

**Maths
GCSE**

Introduction

Welcome to your Mathematics GCSE course! This introduction contains all the information you need to be able to start your course, and you can also use it as a reference point as you work your way through all the modules.

Which Syllabus Does This Course Follow?

This course has been designed to match the requirements of the Assessment and Qualifications Alliance (AQA) 8300 “linear” specification. This specification is examined for the first time in **2017**. Students planning to take exams in 2016 should follow the alternative course appropriate to that specification.

The AQA syllabus has been chosen as being the most suitable of those currently available for an ‘external’ student. An external candidate is usually someone who is not in full-time school-based education, e.g. someone studying part time by open learning, flexistudy, correspondence course, etc, or someone being home-schooled.

Examination Tiers

In a subject like Maths, it is very difficult to produce an exam that tests the skills of all students, from the most able to the weakest. In order to overcome this problem, the exam boards set two different groups of exams, for students of different abilities. When you come to take your exams, you have a choice as to which level of difficulty you aim for.



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There are two levels of difficulty, or 'tiers of assessment': Foundation and Higher. The Higher tier 8300H exams are for students who hope to achieve grades 4-9 (9 is the top grade); the 8300F Foundation tier is for grades 1-5.

Candidates who fail to achieve a grade 4 on the Higher tier or grade 1 on the Foundation tier will be reported as U (unclassified).

When the time comes to apply to sit your exams, you will need to make a realistic assessment of the grades you are capable of. Don't worry about this: your tutor will be able to help you decide nearer the time which is the most appropriate level for you.

Which Tier to Aim for?

This course is suitable for students aiming for Foundation OR Higher Tier exams and it is not necessary to be certain at the outset which tier of exams you will eventually sit. You may find that the Higher Tier topics are too hard or you may be able to cope. The syllabus specifies certain topics which will only come up in Higher Tier examinations. These topics are covered in Section 2 of the course and there is no need to study this section unless you are going to attempt the Higher papers.

Students will normally request that they should be sent Section 2 as they approach the end of their study of the main part of the course. By then students are usually able to judge whether it is worth attempting this section.

Arrangement of Lessons

Foundation Course

lesson no title

Module One: Numbers

- 1 Numbers
- 2 Prime Numbers, Factors and Fractions
- 3 Decimals, Approximations and Accuracy
- 4 Powers and Roots + **Tutor-marked Assignment A**

Module Two: Money

- 5 Ratios and Percentages
- 6 Interest
- 7 Other money matters + **TMA B**

Module Three: Measurement

- 8 Time, Distance and Speed
- 9 Linear Functions
- 10 Further Graphwork
- 11 Other Graphs
- 12 Measurements and Money + **TMA C**

Module Four: Basic Algebra

- 13 Algebraic Expressions
- 14 Factorisation
- 15 Solving Linear Equations
- 16 Solving Quadratic and Other Equations
- 17 Equations in Action; Formulae
- 18 Inequalities
- 19 Function Notation; Triangular Numbers, etc + **TMA D**

Module Five: Basic Trigonometry and Vectors

- 20 Angles, Straight Lines and Symmetry
- 21 Triangles

- 22 What is Trigonometry?
- 23 Bearings
- 24 Vectors + **TMA E**

Module Six: Basic Geometry

- 25 Quadrilaterals and Polygons
- 26 Transformations
- 27 The Circle

Module Seven: Further Geometry

- 28 Perimeter and Area
- 29 Volume and capacity
- 30 Nets and Plans
- 31 Geometrical Constructions
- 32 Loci + **TMA F**

Module Eight: Probability and Statistics

- 33 Tables and charts
- 34 Correlation
- 35 Statistics
- 36 Probability (1)
- 37 Probability (2)
- 37 Testing a Hypothesis + **TMA G**
(Practice Exams if taking Foundation Tier exams)

Higher Course

Module Nine: Further Numbers and Equations

- 38 More on Numbers
- 39 Proof
- 40 Function Notation
- 41 Solving Equations
- 42 Graphs and Transformations
- 43 Equations and Graphs (2)
- 44 Gradients and Area under Curves + **TMA H**

Module Ten: Higher Algebra Topics

- 45 Formulae and Fractions
- 46 Brackets, Indices, etc
- 47 More on Inequalities + **TMA I**

Module Eleven: Further Geometry and Trigonometry

- 48 Higher Level Geometry
- 49 Tangents, Solids, Vectors, etc
- 50 Sine and Cosine Rules
- 51 Area, volume and 3D Geometry

Module Twelve: Further Probability and Statistics

- 52 Cumulative Frequency and Statistical Diagrams
- 53 Conditional Probability + **TMA J**

Module Thirteen: Your Exam

- 54 Problem-Solving and Examination Practice
- Tutor-Marked Assignments K, L and M (Practice Exams)**

How to Study This Course

Start with Module One, Lesson One and work your way through the course materials. The first page of each lesson sets out the aims and context of the lesson. After looking at this, you simply start reading the lesson and follow the instructions given.

Additional Textbooks

The course contains a number of tests and activities, sufficient for most students to do well in the examination. However if you feel you need more practice or an alternative viewpoint, we can recommend the following textbook:

CGP: GCSE Maths Workbook (with Answers and Online Edition)–Higher, published by CGP (ISBN 978-1841466477).

It is *not* compulsory to purchase this text or any other. One easy way to buy supporting texts is through the OOL website

(www.ool.co.uk). You may also choose to buy another textbook that is specifically aimed at a lower level. You could use this for extra practice. There are a variety of other textbooks available, and the answers to problems are usually given in the book, so you can check your own work.

Understanding Basic Ideas

The GCSE places great emphasis on ‘doing Mathematics’ and relating this, wherever possible, to everyday life. Certain techniques and formulae need to be learnt, but the emphasis on ‘doing’ means that you should work carefully through all the examples and exercises in order to be able to solve problems effectively.

Activities

There are a number of activities in each of the lessons. These are placed in special boxes so that you don’t miss them. Space is given underneath each question for you to attempt your answer. The pencil icon is a reminder that you are expected to do some writing.

Please do not ignore any activity just because you think you understand the topic already. Practice is vital! Where appropriate, suggested answers to the activity are to be found at the end of the lesson.

Try not to look at the answers to activities before you have had a go at working them out yourself.

Do make a habit of checking the answers after you have done the activities.

Don’t be discouraged if your answers aren’t right first time. Mistakes are one of the best means of helping you identify what you need to learn. Study the suggested answer, go back and study the method again in the course materials or textbook, and if you can’t understand, contact your tutor.

Your Tutor

Maths is a subject where it is vital to make good use of your tutor. No matter how good you are, you are bound to hit a brick wall every so often where a topic does not make sense no matter how many times you work through it. There is no need

to feel you have failed or that your tutor will think any the worse of you if you ask for guidance. Quite the reverse. Often it will only take a couple of minutes to supply the missing link and set you on the right course.

Tutor-Marked Assignments (TMAs)

There will be a series of tutor-marked assignments (TMAs for short) throughout the course, usually after every three or four lessons or at the end of a module. These tests should be tackled under exam conditions.

You should send your answers to your tutor, with a cover sheet clearly indicating your name and study programme. Your tutor will mark and return your script, and you will be sent specimen answers. The tests are all to be found at the relevant point in the course.

When you first start the course, keep your sights firmly set on the first TMA. It is very satisfying to see it done and send it off, and it gives your tutor a vital indication of how best he or she can help you.

Equipment

- You will need a ruler with metric markings (centimetres), a protractor, and a pair of compasses. For graph work, you will need some squared paper, which is available from most stationers.
- Electronic calculator.** Since a calculator is allowed on one of the written exam papers, it is important that you become familiar with the operation of your calculator at an early stage. As a minimum, it should have the following functions:

$$\begin{array}{cccc}
 + & - & \times & \div \\
 \pi & x^2 & \sqrt{x} & \frac{1}{x}
 \end{array}$$

Also: sine, cosine, tangent and their inverses in degrees. If you ask for a calculator 'for GCSE Maths', most shops will be able to advise you.

Planning Your Work

Think about when you might take the exam and work out how many study weeks you have available. That will give you a rough idea of how many weeks you might allow for each

lesson. (The lessons do vary in length and you will find some easier than others, depending on your previous experience.) As you progress with the course, you will have a better idea of how long you need and how much you can fit into the time you have available.

Working Habits

Here are a few tips to help you make the most of your study.

1. Always show all your working. If you can do a problem in your head, you should still write down how you did it. In the examination, you get marks for showing that you understand the method as well as for using it accurately. If you make an arithmetical error, you will still get marks for using the correct method. (If you get the answer wrong and don't show your method, you won't get any marks.)
2. Set your work out neatly, one step at a time. This really helps you to organise your thinking, which is essential, especially in longer activities.
3. Do lots of examples of each technique. Different questions give you a chance to practise the different variations of a problem, and this helps to make you more skilled and flexible in your work.
4. Make a list of mathematical words and their meaning as you come across them in each lesson. This helps you to remember the technical vocabulary and is extremely useful when you come to doing your revision. It is also very rewarding to see just how many concepts you have mastered!

Strategies for Problem-Solving

Problem-solving is a vital skill and there are various possible strategies that may help. You will be encouraged:

1. To set out cases systematically, and identify how many there are of relevant types.
2. To work backwards from a value given in the problem,
 - (a) where the inverse (the backwards mathematical principle) is familiar, so just has to be applied but may have to be sustained over a number of steps.

- (b) where the inverse is unfamiliar, so has to be worked out ‘from first principles’.
3. To find one or more examples that fit a condition for the answer, and see whether those examples fit with the other conditions in the situation, making adjustments until they do.
 4. To look for and represent relationships between elements of the situation, and then act on them to see if any are useful.
 5. To find features of the situation that can be acted on mathematically, and see where using them takes you.

Or, more simply:

1. Set out cases.
2. Work back familiar; work back unfamiliar.
3. Find an example to fit.
4. Find key relationships.
5. Find mathematical features.

Syllabus and Examinations

The AQA 8300 "Linear" Specification

Students following the AQA 8300 syllabus (or “specification”) take three written exam papers. There is a choice between Foundation tier (8300F) and Higher tier (8300H) papers. It is not necessary to make a decision about which tier is right for you at the outset – that can come later with your tutor’s advice.

The new specification contains an emphasis on “problem”-solving – that is to say, questions are likely to be given a “real world” context. This should make them easier to grasp and visualize while the underlying mathematical skills remain the same. You will find that there is plenty of problem-solving practice within the course.

Examination Structure

Details are given here for the AQA Foundation and Higher tiers. The exam papers are the same length, irrespective of the tier you are entering for, but the Higher papers include harder questions and the balance between different skills is slightly different (e.g. there is likely to be a little more algebra).

Paper 1: non-calculator

Content from any part of the specification may be assessed.

- written exam: 1 hour 30 minutes
- 80 marks
- non-calculator
- 33⅓% of the GCSE

A mix of question styles, from short, single-mark questions to multi-step problems. The mathematical demand increases as a student progresses through the paper.

Paper 2: calculator

Content from any part of the specification may be assessed.

- written exam: 1 hour 30 minutes
- 80 marks
- calculator allowed
- 33⅓% of the GCSE

A mix of question styles, from short, single-mark questions to multi-step problems. The mathematical demand increases as a student progresses through the paper.

Paper 3: calculator

Content from any part of the specification may be assessed.

- written exam: 1 hour 30 minutes
- 80 marks
- calculator allowed
- 33⅓% of the GCSE

A mix of question styles, from short, single-mark questions to multi-step problems. The mathematical demand increases as a student progresses through the paper.

AQA Aims and learning outcomes

Courses based on this specification in mathematics should provide a broad, coherent, satisfying and worthwhile course of study. They should encourage students to develop confidence in, and a positive attitude towards, mathematics and to recognise the importance of mathematics in their own lives and to society. They should also provide a strong mathematical foundation for students who go on to study mathematics at a higher level post-16.

Courses based on this specification in mathematics should enable students to:

- develop fluent knowledge, skills and understanding of mathematical methods and concepts
- acquire, select and apply mathematical techniques to solve problems
- reason mathematically, make deductions and inferences and draw conclusions
- comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

Students should be aware that mathematics can be used to develop models of real situations and that these models may be more or less effective depending on how the situation has been simplified and the assumptions that have been made. Students should also be able to recall, select and apply mathematical formulae.

AQA's Assessment objectives

Assessment objectives (AOs) are set by Ofqual and are the same across all GCSE Mathematics specifications and all exam boards.

The exams will assess the following AOs in the context of the content set out in the Subject Content section.

AO1: Use and apply standard techniques

Students should be able to:

- accurately recall facts, terminology and definitions
- use and interpret notation correctly
- accurately carry out routine procedures or set tasks requiring multi-step solutions.

AO2: Reason, interpret and communicate mathematically

Students should be able to:

- make deductions, inferences and draw conclusions from mathematical information
- construct chains of reasoning to achieve a given result
- interpret and communicate information accurately
- present arguments and proofs
- assess the validity of an argument and critically evaluate a given way of presenting information.

AO3: Solve problems within mathematics and in other contexts

Students should be able to:

- translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes
- make and use connections between different parts of mathematics
- interpret results in the context of the given problem
- evaluate methods used and results obtained
- evaluate solutions to identify how they may have been affected by assumptions made.

Quality of Written Communication (QWC)

As with all GCSE exams, you will need to do the following:

- Ensure that your writing is legible and that spelling, punctuation and grammar are accurate so that meaning is clear.
- Select and use a form and style of writing appropriate to purpose and complex subject matter.
- Organise information clearly and coherently, using specialist vocabulary when relevant.

In this mathematics specification it is expected that, in all questions, candidates will:

- use correct and accurate mathematical notation and vocabulary
- organise their work clearly
- use correct spelling, punctuation and grammar in any explanations they are asked to provide.

Revising for Your Exam

In your overall study plan, you need to allow time to go back over the course and revise all the different sections.

The final module of the OOL course, 'Your Exam', is designed to help you prepare for your exams. This module will guide you through the types of question you are likely to encounter in the two papers and encourages you to tackle practice examination papers.

Oxford Open Learning would like to thank the former AQA for their generosity in allowing us to reprint questions from their specimen examination papers.

Studying the Syllabus

You should be sure to acquire your own copy of the syllabus, either via the AQA Publications Dept or from the website www.aqa.org.uk. Be sure to get the syllabus for the right year!

The Mathematics specification can be purchased from:

AQA Publications
Unit 2, Wheel Forge Way,
Trafford Park
Manchester
M17 1EH (tel: 0870-410-1036)

or downloaded from
<http://ool.co.uk/0014mg>

We advise that you obtain a copy of the syllabus so that you can assess which topics you have covered in the most detail and which ones you will feel happiest about in the exam. AQA can also provide advice booklets on your course, including 'Information for Private Candidates'. As you approach the examination, it will also be helpful to purchase and tackle past papers from AQA.

Using the Internet

All students would benefit from access to the Internet. You will find a wealth of information on all the topics in your course. As well as the AQA website (www.aqa.org.uk), you should get into the habit of checking the Oxford Open Learning site (www.ool.co.uk) where you may find news, additional resources and interactive features as time goes by. If you have not

already done so, you may register for your free copy of *How to Study at Home*, our 200-page guide to home learning, or enrol on further courses. Put it on your favourites list now!

Good luck with the course!

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