OKEHAMPTON COLLEGE

Introduction to A-Level Mathematics & Further Maths

Mathematics
A Level

You will study various topics under the headings of **pure maths** (including algebra, trigonometry, geometry, graphs, sequences and series), **mechanics** (including vectors, kinematics, forces), and **statistics** (including data handling, hypothesis testing, probability).

How is the course assessed?
The A-level course is assessed by 3 written exams at the end of Year 13.
Each paper is worth one third of the course, 100 marks and 2 hours.
Paper 1 – Pure Maths only
Paper 2 – Pure Maths and Mechanics
Paper 3 – Pure Maths and Statistics

What skills will I need and develop in this course?
The study of A-level Maths (and Further Maths) teach you to think logically and systematically, transferable skills that you will develop through problem solving and the application of mathematical knowledge and methods.

You will build upon your knowledge and skills from GCSE, hence the need for at least grade 6 at GCSE (grade 7 preferred) for A-level Maths (grade 8 for Further Maths).

What can the course lead to in terms of higher education and future careers?
Maths is known as a facilitating subject – even if you don't want to study maths at university, the skills that you will develop during the A-level are so useful in other subject areas, that it will often be included in the lists of desirable A-levels for other degree courses. Careers using maths are many and varied, and a Maths A-level may also give you the edge when competing for jobs that don't specifically need mathematical knowledge, due to the importance that some employers place on the skills of logical thinking, problem solving and being able to follow processes.

Possible careers include:

Why is Mathematics a useful subject to study?

If the information above hasn't convinced you, consider these modern quotes about maths!

"Maths is the language in which the universe is written. It's innate to the human brain and is a spectacular thing that we've discovered/invented" **–Dara O Briain – Comedian and Television Presenter**

"The only way you are going to have success is to have lots of failures first" **–Sergey Brin, Maths Graduate and founder of Google**

"Maths is the lifeblood of good MoneySaving, helping you understand when you're getting a good deal and when you're being ripped off." **–Martin Lewis, Money Saving Expert**

"If you stop at general math, you're only going to make general math money" **–Snoop Dogg**

"I took a lot of math classes in college" **–Bill Gates, Founder of Microsoft**

"Maths is the only A level proven to increase earnings in later life – by an average of 10%"- **Elizabeth Truss – Politician**

"Maths is becoming ever-more important to the economy" **– Elizabeth Truss – Politician**

Preparing for A-level Maths

To help you prepare for your studies next year it is really important that your GCSE skills are strong and fluent. The majority of these skills will be used frequently at A level so fluency and accuracy really are key. Please follow the following steps.

1. Log on to this site https://amsp.org.uk/resource/gcse-alevel-transition-resources and watch the 'Guidance on using these resources' video. Then start to work through the sections – each section also includes a skills check which will supplement the diagnostic test that you completed first. Please ensure that you keep all your written notes and worked questions altogether so you can bring them with you in September to show your teacher.
The 'extra ideas' section has some really interesting articles to work through and whilst they would be useful and thought provoking for everyone, **if you are also taking Further Maths at either AS or A Level it would be extra useful**.

2. If extra practice is needed then there are some excellent A Level Transition videos made available on YouTube by Hegarty Maths.
https://www.youtube.com/user/HEGARTYMATHS/videos
These videos can be used to help strengthen your general GCSE knowledge prior to A-Level Maths but at the very minimum pick and choose any topics with which you feel less confident.

3. You were also given the CGP book – Head Start to Maths – again lots of practice questions so use wisely to ensure you are ready for the challenge of A Level maths in September.

4. Finally, complete the 7 questions at the back of this booklet. **We will intend to peer review this test during our first lesson, so do be sure to bring it with you!**

Calculators

- The A-level course (and exam) assumes that you have access to more advanced calculators than we have needed at GCSE. In September we will give you the opportunity to buy the recommended calculators at a reduced price (only available to schools). **(Therefore you do not need to buy your calculator before term starts)**
- If you know any of the Year 13 leavers, you may wish to ask if they would like to sell their calculator to you!
- The recommended calculators together with the 2019 school prices that we were able to obtain are shown below:

HIGHLY RECOMMENDED		ALTERNATIVE MODELS
Scientific		**Graphical**
Casio fx-991EX	£18.25	**(slightly older/reduced functionality/B&W display)**
Graphical – colour display		Casio fx-9750GII
Casio fx-CG50	£71.00	Casio fx-9860GII

You need to be aware of the following things for September onwards!

Ways of working
- Generally your teacher will introduce you to a topic and give you an example or two, demonstrating the method and workings – you are probably advised to make a copy of this!
- You may then get a chance to practise in lessons, but will also need to complete further practice from the exercises in your own time. (Reckon on at least an hour outside lessons for each hour in class – but see the note below about the importance of each module.)
- You must bring your textbook and calculators to every lesson.
- You will need a graphical calculator and are also advised to upgrade from your GCSE calculator. We will give you advice and an opportunity to purchase these through the college in September.

All topics are important
- Remember that although pure maths topics make up the majority of the course, your A-level exam will contain questions from all areas and the applied topics will make up one-third of your overall grade.

Written work
- The answers are in the back of the textbook. You are expected to regularly check your own work and **physically mark** it to show that you have done so. This way, if necessary, you can quickly identify when you are going wrong and correct your work or get help.
- NB: Thorough and clear workings really are essential and you will **not** get full marks in the exams without them – in some cases you won't get any marks if you don't show certain stages!
- Your teachers will set regular topic reviews and assessments so that you can receive feedback on your workings and identify areas which need even more work.

Other suggestions:
- Keep notes pages and practice work separate.
- Use a highlighter, colours or boxes to make important formulae and information stand out.
- Keep a smaller folder for carrying current work.
- Make your own formulae/methods notebook for quick reference during revision.

Probationary period

As with all A-Level courses it is important that all students pass a **probationary period** to ensure their suitability for the course. To ensure that you pass this probationary period you must:

- Gain the GCSE entry grades (5 or more Level 5s including at least grade 6 in Maths)

- Keep up your maths skills by completing the summer tasks

- Complete the 7 questions in the 'Summer Tasks' section of this booklet to an appropriate standard.

- Pass the Introductory test to be held in October.

Summer Tasks – A-level Maths
(Please see back of booklet for Further Maths information)

In preparation for September:

Set up a method for organising your notes.
- Your work should be separated into chapters.
- This is best done by filing A4 sheets (lined paper) into a lever arch folder with dividers (there are 22 chapters to be covered in Year 12).
- If you want to work in notebooks, A4 will be best (solutions and workings will be longer than you are used to at GCSE). You could use post-its, or similar, to separate chapters and make them easier to find.
- **NB Exercise books are not provided in 6th Form – you are expected to bring your own paper and equipment to each lesson.**

Summer Work checklist	✓
• **Work through the resources on** https://amsp.org.uk/resource/gcse-alevel-transition-resources • Remember to keep your notes and practice work	
• Watch some of the A Level Transition videos made available on You Tube by Hegarty Maths. https://www.youtube.com/user/HEGARTYMATHS/videos	
• Set **up your filing system as described above** – the sooner it is up and running, the more organised you will be from the start.	
• Complete the **Summer Prep Work** – Maths assessment questions at the back of this booklet (on paper) and **bring with you** to your first maths lesson (so bring in on **Day 1** just in case!)	
• **Bring** your **completed** and **marked** practice questions, organised by section, to hand in at the **first maths lesson** (so bring in on **Day 1** just in case!)	

Good luck and welcome to A-level maths!

Any questions please email scarter@okehamptoncollege.devon.sch.uk

Summer Prep Work – Maths Assessment

Here is a selection of exam style questions based on some of the topics that you should have reviewed during the diagnostic test and preparatory work. You will see that all of the questions are broken down into several sections – if you can't do one part, please make sure that you still attempt the others if possible.

Please complete these questions (on paper) and bring your work to the first maths lesson.

Q1.

    (a)   Simplify:

    (i) $x^{\frac{3}{2}} \times x^{\frac{1}{2}}$;

(1)

(ii) $x^{\frac{3}{2}} \div x$;

(1)

(iii) $\left(x^{\frac{3}{2}} \right)^{2}$

(1)

(Part question - Total 3 marks)

Q2.

    (a)   Write down the value of p and the value of q given that:

    (i) $\sqrt{3} = 3^{p}$

(1)

    (ii) $\frac{1}{9} = 3^{q}$

(1)

    (b)   Find the value of x for which $\sqrt{3} \times 3^{x} = \frac{1}{9}$

(2)

(Total 4 marks)

Q3.

(a) (i) Express $\sqrt{18}$ in the form $k\sqrt{2}$, where k is an integer.

(1)

(ii) Simplify $\dfrac{\sqrt{8}}{\sqrt{18}+\sqrt{32}}$.

(3)

(b) Express $\dfrac{7\sqrt{2}-\sqrt{3}}{2\sqrt{2}-\sqrt{3}}$ in the form $m+\sqrt{n}$, where m and n are integers.

(4)

(Total 8 marks)

Q4.

It is given that $x = \sqrt{3}$ and $y = \sqrt{12}$.

Find, in the simplest form, the value of:

(a) xy;

(1)

(b) $\dfrac{y}{x}$;
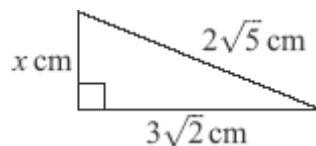
(2)

(c) $(x + y)^2$.

(3)

(Total 6 marks)

Q5.

(a) Express $\dfrac{5+\sqrt{7}}{3-\sqrt{7}}$ in the form $m + n\sqrt{7}$, where m and n are integers.

(4)

(b) The diagram shows a right-angled triangle.

The hypotenuse has length $2\sqrt{5}$ cm. The other two sides have lengths $3\sqrt{2}$ cm and x cm. Find the value of x.

(3)

(Total 7 marks)

Q6.

(a) (i) Express $x^2 - 6x + 11$ in the form $(x - p)^2 + q$.

(2)

(ii) **Use the result from part (a)(i)** to show that the equation $x^2 - 6x + 11 = 0$ has no real solutions.

(2)

(b) A curve has equation $y = x^2 - 6x + 11$.

(i) Find the coordinates of the vertex of the curve.

(2)

(ii) Sketch the curve, indicating the value of y where the curve crosses the y-axis.

(3)

(iii) Describe the geometrical transformation that maps the curve with equation $y = x^2 - 6x + 11$ onto the curve with equation $y = x^2$.

(3)

(Total 12 marks)

Q7.

The triangle ABC, shown in the diagram, is such that AB is 10 metres and angle BAC is 150°.
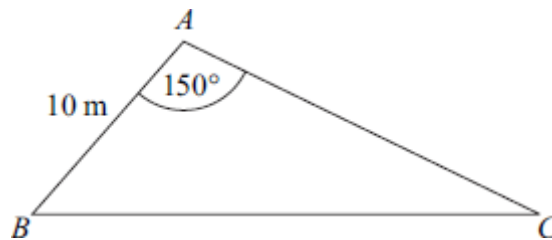
The area of triangle ABC is 40 m².

(a) Show that the length of AC is 16 metres.

(2)

(b) Calculate the length of BC, giving your answer, in metres, to two decimal places.

(3)

(a) Calculate the smallest angle of triangle ABC, giving your answer to the nearest 0.1°.

(3)

(Total 8 marks)

Further Mathematics AS Level and A Level Summer Work 2021
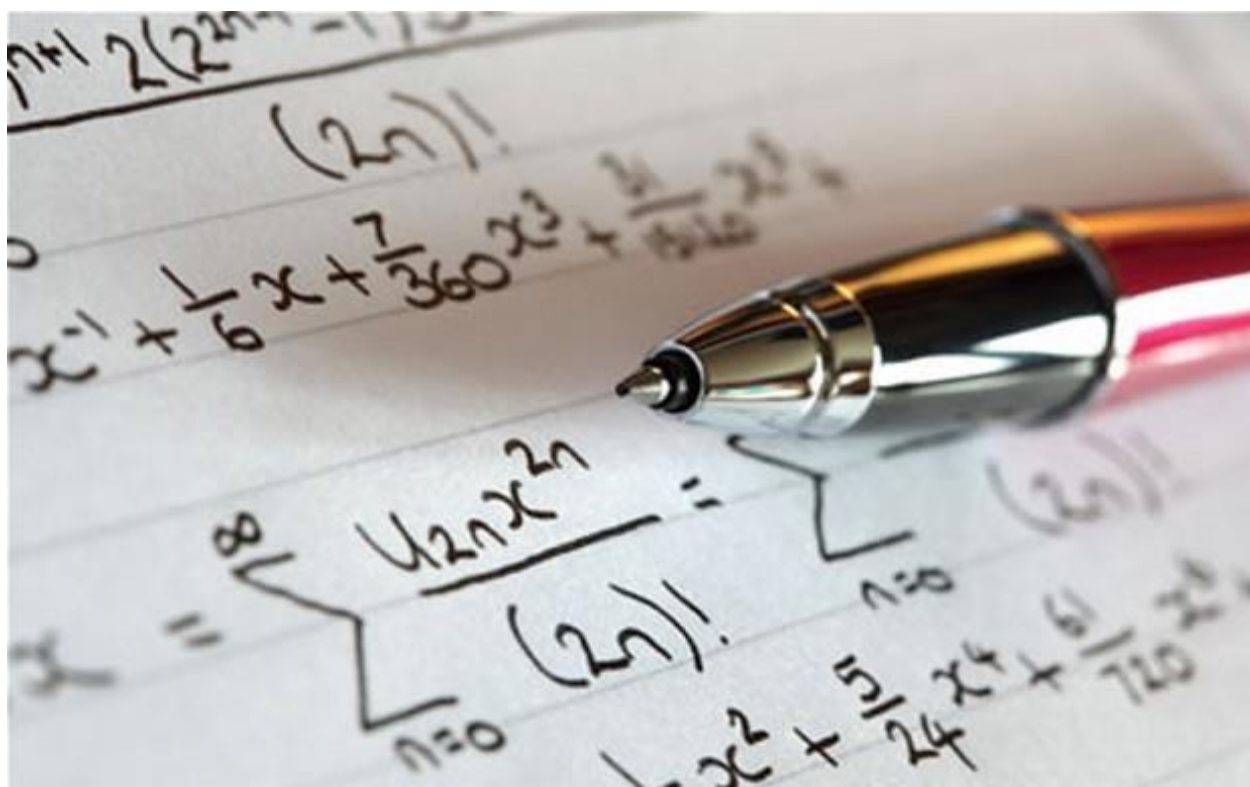
Further Mathematics
A Level

Further Mathematics is a qualification which both broadens and deepens the mathematics covered in A level Mathematics. Further Mathematics is taken alongside A level Mathematics.

WHAT WILL I NEEDTO BE SUCCESSFUL ON THIS COURSE? To succeed at Further Mathematics, you will need 5 GCSEs at A*-C grade (including English and Mathematics) and need to be taking A level Mathematics. Ideally you will have gained a Grade 8 or 9 at GCSE level in Mathematics but we will look at all students on an individual basis to see if they are suitable for the course. Further Mathematics is definitely only suitable for people with a strong motivation to study Mathematics.

WHAT WILL I DO?

Further Mathematics will broaden your understanding of the subject. The pure sections will introduce you to some amazing concepts.

For example,

- complex and imaginary numbers -(widely used in electronic engineering and other fields;
- Conic sections – we are used to studying parabolas but what about circles, ellipses and hyperbolas?
- Hyperbolic Functions – you will never look at a suspension bridge again without considering these!
- Matrices - used in 3D graphics and physical modelling
- inductive proof - a beautiful idea

As well as the pure topics you will study two of the applied topics (in combination with your Mathematics A level). At Okehampton College we cover - Statistics: The study and analysis of data and Mechanics: the mathematics of physics (forces, centres of gravity, collisions etc.)

WHAT CAREERS WOULD THIS BE SUITABLE FOR?

Having a Further Mathematics A level identifies you as someone who has a high level of mathematical ability and has been trained in logical thinking and analysis. This is a big advantage in most areas of life. However, if you are interested in studying a mathematical subject at degree level (e.g. Mathematics, Engineering, Physical Sciences, Computing or similar) then you will find that many of the better universities often give lower offers to candidates with Further Mathematics.

WHERE CAN I FIND OUT MORE?

Email scarter@okehamptoncollege.devon.sch.uk

AQA | AS and A-level | Further Mathematics | Specification at a glance

Summer Work to prepare for Further Maths.

Task 1.

<u>Algebra</u>

Your basic algebra skills will need to be quick and accurate to deal with the content of Further Maths. This means that you can factorise quadratics with coefficients of x, you can solve simultaneous equations with non-linear equations by substituting and you can use all three methods to solve quadratic equations. All of these could/will involve non-integer numbers so your fraction work also needs to be strong particularly simplifying and manipulating algebraic fractions.

Therefore ensure that you complete the preparation for A-level Maths carefully, with particular focus on the algebra sections. If you were at Okehampton college previously you should still have access to Hegarty Maths where you can find plenty of further practice questions

Task 2

Have a look at the two Further Maths videos [here](). Matrices is a topic you may be familiar with if you completed the Level 2 AQA Certificate in Further Maths during Year 11. Complex numbers are an integral part of higher maths and you will become as familiar with these as you are now with integers, rational and irrational numbers. Both videos have a DESMOS activity embedded. This is a free maths graphing tool that can be downloaded onto any device including phones. The use of technology can really help you explore your maths and find connections and properties for yourself so have a play and have some fun!

Any questions please email scarter@okehamptoncollege.devon.sch.uk