

## A-Level Maths at QM : a Student's Guide

Welcome! This guide is designed to help you find your way with the AS and A2 Mathematics courses.

### Course Structure

The AS course consists of three units : Core Mathematics 1, Core Mathematics 2 and Mechanics 1. For those of you continuing to the Upper Sixth, the A2 course consists of three more units : Core Mathematics 3, Core Mathematics 4 and Decision Mathematics 1.

Core Mathematics can be thought of as a mathematician's toolbox, the techniques that are needed to go about solving real-life problems. This will involve improving your algebra and trigonometry beyond all recognition, as well as introducing new and very important ideas such as logarithms and calculus.

Mechanics is the study of forces and objects in motion, and is therefore of relevance to many everyday situations. Suppose a motorcycle skids and hits a stationary car. The tyre mark made by the skidding motorcycle is 20 metres long. Was the motorcycle exceeding the speed limit? Mechanics helps you find out.

Decision Mathematics is the study of algorithms (the systematic use of mathematical processes) and their application to problem-solving. It is a recently developed area of Mathematics, designed to solve modern-world problems, such as finding the shortest route a snowplough can take to cover a road network, or the most efficient way to organise complex tasks, such as cooking Christmas dinner.

### Further Mathematics

Further Mathematics is recommended for able girls who really enjoy their maths, and want to study each area in more detail. We recommend this course to all those who want to study Mathematics in some form in Higher Education, and to those thinking of applying for maths, science or ICT-based courses at Oxbridge.

As with ordinary Maths, you can do a full A2 in Further Maths, or stop at AS-level. The AS course consists of Statistics 1, Statistics 2 and Further Pure Mathematics 1. For the A2 course, you study Decision Mathematics 2, Further Pure Mathematics 2 and Mechanics 2.

Statistics involves gathering, processing and interpreting data, and the study of probability theory. Further Pure Mathematics explores wider themes within Core Mathematics.

### Examinations

All exams are 1½ hours long (plus extra time, if you qualify for it). You may use a calculator for all of the exams except Core Mathematics 1. Exams are taken in January and May/June, and you may resit any exam as often as you like, with the highest mark you score going forward.

You are given a formula book in the exams, although be aware it doesn't have everything in it. You are expected to remember quite a lot, so it is worth your while getting acquainted with the contents of the formula book.

## **Keeping Track of Your Progress**

There is a topic review prep for every topic in each unit. These are designed to check whether you have understood the ideas involved, and are able to apply them to a range of problems.

We set two tests for each unit to help you review your work regularly, and to check that stuff isn't going in one ear and out of the other.

## **Resources**

Have a look at the A-level folder in the Maths section of the shared area. For each unit you will find a lot of stuff, but most importantly...

- Lesson handouts with detailed answers. Ideal if you miss a lesson.
- Every past exam paper with the answers and mark scheme. The more past papers you do, the better prepared you'll be for your exams.

Also on the network is *Autograph*, an excellent graph-plotting package that's well worth the time it takes to familiarise yourself with it.

Web sites such as [www.plus.maths.org](http://www.plus.maths.org) and [www.nrich.maths.org](http://www.nrich.maths.org) are a rich source of interesting mathematical articles and puzzles.

## **Good Study Habits**

Good file organisation is essential. If you can't find what you're looking for in half a minute, your system needs sorting out. We recommend one file for each unit, with individual topics separated by file dividers.

Keeping on top of your work is a lot better than falling behind and trying to catch up again. If you are experiencing problems with time management, come and talk to us and/or your form tutor.

Don't feel the prep you are set is all you have to do : you may need more practice to fully grasp each concept. The review exercises in the text books are stuffed full of past exam questions, and are excellent for keeping your skills honed.

Don't be worried about being stuck. Only a very, very few students can sail through A-level Maths without a problem. What matters most is how you respond when you get stuck. Look things up, compare the questions you are stuck on with other similar questions, ask a friend, or come and ask us – but whatever you do, make sure you understand it at the end.

Presentation is very important in mathematics. Those students who present their work neatly and clearly tend to make fewer mistakes than those who do not. Clear diagrams, particularly in Mechanics, can make it a lot easier to process information given in questions.

Get involved in lessons, think on your feet, and don't be paralysed by fear of getting it wrong. You often learn more by getting it wrong and then working out why.

## **University**

It seems a long way off, but very soon you will be giving serious thought to your Higher Education. A-level Mathematics will open the door to a wide range of courses to you. For those wishing to pursue Maths at Oxford, Cambridge or (in some cases) Warwick, you will need to take STEP papers, in addition to your Maths and Further Maths A-levels. STEP (sixth term entry paper) is very demanding and a real test of mathematical nous. Individual coaching for STEP can be provided on request.

LOWER SIXTH MATHEMATICS (AS) 2010-12				
Term	Group B : Ms. Sutcliffe (3 hours/week) Group E : Mr. Taylor (3 hours/week)		Group B : Mrs. Herbert (2 hours/week) Group E : Mrs. Viant (2 hours/week)	
	1a	C1	Expanding and factorising (1)	C1
Quadratics (5)			Surds (2)	
Graphs and transformations (5)			Coordinate geometry (3)	
Arithmetic series (4)			Simultaneous equations (2)	
Differentiation (5)			C1 TEST 1	
1b	C2	Integration (2)	M1	Kinematics (7)
		C1 TEST 2		
		Factor and remainder theorems (3)		
	Coordinate geometry of the circle (4)			
C1	C1 past paper practice (3)	Forces (2)		
2a	C2	C1 examination Mon 10 Jan am		M1
		Binomial theorem (4)	Statics of a particle (4)	
		Trigonometry (9)	Newton's laws of motion (3)	
		C2 TEST 1	M1 TEST 1	
2b	C2	Exponentials and logarithms (3)	M1	Connected particles (3)
		Geometric series (4)		Momentum and impulse (3)
		Differentiation (4)		Moments (4)
		Integration (4)		M1 TEST 2
		C2 TEST 2		M1 past paper practice (1)
3a	C2	C2 past paper practice (9)	M1	M1 past paper practice (6)
	C2 examination Mon 23 May pm		M1 examination Fri 13 May pm	
3b	C3	Functions (5)	C3	Algebraic fractions (4)
		Transformations of graphs (3)		Exponentials and logarithms (3)
		C3 TEST 1		

UPPER SIXTH MATHEMATICS (A2) 2010-12				
Term	Teacher A (3 hours/week)		Teacher B (2 hours/week)	
	1a	C3	Trigonometry (8)	C3
C4		Partial fractions (4)	Numerical methods (3)	
		Parametric functions (6)	C3 TEST 2	
1b	C4	Binomial theorem (4)	D1	Algorithms (4)
	C3	C3 past paper practice (10)		Graphs and networks (2)
2a	C3 examination Jan (TBA)		D1	Algorithms on graphs (5)
	C4	Differentiation (4)		Route inspection (3)
		C4 TEST 1		D1 TEST 1
		Integration 1 (9)		Critical path analysis (5)
2b	C4	Integration 2 (7)	D1	Linear programming (5)
		Vectors (5)		Matchings (2)
		C4 TEST 2		D1 TEST 2
3a	C4	C4 past paper practice (12)	D1	D1 past paper practice (8)
3b	C4 examination June (TBA)		D1 examination May (TBA)	

<b>LOWER SIXTH FURTHER MATHEMATICS (AS) 2010-12</b>						
<b>Term</b>	<b>Mrs. Viant (3 hours/week)</b>			<b>Ms. Sutcliffe (2 hours/week)</b>		
<b>1a</b>	S1	<i>Measures of location (4)</i>		S1	<i>Graphical representation (4)</i>	
		<i>Measures of dispersion (5)</i>			<i>Probability (4)</i>	
		Discrete random variables (3)			<i>S1 TEST 1</i>	
		Correlation (3)			The Normal distribution (4)	
		Regression (3)				
<b>1b</b>	S1	S1 past paper practice (7)		S1	Modelling (1)	
					<i>S1 TEST 2</i>	
	FP1	<i>Series (3)</i>	S2	<i>Binomial distribution (5)</i>		
	<i>Coordinate systems (4)</i>					
<b>2a</b>	S1 examination Fri 14 Jan pm			S2	<i>Poisson distribution (4)</i>	
	FP1	<i>Numerical solution of equations (4)</i>			<i>Continuous random variables (4)</i>	
		<i>FP1 TEST 1</i>			<i>S2 TEST 1</i>	
		Matrix algebra (7)			Approximations with the Normal distribution (3)	
<b>2b</b>	FP1	Proof (5)		S2	Hypothesis tests (4)	
		Complex numbers (7)			<i>S2 TEST 2</i>	
		<i>FP1 TEST 2</i>			<i>S2 past paper practice (3)</i>	
		FP1 past paper practice (12)			<i>S2 past paper practice (8)</i>	
<b>3a</b>	FP1			S2	<i>S2 examination Mon 23 May pm</i>	
<b>3b</b>	M2	<i>Projectiles (4)</i>		M2	<i>Centres of mass (6)</i>	
	FP1 examination Fri 17 June pm					
	M2	<i>Kinematics (3)</i>				
		<i>M2 TEST 1</i>				

<b>UPPER SIXTH FURTHER MATHEMATICS (A2) 2010-12</b>					
<b>Term</b>	<b>Teacher A (3 hours/week)</b>			<b>Teacher B (2 hours/week)</b>	
<b>1a</b>	M2	Work, energy and power (7)		M2	Statics (4)
		Collisions (5)		D2	<i>Transportation problems (6)</i>
		<i>M2 TEST 2</i>			<i>Assignment problems (5)</i>
		M2 past paper practice (8)			
<b>1b</b>	M2			D2	<i>Travelling salesman problem (7)</i>
	FP2	<i>Inequalities (4)</i>			<i>Further linear programming (5)</i>
		<i>Series (2)</i>			<i>D2 TEST 1</i>
		<i>Further complex numbers (6)</i>		Game theory (6)	
<b>2a</b>	M2 examination Jan (TBA)			D2	
	FP2	<i>First order differential equations (5)</i>			
		<i>FP2 TEST 1</i>			
		Second order differential equations (5)			
<b>2b</b>	FP2	Maclaurin and Taylor series (7)		D2	Flows in networks (4)
		Polar coordinates (6)			Dynamic programming (4)
		<i>FP2 TEST 2</i>			<i>D2 TEST 2</i>
<b>3a</b>	FP2	FP2 past paper practice (12)		D2	<i>D2 past paper practice (8)</i>
<b>3b</b>	FP2 examination June (TBA)			D2 examination June (TBA)	