Advanced Mathematics Support Programme®

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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 content to suit your talk/event.
- This is an updated version for use from September 2021.
- It includes information on Core Maths, A levels in Mathematics and Further Mathematics, potential careers and applying to university

Why study Mathematics?

A guide for Students, Parents and Carers

Why study Mathematics?

Leads to versatile qualifications
well-respected by employers and higher education

Develop key employability skills
e.g. problem-solving, communication, logical reasoning and resilience

Support the study of other A levels

Excellent preparation
for a wide range of university courses

Increase knowledge and awareness
of mathematical techniques and their applications

Stimulating and challenging courses

A global perspective

Post-16 Mathematics options

AS/A level Mathematics

AS/A level Further Mathematics

Level 3 Core Maths

A level Statistics

Which should you choose?

What are the options?

AS/A level Mathematics	Extends GCSE Maths and introduces new ideas
AS/A level Further Mathematics	An additional A level to add breadth/depth
Level 3 Core Maths	Develops maths skills and knowledge to focus on applied problem solving
A level Statistics	Focuses on data analysis and statistical techniques

What is Core Maths?

Versatile qualification equal in size to an AS level

Supports the maths in other courses

Interesting, engaging and relevant to the world we live in

Maths of life and the workplace

Excellent preparation for university

A course that develops valuable mathematics skills

For any student with at least a GCSE Mathematics grade 4

Main Content of Core Maths

- Financial Maths
- Statistics & Probability
- Critical Analysis
- Modelling (spreadsheets)
- Estimation

What is Core Maths like?

How much domestic water does the UK require every year?

A new teacher earns £23,000 per year, has no student loans, and pays 7.4% of their salary into a pension scheme. What is the teacher's net monthly salary after tax and national insurance contributions?

A genetic disease occurs in one in every 10,000 people. A test for the disease is accurate 98% of the time. If you are tested and the result is positive, what are the chances of you actually having the disease?

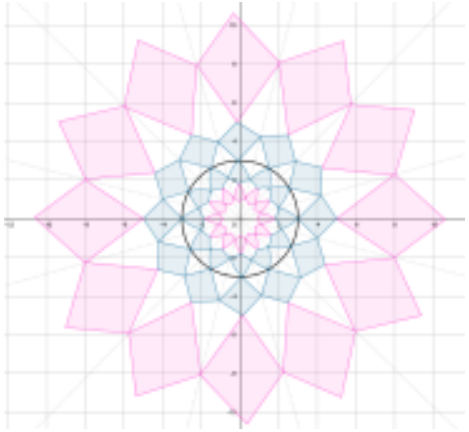
The speed of cars driving down a road with a speed limit of 50mph is recorded. The mean speed was 47mph and the standard deviation of the speeds 5mph. What percentage of the cars were breaking the speed limit?

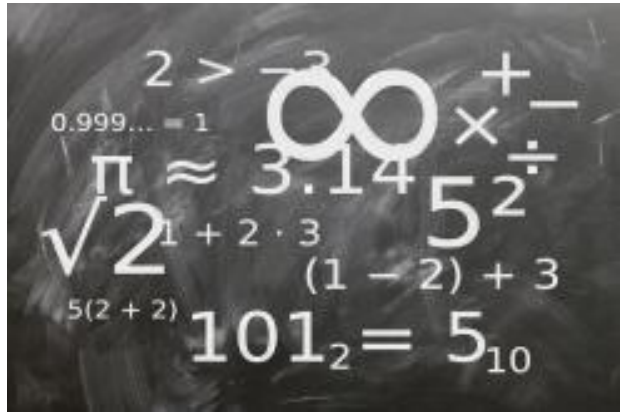
What is in AS/A level Mathematics?

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

What is Pure Mathematics?

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





What is Pure Mathematics?

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

The points A and B have coordinates (4,-2) and (10,6) respectively.

Find the equation of the circle that has AB as a diameter.

What is Statistics?

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

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

What is the probability of two '100 year floods' happening within the space of 5 years?

What assumptions have you made?

What is Statistics?

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

Professor Sir Adrian Smith

What is the probability of two '100 year floods' happening within the space of 5 years?

What assumptions have you made?

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.

Particularly useful for careers in physics or engineering

What is Mechanics?

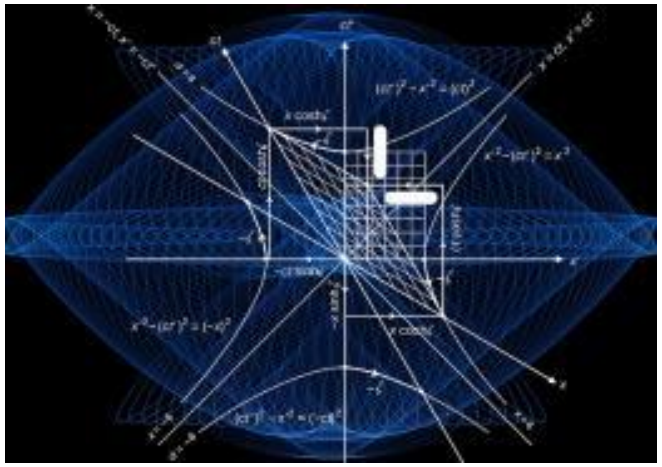
The modelling of the world around us, the motion of objects and the forces acting on them.

A golfer drives their ball from a tee on horizontal ground so that it has an initial velocity of 50ms^{-1} at an angle of 40 degrees above the horizontal.

How far down the fairway will the ball land?

What is Further Mathematics?

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



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

What is in Further Mathematics?

AS level

Pure Mathematics	Additional Pure, Statistics, Mechanics or Decision Mathematics

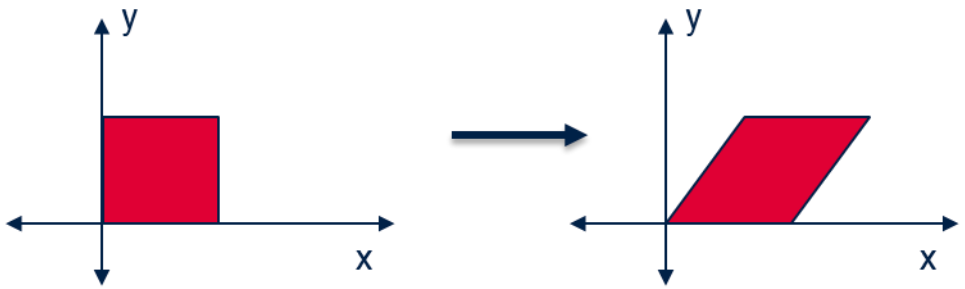
A level

Pure Mathematics	Additional Pure, Statistics, Mechanics or 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 $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$. They can be used to solve sets of simultaneous equations and to represent transformations such as the shear shown in the diagram below.



$$\sqrt{-1} = i$$

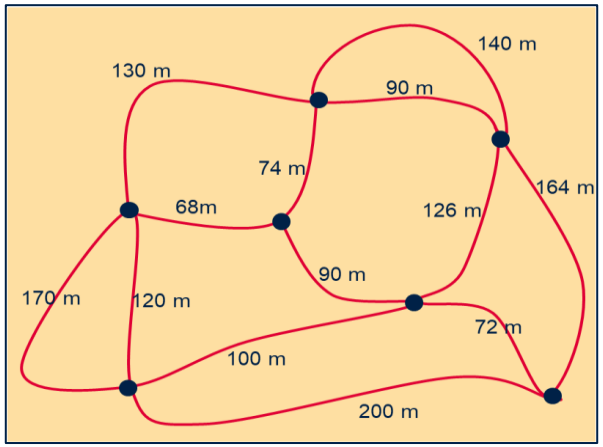
$$a + bi$$

Real part Imaginary part

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 on the left.

What is Discrete/Decision Mathematics?

Many of the problems in Discrete maths involve Optimisation i.e. finding an efficient solution

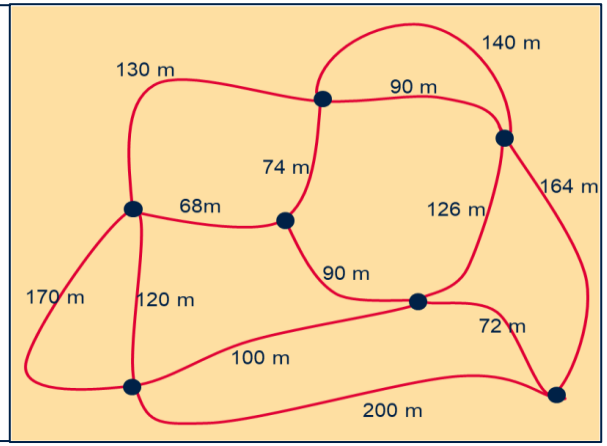


Methods are applicable to many real world situations.

What is Discrete/Decision Mathematics?

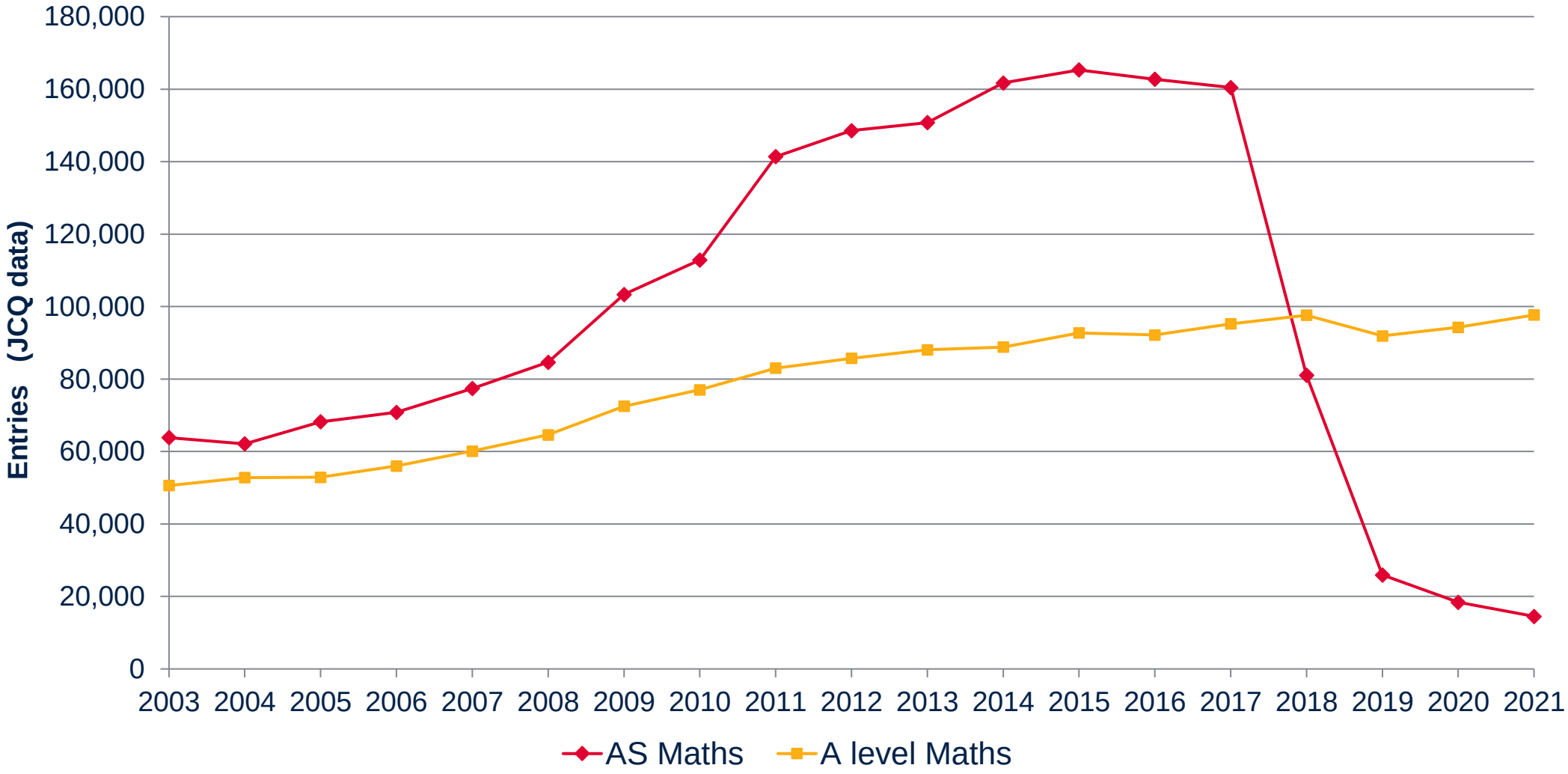
Many of the problems in Discrete maths involve Optimisation i.e. finding an efficient solution

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

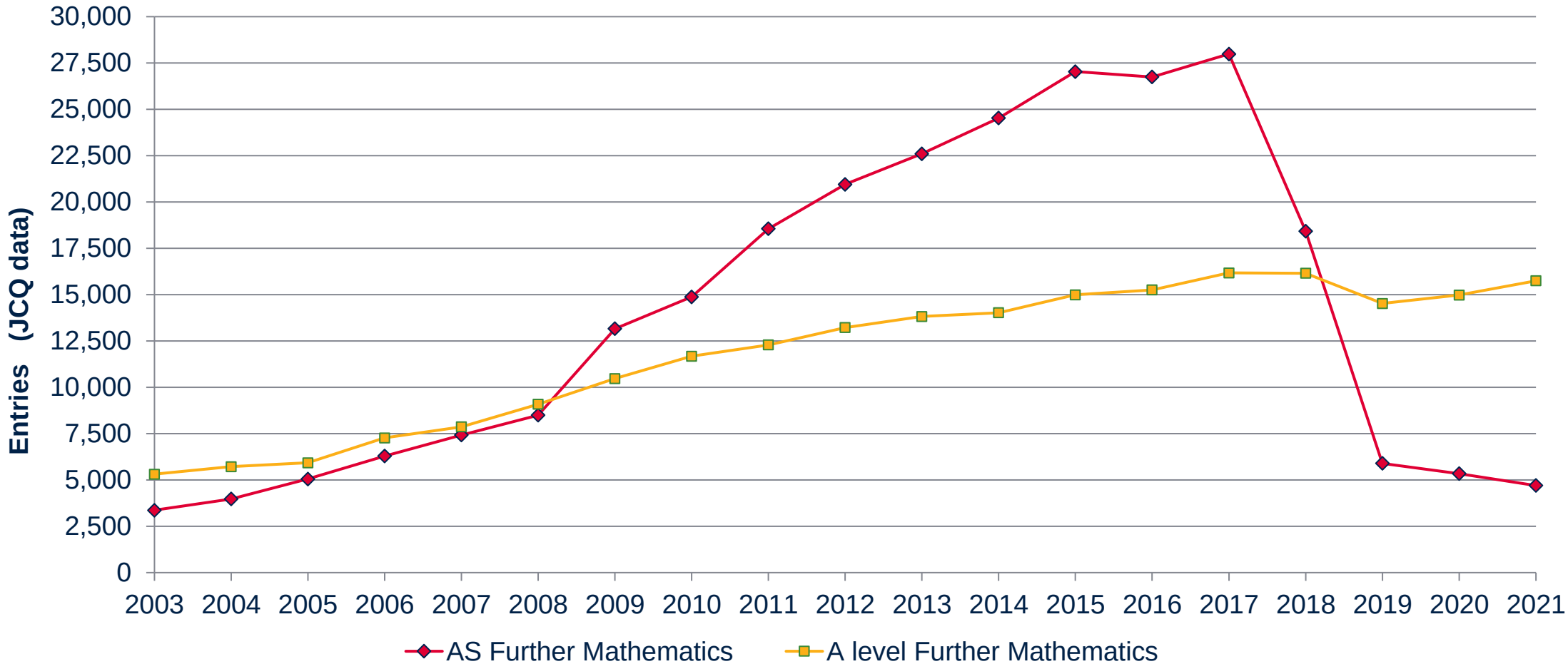


Methods are applicable to many real world situations.

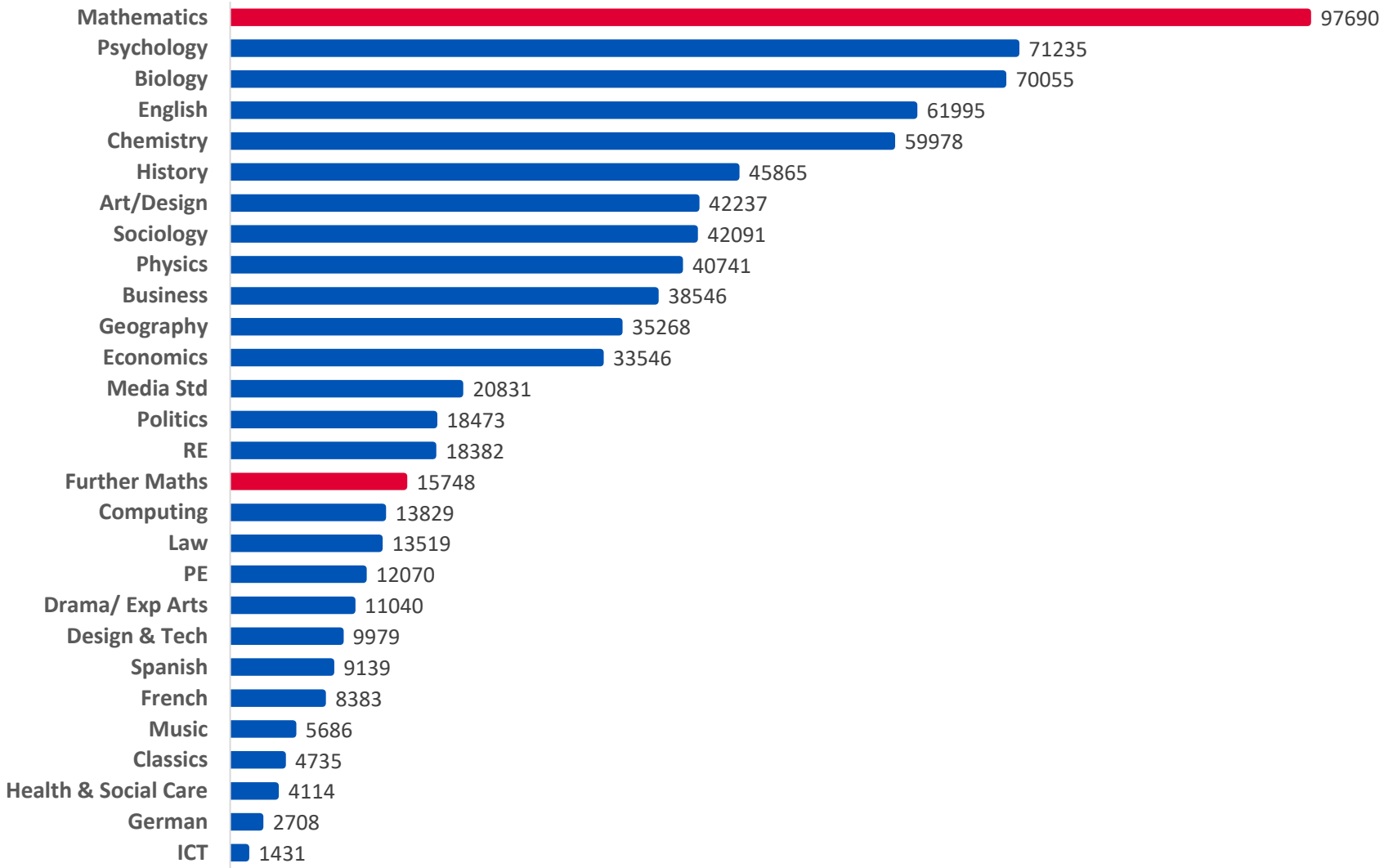
A and AS level Mathematics entries in the UK 2003-2021 (JCQ data)



A and AS level Further Mathematics entries in the UK 2003-2021 (JCQ data)



2021 UK A level entries by subject (JCQ data)



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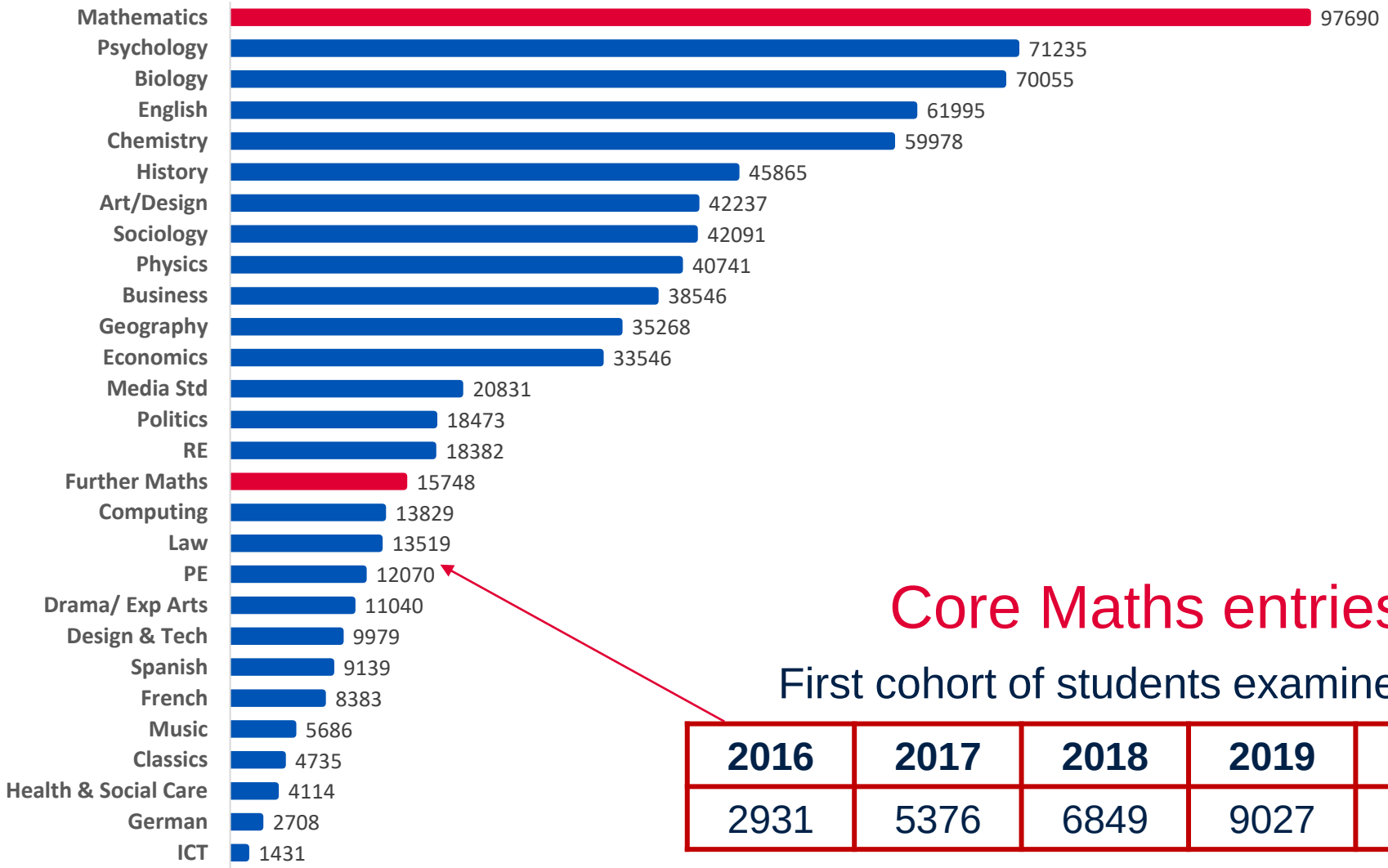
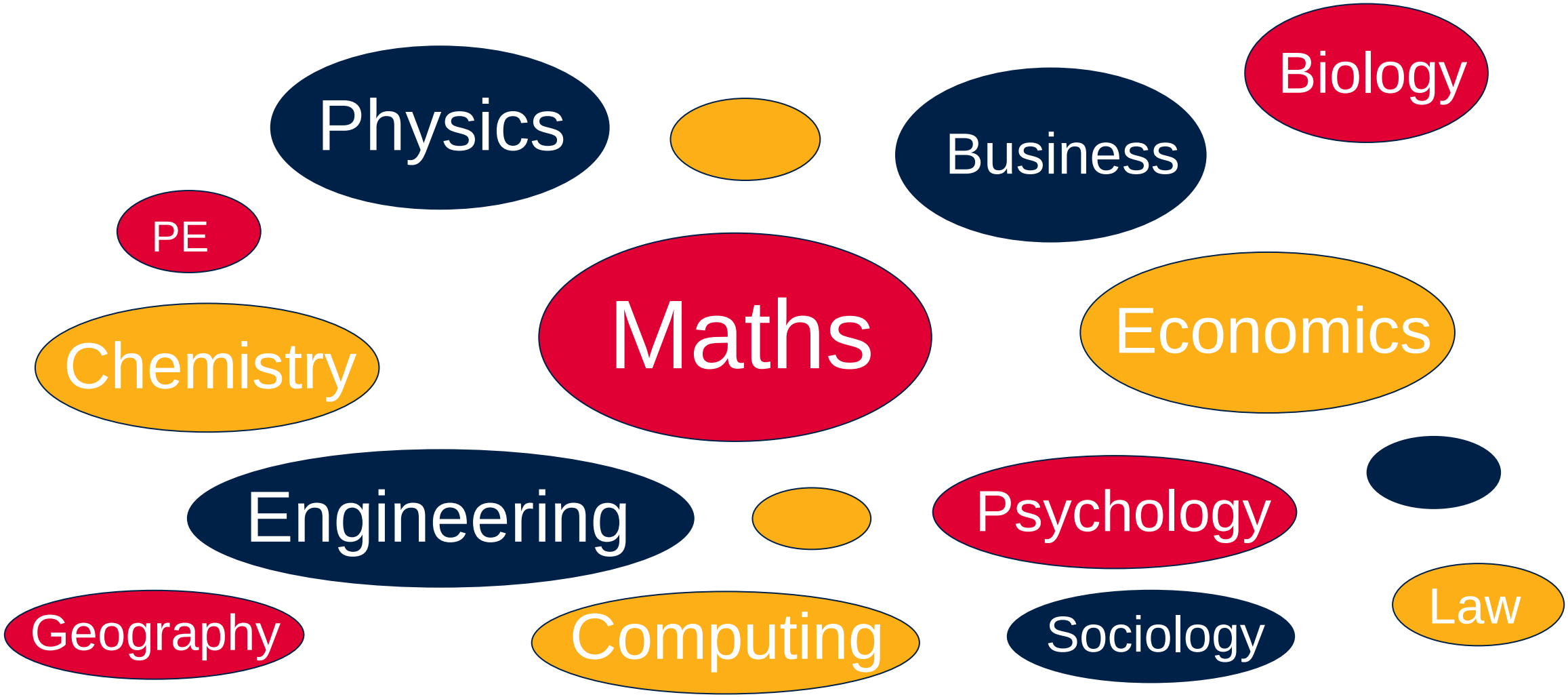


Core Maths entries

First cohort of students examined in 2016

2016	2017	2018	2019	2020	2021
2931	5376	6849	9027	11792	12116

Many subjects use maths

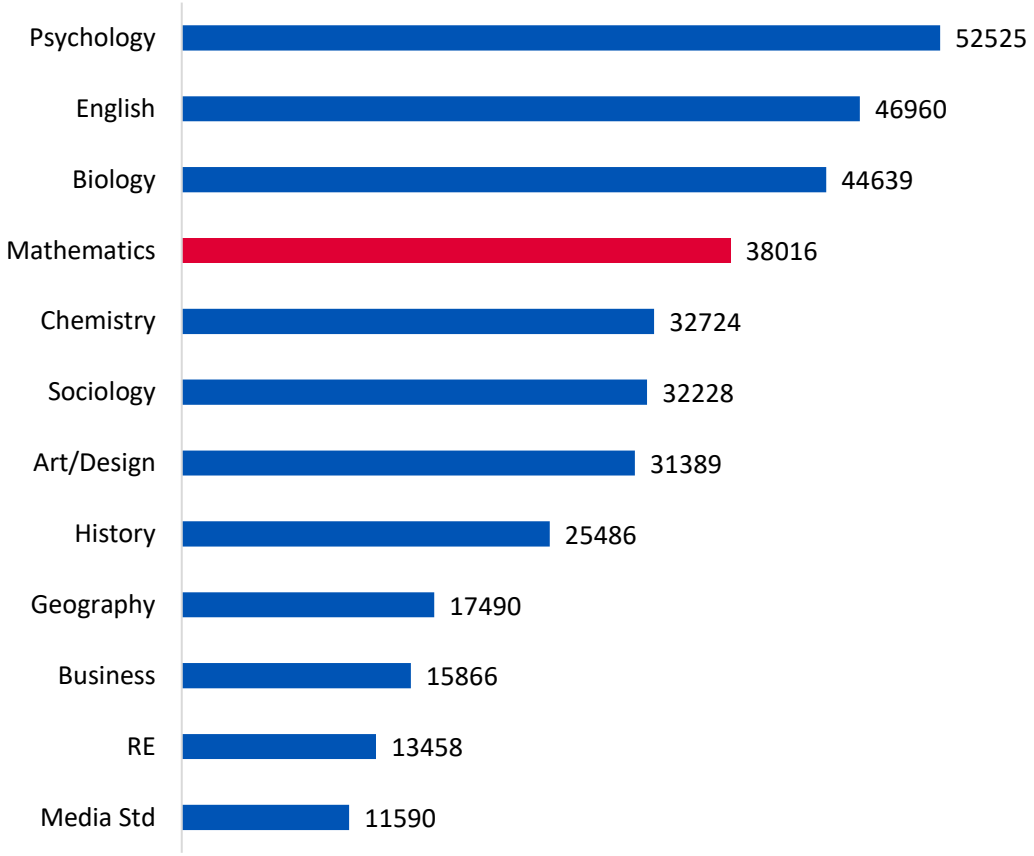


Maths content in other A levels

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

Top A level subjects for females in the UK in 2021



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

Maths is the fourth most popular A level for girls.

47% of the Level 3 Core Maths cohort are female

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

Michael Turner, JCQ's Director General

What are the career opportunities?

Career myths

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

You only do a mathematics degree to become a mathematics teacher.

Most careers that require A level Mathematics are male-dominated.

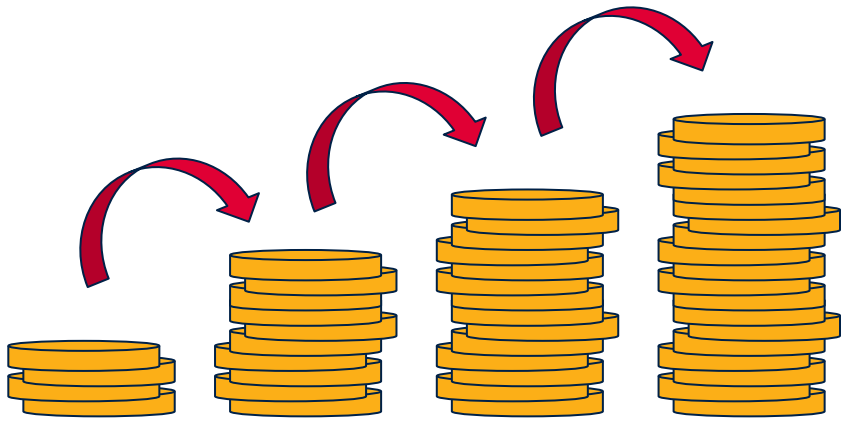
Further Mathematics is an A level just for students who want to become engineers or physicists

"Quantitative skills are required in a wide range of occupations and activities, embracing not only the mathematical and physical sciences but also the social sciences, the humanities and the creative arts. Mathematics is now intrinsic to some aspects of the creative arts… and learned societies argue that students across the sciences, social sciences and humanities need significant quantitative skills, and these should be a central component of their education."

Professor Sir Adrian Smith

Source: Review of Post-16 Mathematics

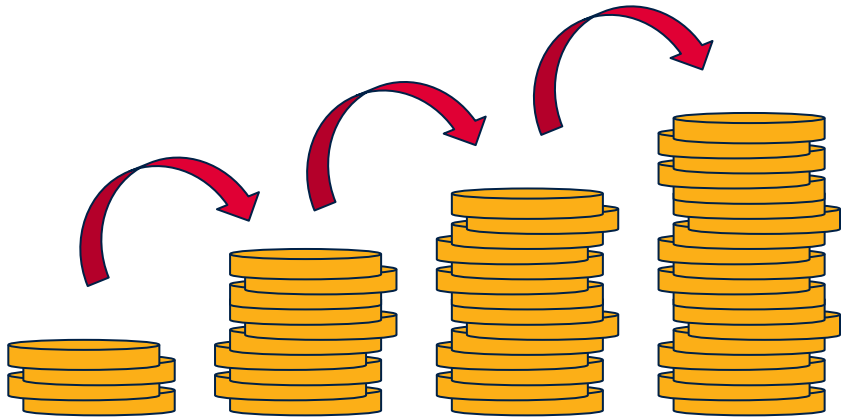
What are the career opportunities?



"…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."

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

What are the career opportunities?



PUTTING A PRICE ON EXAMS

Average salary six years on, by subject taken at A-level

Further maths	£25,500	**Chemistry**	**£21,600**
Maths	**£22,500**	P.E.	£20,400
Physics	£23,700	**French**	**£19,900**
Computing	**£22,500**	History	£19,400
Business Studies	£21,000	**English Literature**	**£19,200**
Geography	**£20,900**	Sociology	£18,300
Biology	£20,600	**Art and Design**	**£16,800**

https://www.gov.uk/government/publications/post-16-education-earnings-outcomes-for-level-3-achievements

Careers using maths

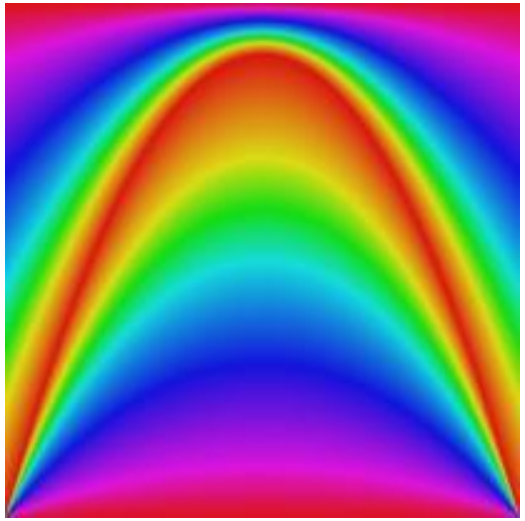
Applications of mathematics in technology:

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

Careers using maths

On-going applications in engineering, such as:

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



Careers using maths

New scientific processes such as:

- Modelling populations
- Modelling 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?

Degree-equivalent qualifications

A levels or equivalent required for entry

The employer covers the cost.

You are paid a salary while you study

Popular alternative to a degree at university.

Mathematics is desirable for many apprenticeships

Examples include:

- Actuarial
- Software Engineering
- Data Science
- Quantity Surveying

Exemplar Entry Requirements

Civil/Structural Engineering Degree Apprenticeship

3 A levels at grade A* to C including Mathematics

UCAS.com, September 2021

BSc Computer Science with Digital Technology Partnership - Degree Apprenticeship

AAA Grade A in A level Mathematics required

PwC, September 2021

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.

Students applying to study a degree in a STEM subject should also consider taking Further Mathematics, to at least AS level, alongside A level Mathematics.

According to research by UCL, students with an A level in Mathematics are more likely to attend a Russell Group university ....

A level Maths and degree courses

Degree subject category	% of accepted students with A levels who have studied A level Maths
Mathematics (G1)	100%
Physics (F3)	99%
Chemical, Process and Energy Engineering (H8)	98%
Mechanical Engineering (H3)	93%
Pre-clinical medicine (A1)	75%
Economics (L1)	70%
Computer Science (I1)	57%
Chemistry (F1)	34%

A level Further Maths and degrees

Degree subject category	% of accepted students with A levels who have studied A level Further Maths
Mathematics (G1)	65%
Physics (F3)	38%
General Engineering (H1)	28%
Mechanical Engineering (H3)	26%
Chemical, Process and Energy Engineering (H8)	17%
Computer Science (I1)	16%
Economics (L1)	11%
Chemistry (F1)	8%

A level Maths opens doors to leading universities

Taking maths at A-level is more helpful for landing a place at a Russell Group university than studying at a grammar or private school, research from University College London's Institute of Education suggests. There is even a maths premium for degree subjects that are not directly related to maths or which require a different skillset, such as languages and humanities.

Source: https://schoolsweek.co.uk/a-level-maths-is-more-useful-for-top-university-places-than-private-school

Exemplar Entry Requirements

ABB including Maths at A **or**

ABC if taking both A level Mathematics and Further Mathematics (Maths at A and Further Maths at B)

University of Kent 2021 entry

A*A*A - Mathematics, Further Mathematics and one other subject. Also, Grade 1 in STEP II and III.

Cambridge University 2021 entry

CCE including Mathematics (typical offer)

London Metropolitan University 2021 entry

Exemplar Entry Requirements

ABB-BBB to include Maths.

Swansea University (Chemical Engineering degree), 2021 entry

AAB including Mathematics and either Physics, Electronics, Further Mathematics or Chemistry.

Manchester University (Electrical & Electronic Engineering degree), 2021 entry

BCC including Mathematics and one other Science at grade C or above.

Northampton University (Mechanical Engineering degree), 2021 entry

Exemplar Entry Requirements

AAB - 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), 2021 entry

ABB-BBB including grade B in Maths.

Reading University (Meteorology and Climate degree), 2021 entry

BBC to include a grade B from A Level Maths and Physics

University of Lincoln (Physics degree) 2021 entry

Exemplar Entry Requirements

ABB. One science A level required, two science A levels preferred and may lead to a lower offer. (List of sciences includes Mathematics and Further Mathematics)

Liverpool University (Psychology degree), 2021 entry

A*AA. Applicants must have achieved an A in A level Maths

University of Warwick (Economics degree), 2021 entry

University entry requirements

Look at the entry requirements on an individual university's website for the degree subjects that you might be interested in

In some cases **a qualification in Core Maths or or A level Mathematics/Further Mathematics will reduce the grades required for entry** to a degree course in a related subject

Visit www.ucas.com for additional information

Exemplar University Alternative Offers

Typical offer A level	Alternative offer A level
A*AA	AAA
AAA or A*AB	AAB
AAB	ABB

- Applies to all degrees that **do not require** A level Maths
- For students achieving a **grade B** in **Core Maths**
- Or grade B in AS or A level Maths or AS or A level Statistics if studied in addition to 3 subjects.

Courses: Architecture, Business Courses, Biosciences, Chemistry, Pharmacy, Education, Health and Sport degrees, Languages, Politics, Psychology, and Social Sciences

Exemplar University Alternative Offers

Typical offer A level	Alternative offer A level
A*AA	AAA
AAA or A*AB	AAB
AAB	ABB

- Applies to degrees that **require** A level Maths
- For students achieving a **grade B** in **AS or A level Further Maths**

Courses: Civil, Chemical, Mechanical and Electrical Engineering, Computer Science, Physics, Economics and Accounting & Finance

The University of Sheffield

If we offer you a place on certain courses with a GCSE Maths requirement, and you're taking a Core Maths qualifications, we'll make you an alternative offer equivalent to one A Level grade below the standard entry requirements for your course, subject to you achieving a specific grade in Core Maths.

Taken from https://www.sheffield.ac.uk/undergraduate/apply/access#

The University of Sheffield

BSc Psychology: AAB including 1 specified science, or ABB, including 1 specified science + A in Core Maths

BSc Quantitative Social Sciences: ABB or BBB + B in Core Maths

BA Architecture: AAA with at least one acceptable subject, or AAB with at least one acceptable subject + B in Core Maths

BSc Biomedical Science: AAB, including two science subjects, or ABB, including two science subjects + B in Core Maths

The University of Sheffield

If we offer you a place on certain courses with an A Level Maths requirement and you're taking AS or A Level Further Maths, we'll make you an alternative offer equivalent to one A Level grade below the standard entry requirements, subject to you achieving a specific grade in Further Maths.

Taken from https://www.sheffield.ac.uk/undergraduate/apply/access#

The University of Sheffield

BSc Chemistry: AAB including Chemistry, or BBB, including Chemistry + B in a EPQ, or ABB, including A in Chemistry + A in Further Maths

BEng Aerospace Engineering:

AAB, including Maths and a science, or ABB, including Maths and a science + B in a relevant EPQ, or ABB, including Maths and a science + A in AS or B in A Level Further Maths

The University of York

If you achieve B or higher in Core Maths, you may be eligible for an alternative offer up to one A level grade (or equivalent) below our typical offer.

This applies to a wide range of courses including

Biology, Business and Management, History of Art, Midwifery Practice, Music, Philosophy, Social Work

My child loves maths. Is there any more they could be doing?

Take Further Mathematics at AS or A level

Tackle problems on the NRICH website

Subscribe to the new AMSP SUMS magazine

Study for additional qualifications in mathematics such as STEP, TMUA or the MAT, which are required for entrance to some leading universities to study mathematics.

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

Nrich www.nrich.org.uk

About the AMSP

- A government-funded initiative, managed by MEI, providing national support for teachers and students in all state-funded schools and colleges in England.
- It aims to increase participation in AS/A level Mathematics and Further Mathematics, and Core Maths, and improve the teaching of these qualifications.
- Additional support is given to those in priority areas to boost social mobility so that, whatever their gender, background or location, students can choose their best maths pathway post-16, and have access to high quality maths teaching.

Contact the AMSP

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amsp.org.uk

Advanced_Maths