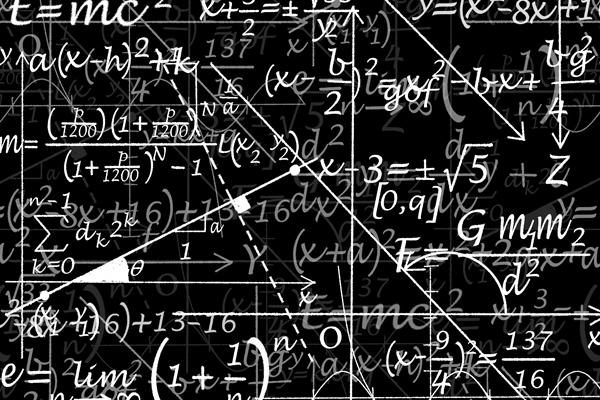
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[](https://drfrostmaths.com)

**PRE A LEVEL COURSE IN**

**FURTHER MATHEMATICS**

[](http://www.examsolutions.net)

**Course information**

The **A Level** Further Mathematics course is delivered in a classroom environment, with some new content being introduced by your teacher and some discovered by you. You will be required to work individually and collaboratively, and will be expected to complete a significant proportion of your study outside of class.

As with A Level Mathematics, completing an A Level Further Mathematics course will require you to use all of the skills you gained at GCSE from the start. If you don’t already have a good grasp of these, you need to remedy this before you begin. Successful completion of the pre-course work provided will prepare you well and enable you to start the course with confidence. Please bring the completed work to your first maths lesson in the week beginning Monday September 9th. There will then be an algebra test in the week beginning Monday 16th September designed to ensure you have the required skills to succeed at the course.

A large part of studying A-Level Further Mathematics is about learning how to solve problems, and “getting stuck” is part of the learning process. **You should expect to get stuck while working on the pre-course work, and then continue getting stuck throughout the course!** The important thing is what you do when you do get stuck. Most of the course content is new, so you will be expected to do your own research and consolidation when required. We recommend the following sites:

[https://www.mathsgenie.co.uk/gcse.html](https://www.google.co.uk/url)

[https://alevelmathsrevision.com/](https://www.google.co.uk/url)

[https://drfrostmaths.com](http://www.physicsandmathstutor.com)

[http://www.examsolutions.net](https://www.theguardian.com/education/ng-interactive/2022/sep/24/the-guardian-university-guide-2023-the-rankings)

[http://www.physicsandmathstutor.com](https://my.integralmaths.org/course/view.php)

Once you have started the course you will also be able to seek help in the following ways:

* **Lunchtime support,** with A Level teachers available two times a week
* **After school support,** with A Level teachers available once a week
* **Extra Year 12 lessons** once a week which consist of review work and a chance to work on home study/consolidation with peers and an A Level teacher to support you
* The **online class textbook**
* Your **class teacher**, who will be pleased to help you **if you ask**

Integrated into the course are revision, consolidation, extension and regular testing lessons. Problem solving, modelling and exam-style questions are embedded into the course from the start.

**Further Mathematics Course**

The (Edexcel) specification can be accessed here:

[https://qualifications.pearson.com/content/dam/pdf/A%20Level/Mathematics/2017/specification-and-sample-assesment/a-level-l3-mathematics-specification.pdf](https://www.mathsgenie.co.uk/gcse.html)

Further Mathematicians complete A Level Mathematics and A Level Further Mathematics.

The two courses are delivered to a Further Maths class by three teachers.

Further Mathematics is split in to 3 distinct areas, Core, Further Statistics 1 and Further Mechanics 1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Content Overview | Assessment Overview | |
| Core | * Complex Numbers * Roots of Polynomials * Matrices * Proof by Induction * Polar Coordinates * Hyperbolic Functions * Differential Equations | 2 × 1 hour 30 minute examinations | of total A Level |
| Further Statistics 1 | * Poisson Distributions * Geometric and Negative Binomial Distributions * Chi Squared Tests * Probability Generating Functions | 1 x 1 hour 30 minute examination | of total A Level |
| Further Mechanics 1 | * Momentum and Impulse * Work, Energy and Power * Elastic Strings and Springs * Elastic Collisions in one and two dimensions | 1 x 1 hour 30 minute examination | of total A Level |

**Textbooks**

Pearson: Edexcel A Level Further Mathematics **– Core Pure Mathematics Year 1** (+ Year 2 in Year 2)

Pearson: Edexcel A Level Further Mathematics **– Further Statistics 1**

Pearson: Edexcel A Level FurtherMathematics **– Further Mechanics 1**

You will have access to the course textbook in class and will have an online account to access it in the study centre and at home. The online version includes links to various useful resources, including tutorials on the effective use of the graphical calculator. We recommend you purchase your own hard copy of the textbooks to use at home or in study periods.

Helpful video’s that link up with the textbook exercises can be found here:

[Haberdashers' Adams Maths Department - YouTube](https://alevelmathsrevision.com/)

**Graphical Calculators**

A graphical calculator (which must be the Casio FX-CG50) will be required for the course. The school purchases the calculators at a discount, and in the first couple of weeks of term you will have the opportunity to buy one through the department via Wisepay. (Payment plans are available if required)

Summer Transition Work

To extend your problem-solving skills and exam technique complete this Further Maths Task as well as the 3 Tasks in the summer transition work for Mathematics.

**1.** (*a*) Find the value of 3*x*3 + 2*ax*2 – 4*x* + 5*a* when *x* = –3.

**(2)**

(*b*) Find the value of *a* when 69 + 23*a* = 0.

**(1)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2.** Three Bags, *A*, *B* and *C*, each contain 1 red marble and some green marbles.

Bag *A* contains 1 red marble and 9 green marbles only

Bag *B* contains 1 red marble and 4 green marbles only

Bag *C* contains 1 red marble and 2 green marbles only

Sasha selects at random one marble from Bag *A*.

If he selects a red marble, he stops selecting.

If the marble is green, he continues by selecting at random one marble from Bag *B*.

If he selects a red marble, he stops selecting.

If the marble is green, he continues by selecting at random one marble from Bag *C*.

(*a*) Draw a tree diagram to represent this information.

**(2)**

(*b*) Find the probability that Sasha selects 3 green marbles.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.** (*a*) Rearrange the equation 1 –  – 2*x* –  = 0 into the form *ax*2 + *bx* + *c* = 0.

**(1)**

(*b*) Solve the equation found in part (*a*).

**(1)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4.** Show that  =  where *A* and *n* are integers to be found.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5.** Find the area of the sector *AOB*.

****

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6.** (*a*) Find *x* when  = –

**(2)**

(*b*)

*C*

*B*

*A*

The diagram shows a right-angled triangle *ABC* where *AB* = *x*2 – *x* and *AC* = *x*2 – 4*x*.

Find the distance *BC* when *x* = 4.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**7.** (*a*) Write f(*x*) = 2*x*2 + 4*x* + 9 in the form *a*(*x* + *b*)2 + *c*.

**(3)**

(*b*) Sketch the curve with equation *y* = 2*x*2 + 4*x* + 9, showing any points of intersection with the coordinate axis and the coordinates of any turning point.

**(3)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8.** Find *x* when 10 (cos *x*)2 = 9, 0° < *x* < 90°.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9.** Magali is studying the mean total cloud cover, in oktas, using data from the large data set. The daily mean total cloud cover for all 184 days from the large data set is summarised in the table below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Daily mean total cloud cover (oktas)** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **Frequency (number of days)** | 0 | 1 | 4 | 7 | 10 | 30 | 52 | 52 | 28 |

One of the 184 days is selected at random.

(*a*) Find the probability that it has a daily mean total cloud cover of 6 or greater.

**(1)**

There were 28 days that had a daily mean total cloud cover of 8. For these 28 days the daily mean total cloud cover for the **following** day is shown in the table below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Daily mean total cloud cover (oktas)** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **Frequency (number of days)** | 0 | 0 | 1 | 1 | 2 | 1 | 5 | 9 | 9 |

(*b*) Find the proportion of these days when the daily mean total cloud cover was 6 or greater.

**(1)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**10.** (*a*) Solve the simultaneous equations

*x* + 880*y* = 1100

*x* + 300*y* = 680

**(1)**

(*b*) Find the least value of *n* when 2*n* – (428 + 0.84*n*) > 0

**(1)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**11.** (*a*) Expand and simplify *y* = *x*(*x* + 2)(*x* – 4).

**(1)**

(*b*) Find the value of *x*4 – *x*3 – 4*x*2 when *x* = 2.

**(1)**

(*c*) Expand and simplify *y* = (*x* + 2)2(3*x*2 – 20*x* + 20).

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**12.** Given that *a* – *b* = , show that *a* = .

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13.** Work out how far a car moving at 60 km h–1 travels in 0.8 seconds, giving your answer in metres.

**(1)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**14.** If *n* is an integer greater than 1, show, by considering both odd and even numbers, that *n*2 + 2 is not divisible by 4.

**(4)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**15.**

*A*

*M*

*C*

*N*

*B*

*O*

The diagram shows a sketch of triangle *OAB*.

The point *C* is such that = 2.



The point *M* is the midpoint of *AB*.

The straight line through *C* and *M* cuts *OB* at the point *N*.

Given = **a** and = **b**, **f**ind in terms of **a** and **b**.



**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**16.** Use the iteration formula

*xn* + 1 =



with *x*1 = 1.5 to find *x*4 to 3 decimal places.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**17.** (*a*) A runner finishes a race in 24 + (6 ´ 1.05) + (6 ´ 1.052) minutes. Find this time in hours, minutes and seconds.

**(1)**

(*b*) A runner finishes a race in 24 + 6.3 ´  minutes. Find this time in hours, minutes and seconds.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**18.** *y* = . Find the value of *p* when *y* = , *x* = 3 and *q* = 4.

**(2)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**19.**

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[A sphere of radius *r* has volume *πr*3 and surface area 4*πr*2]

A manufacturer produces a storage tank modelled in the shape of a hollow circular cylinder closed at one end with a hemispherical shell at the other end as shown in the diagram above.

The cylinder has radius *r* metres and height *h* metres and the hemisphere has radius *r* metres.

The volume of the tank is 6 m3.

Show that the surface area of the tank, in m2, is given by

*πr*2

**(4)**

**CAREER PATHWAYS IN MATHS**

[Where maths meets... the world of work! - AMSP](https://qualifications.pearson.com/content/dam/pdf/A%20Level/Mathematics/2017/specification-and-sample-assesment/a-level-l3-mathematics-specification.pdf)

Follow this link to see how, with an A Level in Further Maths you could work in orthotics and prosthetics, be a green engineer or astronaut or work in digital media

[Maths is your future: Visual effects artist - YouTube](https://www.youtube.com/watch?v=ALlcVjkRyJI&list=PLsEhnSoqPxmfVSLuUUdvbjY6O068phZvl)

Or follow this link to watch a series of 5 videos hosted by Matt Parker looking at how having A level maths is important for the following careers:

Visual effects artist, Satellite controller, Veterinary surgeon, Mechanical engineer and Data analyst

But that is obviously not an exhaustive list…a Maths A Level closes very few doors and is also useful in careers such as…

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**University Pathway:**

The current top 5 Universities for Maths (as rated by the guardian) are:

1. St Andrews
2. Oxford
3. Cambridge
4. London School of Economics
5. Imperial College

Follow this link to see more: [The Guardian University Guide 2023 – the rankings | University guide | The Guardian](https://amsp.org.uk/teachers/11-16-maths/transition-to-level-3-maths/where-maths-meets-the-world-of-work/)

**Entry exams:**

Many top Universities like you to sit entry exams before being accepted on to a maths related degree course. Make sure you sign up for our enrichment course on this which helps you to prepare for them. They currently consist of the STEP , the MAT and the TMUA.

|  |  |  |
| --- | --- | --- |
| **STEP** | **The MAT** | **The TMUA** |
| Summer term (June) in Year 13 | Autumn term (November) in Year 13 | Autumn term (November) in Year 13 |
| STEP II – A Level Mathematics content  STEP III – A Level Mathematics and Further Mathematics content | Content from AS Level Mathematics  + Sequences and series | Content from AS Level Mathematics  + Sequences and series |
| 3 hour exams | 2 hours 30 minutes exam | 2 hours 30 minutes exam |
| Written papers | Fully online | Fully online |
| Choice of 8 Pure and 4 Applied questions  Marks totalled for best 6 attempts | 1st section – 25 multiple choice questions of varying difficulty (worth 2,3 or 4 marks)  2nd section – 2 longer questions worth 15 marks each | Paper 1 – Applications of Mathematical Knowledge - 20 multiple choice questions  Paper 2 – Mathematical Reasoning – 20 multiple choice questions |

**What can you do now?**

We suggest you start keeping up to date with SUMS. Use this link to take you to the latest editions:

https://amsp.org.uk/sums-steps-to-university-for-mathematical-students/

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A picture containing text, screenshot, human face, person

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