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Why study mathematics

- A Level mathematics is a much sought-after qualification for entry to a wide variety of full-time courses in higher education. There are also many areas of employment that see a Mathematics A Level as an important qualification and it is often a requirement for the vocational qualifications related to these areas. An AS in mathematics is very valuable as a supporting subject to many courses at Advanced GCE and degree level, especially in the sciences, computing, geography, psychology, sociology and medical courses.
- Careers or higher education courses that desire mathematics qualifications include economics, medicine, architecture, engineering, accountancy, teaching, psychology, physics, computing, and information and communication technology.
- People entering today's most lucrative industries, such as IT, banking and the stock market, need to be confident using mathematics on a daily basis. To be sure of this, many employers still look for a traditional mathematics A-level qualification. Researchers at the London School of Economics have found that people who have studied mathematics can expect to earn up to 11% more than their colleagues, even in the same job!

About studying mathematics

- Mathematics at AS and Advanced GCE is a course worth studying not only as a supporting subject for the physical and social sciences, but in its own right. It is challenging but interesting. It builds on work you will have met at GCSE, but also involves new ideas produced by some of the greatest minds of the last millennium. While studying mathematics you will be expected to:
 - Use mathematical skills and knowledge to solve problems.
 - Solve problems using mathematical arguments and logic. You will also have to understand and demonstrate what is meant by proof in mathematics.
 - Simplify real-life situations so that you can use mathematics to show what is happening and what might happen in different circumstances.
 - Use the mathematics that you learn to solve problems that are given to you in a real-life context.
 - Use technology to enhance your learning and application of the subject

What will it be like?

- Mathematics involves the evolution of theory to devise techniques to solve numerical problems. The subject is correctly seen as subtle, challenging and rewarding. At AS and A2 level the subject is split into pure and applied mathematics modules. All courses require you to study pure or core (C) components. There are also applied mathematics modules covering statistics (S), mechanics (M) and decision theory (D).
- Pure mathematics includes topics already met at GCSE level such as trigonometry, geometry and algebra. These topics are taken to a more advanced level and the discipline of calculus is also introduced.

- Mechanics consists of topics perhaps previously associated more with physics than with mathematics. Students learn about forces, motion, and static equilibrium.
- Statistics is a study of the collection, organisation, presentation, and analysis of data from real life problems. The aim is to model for future outcomes using probability theory.
- Decision theory is the study of algorithms, networks, optimisation, sorting and matching problems. It is highly applicable to computer science and business. You will learn how to make optimised decisions and to computerise tasks in a variety of applications.

Compared to GCSE

- A Level mathematics is naturally more challenging than GCSE. Skills that used to be regarded as difficult questions in their own right in GCSE will soon be regarded as basic tools needed to solve problems with. Many of the key ideas studied in GCSE will be continued and developed, with the addition of some brand new concepts. The most important change from GCSE is a need to be very confident and accurate in your use of algebraic techniques. If these skills are not secure then it must be the first thing to address before you can progress comfortably with the course.
- Pupils will also be expected to work more hours each week on their mathematics and spend more time studying outside of class, but this will be the same for all A Level subjects.

How do I succeed?

- The simple answer is that it will take hard work. You will need to keep up with all work set.
- In previous years students who did not keep up with work did not perform as well.
- There is always support available. You must make use of it. Speak to your teacher if you feel you are not coping, or that you require more help. We will help you!

Next steps

Whatever your plan, an A-level (or equivalent) in maths will impress both prospective employers and university admission tutors. It shows you can think logically, accurately process information, and skilfully manipulate numbers.

Thinking of going straight into employment?

- Employers look for hard-working, self-motivated, and intelligent people to join their staff. Obtaining a maths A-level shows that you have what it takes. You may not use algebra or probability in your job every day, but the transferable skills of analysis, logic, and problem solving will always come in handy.

Thinking about university?

- Some degree subjects like physics and engineering ask for a maths A-level as part of the entry requirements. Others such as medicine and architecture don't make it a necessity, but they still have a decent amount of mathematical content. If you go in with a maths A-level, you'll have a much easier time than those who don't.

Thinking about a maths degree?

- If you've decided to study maths at university, there's great news: qualified mathematicians are always in demand. If you wish to apply to Oxford, Cambridge or Imperial universities you may be required to complete an entrance exam. They are very hard so you will need to spend several months preparing.
- The modern world needs mathematicians. Maths and science are required for the continued development of our increasingly technological lives. The UK's knowledge economy needs more mathematical skills for the financial, communication, transportation sectors and areas like genome modeling etc. Without mathematicians, we'd be in trouble!

Thinking about teaching maths?

- You might be close to finishing your secondary education, but there are thousands of 11-year-olds just starting each year. They need someone to teach them maths, and it could be you. After completing a maths degree you can go on to train as a teacher and government incentives mean that maths teachers are generally paid more than any of their colleagues. There is also currently the chance to claim a tax free £25,000 bursary.

Thinking about earning more?

- It's not just maths teachers that earn more - a maths degree is a great investment, whatever career you choose. On average, a graduate of any degree can expect to earn around £129,000 more in their lifetime compared to a person leaving education with two A-levels. For maths and computing graduates this figure rises to over £220,000!
- With all of the opportunities a maths qualification can offer, you probably want to learn a bit more about where it can take you. The Maths Careers website is full of useful advice and fantastic career profiles, so have a look around to find out what maths can do for you.

More information can be found at

<http://www.mathscareers.org.uk/>

Studying mathematics at Kingsdale foundation school

Some key points to remember when studying maths;

- You will be provided with a folder, writing pad and file dividers. You must bring them every lesson and keep them organised. You must supply your own paper refill pads.
- Keep notes from every lesson. This will often be in the form of model answers with annotation. If you are unsure what should be written down and when, then ask your teacher. These notes should be kept neat and organised in your folder. Your teacher will periodically check these.
- Mark all your work before moving on. Any mistakes should be annotated with corrections and explanations.
- A scientific calculator is sufficient for the course but some of you may wish to think about getting a graphic calculator especially if you are considering a degree course with a high percentage of mathematical content, e.g. mathematics, physics, economics.
- You should expect to spend at least as much time studying mathematics outside lessons as you do in lessons (5 hours). This will need to increase if you are having difficulties with a particular topic.
- If you are having difficulties with homework, go and see the teacher **before** the lesson.
- Be persistent! Try a question, if you get it wrong - try again. If you still get it wrong get help from any member of the faculty. If you can't get started, look back through your notes and the examples in the textbook. There are many online resources that can also help.
- If you miss a lesson due to illness you should aim to catch up as soon as possible, ideally before your next mathematics lesson. Copy any notes or examples and work through any questions on your own. Ask your teacher for help if necessary.
- If you know in advance that you need to miss a lesson you should first gain permission from your mathematics teacher and then agree an action plan for catching up any missed work.
- If you are really struggling, talk to your teachers. Don't just hope for the best; get some help!
- Do you know your Fermat from your Leibniz? Take an interest in mathematics; the more you discover the more interesting it gets!

If in doubt talk to your teachers - they are nice, helpful people!

Brief course overview

You will follow the Edexcel exam board for mathematics. The courses are split into three modules in year 12 and an additional three modules in year 13

A Level Mathematics

Year 12	Core Mathematics 1 (C1) and 2 (C2) algebra, coordinate geometry, sequences and series, polynomials, differentiation, integration and graph sketching, factor theorem, trigonometry and logarithms.	Statistics 1 (S1) numerical measures, data representation, probability, correlation, regression, discrete random variables and normal distributions.
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Year 13	Core Mathematics 3 (C3) natural logarithms, functions, algebraic fractions, further differentiation and solving equations using numerical methods.	Core Mathematics 4 (C4) partial fractions, trigonometry, parametric equations, vectors, further integration and differential equations.	Mechanics 1 (M1) equations of motion, dynamics and statics of a particle, moments and vectors.
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A Level Further Mathematics

Year 12	Further Pure 1 (FP1) Complex numbers, solving non-standard equations, parametric equations, matrices, series, proof by induction	Decision 1 (D1) Algorithms, networks, critical path analysis, linear programming, matching algorithms	Decision 2 (D2) Transport problems, allocation problems, further linear programming, game theory, network flows, dynamic programming
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Year 13	Further Pure 2 (FP2) Further complex numbers, differential equations, Maclaurin and Taylor series, polar coordinates	Further Pure 3 (FP3) Hyperbolic functions, the conics, differentiation and integration of hyperbolic functions, vectors in 3D, matrices in 3D	Mechanics 2 (M2) or Statistics 2 (S2) We will discuss which module we will take with the group to ensure we do the most suitable course
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Programme of study

Year 12 Core

Autumn term 1	Course Introduction and general GCSE review Initial assessment Algebra - Indices, surds, quadratics, identities, algebraic manipulation Algebra - remainder theorem and factor theorem Logarithms Binomial sequences
Autumn term 2	Exam week Graph Sketching and graph transformations Equations of straight lines Equations of circles Trigonometry - sine rule, cosine rule, identities and equations Radians and applications Trigonometry graphs
Spring term 1	Differentiation - first principles, basic functions, tangents and normals, stationary points. Integration - basic functions, finding the constant of integration, area under a curve, trapezium rule Exam week
Spring term 2	Differentiation 2 Integration 2 Arithmetic and geometric sequences and series
Summer term 1	Exam preparation
Summer term 2	AS completed, preparation for A2 course Start A2 modules

Year 12 Statistics

Autumn term 1	Summarising data by location - mean, median, mode, frequency tables Summarising data by dispersion - range, quartiles, percentiles, standard deviation Representing data - histograms, stem and leaf, outliers, skew
Autumn term 2	Probability - introduction, independent probability, conditional probability Correlation - scatter diagrams, product moment correlation coefficient
Spring term 1	Regression - equation of the least squares regression line Discrete random variables - expected values, variance, cumulative probability
Spring term 2	Functions of random variables - mean and variance of a linear function of a random variable. Normal distribution - normal distribution model, calculating z values, multiple tail models
Summer term 1	Review Revision and Mock Exams External examinations
Summer term 2	AS completed

Year 13 Core

Autumn term 1	Algebraic fractions, Functions - modulus, transformations, natural log and e Numerical methods for solving equations Trigonometry 1 - identities and reciprocals
Autumn term 2	Exam Week Trigonometry 2 - addition rule, double angles Trigonometry 3 - harmonic addition and inverses Differentiation 1 - Chain rule, product rule, quotient rule, trigonometry, logs
Spring term 1	Differentiation 2 - Chain rule, product rule, quotient rule, trigonometry, logs Exam Week Partial fractions Parametric equations
Spring term 2	Binomial expansion Differentiation 3 - implicit, exponentials, connected rates of change and differential equations Vectors - definitions, 3D, scalar product, dot product, equation of a line
Summer term 1	Integration - reverse chain rule, by parts, by substitution, trigonometry, volume of revolutions, solving differential equations Exam preparation
Summer term 2	External examinations Course completed

Year 13 Mechanics

Autumn term 1	Introduction to modelling Kinematics Dynamics 1
Autumn term 2	Exam Week Dynamics 2
Spring term 1	Statics Exam Week Moments 1
Spring term 2	Moments 2 Vectors
Summer term 1	Review Revision Mock Exams External examinations
Summer term 2	Course completed

*Please note that the above times and dates may change due to unforeseen circumstances.

Assessment

External

Each unit is assessed by a 1½ hour written examination with a maximum of 75 marks allocated. These 75 marks are converted into a maximum of 100 UMS marks (approximately the percentage scored on each paper) and your overall grade is calculated from the table below.

Grade boundaries	Max Mark	A*	A	B	C	D	E	U
AS Mathematics	UMS 300	240	210	180	150	120	0	
A level Mathematics	UMS 600	480	420	360	300	240	0	

An A* grade can be achieved for A2 if a student receives enough UMS marks for an A grade **and** achieves 90 or above UMS marks on their A2 exams.

The exam calendar will be released during the year.

Modules can be re-sit, but due to exams only being available to be sat once per year there are very limited opportunities to do so.

Internal

As well as the external assessment there will be regular internal assessment carried out by your teachers. These will normally come in one of three forms.

1. Regular small assessments at the end of each topic based on past exam questions. These will be approximately 30 minutes and form the majority of your continual assessment. Students will be given warning of these but should expect one after completion of a chapter.
2. Half term assessments based on all topics taught to date in their current modules of study.
3. Full mock papers in the form of past papers. These will be done on completion of modules and during exam preparation.

All internal assessment will follow the same grade boundaries as external assessment;

80% grade A
70% grade B
60% grade C
50% grade D
40% grade E

Assessment schedule*

Year 12

First week in Autumn Term 1	Initial assessment on A/A* GCSE algebra, 45 minutes in class.
First week in Autumn Term 2	Exam week. 1.5 hour exam in exam hall. 1 hour on topics from C1 30 minutes on topics from S1
Spring Term 1	Exam week. 1.5 hour exam in the exam hall. Full C1 paper covering all C1 topics.
Summer Term 1	Full mock papers to be completed for C1, C2 and S1 in exam conditions.

**There will also be regular short topic assessments as mentioned earlier. Your teacher will give you advance notice of these.*

Summer exam timetable

The summer exam period runs from May until June. Your exams could be scheduled anytime in these months.

Recommended reading

While not a necessity for success in the course, some potentially interesting reading;

A History of Mathematics by Carl B. Boyer

Infinity: The Quest to Think the Unthinkable by Brian Clegg

The Man Who Loved Only Numbers by Paul Hoffman

A Brief History of Time by Stephen Hawking

Introduction to Mathematical Philosophy by Bertrand Russell

Fermat's Last Theorem by Simon Singh

A Very Short Introduction to Mathematics by Timothy Gowers

Flatland: A Romance of Many Dimensions by Edwin Abbott Abbott

Journey Through Genius: The Great Theorems of Mathematics by William Dunham

The Simpsons and their Mathematical Secrets by Simon Singh

Useful websites or apps

Please note that some may not be free. These are not essential for the course.

Exam Solutions

www.examsolutions.net

Revision tools. A phone app available.

MyMaths

www.mymaths.co.uk

Homework and revision tools. May not work on tablets or phones.

Username: kingsdale Password: chocolatecake

Math Centre

www.mathcentre.ac.uk

Revision and learning tools.

Maths Careers

www.mathscareers.org.uk

More information on what careers mathematics can lead to.

Edexcel

qualifications.pearson.com/en/qualifications/edexcel-a-levels/mathematics-2008.html

Course information for A Level Mathematics and A Level Further Mathematics.

Wolfram Alpha

www.wolframalpha.com

A 'computation engine' for solving many types of problems. An app is also available.

Desmos

www.desmos.com

A graphing app for plotting all types of equations.

Geogebra

www.geogebra.org

A geometry program that allows you to explore all kinds of geometry as well as algebra and graphs.