



FMSP

*Let maths
take you further* ®

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Presentation for parents / carers

- These slides form an approximately 20-30 minute presentation for parents/carers about the importance of studying Mathematics post-GCSE
- They can be adapted and used for a presentation to students and/or their parents/carers.
- Please add or remove slides to suit your talk/event.
- This is an updated version for use from September 2017
- It includes brief information on Core Maths and the new A levels in Mathematics and Further Mathematics for students commencing courses in 2017.

Why study Mathematics?



A guide for
Students,
Parents and
Carers

Post-16 Mathematics options

GCSE Mathematics
re-sit

Core
Maths

AS or A level
Mathematics

AS or A level
Further
Mathematics

Important questions

- What is Core Maths?
- What does A level Mathematics involve?
- What is Further Mathematics?
- Why should my daughter/son study A level Mathematics?
- What are the career opportunities with A level Mathematics?
- Is A level Mathematics needed for entry to university degree courses?

What is Core Maths?

- A course for those who want to keep up their valuable mathematics skills but are not planning to take AS or A-level Mathematics.
- A two-year level 3 qualification, similar to an AS.
- Suitable for students with the equivalent of a GCSE Mathematics grade 4 or above.
- Focuses on using and applying mathematics to address authentic problems drawn from study, work and life.
- Includes new content such as statistics, financial mathematics and using algebra.

Why study Core Maths?

- Helps develop real-life mathematics skills.
- Supports other A level subjects – geography, social sciences, business etc.
- Develops ability in mathematics in preparation for university study.
- Provides useful skills for employment.
- Develops valuable life skills which will help students to understand information and make better informed decisions.

What is covered in AS/A level Mathematics?

All of the content in the AS/A level Mathematics qualification is compulsory and is the same for all examination boards.

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%)

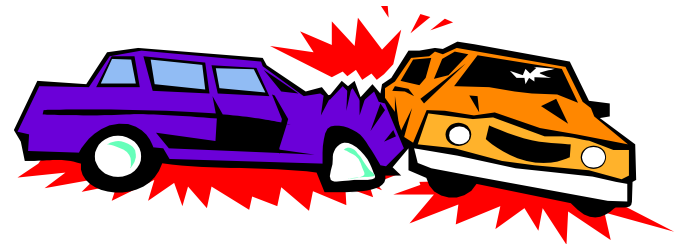
statistical sampling, data presentation and probability leading to the study of statistical distributions

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 chance of an event occurring



Actuaries study statistical information to calculate the risk of a driver of a certain age having a car accident or the risk of flood. This information would be used by insurers in establishing the cost of the annual premiums.

What is Mechanics?

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



What angle should a cricketer aim to hit the ball in order to maximise the distance it will travel?

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

What is Further Mathematics?

- Mathematics and Further Mathematics can both be taken at either AS level or at A level.
- Further Mathematics is an additional AS/A level qualification taken **in addition to** an AS/A level mathematics course.
- It is designed to stretch and challenge able mathematicians and prepare them for university courses in mathematics and related quantitative and scientific subjects.

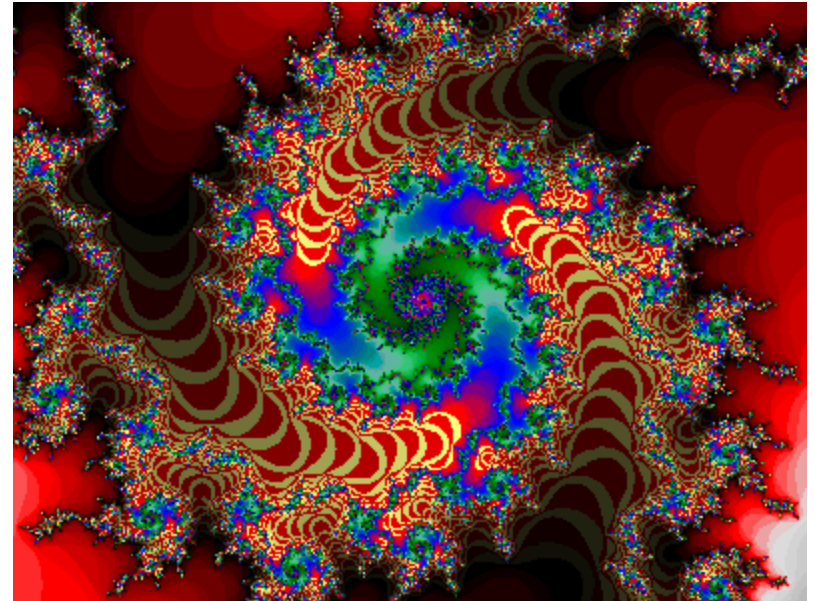
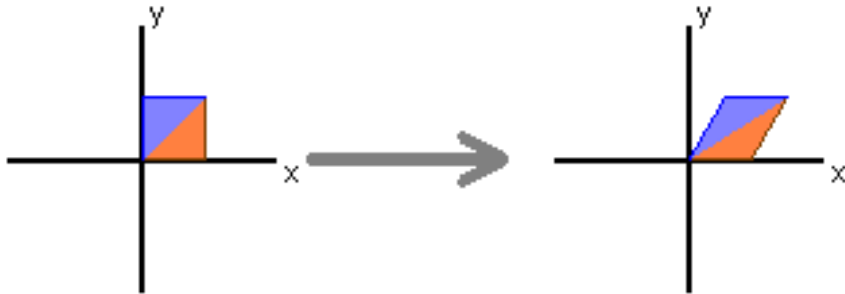
What is covered in Further Mathematics?

- 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 include:
 - ❖ Additional pure mathematics
 - ❖ Additional statistics and/or mechanics
 - ❖ Discrete / Decision Mathematics
- Individual schools/colleges will provide more information on their chosen specification and examination board for Further Mathematics.

What pure maths is covered 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.



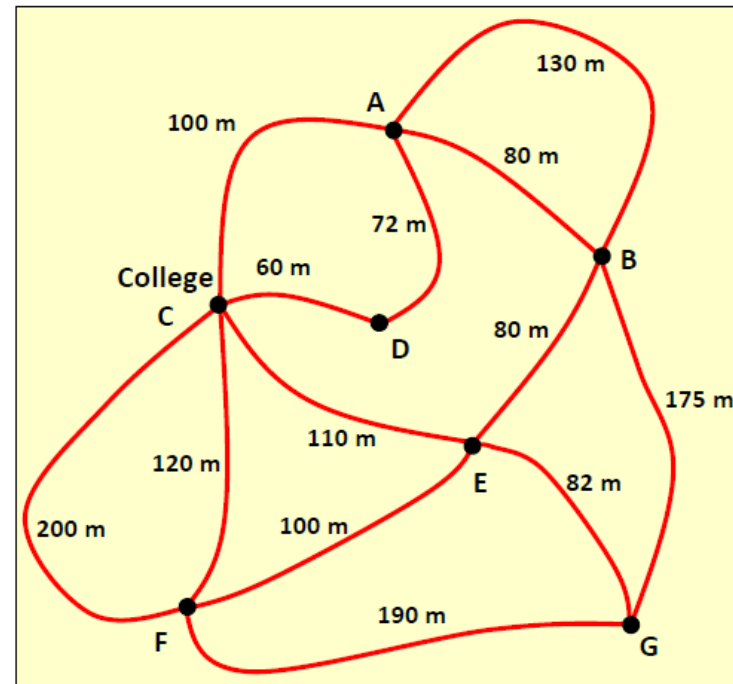
Complex numbers are based on the 'imaginary' number $\sqrt{-1}$. They lead to the study of lots of new areas of mathematics, including fractals like those shown in the image above.

What is Discrete/Decision Mathematics?

One area of discrete mathematics is graph theory, which includes solving problems such as:

What would be the most efficient route for delivering post around this network of streets?

This topic uses algorithms vital in computer science.



(Image taken from

<http://www.nuffieldfoundation.org/sites/default/files/files/FSMA%20Chinese%20postman%20problems%20student.pdf>)

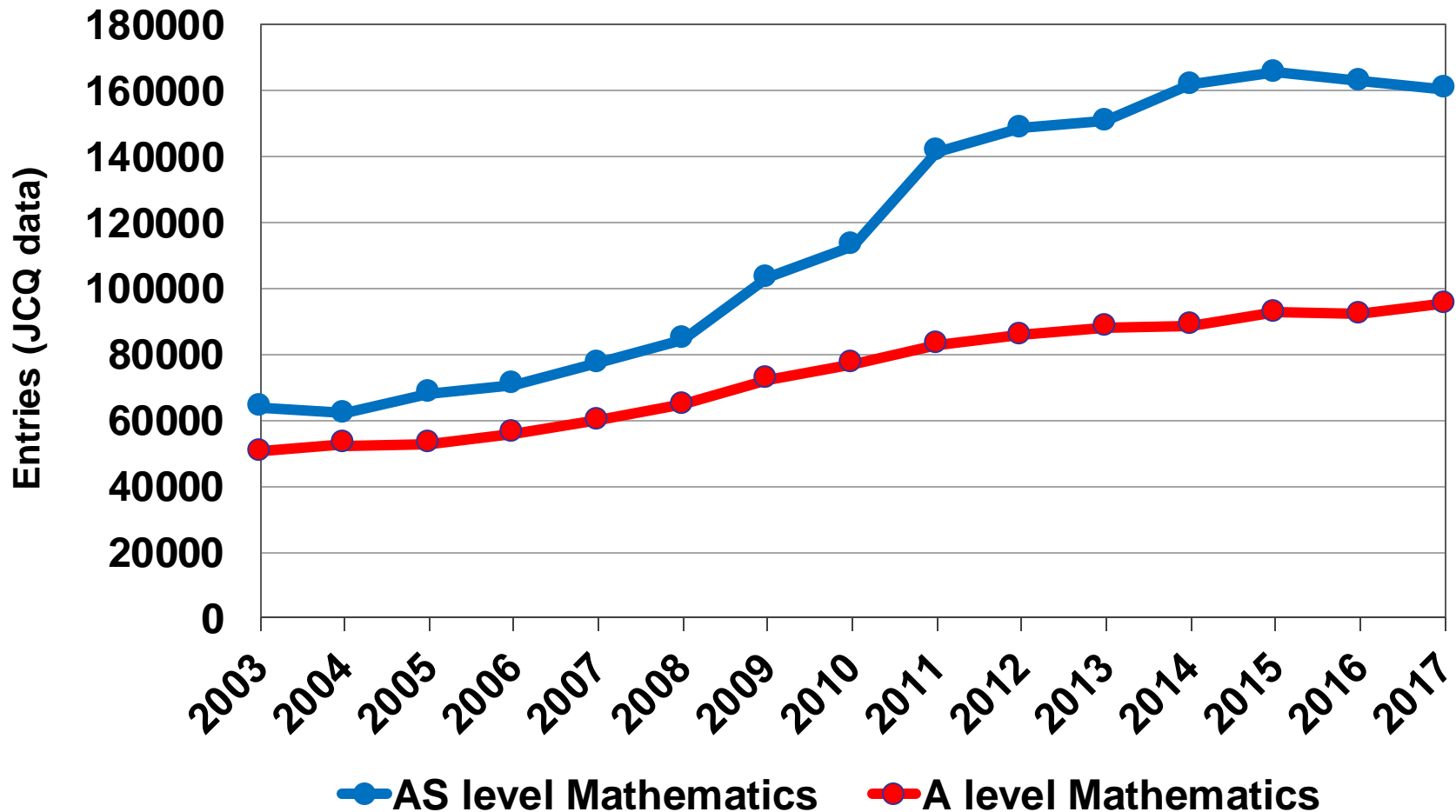
Why study Mathematics A levels?

Studying Mathematics and Further Mathematics will:

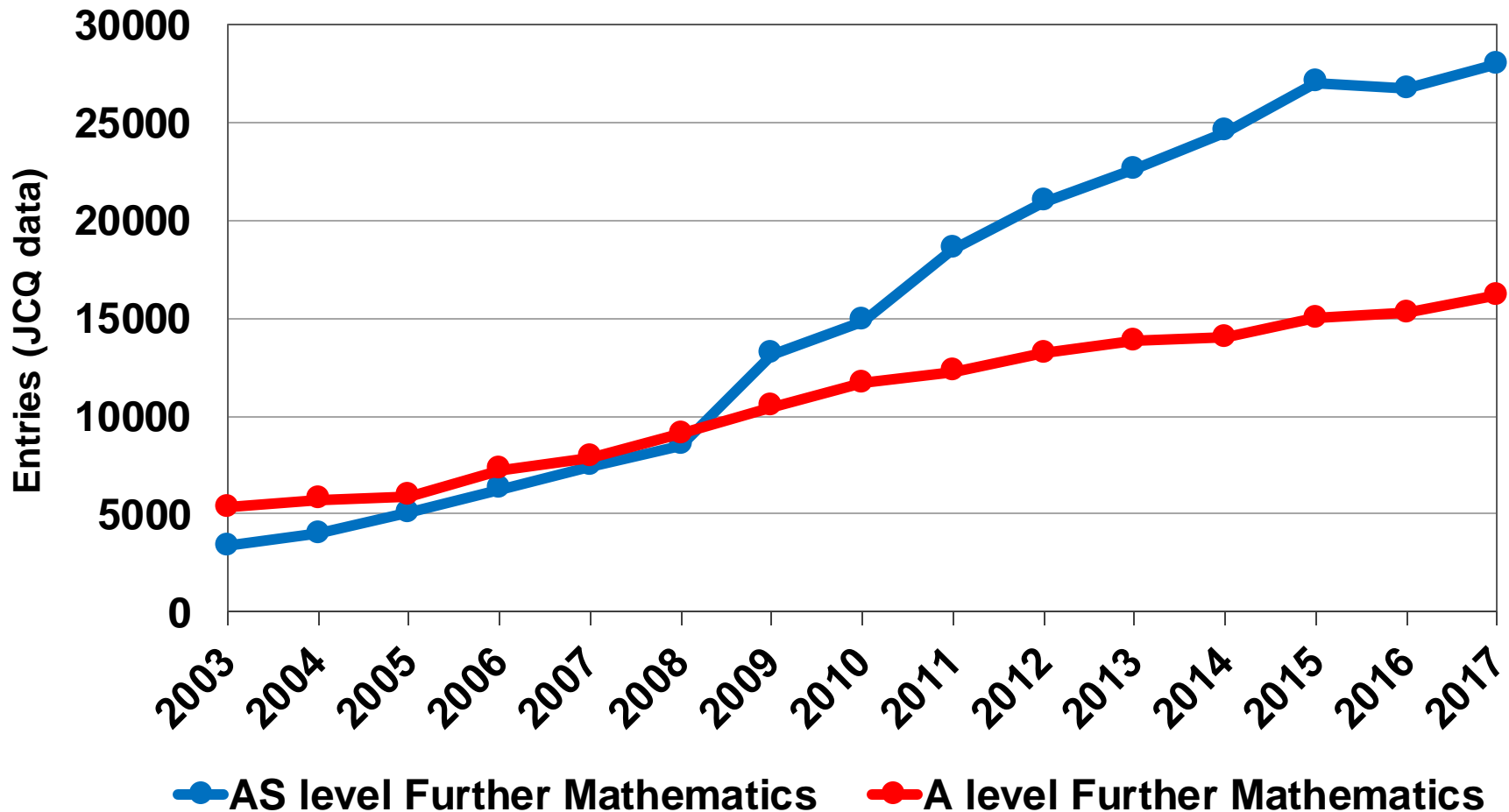
- provide a stimulating and challenging course;
- develop key employability skills such as problem-solving, logical reasoning, communication and resilience;
- increase knowledge and understanding of mathematical techniques and their applications;
- support the study of other A levels;
- provide excellent preparation for a wide range of university courses;
- lead to a versatile qualification that is well-respected by employers and higher education.



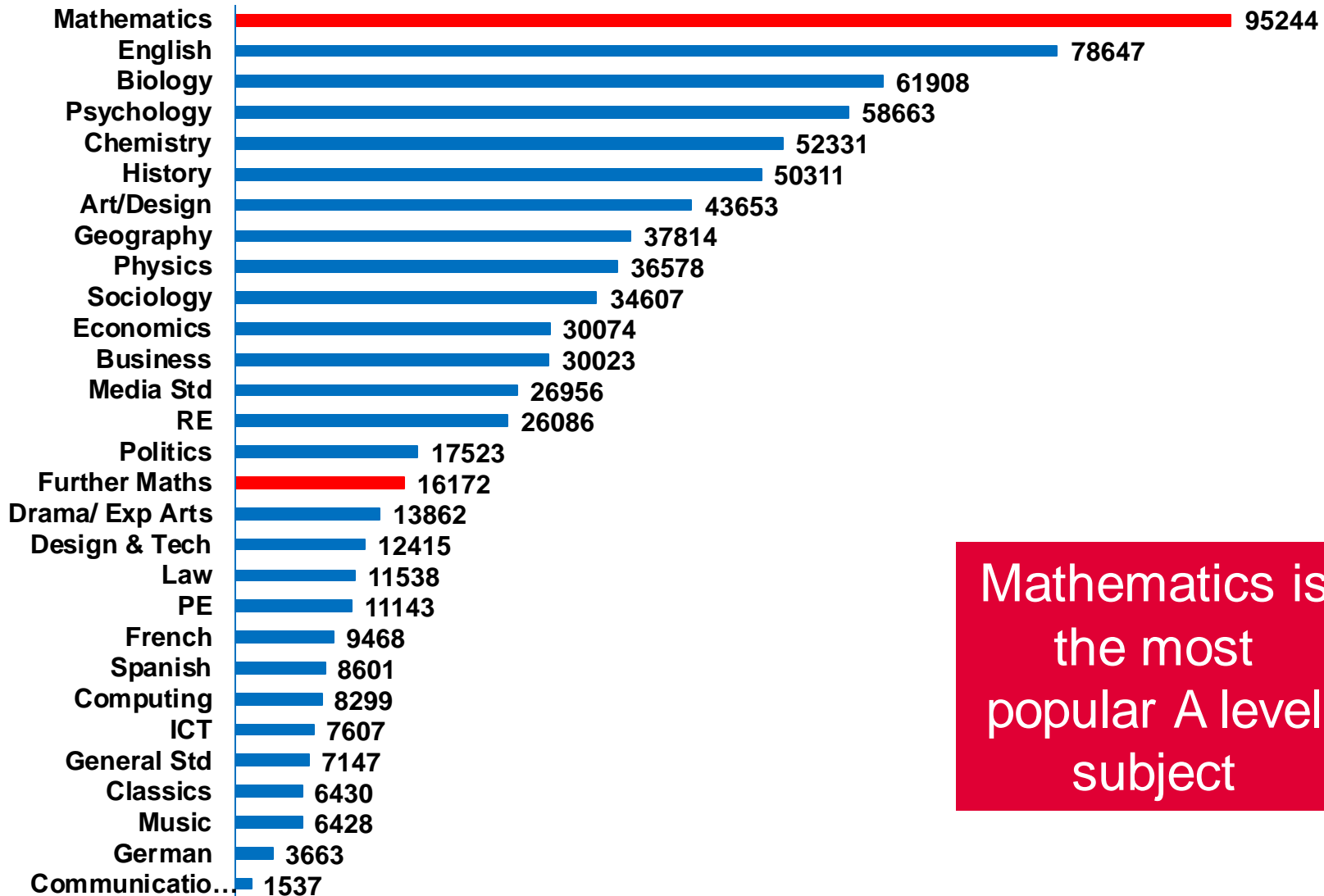
AS/A level Mathematics entries



AS/A level Further Mathematics entries



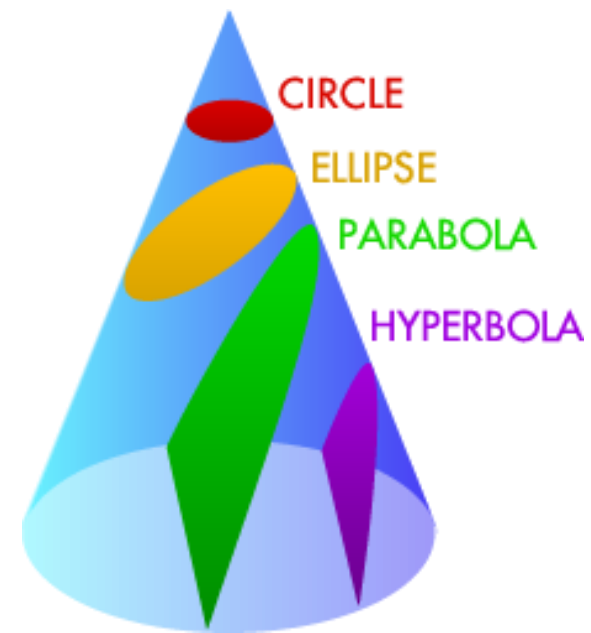
2017 A level entries by subject



Mathematics is the most popular A level subject

Common career misconceptions

- Unless you plan to do a STEM (Science, Technology, Engineering, Mathematics) degree, you don't need A level Mathematics or Further Mathematics.
- 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 no longer true.

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

What are the career opportunities?

“...the subjects that keep young people’s options open and unlock the door to all sorts of careers are the STEM subjects (science, technology, engineering and maths). The skills gained from studying these subjects come in useful in almost any job you could care to name - from the creative and beauty industries to architecture.”

Nicky Morgan, former Secretary of State for Education

Source: www.gov.uk/government/speeches/nicky-morgan-speaks-at-launch-of-your-life-campaign

What are the career opportunities?

“...analysis highlights the economic value of good mathematical skills and of higher level qualifications...There is compelling evidence of 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>)

What are the career opportunities?

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



© Ironclad Games Corporation Vancouver, BC.

There are many new applications of mathematics in technology:

- Games Design
- Internet Security
- Programming
- Communications



What are the career opportunities?

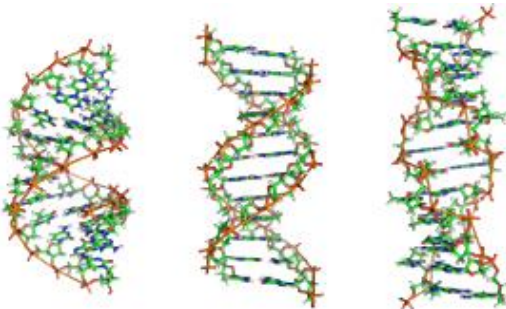
On-going applications in engineering, such as



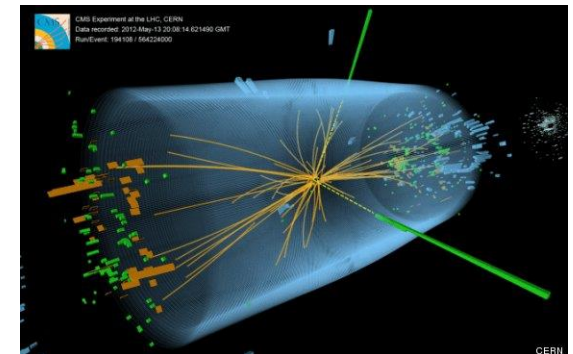
Aircraft Modelling
Fluid Flows
Acoustic Engineering
Electronics
Civil Engineering.



...and new scientific processes such as modelling populations



Quantum Physics,
Astronomy,
Forensics and
DNA sequencing.



What are the career opportunities?

Financial systems and online purchasing systems are also underpinned by mathematics, relying heavily on online security and encryption.

amazon.com[®]

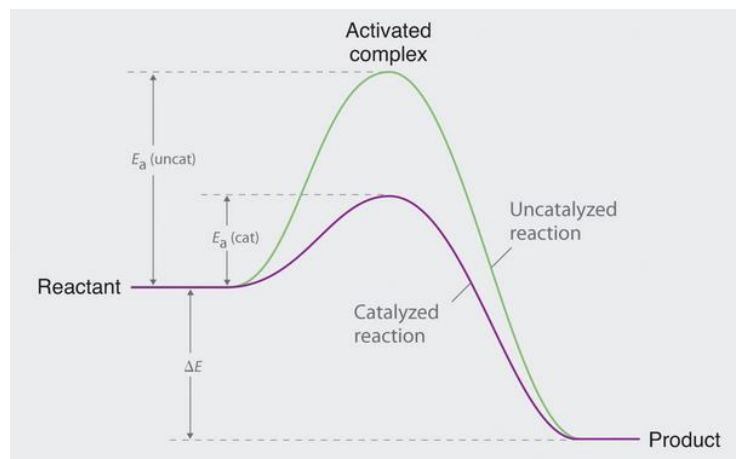


GCHQ has the largest group of mathematicians working anywhere in the country!

GCHQ

What are the career opportunities?

A good understanding of mathematics is beneficial for the study of chemistry, biology and geography.



Psychologists use statistics to analyse the relationships between variables and predict behaviours.

Lawyers rely on statistical data and the logical thought processes developed through the study of mathematics.

Girls' participation in Mathematics

- Girls made up 55% of the A level cohort in 2017; but 39% of the A level Mathematicians and around 27% of the A level Further Mathematicians were female.
- Girls achieve **similar proportions of high grades in GCSE Mathematics** and so have the same opportunities to progress to advanced level study of mathematics.
- It is **vital that girls are encouraged to study Mathematics and Further Mathematics** to ensure they achieve their potential in these subjects and have the full range of career opportunities open to them post-16.
- **Parents and carers can play a key role** in positively influencing girls' A level choices towards mathematics and towards a range of mathematical careers in both STEM and non-STEM disciplines.



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.

A level Maths and degree courses

Degree subjects	% of students starting courses with A level Mathematics (2013)
Computing	50%
Economics	69%
Chemistry	71%
Biology	38%
Psychology	13%
Geography	20%
Business & Management	38%
Sociology	4%

A level Further Maths and degrees

Degree course	% of students starting course with A level Further Mathematics (2013)
Mathematics	60%
Physics	36%
Engineering	23%
Computer Science	12%
Economics	15%
Finance	21%

A level Maths opens the door to leading universities

“Doing facilitating subjects, **particularly maths**, may be a sensible choice of A-level for those aspiring to a high-ranking university, even if the content is not required for the intended course.”

Report by Catherine Dilnot, Institute of Education, 2017

Exemplar Entry Requirements

Typical offers are:

- AAA or A*AB
- AAB or A*BB , including Further Mathematics A-level
- AAB or A*BB, **PLUS** Grade A in AS-level Further Mathematics

In all cases, the first grade quoted is the Mathematics A-level.

Leeds University (Mathematics degree), 2018 entry

Exemplar Entry Requirements

- AAB-BBB including Mathematics and Chemistry. Other recommended subjects include Physics, Further Mathematics, Design Technology, IT/Computing and Biology.

Swansea University (Chemical Engineering degree), 2018 entry

- AAB including Mathematics, plus either Physics, Electronics or Further Mathematics.

*Manchester University (Electrical & Electronic Engineering degree),
2018 entry*

Exemplar Entry Requirements

Our typical offers for students who are studying 3 A-levels are:

- AAB to include Chemistry
- ABB to include Chemistry and one further science subject (from Biology, Human Biology, Physics, Maths, Further Maths, Psychology, Geography or Geology).

Southampton University (Chemistry degree), 2018 entry

Exemplar Entry Requirements

- ABB including at least one science subject (from a list including Mathematics and Further Mathematics).
- Two science A levels are preferred and may lead to a lower offer.

Liverpool University (Psychology degree), 2018 entry

- Typical Offer: A*AA including Mathematics at grade A or above. A level Economics not required.
- At least grade 7 in GCSE Mathematics.

University of Durham (Economics degree), 2018 entry

Exemplar Entry Requirements

- ABB-BBB including Mathematics and Physics.

Reading University (Meteorology and Climate degree), 2018 entry

- A*A*A (A* in Mathematics), plus STEP.
- Many colleges also require Further Mathematics.
- For 2019 entry A level Further Mathematics will be required by *all* colleges.

Cambridge University (Mathematics degree), 2018 entry

University entry requirements

- Look at the entry requirements on the individual university's website for the degree subjects that your son/daughter might be interested in.
- In some cases a qualification in Mathematics or Further Mathematics will reduce the grades required for entry to a degree course in a related subject.
- Visit www.ucas.ac.uk for information.



My son/daughter loves mathematics – how can they be stretched?

- Take Further Mathematics.
- Participate in the Senior Maths Challenges in the Autumn term.
- Tackle problems on the NRICH website.
- Study for additional qualifications in mathematics such as AEA, STEP, TMUA or the MAT, which are required for entrance to some leading universities to study mathematics.



Other sources of information

- The mathematics teachers at your school
- FMSP website www.furthermaths.org.uk
- Maths Careers website www.mathscareers.org.uk
- Future Morph careers website www.futuremorph.org
- Universities and Colleges Admissions Service (UCAS)
www.ucas.com
- Best course 4 me www.bestcourse4me.com
- Tomorrow's Engineers www.tomorrowsengineers.org.uk
- The Institute of Physics (IOP) www.iop.org

The Further Mathematics Support Programme

The FMSP aims is to increase the uptake of AS and A level Further Mathematics to ensure that more students reach their potential in mathematics.

The FMSP website has further advice on studying A level Mathematics and Further Mathematics, enrichment resources for students and information on applying to university.

To find out more visit www.furthermaths.org.uk



The screenshot shows the homepage of the Further Mathematics Support Programme website. At the top, there is the FMSP logo and the text 'Further Mathematics Support Programme' with the phone number '01225 738 492'. Below this is a navigation menu with links for 'Students', 'Teachers', 'Universities', 'Events', 'Regions', 'Resources', and 'About us'. A large red banner features the text 'Supporting teachers to provide the best mathematical opportunities for students' over a photo of students in a classroom. The main content area is divided into several sections: 'Online resources' with a link to 'Integral' (MEI's online learning resources for students and teachers); 'Popular pages' listing 'Live Online PD', 'STEM', 'Key Stage 4 Enrichment', 'V10 Team Competition', 'Y13', and 'TSM'; 'FMSP News' with three recent news items: 'A-level results - further increase in Further Maths numbers in Wales', 'August 2013: A-level results - students continue to look to 'local demanding' qualifications', and 'June 2013: MEI/National STEM Centre Teachers new to leading A-level mathematics residential week'; 'Online registration' with a 'REGISTER NOW' button; and 'FMSP Regions' with a map of the UK and the text 'To find out about the FMSP in your area please select a region from the map below'.