Maths IGCSE

Introduction

Welcome to your Mathematics IGCSE 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 Edexcel IGCSE Specification A 4MA1 for exams in 2019 and later years.

The International General Certificate of Secondary Education (IGCSE) enables students to develop their mathematical knowledge and skills in a way which encourages confidence and provides satisfaction and enjoyment. The course provides students with a firm foundation for the further study of Mathematics and other disciplines. Students who obtain an IGCSE qualification from Edexcel are prepared for further academic success, including progression to A and AS Level study, and equipped with the skills needed for immediate employment, IGCSE is recognised as evidence of ability by academic institutions around the world.

The Edexcel syllabus is highly suitable for 'external' students – those not in full-time school-based education, e.g. someone studying part time by open learning, flexistudy, correspondence course, or someone being home-schooled.

The OOL Course is suitable for students aiming for *either* the Foundation Tier exams (with potential grades 5-1, following the course up to Module Seven), *or* the Higher Tier exams (grades 9-4). All students sit two papers (see page 9 of this introduction for details).

Oxford Open Learning

Arrangement of Lessons

Foundation Tier Course: Module 1: Numbers

Lesson	Subject
1	Numbers
2	Prime Numbers, Factors and Fractions
3	Decimals, Approximations and Accuracy
4	Indices
	Tutor-Marked Assignment A

Module 2: Money

5	Ratios, Proportion and Percentages
6	Percentages and Interest
7	Other Money Matters

Module 3: Measurement

8	Time, Distance, Speed and Conversion
9	Other Money Matters
	Tutor-Marked Assignment B

Module 4: Basic Algebra

10	Basic Algebra
11	Factorisation
12	Solving Equations
13	Equations in Action; Formulae
14	Inequalities and Accuracy
	Tutor-Marked Assignment C

Module 5: Basic Geometry

15	Angles, Straight Lines and Symmetry
16	Triangles
17	Quadrilaterals and Polygons
18	Transformations
19	The Circle
	Tutor-Marked Assignment D

Module 6: Further Geometry and Trigonometry; Probability

20	Mensuration
21	Geometrical Constructions and Solid Figures
22	Volume, Surface Area and Capacity
23	Trigonometry (1)

24 Bearings
25 Probability and Sets
Tutor-Marked Assignment E

Module 7: Graphwork and Statistics

26 Representing Data
27 Graphs and Gradients
28 Quadratic Graphs
29 Introduction to Statistics
30 Distance, Velocity, Acceleration and Time
Tutor-Marked Assignment F

Plus Lesson 51 and TMA K and TMA L if you are *not* going on to the Higher Tier Course.

Higher Tier Course

Module 8: Graphs, Probability and Experimental Work

31 Harder Graphs
32 Further Probability
33 Venn Diagrams, Sets and Probability
Tutor-Marked Assignment G

Module 9: Further Numbers and Equations

34 Numbers and Indices
35 More on Probability: Tree Diagrams
36 Solving Equations
37 Sine and Cosine Graphs
38 Formulae and Fractions
39 Brackets, Indices, etc
40 Inequalities and Graphwork
Tutor-Marked Assignment H

Module 10: Advanced Geometry and Trigonometry

41 Further Geometry
42 Chords, Tangents and Polygons
43 Vectors
44 Trigonometry (2)
45 Trigonometry (3): the Sine Rule and the Cosine Rule
46 Trigonometry (4): Circles and Other Geometric Shapes
Tutor-Marked Assignment I

Module 11: Further Graphwork, Statistics and Number Work

47 Proof
48 Gradients and Differentiation
49 Cumulative Frequency
50 Functions
Tutor-Marked Assignment J

Module 12: Your Exam

51 Revision for your Examination
Tutor-Marked Assignments K and L

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 should 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, we can recommend the following textbook:

> Trevor Johnson & Tony Clough: *IGCSE Mathematics for Edexcel Practice Book*, published by Hodder (ISBN: 978-1471889035).

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 IGCSE 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 most questions 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 for 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 to 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 in which 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 seem to make sense, no matter how many times you work through it. There is no need to feel that 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.

Twig Resources

We hope that students of this course will also take the opportunity to learn from the wealth of Twig resources to which this course is linked. Twig have produced more than a thousand educational films, particularly for science, maths and geography, and these complement the lesson materials here to enhance the learning experience.

To view the films, you will need an e-mail account, internet access and a password, supplied to you on enrolment. As you work through the lessons, you will come across Twig-links quite regularly, looking like this:

Log on to Twig and look at the film titled: **The Prime Number Code**

www.ool.co.uk/1673wp

Why prime numbers are the building blocks of encryption, used for information security, in cash machines and to hide your identity online.

To reach the film, you would either type the URL into your web-browser (here www.ool.co.uk/1673wp) or search the Twig site (www.twig-world.co.uk) for 'Prime Number'. Having watched it, you return to the lesson.

Access to these resources is offered on the following terms:

1. OOL is not responsible for the content of the Twig films or for the technology which transmits them.

2. The films may not be accessible at certain times.

3. OOL cannot be responsible for any technical difficulties students may have in viewing the films and cannot advise on any software or hardware issues.

4. Access is limited in any case to the period until the student's expected exam date.

5. Students are responsible for remembering their own usernames and passwords. Please note: once assigned, a username *cannot* be changed. Passwords can be.

6. Passwords are supplied for the use of the named student only and should not be passed on to any third parties under any circumstances – because each password is unique it will be apparent if it is used on numerous machines.

7. The films are of greater or lesser relevance and it is probable that some parts of many of the films will be too "advanced" for your needs, include ideas you have not yet covered, or introduce information that is not required for the Edexcel specification.

8. If you find that a film is not helpful or interesting, stop watching it! It is possible to study the course successfully without watching *any* of the films.

Remember that this is bonus material only, adding depth and context to the course, and this pack forms the spine of the learning material. But each film we have selected should make studying that little bit easier and more enjoyable.

9. Alongside each film, the Twig site offers various additional resources. You can download a transcript of the film, take a quiz or even an advanced quiz. These are optional extras if you have time and inclination.

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 start the course, keep your sights firmly set on the first TMA. It is very satisfying to complete it and send it off, and it gives your tutor a vital indication of how 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.** A calculator should be used in both of the examinations, so 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:

  $+$ $-$ $\times$ $\div$

  π x^2 $\sqrt{x}$ $\frac{1}{x}$

  Also: sine, cosine, tangent and their inverses in degrees.

If you ask for a calculator 'for GCSE Maths', most shops will be able to help. Please bear in mind that algebraic or graphical calculators are not permitted in the exam.

Planning Your Work

Think about when you might take the exam and work out how many study weeks you have left. This will give you an 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 available.

It makes sense to leave plenty of time at the end of your studies for revision and examination practice. You should find past papers and/or specimen papers on the Edexcel website. Take every opportunity you can!

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 will 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 meanings as you come across them in each lesson. This helps you to remember technical vocabulary and will be extremely useful when you come to revise. It is also very rewarding to see just how many concepts you have mastered!

Syllabus and Examinations

The Edexcel Specifications 4MA1 - Foundation or Higher?

Students following the Edexcel syllabus (or "specification") take two written papers. There is no coursework.

The subject code for exam entry is 4MA1. This gives you a choice between the Foundation and Higher Tiers. If you take the Higher Tier, you will face some harder topics but if you take the Foundation Tier, you cannot be awarded the top grades. Don't worry – you do not need to decide immediately. Your tutor should advise you on the basis of your progress in the early modules of the course. The Foundation Level topics are contained in the first seven modules, so you may stop at the end of Module Seven.

Eventually, you will *either* sit Paper 1F and 2F *or* you will sit Paper 1H and 2H.

Grading

The main change, since the 2018 exams, has been in the way the grading system works. Instead of a grade between A and G, you will be awarded a grade between 9 (best) and 1 (worst), as with the new GCSEs. This allows for a little more differentiation, especially at the top end. It is anticipated that a new grade 5 will be considered as equivalent to the top end of the old grade C and grade 4 to a "low" grade C. But different institutions might even require a grade 6 – you will need to check.

If you take the Foundation Tier exams, the grade range is 5-1, i.e. you cannot do better than a 5. The available range for the Higher Tier is 9-4.

There may be some questions common to both Foundation and Higher Tier papers. All papers are two hours long and marked by Edexcel.

This course is also divided into a Foundation Tier (as far as the end of Module Seven) and a Higher Tier. Most students will be uncertain when they start how well they will progress and so they won't know if the Higher Tier is for them or not. By the end of Module Seven, it should be clearer. If you have run out of study-time before your exams or if you are finding topics too challenging, it may be sensible to study no further than Module Seven and take the Foundation Tier exams only. The tutor

should be able to advise at that point whether this is a sensible decision.

However, it should be noted that, in order to follow a natural teaching sequence, certain Higher Tier topics are included within the Foundation course. These are marked as Higher Tier topics and may be omitted if the student is already certain that the Higher Tier is beyond their ambitions.

In some cases, the boundaries between Foundation tier topics and Higher Tier topics are a little fuzzy. Please consult the specification if you need to check where those boundaries lie.

In general terms, our advice would be to have a go at the Higher Tier topics and take the Higher Tier exams, even when you have found certain topics difficult. You don't have to score 100% to achieve a good grade!

The Specification Objectives

The Edexcel IGCSE in Mathematics (Specification A) qualification is designed to enable students to:

- develop their knowledge and understanding of mathematical concepts and techniques
- acquire a foundation of mathematical skills for further study in the subject or related areas
- enjoy using and applying mathematical techniques and concepts, and become confident to
- use mathematics to solve problems
- appreciate the importance of mathematics in society, employment and study.

Examination Structure

First Examination: Paper 1F or 1H

2 hours – 50% of the total marks

Second Examination: Paper 2F or 2H

2 hours – 50% of the total marks

In **all** examination papers:

- diagrams will not necessarily be drawn to scale and measurements should not be taken from diagrams unless instructions to this effect are given
- each student may be required to use mathematical instruments, e.g. pair of compasses, ruler, protractor
- calculators may be used
- tracing paper may be used
- formulae sheets will be provided.

Topics are *not* split between the two papers you will take. *All* the Foundation content will be relevant to Papers 1F and 2F and all the Foundation and Higher content will be relevant to Papers 1H and 2H.

Studying the Syllabus

The Edexcel IGCSE Mathematics specification 4MA1 specification is at www.ool.co.uk/0011mi2.

We advise that you obtain a copy of the syllabus so that you can assess which topics you have covered in sufficient detail. But the exams are designed to test your mastery of *all* the required topics – you can't pick and choose your favourites! Edexcel can also provide lots of other resources for your course. As you approach the examination, it will be helpful to look at the website (see in particular, Examzone) and see what is available.

Knowledge, Skills and Understanding

This Edexcel IGCSE in Mathematics (Spec. A) requires students to demonstrate application and understanding of the following:

Number

- Use numerical skills in a purely mathematical way and in real-life situations.

Algebra

- Use letters as equivalent to numbers and as variables.
- Understand the distinction between expressions, equations and formulae.
- Use algebra to set up and solve problems.
- Demonstrate manipulative skills.
- Construct and use graphs.

Geometry

- Use properties of angles.

- Understand a range of transformations.
- Work within the metric system.
- Understand ideas of space and shape.
- Use ruler, compasses and protractor appropriately.

Statistics

- Understand basic ideas of statistical averages.
- Use a range of statistical techniques.
- Use basic ideas of probability.

Problem-solving and reasoning

- Translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes.
- Make deductions and draw conclusions from mathematical information
- Construct chains of reasoning
- Present arguments and proofs
- Interpret and communicate information accurately.

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. 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.

Good luck with the course!