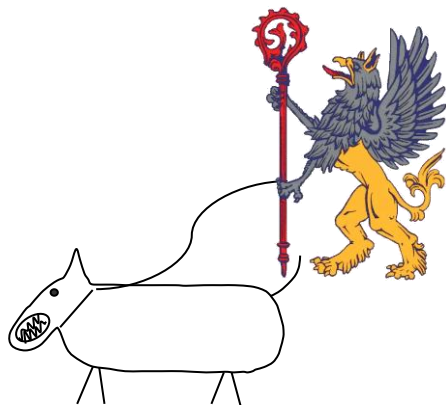




The Gryphon School

Sixth Form

Further Maths A-Level

Transition Handbook



A modern take of Escher's Infinite Droste Effect

Mathematics Course Outline

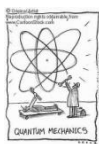
The A-Level Further Mathematics course extends your knowledge of topics in **NUMBER**, **ALGEBRA** and **TRIGONOMETRY** as well as learning new ideas such as **CALCULUS**, **COMPLEX NUMBERS** and **MATRICES**. These topics will be explored in great depth and detail; you will study a wide variety of mathematical concepts that are exclusive to the Further Maths A Level course.

ALL students will study some **MECHANICS** and some **STATISTICS** as part of the course. As well as making students more rounded mathematicians this change will open doors to a wider number of mathematically related careers in engineering, science, economics, accountancy or actuarial work amongst others.

All A-Level Further Maths students study Pure Mathematics;

- Proof
- Coordinate Geometry: (Equation of a line/Circle/Parametrics)
- Series (Arithmetic, Geometric and Binomial Expansion)
- Trigonometry
- Exponentials and Logarithms
- Differentiation and Integration (known as Calculus)
- Complex Numbers
- Vectors and Matrices
- Further Coordinate Systems

In addition **ALL** students will study the two following applications of mathematics.



Mechanics

Quantities and Units in Mechanics
Forces and Newton's Laws
Kinematics
Moments



Statistics

Statistical Sampling
Data Presentation
Probability
Statistical Distributions
Statistical Hypothesis Testing

How the Course is Assessed

There is **NO** coursework for Further Mathematics and it is vital that work is carried out at a regular rate throughout the year. Please factor in time for your maths when deadlines for other subjects are considered.

The course is assessed through a total of seven examinations at the end of the two year course. These include the three exams taken by A Level Mathematics students (two Pure Maths and one Mechanics/Statistics paper), two compulsory Further Pure Mathematics exams, and two 'Further Maths Option' exams.

The three Maths exams are 2 hours long and 100 marks each, the four Further Maths exams are 90 minutes long and 75 marks each.

Paper 1 and Paper 2 assess your two year's work on PURE Mathematics.

May/June Examinations

Further Maths students will take **all** of their exams in **May/June** of year 13. All examinations must be sat in any single year (you cannot sit a single exam early or indeed retake a single examination).

Monitoring Your Progress

All students will sit an internally set exam within the first week of the course which will test the essential knowledge required for success at A level. This will be based on the work covered in the Pure element of the transition task.

Throughout the course you will be expected to complete a number of formal assignments. These will prepare you for end of unit assessments. The dates for these will be issued at the beginning of the course to give plenty of time for proper preparation.

How the Course is Delivered

To complete the Further Maths course requires two of your A Level options; as such your timetable will contain a large number of Further Maths lessons. These will be split between two teachers who will deliver the Maths and Further Maths content between them over the two years. This includes all Pure Maths, Mechanics, Statistics and Further Pure topics.

Departmental Expectations

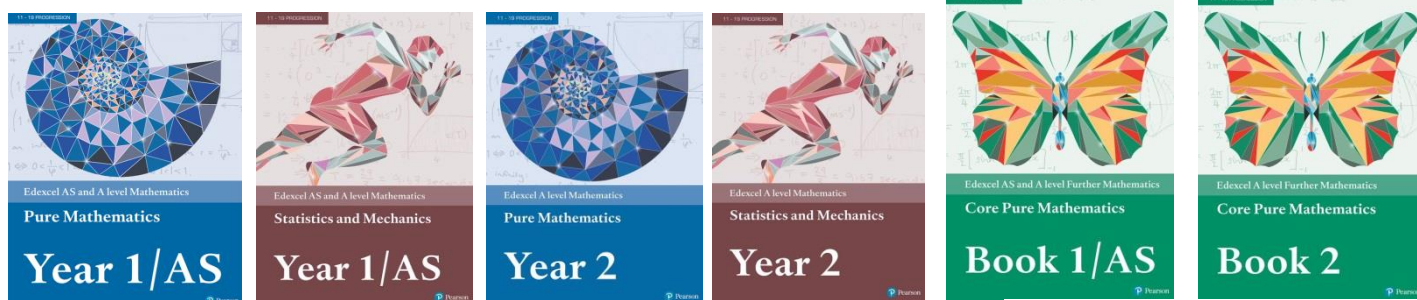
You are expected to take responsibility for yourself to ensure that you catch up on any missed work due to absence, or seek further guidance on specific topics causing confusion. You can expect a warm reception from members of staff if you wish to arrange a time to help them with work you are struggling with.

Staff offer support on selected lunchtimes in the Maths Zone. Staff will make themselves available during the school day and via email when you are on study leave.

Please do not bury your head in the sand if you are experiencing difficulties. Most problems can be sorted out when tackled at an early stage. Leaving it for 3 weeks is too late.

It goes without saying that you are expected to attend all lessons, on time, and with the correct equipment.

You will be provided with electronic access to the following textbooks* at the start of the course; these can also be bought online should you wish to have a hard copy.



*(plus two FM Option Books)



Due to the changes to A Level Maths that were introduced in 2017, there has been a significant change in the expectation for calculators. Students now need more functionality than standard GCSE scientific calculators can manage. This being said, Casio have developed a calculator which will fulfil this need. We therefore advise that all A Level Maths students to be equipped with the **Casio fx-991CW**.

You will be required to provide two lever-arch files (one for Maths, one for Further Maths) that you use to keep the majority of your work in, which we will help you to set up and organise in the first weeks of Year 12. You will be given exercise books in which to keep essential notes. You will be given an assignment booklet which will contain ALL of your homework for the FISRT year of the course. We expect you to complete set assignments to an acceptable standard by the deadline given. You should always work to a goal of completing work promptly to ensure that any areas of difficulties are overcome.

How to Use Your Folders

All A Level Further Maths students are expected to have two lever arch files to keep their work in. You will want to have a supply of plastic wallets to put work in. Each folder will consist of:

Course Handbook & Overview

This booklet gives you an overview of the course along with information on textbooks, Homeworks and MathsZone

Course Summary Sheets

These summarise the key points of each chapter from the textbook. You may wish to tick each summary point off when revising to help ensure you have covered everything.



Revision Notes (exercise book)

Your blue exercise book is for clear, concise notes. Your teacher will help you to know when to write in this book; it is for definitions and clear examples. Later in the year you may wish to make revision cards based on the notes in this book.

Assessments (inc. record sheet)

You will be set small topic assessments on a regular basis. You should complete these on paper and your teacher will mark and give feedback on these. If you score less than 50% or you feel you would like some extra feedback from a Maths teacher there will be a specific MathsZone session you can attend in the following weeks (see MathsZone section of this booklet for dates). When you receive your assessments, you should complete the relevant section of the Assessment Recording Sheet, including score, and specific feedback from your teacher, and any notes you want to make for yourself

Homework

Homework will be set from the Homework booklet, which has been sent to you via iLesson. Your teachers will indicate when you should attempt the next homework. You will have a week to complete it before your teacher sends you worked solutions. You should then spend time reviewing your work and making any corrections needed (preferably in a different colour pen). If there are questions you do not understand you should then ask your teacher. All homeworks should be completed on paper and be kept in your folder – your teacher may ask to see your work at any point.

General Classwork

Any classwork that you do that is not in your blue book should be done on paper or in a 'rough book' and kept in your folder. This is most likely to have been 'practice' work rather than revision notes.

Independent Study

You will be expected to complete Maths work in your study periods to support your classroom learning. Keep a record of your independent study on the sheet provided.

Wider Reading

If you are considering a Maths-based career or University route after your A Levels, you would be well advised to do some wider reading around the subject. Here is a list you may find useful; it is not an exhaustive list and there is room for you to fill in your own activities too.

PPEs – make sure to keep your PPEs in your folder so that you can use them to revise for your A Level exams

Main Task:

Follow this link: [Integral \(integralmaths.org\)](https://integralmaths.org) to register for an Integral Account.

This will generate a login and password for you to access the Integral website.

Once logged in, navigate to the Transition to A Level Maths section.

The screenshot shows the Integral website interface. At the top, there is a navigation bar with the Integral logo, a search icon, and a user profile for Patrick Unwin. Below the navigation bar is a green banner with the text 'Transition to A level Mathematics' and a breadcrumb trail: 'Dashboard / My courses / Transition Alevel'. The main content area is divided into two columns. The left column contains a list of topics: 'Introduction', 'Certificates', 'Integers', 'Geometry', 'Surds and indices', 'Coordinate geometry', 'Algebraic manipulation', 'Trigonometry', and 'Completing the square'. The right column contains a 'Completion Progress' section with a progress bar and a 'Calendar' section for June 2021.

Introduction

This is a 7 minute video to introduce you to the course.

When you have watched the video, the course materials will appear on this page.

Certificates

When you have completed at least one assessment, a link will appear below to allow you to download a certificate showing your grades for the assessments in this course. You may wish to print your certificate to show your teacher. If you complete more assessments after downloading your certificate, you will be able to download an updated version.

Integers

Geometry

Surds and indices

Coordinate geometry

Algebraic manipulation

Trigonometry

Completing the square

Completion Progress

Calendar

June 2021

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Hide group events

Hide user events

For each section you should work through the 'From GCSE to A Level' activities, before completing the Assessment. 'Going Deeper' is there for students who want to push themselves a little further and discover a little more about each topic. As Further Mathematicians, we would hope you would look into at least a few of these alongside the main content!

Transition Task - Support

Should you find you want extra practice on any of the topics, follow this link: [Transition to A level Mathematics resources: Essential Skills | AMSP](#)

Here you will find detailed PDFs on each of the key topics from GCSE that you will rely on in A Level Maths.

Optional Extra A Level Transition Work

These are the skills from the higher tier GCSE that you should be fluent with in order to make a successful transition to A-Level Maths.

The standard questions would have been grade 7 or above at GCSE. *Standard questions are written in black font.*

The questions in **RED** are CHALLENGING questions that would have been Grade 8 or 9. We would hope students studying Further Maths feel able to try these red questions too!

Number

Index Laws - Fractional indices

Surds

Basic Algebraic Skills

Factorise – linear, quadratic, cubic

Expanding Brackets (inc. three brackets)

Completing the square

Algebraic Fractions

Rearranging Formulae

Solving Equations

Solve Quadratic Equations

Simultaneous Equations – Quadratic and Linear

Solving Linear and Quadratic Inequalities inc. Regions

Functions and Graphs

Function Transformations

Composite Functions

Inverse Functions

Equation of a line – Perpendicular

Number

Index Laws – inc. fractional indices

Find the value of a) $25^{\frac{1}{2}}$ b) 3^{-2} c) $64^{-\frac{2}{3}}$ d) $\left(\frac{25}{16}\right)^{-\frac{3}{2}}$

Given that $3^{-n} = 0.2$, find the value of $(3^4)^n$

Surds

Simplify a) $\sqrt{75}$ b) $\sqrt{96}$ c) $\sqrt{63} - \sqrt{28}$

Simplify a) $\sqrt{2} \times \sqrt{2}$ b) $\sqrt{2} \times \sqrt{8}$ c) $\sqrt{3} \times \sqrt{6}$ d) $\frac{6}{\sqrt{2}}$

Expand $(1 + \sqrt{2})(3 - \sqrt{2})$

Give your answer in the form $a + b\sqrt{2}$ where a and b are integers.

Show that $\frac{3+\sqrt{2}}{5+\sqrt{8}}$ can be written as $\frac{11-\sqrt{2}}{17}$

$(a + \sqrt{8})^2$ can be written in the form $c + d\sqrt{2}$, where a, c and d are integers.

Find in terms of a, and expression for c and an expression for d.

Show that $\frac{4}{\frac{1}{\sqrt{3}} + \sqrt{3}}$ can be written as $\sqrt{3}$

Basic Algebraic Skills

Factorise – linear, quadratic, cubic

Factorise

$$6x + 9$$

$$15x^2 - 6x$$

$$24x^2y^3 + 16xy^4$$

$$x^2 + 3x + 2$$

$$x^2 + 5x - 6$$

$$6x^2 + x - 2$$

$$x^2 - 121$$

$$x^2 - y^2$$

$$9a^2 - 16b^2$$

Factorise

$$5(2x - 1)^2 + 3x(2x - 1)$$

Expanding Brackets (inc. three brackets)

Expand a) $3xy^2(2x - 5y)$ b) $(x + 1)(x + 7)$ c) $(3x + 1)(2x - 5)$ d) $(2x + y)(2x - y)$

Amzol thinks that $(x + 5)^2 \equiv x^2 + 25$ for all values of x .

Is Amzol right?

You must show how you get your answer.

Martin expands $(2x + 1)(2x - 3)(3x + 2)$

He gets $12x^3 - 4x^2 - 17x + 6$

a) Explain why Martin's solution cannot be correct.

b) Expand the brackets to find the correct solution.

Completing the square

$x^2 + 6x - 3$ can be written in the form $(x + a)^2 + b$. Find the values of a and b .

By completing the square solve $x^2 - 6x - 8 = 0$

Give your answer in the form $a \pm \sqrt{b}$

By completing the square find the coordinates of the turning point of the curve with equation $y = x^2 + 10x + 18$. You must show your working.

Write $2x^2 + 16x + 35$ in the form $a(x + b)^2 + c$ where a , b and c are integers

Algebraic Fractions

Simplify fully

$$\frac{2x^2 - 5x + 3}{x^2 + 5x - 6}$$

Write $\frac{5}{x-3} - \frac{4}{x+3}$ as a single fraction in its simplest form.

Show that $\frac{1}{2x^2 + x - 15} \div \frac{1}{3x^2 + 9x}$ simplifies to $\frac{ax}{bx + c}$ where a , b and c are integers

Rearrange Formulae

Make t the subject of the formula

$$y = \frac{t}{3} - 2a$$

$$x = \sqrt{\frac{2t}{b}} + h$$

Make m the subject of the formula

$$f = \frac{4-3m}{5+m}$$

$$\frac{m}{v} - \frac{t}{b} = \frac{m-t}{R}$$

Solving Equations

Solve Linear Equations (inc. with Fractions)

Solve

$$2(5x + 3) = 3x + 17$$

$$7 = \frac{x}{2} - 2$$

$$\frac{4(8x-2)}{3x} = 10$$

Solve Quadratic Equations

By factorising solve

$$x^2 + 3x = 0$$

$$x^2 - 5x - 6 = 0$$

$$2x^2 - 5x - 3 = 0$$

By using the quadratic formula solve

$$3x^2 - 5x - 1 = 0$$

Give your answers to 3 decimal places.

Simultaneous Equations – Quadratic and Linear

Solve the simultaneous equations

$$4x + y = 10$$

$$x - 5y = 13$$

Solve algebraically

$$x^2 + y^2 = 18$$

$$x - 2y = -3$$

Solve Equations using an Iterative Method.

a) Show that the equation $x^3 + 5x - 4 = 0$ has a solution between $x = 0$ and $x = 1$

b) Show that the equation $x^3 + 5x - 4 = 0$ can be rearranged to give $x = \frac{4}{x^2 + 5}$

c) Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{4}{x_n^2 + 5}$ twice,

To find an estimate for the solution of $x^3 + 5x - 4 = 0$

Solving Linear and Quadratic Inequalities (inc. Regions)

Solve the inequalities

$$5(2 - 3x) > 20$$

$$x^2 > 3(x + 6)$$

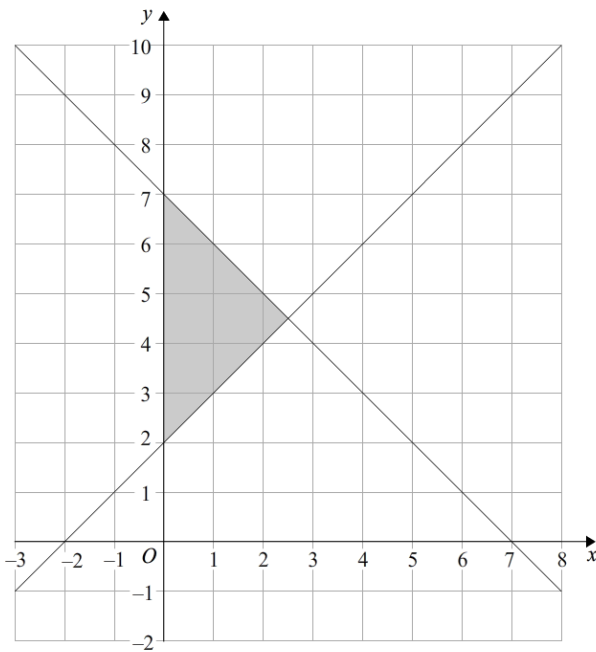
$$2x^2 - 5x - 12 > 0$$

For her maths homework, Helen answered the following question.

Shade the region that is defined by all these inequalities.

$$x + y \leq 7 \quad y \geq 0 \quad y \leq x + 2$$

Here is Helen's answer.



- Circle the two inequalities that she has shaded incorrectly.
- Shade the correct region on the graph.

Functions and Graphs

Composite Functions/Inverse Functions

For all values of x

$$f(x) = 2x - 3 \quad \text{and} \quad g(x) = x^2 + 2$$

- (a) Find $g(-4)$
- (b) Show that $fg(x) = 4x^2 - 12x + 11$
- (c) Find $f^{-1}(x)$

f and g are functions such that

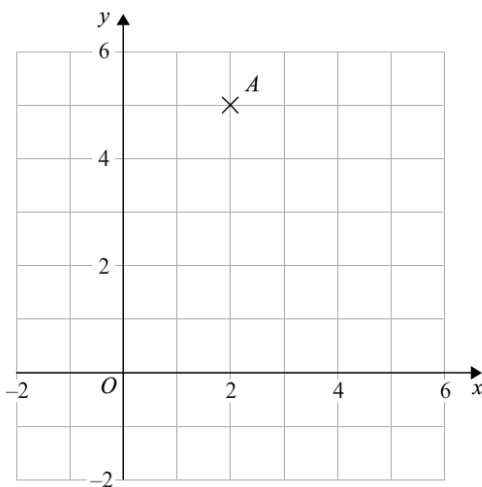
$$f(x) = 3x^2 \quad \text{and} \quad g(x) = \frac{1}{x-2}$$

Find $gf(4)$

Give your answer as a fraction

Equation of a line – Perpendicular

Find an equation of the straight line with a gradient of 3 that passes through the point A.



A is the point with coordinates (1, 3)

B is the point with coordinates (4, -1)

The straight line L goes through both A and B.

Is the straight line with equation $2y = 3x - 4$ perpendicular to the line L?

You must show your working.