your phone:

These will keep your maths brain in gear over the holidays:

- Brilliant (brilliant.org)

- Euclidea (HORIS INTERNATIONAL LIMITED)

Suggested Visits / Activities

Maths is not an easy subject to recommend trips for, but some suggested places, if you happen to be nearby, are:

- Bletchley Park (home of the WW2 codebreakers, near Milton Keynes)

- Woolsthorpe Manor (Isaac Newton's house – National Trust property in Lincolnshire)

- Science Museum, London. The Winton Gallery examines the fundamental role mathematicians, their tools and ideas have played in building the world we live in

- The Museum of the History of Science, Oxford . Interesting if you have a general interest in the history of science and mathematics.
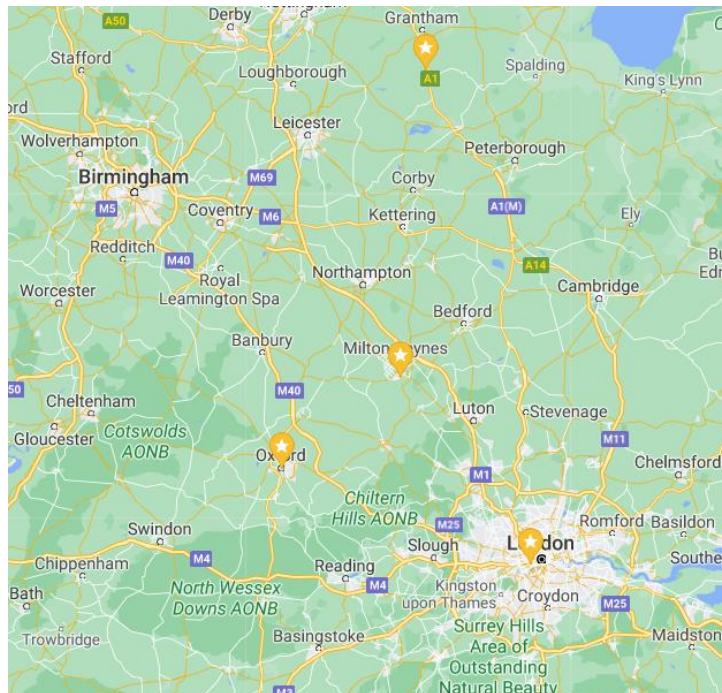
Please get in touch if you have any questions about the course.

Mr R Miles, Head of Key Stage 5 Mathematics. Email: r.miles@maidenerleghtrust.org.