Mathematics
A Level

Why Study Mathematics

- Stimulating and challenging courses;
- Increase knowledge and understanding of mathematical techniques and their applications;
- Support the study of other A levels;
- Develop key employability skills such as problem-solving, logical reasoning, communication and resilience;
- Excellent preparation for a wide range of university courses;
- Leads to versatile qualifications that are well-respected by employers and higher education.

WHY STUDY MATHEMATICS AT TGGS

Very experienced dedicated teachers and…
Our results speak for themselves!!

What is covered in A level Mathematics?

Pure Mathematics

(66%)

methods and techniques which underpin the study of all other areas of mathematics, such as, proof, algebra, trigonometry, calculus, and vectors.

Statistics

(17%)

statistical sampling, data presentation and probability leading to the study of statistical distributions

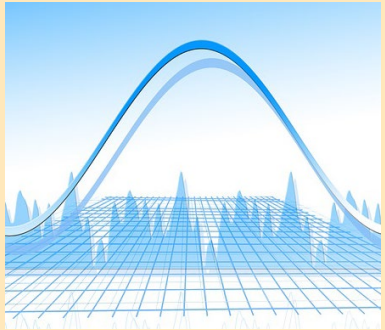
Mechanics

(17%)

the study of the physical world, modelling the motion of objects and the forces acting on them.

What is Statistics?

Reaching conclusions from data and calculating the likelihood of an event occurring.



"The majority of private sector organisations believe the use of data analytics will be the most important factor in increasing growth in UK businesses"

Professor Sir Adrian Smith

Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630488/AS_review_report.pdf

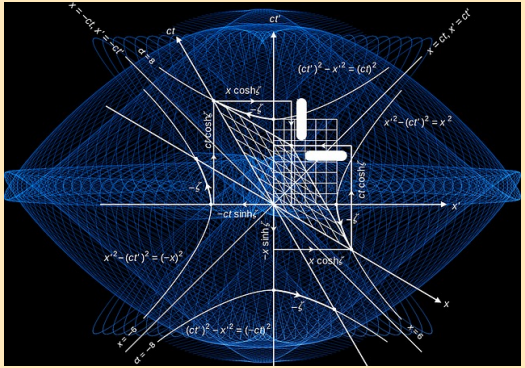
What is Mechanics?

The modelling of the world around us, the motion of objects and the forces acting on them.

Students planning careers in physics or engineering would find mechanics particularly useful.

What is Further Mathematics?

Further Mathematics is an additional AS/A level qualification taken **in addition to** an AS/A level in Mathematics.



It is designed to stretch and challenge able mathematicians and prepare them for university courses in mathematics and related quantitative and scientific subjects.

What is covered in Further Mathematics?

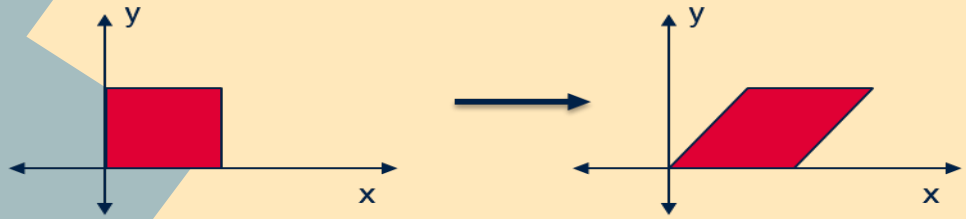
- Pure mathematics content, making up at least 30% of the AS level and at least 50% of the A level.
- The remainder of the content is made up of options which will include some of:

- Additional pure mathematics
- Additional statistics and/or mechanics
- Discrete / Decision mathematics

Pure maths in Further Mathematics

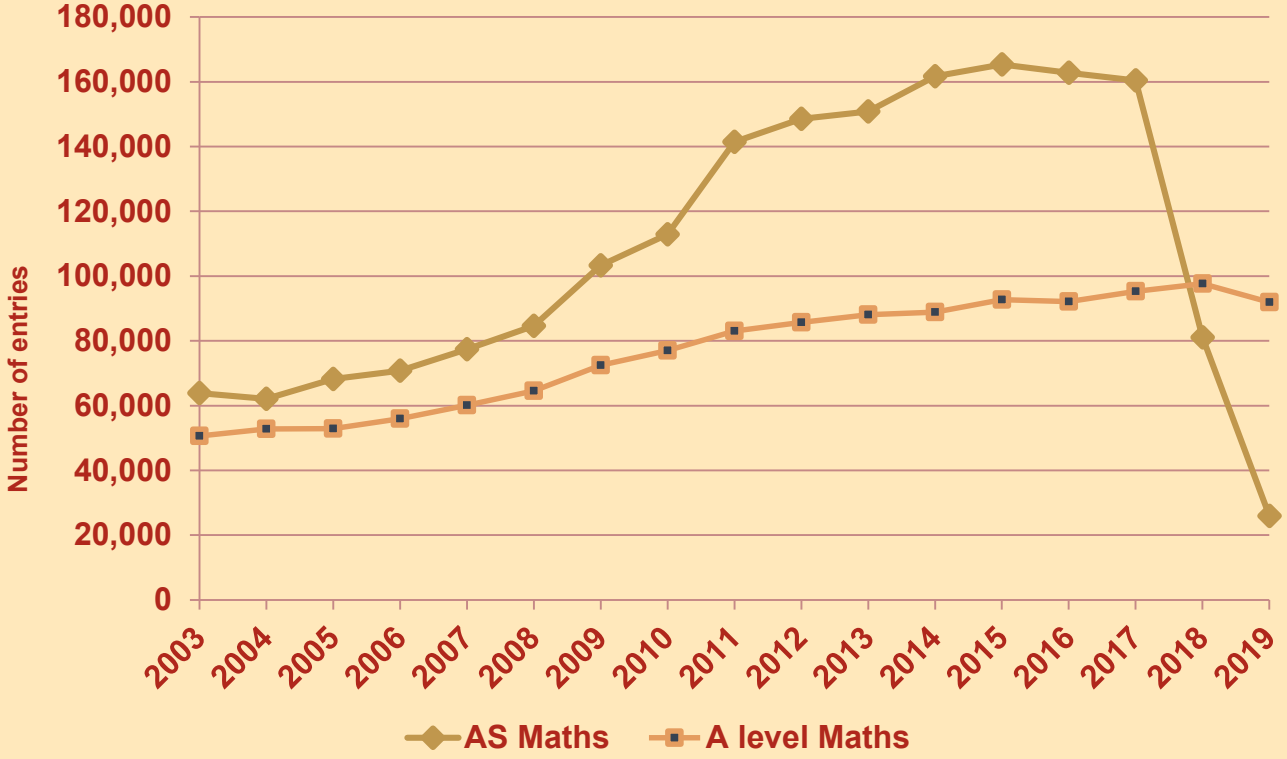
Two examples of important Further pure topics are complex numbers and matrices.

Matrices are arrays of numbers such as $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$. They can be used to solve sets of simultaneous equations and to represent transformations such as the shear shown in the diagram below.

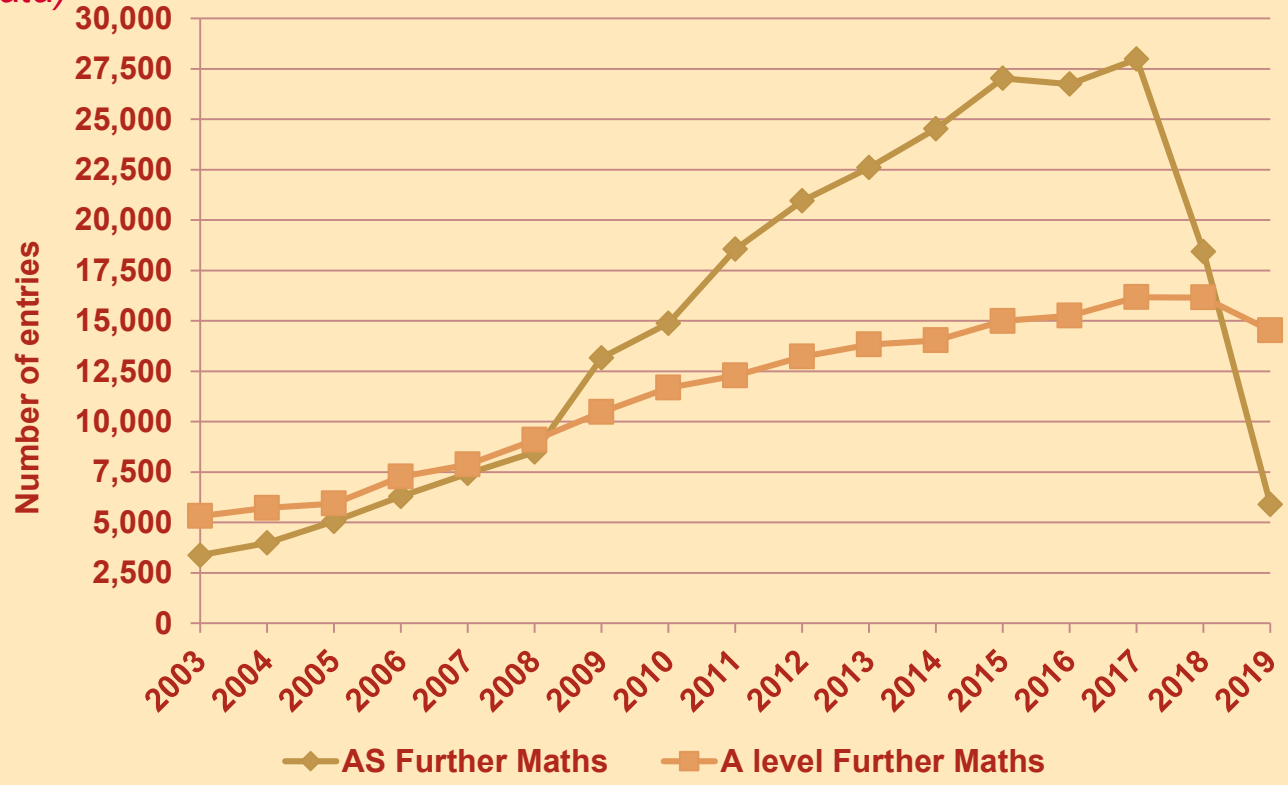


Complex numbers are based on the 'imaginary' number $\sqrt{-1}$. They lead to the study of lots of new areas of mathematics, including fractals like those shown in the image above.

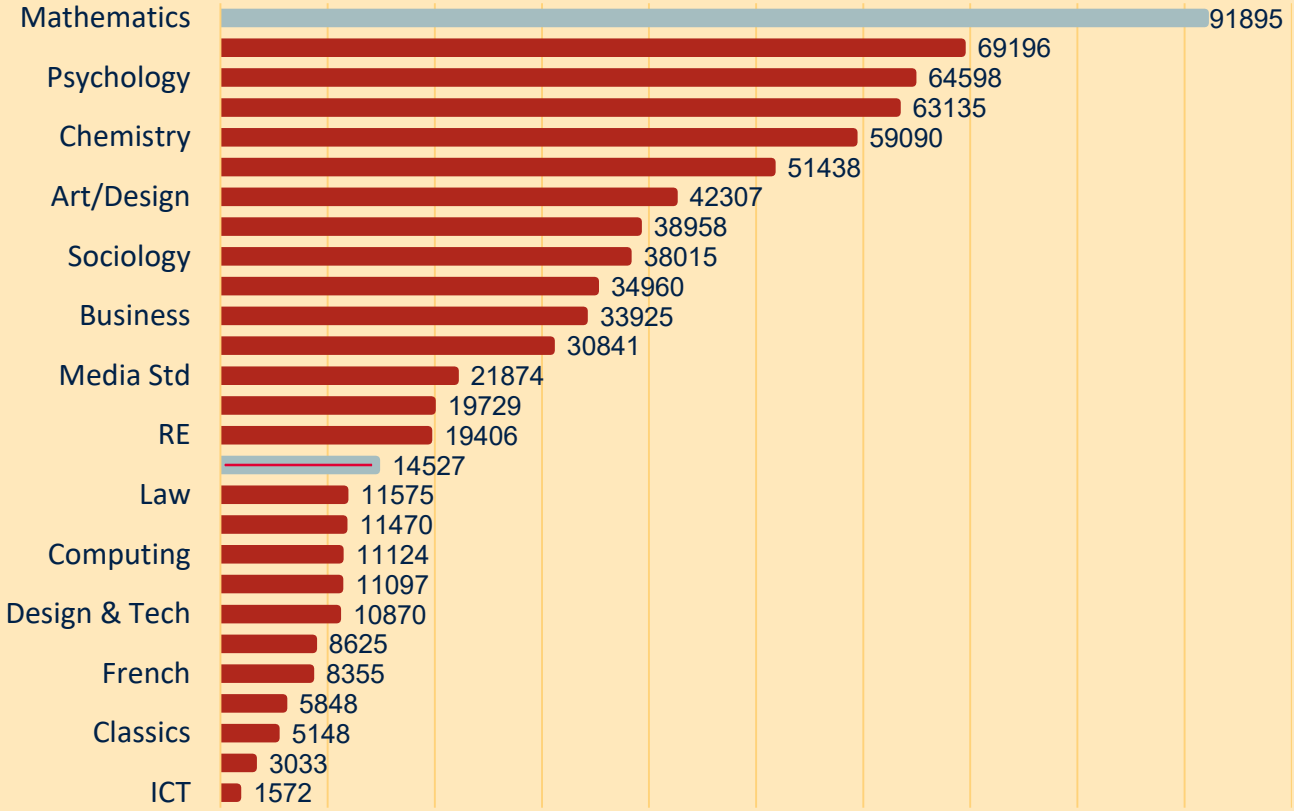
A and AS level Mathematics entries in the UK 2003-2019 (JCQ data)



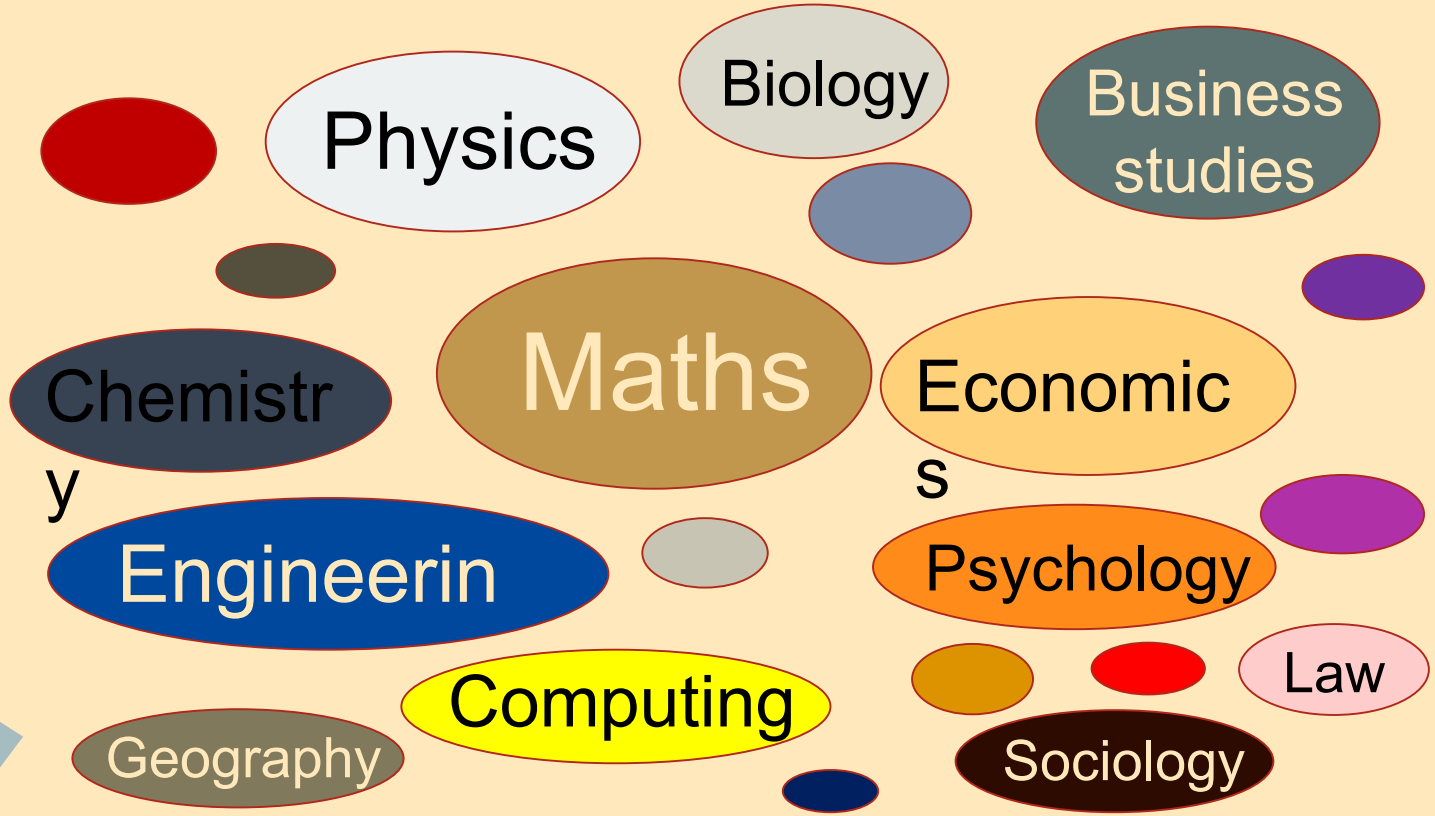
*A and AS level **Further Mathematics** entries in the UK 2003-2019 (JCQ data)*



2019 UK A level entries by subject (JCQ data)



Many subjects use maths



Maths in other A levels

Geography (no specific percentage but geographical skills include quantitative and qualitative skills equally)

Economics (at least 20%)

Biology (at least 10%)

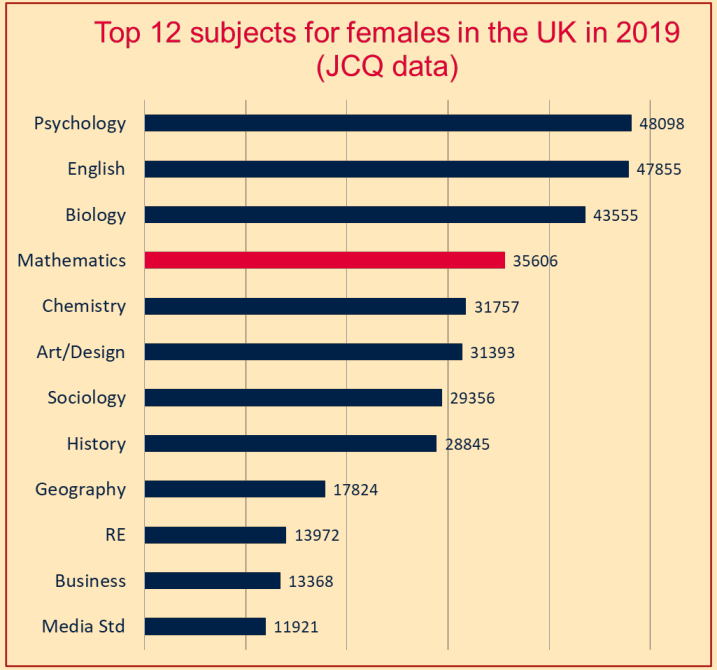
Business (at least 10%)

Psychology (at least 10%)

PE (at least 5%)

Sociology (no specific percentage but you will be analysing data)

Girls' participation in Mathematics



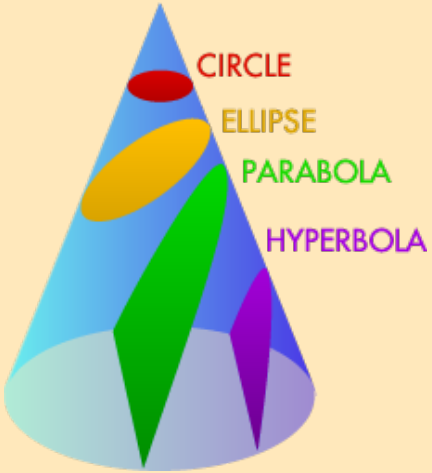
- Maths is the fourth most popular A level for girls.
- Parents and carers play a **key** role in positively influencing girls' A level and future career choices towards mathematics in both STEM and non-STEM disciplines

"We are moving, albeit slowly, towards greater gender equilibrium in entries"

Michael Turner, JCQ's Director

Common career misconceptions

- Unless you plan to do a STEM (Science, Technology, Engineering, Mathematics) degree, you don't need to study mathematics post-GCSE



- Most careers that require A level Mathematics are male-dominated.
- You only do a mathematics degree to become a mathematics teacher.
- Further Mathematics is an A level just for students who want to become engineers or physicists.

These are not true!

Mathematics is relevant to many different careers, apprenticeships and degrees, all of which now require better quantitative skills.

What are the career opportunities?

What are the career opportunities?

“Maths is the only A level proven to increase earnings in later life - by an average of 10%.”

(Source www.gov.uk/government/speeches/elizabeth-truss-on-support-for-maths-and-science-teaching)

What are the career opportunities?

"…analysis highlights the value of good and of qualifications… compelling evidence continued wage returns of up to 11% to A level Mathematics. "

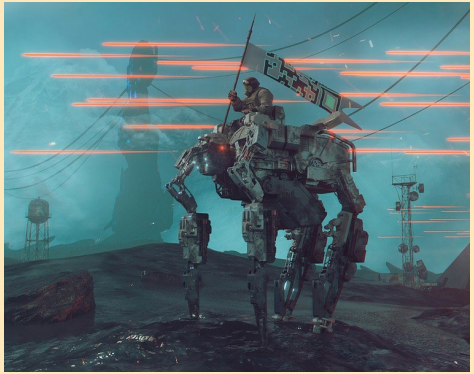
(Source: Rethinking the Value of Advanced Mathematics Participation, 2016 http://www.nottingham.ac.uk/education/documents/research/revamp-final-report-3.1.17.pdf)

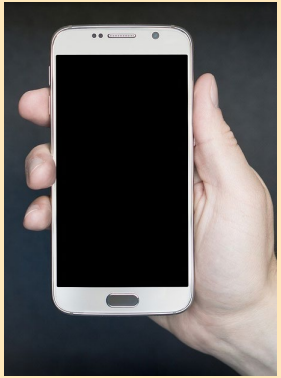
Careers using Maths

There is a huge shortage of people with STEM skills needed to enter the workforce.

Applications of mathematics in technology:

- Medical
- Games Design
- Internet Security
- Financial Cryptography
- Programming
- Communications

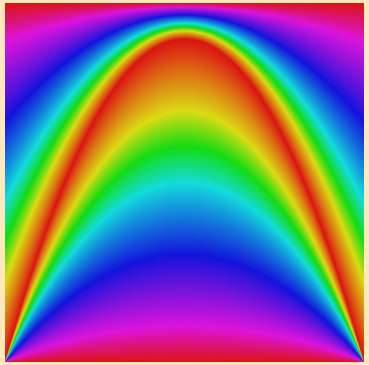




Careers using Maths

On-going applications in engineering, such as:

- Aircraft Modelling
- Fluid Flows
- Acoustic
- Engineering
- Electronics
- Civil Engineering.



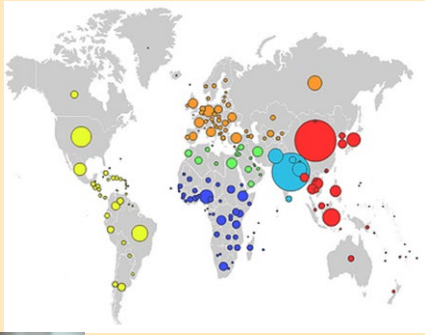
New scientific processes such as:

- Modelling populations and Diseases
- Quantum Physics
- Astronomy
- Forensics
- DNA sequencing

Careers using Maths

Applications relating to human behaviours and interactions:

- Data Science
- Psychology
- Law
- Economics
- Climate Change
- Environmental Modelling
- Political Science
- International Development



What are Higher/Degree Apprenticeships?

- Designed to offer degree-equivalent qualifications.
- A popular alternative to obtaining a degree directly from a university.
- The employer will cover the cost.
- Paid a salary while you study.
- A levels or equivalent qualifications required for entry.
- Mathematics is also essential or desirable for a wide range of apprenticeships.
- Examples include:
  - Actuarial
  - Data Science
  - Software Engineering
  - Quantity Surveying

Other sources of information

- AMSP website www.amsp.org.uk
- Maths Careers website www.mathscareers.org.uk
- Apprenticeship websites e.g. www.amazingapprenticeships.com
- Universities and Colleges Admissions Service (UCAS) www.ucas.com
- Russell Group Universities www.informedchoices.ac.uk
- Tomorrow's Engineers www.tomorrowsengineers.org.uk
- The Institute of Physics (IOP) www.iop.org

Is A level Mathematics needed for entry to university degree courses?

- It is important to have strong maths skills for progression to many degree courses at university.
- A level Mathematics is also essential or desirable for a wide range of degree courses including economics, computing, social sciences and business.
- According to research by UCL, students with an A level in Mathematics are more likely to attend a Russell Group university.
- Any student applying to study a degree in a STEM subject should also consider taking Further Mathematics to at least AS level alongside A level Mathematics.