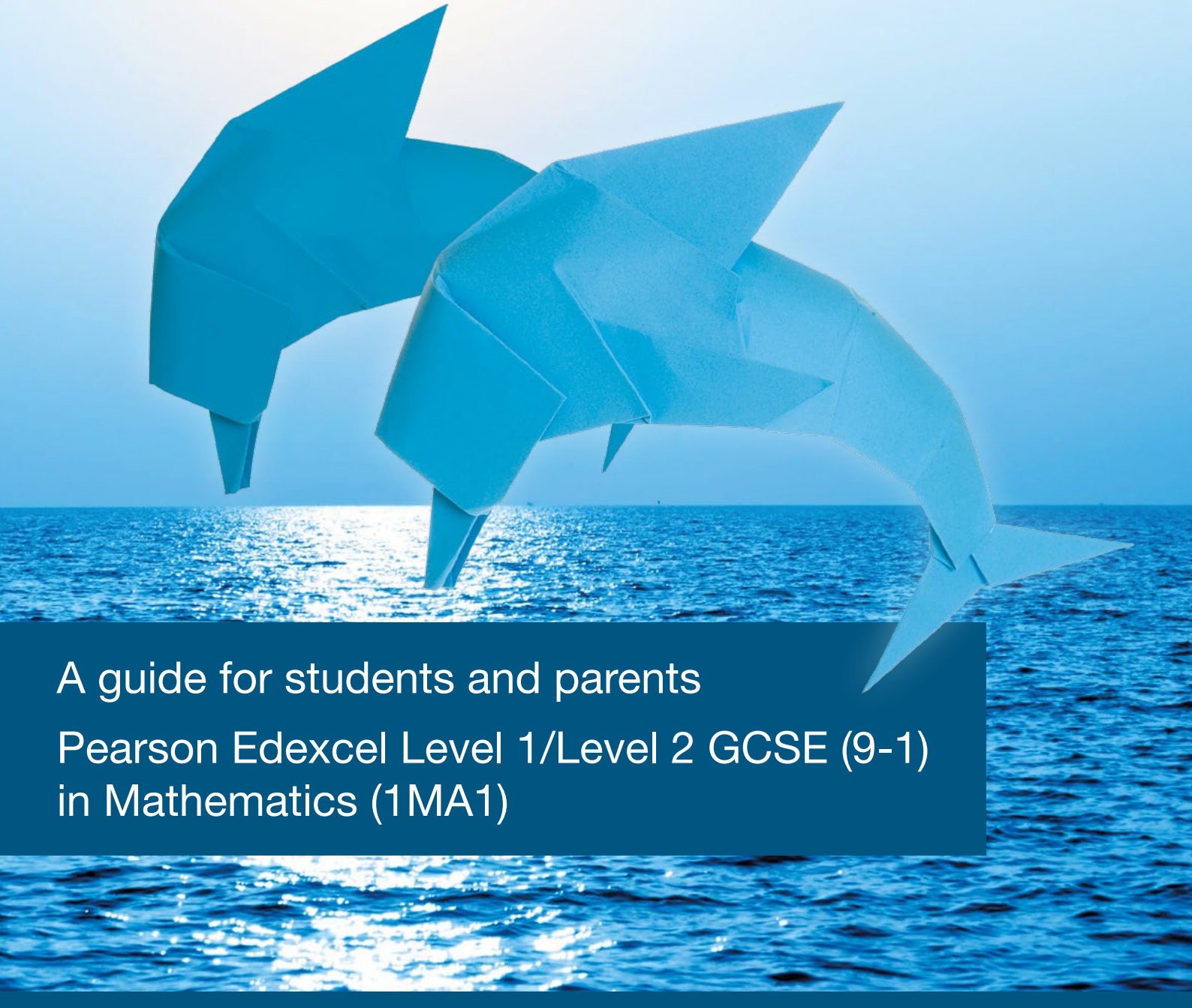
edexcel

GCSE (9-1) Mathematics

First examinations in 2017



A guide for students and parents

Pearson Edexcel Level 1/Level 2 GCSE (9-1) in Mathematics (1MA1)

ALWAYS LEARNING

PEARSON

Introduction

The Pearson Edexcel GCSE (9–1) in Mathematics is intended to:

- provide evidence of students' achievements against demanding and fulfilling content, to give students the confidence that the mathematical skills, knowledge and understanding that they will have acquired during the course of their study are as good as that of the highest performing jurisdictions in the world
- provide a strong foundation for further academic and vocational study and for employment, to give students the appropriate mathematical skills, knowledge and understanding to help them progress to a full range of courses in further and higher education
- provide (if required) a basis for schools and colleges to be held accountable for the performance of all of their students.

Students who study for GCSE Mathematics will be expected to:

- develop confidence and competence with the defined mathematical content
- develop fluent knowledge, skills and understanding of mathematical methods
- 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
- recall, select and apply mathematical formulae.

We have developed and designed this qualification to ensure it is comparable to those taken in high-performing countries and meets the needs of further and higher education institutions and employers in the UK so you can be confident that this qualification is world-class and will be recognised whatever next steps you wish to take.

What's new about GCSE for 2017?

From September 2015, schools and colleges will be teaching new GCSE Mathematics (9–1) specifications (as a two year course) and first wards for these (the first time certificates with new grades will be awarded) will be in August 2017.

The GCSE will be entirely assessed by written examination, which means no coursework will be required.

The content of our GCSE Mathematics specification has been grouped into topic areas:

Number; Algebra; Ratio, proportion and rates of change; Geometry and measures, Probability; Statistics.

However, the main thing that's new about GCSE Mathematics is that it is going to change and be more demanding for everyone:

- the volume of subject content has increased for both Foundation tier and Higher tier (see pages 4–7 for the list of topics that must be studied for both Foundation and Higher tiers)
- the demand of that content is increasing too, with harder topics being introduced. This is true for both Foundation Tier students and Higher Tier students (see pages 4–7 where we have clearly shown what these new topics are)
- the total time for the examinations is increasing, from 3 ½ hours to 4 ½ hours, which has meant three exam papers instead of two. Modular exams are a thing of the past – all exams will be sat at the end of the course (see page 8 for an overview of the assessment)
- there are fewer marks at the lower grades and more marks at the higher grades on all Foundation Tier and Higher Tier papers
- a new grading structure is being introduced, from grade 9 to 1, to replace the familiar A* to G grading scale. 9 will be the highest grade, 1 the lowest. All GCSEs will eventually move to this new grading structure, but this is happening in phases. English and maths are the first two subjects so students will be awarded a grade from 9 to 1 for those subjects from 2017 whilst other GCSE subjects will still be awarding grades A*-G (see page 11 for more information on the new grading scale)
- in the assessments there's a greater emphasis on problem solving and mathematical reasoning, with more marks now being allocated to these higher-order skills
- students will be required to memorise formulae – fewer formulae will be provided in examinations (see page 10 for the list of formulae that can be provided to students in the examinations and the list of formulae students need to memorize)

You may find that some schools are devoting more lesson time to teach GCSE Mathematics in Year 10 and 11 as a result of these changes.

Together these changes are designed to help students emerge from GCSE Mathematics with a level of confidence and fluency that will provide a genuine foundation for the rest of their learning and working lives.

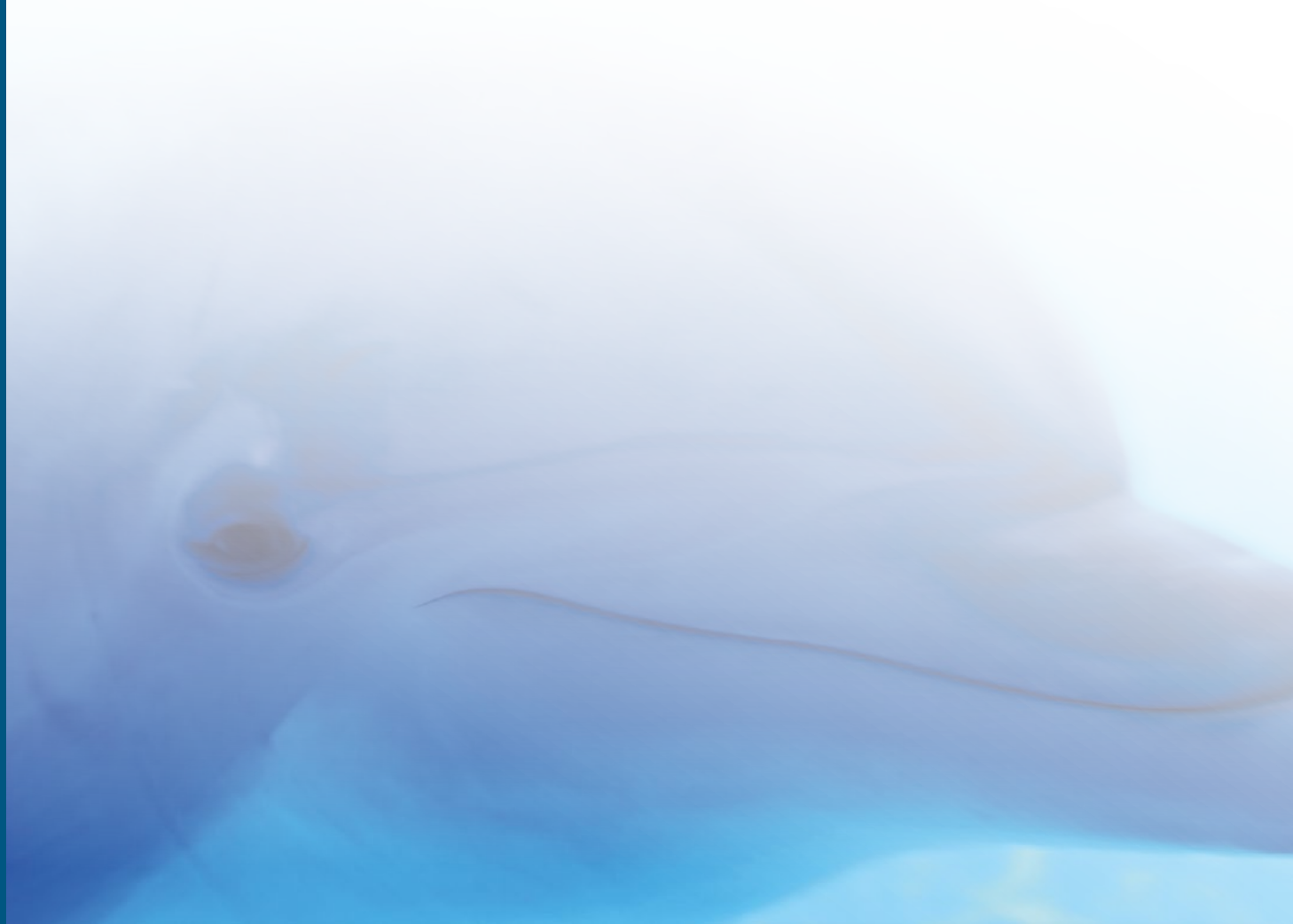
At Pearson, we'll make sure that students will be sitting carefully differentiated examination papers, written in a clear and unambiguous way, with opportunities for them to build their confidence as they progress through the paper.

Clear mark schemes used by examiners will ensure that students are able to demonstrate their mathematical ability so all they achieve the grades they deserve.

Support will be made available to all teachers to help understand the increase in demand, including exemplar student work and examiner commentaries. We'll provide teachers with free and paid-for resources that focus on building fluency, reasoning and problem-solving skills for students across all grades as well as support for tracking students' progress, including sets of practice papers and mock papers.

Of course, the key to students' success isn't to be found in a qualification and the help we provide. Instead it's in what they do every day to develop their understanding, increase their confidence and their exposure to the range of mathematical experiences that will shape their success.

And we'll do everything we can to support you in doing that, every step of the way.



The Content

Foundation tier	New to Foundation tier
Number	**Number**
• Integers and negative numbers	
• Place value	
• Four operations	
• Fractions	
• Decimals	
• Fractions, decimals and percentages	
• Reciprocals	
• Primes, factors and multiples	
• Approximation, estimation and rounding	• Rounding: use inequality notation to specify simple error intervals
• Roots and powers	
• Index laws	• Index laws: zero and negative powers
• Standard form	• Standard form
Algebra	**Algebra**
• Expressions, equations and formulae	
• Algebraic manipulation	• Algebraic manipulation: expanding the product of two linear expressions Algebraic manipulation: factorise quadratic expressions in the form $x^2 + bx + c$
• Inputs and outputs	
• Linear equations	
• Quadratic equations	• Quadratic equations: solve by factorisation
• Simultaneous equations	• Simultaneous equations: linear/linear
• Linear inequalities	
• Sequences	• Sequences: Fibonacci, quadratic and geometric progressions
• Coordinates in 2D	
• Graphs: linear, quadratic, cubic, reciprocal	• Graphs: plot cubic and reciprocal graphs Graphs: gradient of a straight-line graph as a rate of change
• Real-life graphs, e.g. distance-time, travel and conversion graphs	
• Gradients of straight lines	
• Roots, intercepts and turning points of quadratic functions	• Roots, intercepts and turning points of quadratic functions
Ratio, proportion and rates of change	**Ratio, proportion and rates of change**
• Ratio and ratio notation	• Ratio: relating ratios to linear functions
• Converting between units	
• Scale factors, maps and scale drawings	
• Percentages	
• Direct and inverse proportion	• Direct and inverse proportion
• Compound measures	• Compound measures: density and pressure
• Compound interest and multipliers	• Compound interest and reverse percentages

Foundation tier	New to Foundation tier
Geometry and measures • Geometric reasoning • Angle properties • Properties of 2D shapes • Properties of 3D shapes • Plans and elevations • Area • Perimeter • Volume • Circles • Measures • Time calculations • Bearings, maps and scale drawings • Constructions and loci • Transformations • Congruence and similarity • Pythagoras' Theorem • Trigonometry • Vectors	**Geometry and measures** • Area and perimeter: compound shapes • Area and volume: more complex shapes and solids • Circles: lengths of arcs and areas of sectors of circles • Transformations: fractional enlargements • Trigonometry: ratios in 2D right-angled triangles Trigonometry: know the exact values of certain trigonometric ratios • Vectors
Probability • Probability scales • Frequency trees • Theoretical probability • Relative frequency • Sample space diagrams • Adding probabilities • Venn diagrams • Probability tree diagrams	**Probability** • Venn diagrams • Tree diagrams
Statistics • Primary and secondary data • Sampling and bias • Tables and charts: pictograms, line, pie, bar, time-series, frequency polygons • Stem and leaf diagrams • Scatter graphs and lines of best fit • Averages and range • Grouped data	**Statistics** • Sources of bias and sampling

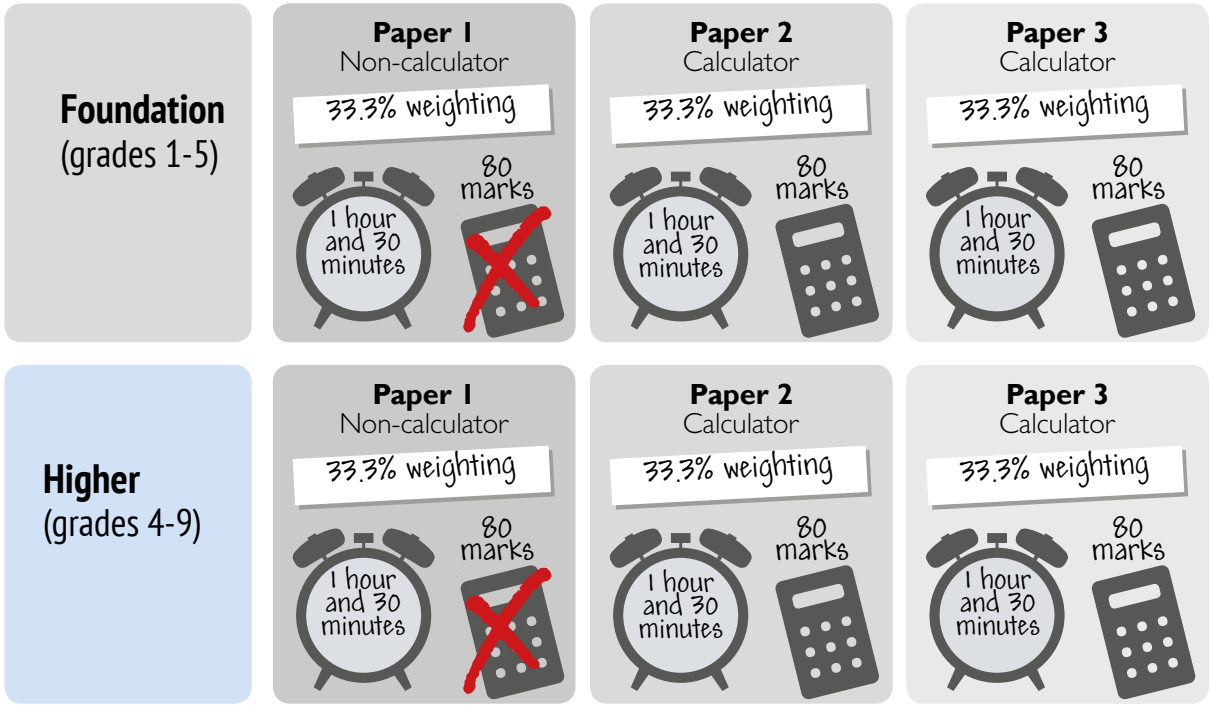
Higher tier	New to Higher tier
Number	**Number**
• Integers and negative numbers	
• Place value	
• Four operations	
• Product rule for counting	• Product rule for counting
• Decimals	
• Fractions	
• Fractions, decimals and percentages	
• Reciprocals	
• Primes, factors, multiples, highest common factor, lowest common multiple	
• Approximation, estimation and rounding	• Rounding: use inequality notation to specify simple error intervals
• Roots and powers	• Roots and powers: estimate powers and roots of any given positive number
• Index laws, including fractional indices	
• Standard form	
• Surds	
• Bounds	
Algebra	**Algebra**
• Expressions, equations and formulae	
• Algebraic manipulation	• Algebraic manipulation: expand the product of more than two binomials
• Algebraic fractions	
• Algebraic proof	
• Functions and function notation	• Functions and function notation
• Linear equations	
• Quadratic equations	
• Simultaneous equations	
• Linear and quadratic inequalities, including set notation	
• Iteration	• Iteration
• Sequences	• Sequences: Fibonacci, quadratic and geometric progressions Sequences: simple geometric progressions including surds Sequences: finding the nth term of quadratic sequences
• Coordinates in 2D	
• Graphs: linear, quadratic, cubic, reciprocal, exponential, trigonometric, of circles	• Graphs: gradient of a straight-line graph as a rate of change
• Real-life graphs, e.g. distance-time, travel and conversion graphs	
• Gradients of straight lines	
• Transformations of functions	
• Roots, intercepts and turning points of quadratic functions	• Roots, intercepts and turning points of quadratic functions; deduce turning points by completing the square
• Area under graphs	
Ratio, proportion and rates of change	**Ratio, proportion and rates of change**
• Ratio and ratio notation	• Ratio: relating ratios to linear functions
• Converting between units	
• Scale factors, maps and scale drawings	
• Percentages	
• Direct and inverse proportion	
• Compound measures	
• Rates of change	• Rates of change
• Compound interest and multipliers	
• General iterative processes	

Higher tier	New to Higher tier
Geometry and measures • Geometric reasoning • Angle properties • Properties of 2D shapes • Properties of 3D shapes • Plans and elevations • Area • Perimeter • Volume • Circles • Measures • Bearings, maps and scale drawings • Constructions and loci • Transformations, including combinations • Congruence and similarity, including areas and volumes • Pythagoras' Theorem • Trigonometry, including sine and cosine rule, area of a triangle, and 3D shapes • Circle theorems • Vectors, including geometric proofs	**Geometry and measures** • Trigonometry: know the exact values of certain trigonometric ratios
Probability • Frequency trees • Theoretical probability • Relative frequency • Sample space diagrams • Adding probabilities • Venn diagrams • Probability tree diagrams • Conditional probabilities	**Probability** • Venn diagrams • Tree diagrams • Conditional probabilities: Venn diagrams
Statistics • Primary and secondary data • Sampling and bias • Tables and charts: line, pie, bar, time-series, frequency polygons • Stem and leaf diagrams • Histograms with unequal class intervals • Scatter graphs and lines of best fit • Averages, range and quartiles • Grouped data • Box plots • Cumulative frequency	**Statistics**

Overview of assessment

There will be three written papers, each contributing 33 % of the marks towards the final grade.

There are two tiers of entry:



Paper	Tier Availability	Method of Assessment	Availability	First Assessment	Weighting	Structure of Assessment
1	F and H tiers	Written examination	November*, June	June 2017	33⅓%	Non-calculator
2	F and H tiers	Written examination	November*, June	June 2017	33⅓%	Calculator
3	F and H tiers	Written examination	November*, June	June 2017	33⅓%	Calculator

*November sessions are for students retaking GCSE Mathematics and they must be aged 16 or over.

Examination aids

Use of Calculators

When obtaining a calculator that you will need for Paper 2 and Paper 3 make sure you adhere to the following rules:

Calculators must be:

- of a size suitable for use on the desk
- either battery or solar powered
- free of lids, cases and covers which have printed instructions or formulas.

Calculators must not:

- be designed or adapted to offer any of these facilities:
  - language translators
  - symbolic algebra manipulation
  - symbolic differentiation or integration
  - communication with other machines or the internet
- be borrowed from another candidate during an examination for any reason
- have retrievable information stored in them, including (but not limited to):
  - databanks
  - dictionaries
  - mathematical formulas
  - text

Formulae

Below is a list of formulae that students do not have to memorise and can be provided within the examination, as part of the relevant question.

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

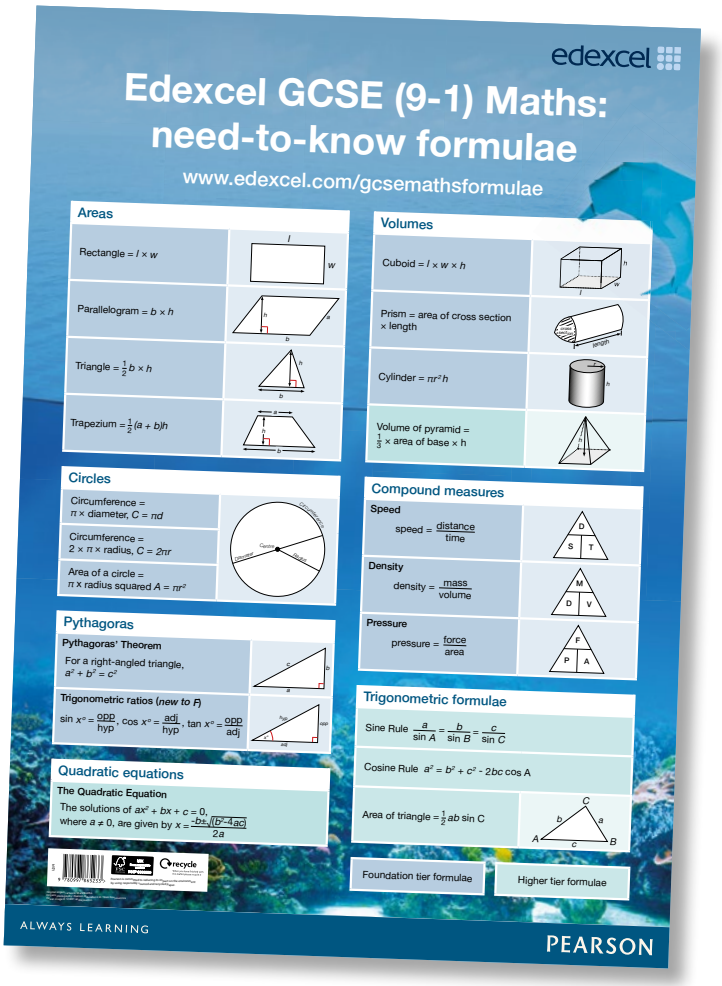
Curved surface area of a cone $= \pi r l$

Surface area of a sphere $= 4\pi r^2$

Volume of a sphere $= \frac{4}{3}\pi r^3$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

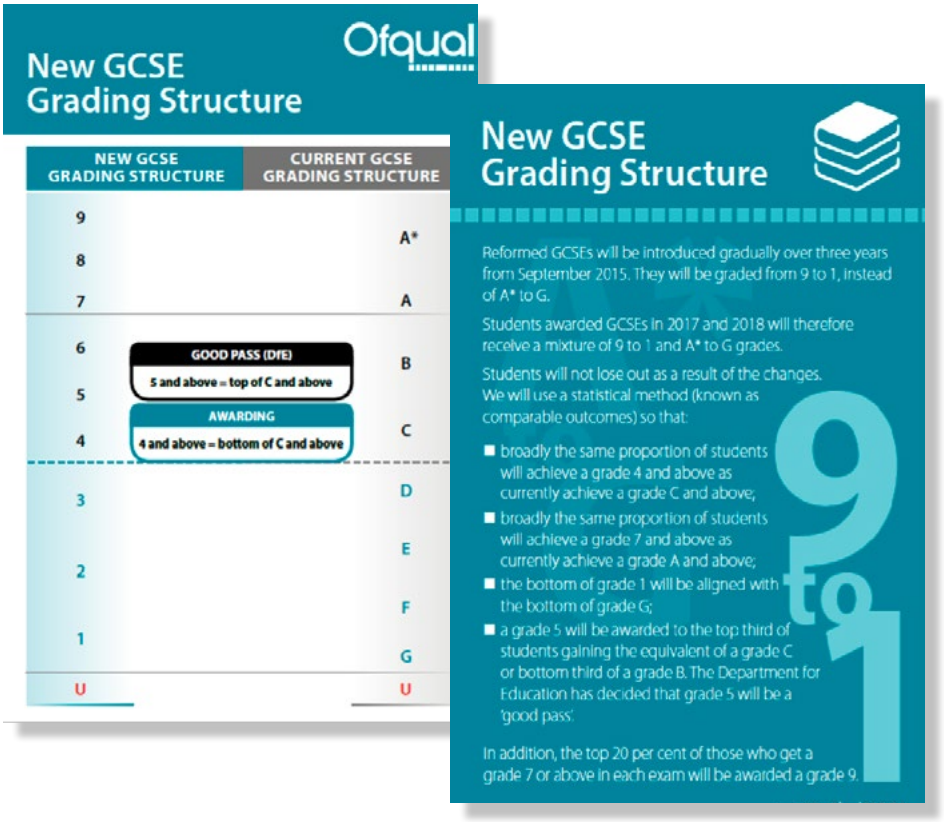
Here's a list of the formulae that students have to memorise and recall:



Students will probably be familiar with this poster, which is likely to be displayed in their classrooms. They can download a smaller, black-and-white version from our website which they can stick inside their exercise books.

The new grading scale

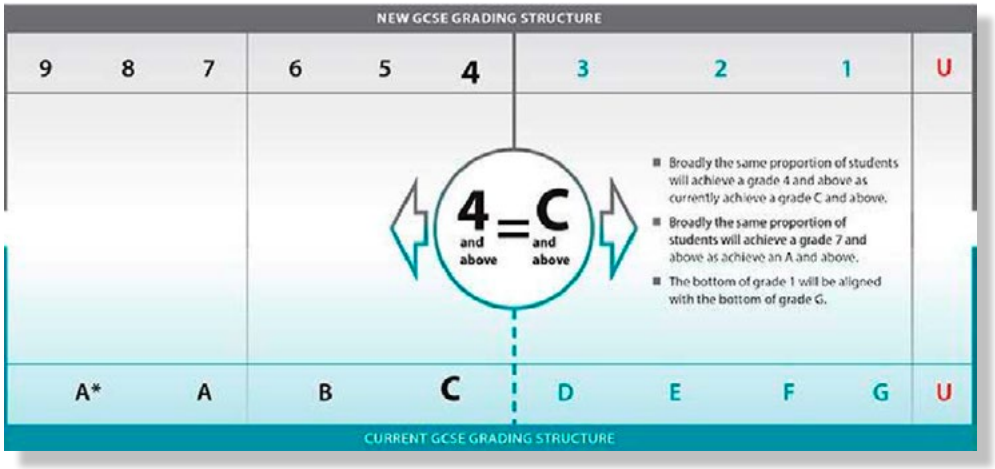
Eventually all reformed GCSEs will be graded on the new scale 9-1. Ofqual, the regulator, have published the following guidance regarding the grading of new GCSEs in 2017.



Grade 5 will be the new 'good pass' for GCSE Mathematics.

Under the new system, a 'good pass' – currently a C grade - will become a grade 5 under the new scale. The new 'good pass' is comparable to a high C or low B under the current system, making it comparable to the standard aimed for by pupils in top-performing countries such as Finland, Canada, the Netherlands and Switzerland.

For the first two years of the specification (academic years 2017 to 2018 and 2018 to 2019) students who have achieved a grade 4 are not required to retake GCSE Mathematics.



The new Foundation tier

Teachers will be working with you to make decisions as to which tier (Foundation or Higher) is more appropriate for each student. It is important to remember that the new Foundation tier is more demanding than the current Foundation tier so just because a student may have previously been suitable for Higher tier that may no longer be the case as the content and assessment is quite different. Here are some of the things to consider when choosing tier of entry.

- A grade 5 – the new good pass can be attained through Foundation tier
- There is harder content that has been introduced to Foundation from Higher tier such as simultaneous equations
- The Foundation papers include questions targeted at the top of grade 5 which is broadly comparable to a low grade B
- The papers will include more questions testing higher order skills such as problem solving and reasoning
- There are common questions between Foundation and Higher tier papers that appear towards the end of the Foundation tier sample papers and form the first part of the Higher tier sample papers.

Progression

What GCSE Maths grade have you achieved at the end of Year 11?	What maths qualifications you can do next...	
I have achieved a grade 6/7 or above	I can study AS or A level Mathematics (and Further Mathematics)	AS and A level Mathematics is a prerequisite for some undergraduate degree courses at University such as Medicine and Economics
I have achieved a grade 4 or above (in 2017 and 2018) or a grade 5 or above (in 2019 and beyond)	I can study a Level 3 Core Mathematics course	Core Mathematics can help you prepare you for some undergraduate courses at University such as Geography and Psychology

A good pass in GCSE Maths is essential for progression to many level 3 academic (e.g. A levels in Sciences and Geography) and vocational courses (e.g. BTEC Engineering) as well as areas of employment such as teaching, fashion and childcare.

Good Pass

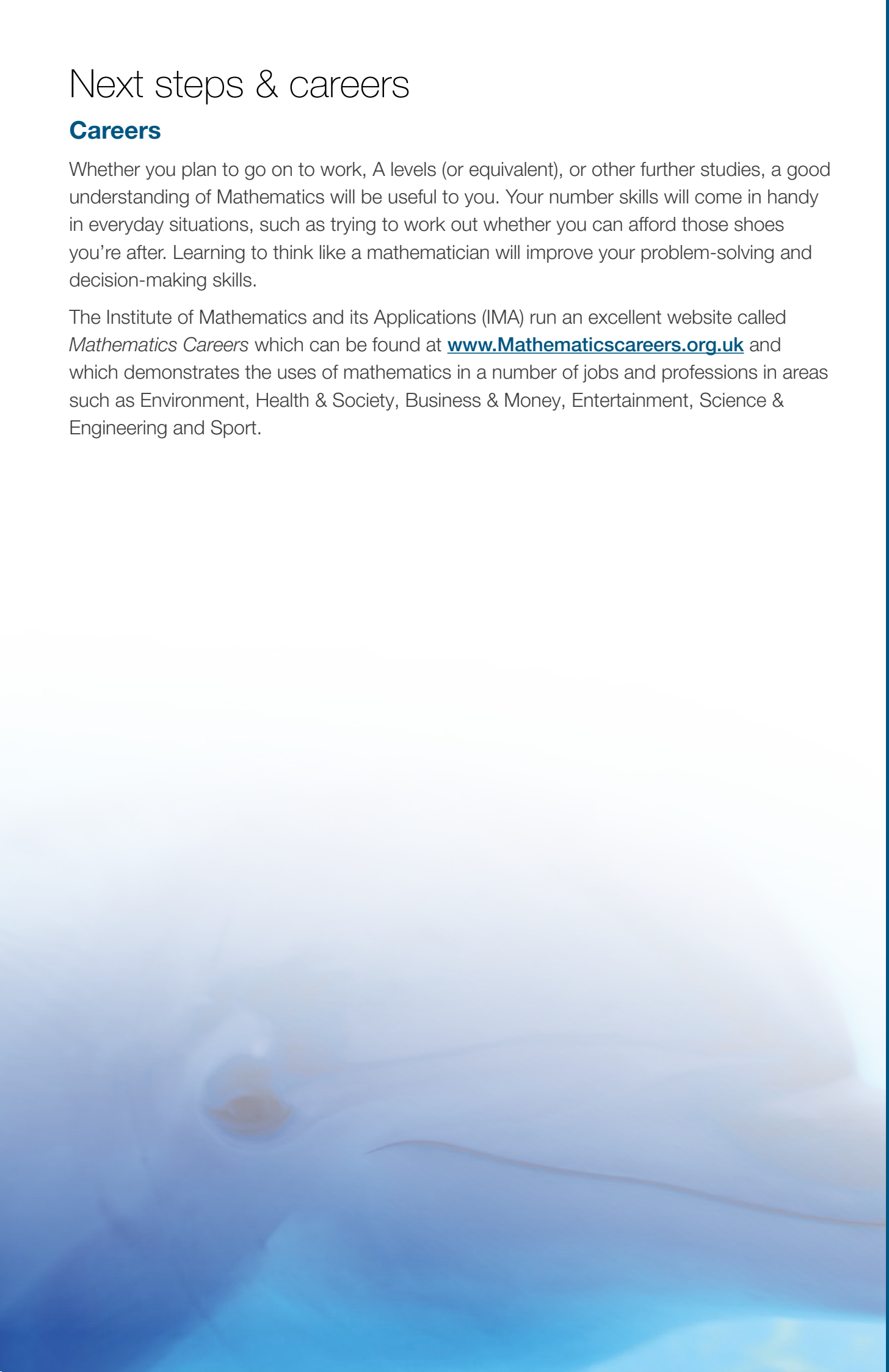
I have achieved a grade 3 (in summer 2017 and 2018) or a grade 4 or (in 2019 and beyond)	I need to retake GCSE Maths - I can do this as soon as November or I can enrol on a retake course and retake the exam the following summer
I have achieved a grade 1 or 2	I need to work towards achieving a higher grade in GCSE Maths - I can do this by taking other qualifications such as Functional Skills and Edexcel Awards

Next steps & careers

Careers

Whether you plan to go on to work, A levels (or equivalent), or other further studies, a good understanding of Mathematics will be useful to you. Your number skills will come in handy in everyday situations, such as trying to work out whether you can afford those shoes you're after. Learning to think like a mathematician will improve your problem-solving and decision-making skills.

The Institute of Mathematics and its Applications (IMA) run an excellent website called *Mathematics Careers* which can be found at **www.Mathematicscareers.org.uk** and which demonstrates the uses of mathematics in a number of jobs and professions in areas such as Environment, Health & Society, Business & Money, Entertainment, Science & Engineering and Sport.



AS and A level Mathematics

If you are interested in taking mathematics as one of your A level options, you will need to take the higher tier GCSE course because the A level course builds on some of the topics from higher tier. Many schools and colleges will require a GCSE Mathematics grade of 7 or better for access to their A level Mathematics course.

While studying A level Mathematics you will be expected to solve problems by using mathematical arguments and logic. You will also have to understand and demonstrate what is meant by proof in mathematics.

A level Mathematics is an entry requirement for some higher education courses and is a much sought after qualification for many others. There are also many areas of employment which value A level Mathematics and it is often a requirement for the vocational qualifications related to these areas.

A GCSE in Mathematics is very valuable as a supporting subject to many courses at GCSE, A level and degree level, for example physics, chemistry, biology, geography, psychology, sociology, and medical courses.

AS and A level Further Mathematics

If you are interested in taking your mathematics studies even further, there are AS and A level courses in further mathematics. These are particularly useful if you plan to take a degree in mathematics, physics or one of the engineering subjects and there are some universities who require A level Further Mathematics for entry to their mathematics degree courses.

We will be producing published resources specifically for delivery of our Edexcel A level Mathematics and Further Mathematics 2017 qualification. More details to follow soon.

Mathematics in Context (Core Maths)

If you are interested in extending your maths skills beyond GCSE but feel AS or A Level Mathematics may not be right for you, consider studying Level 3 Core Maths instead.

Core Maths is a new qualification intended to teach pupils how to use and apply maths in real situations. It is aimed at students with a good pass at GCSE Maths, who wish to maintain and develop their mathematics but who do not wish to pursue AS or A level maths.

Our Edexcel Level 3 Mathematics in Context qualification is our version of Core Maths and will be useful when you're moving on to higher education, training or employment. The qualification is recognised in UCAS points, so will count if you are applying for university.

During the course you will look at how to use and apply maths in many different real life situations. You will read articles that involve interpreting data and mathematical information, all from relevant and interesting sources. The content has been carefully selected to support the mathematical needs of a range of AS, A Level and BTEC Level 3 qualifications, and to provide a progression from GCSE Mathematics.

Mathematics in Context can be chosen as part of a selection of Level 3 qualifications which may be academic, Applied General, Technical Level or a mixture, to complement and support your other subjects. Mathematics in Context also counts as the mathematics element of the Technical Baccalaureate, so will help if you're considering a vocational programme too.

If you are interested in taking Mathematics in Context (Core Maths) you will probably need to achieve at least a grade 4 or 5 in GCSE. Check with the school or college you are interested in to make sure.

Supporting students

The student area on our website can support you with anything from searching for past papers to understanding your results and how you go about getting a replacement certificate. Take a look here: **qualifications.pearson.com/students**

ResultsPlus

ResultsPlus is a free online results analysis tool for teachers that gives them a detailed breakdown of their students' performance in Edexcel exams.

Widely used by teachers across the country, ResultsPlus provides the most detailed analysis available of students' performance and helps them to identify topics and skills where students could benefit from further learning, helping them gain a deeper understanding of their subject.

*In addition to the ResultsPlus service, we also offer a **student specific** version, ResultsPlus Direct.*

ResultsPlus Direct

ResultsPlus Direct is a free online service that gives students a detailed breakdown of their performance in Edexcel exams.

Results are released to students on ResultsPlus Direct from 9am on results days.

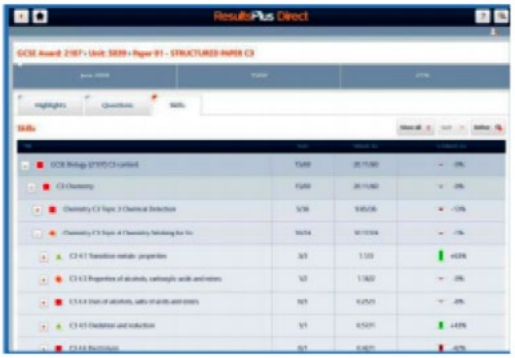
ResultsPlus Direct allows students to:

- view all of their historical Edexcel results in one place - qualifications available are A level, GCSE, Project, Digital Applications (CiDA and DiDA), Functional Skills, Principal Learning, Edexcel Award, Edexcel Certificate, PLSC, International A level and International GCSE
- see a question-by-question breakdown of their results
- compare their performance to that of all other Edexcel students
- use skills maps and highlight reports to identify areas of improvement
- view mock exam reports (from mock papers assigned by teachers from ResultsPlus Direct).

These reports help students gain a deeper understanding of a subject and identify topics or skills which may require more focus as part of future learning. Results will update automatically each Results Day (not just for August) and whenever new scores from Edexcel mock papers are entered.

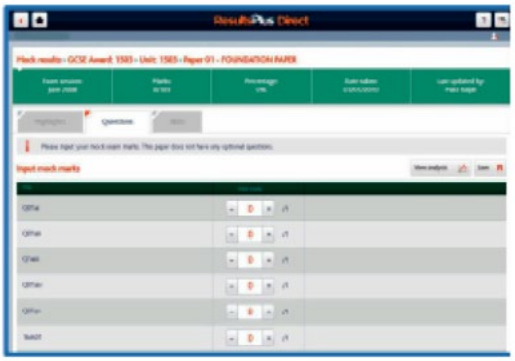
- **Greater detail, with question-by-question analysis, highlight reports and skills maps for each students**

  Being able to view their own performance reports may help students understand how they performed on each question in their exam and mock papers. These reports can help them analyse their knowledge of the subject and identify the most suitable pathways for their future. Should they choose to do so, students will also be able to share their reports with their parents.



- **Mock exam reporting to support past paper mock exams marked by teachers, plus the facility for students to enter the marks themselves**

  For past Edexcel exam papers sat as mocks, this analysis will be available as soon as the marks from the paper have been uploaded to ResultsPlus. These reports may help teachers work with their students to support their learning. In addition, ResultsPlus Direct 2.0 will also allow the students themselves to upload the marks from these mock papers, as well as teachers.



- **Access through smart devices like iPhone or Android devices, tablets and PCs**

  To meet the needs of today's technology-savvy students, the new service will be accessible anywhere.

- **A lifetime account that allows their results data to travel across institutions**

  Any students moving to a new school or college will have the option to share their own reports with new institution to help improve transition.

Degree Course Finder

Our Degree Course Finder (DCF) tool has been created for students studying a Pearson qualification (Edexcel, BTEC or LCCI) who are looking for progression options to university. The DCF also guides parents, teachers and school support staff to help students make informed decisions.

The DCF shows you universities around the world that have confirmed that they recognise Pearson qualifications:

- A level
- International Advanced Level (IAL)
- BTEC
- LCCI

Find our more on the website **www.degreecoursefinder.pearson.com**

Contact us

You can find contact details for our Student Services Learner Support Helpdesk below:

Telephone: **0845 618 0440**

Email: **students@pearson.com**

Twitter: **@EdexcelStudents**

Facebook: **www.facebook.com/EdexcelStudents**

Published resources

Help build your confidence in Maths

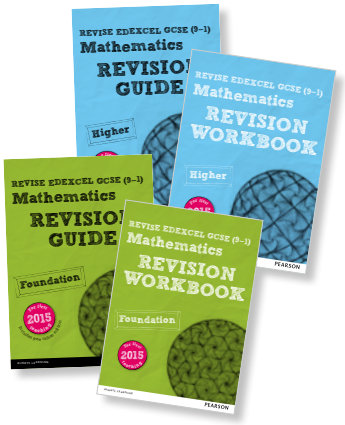
Our Edexcel GCSE (9-1) Mathematics course has been developed to help build confidence in maths. Whether you're getting ready for exams, just need some extra practice on specific topics or problem-solving we've developed resources to help you.

Our resources cover higher and foundation tier and include:

- Practice, Problem-solving and Reasoning Books
  - plenty of extra practice on every topic
  - hints and tips to support homework
  - level indicators so you can see how challenging the question is.

- ActiveLearn Digital Services online homework and practice resources
  - Lots of practice - over 4000 questions covering all topics
  - Lots of support - over 500 supporting videos and interactive worked examples
  - Instant feedback - see where you've gone wrong (or got it right!)

- REVISE revision resources
  - One-topic-per-page format
  - 'Learn it' sections showing which formulae you need to learn for the exam.
  - Worked examples to demonstrate good exam technique
  - 'Now try this' exam-style practice questions.



Pearson progression support

Introduction to the support for 11-16 progression from Pearson

We know that it's important for you to understand how your progressing, so you can make sure you're on track to achieve your potential. With the removal of national curriculum levels and a new grading structure at GCSE (9-1 replacing A*-G) this has become even more critical. Your school may have made the decision to use our Progression Service to help measure progress.

How does the support for progression from Pearson help?

In order to help, your school may be using the following tools to track progress:

The Progression Scale

For ages 11-16, from KS3 to GCSE, we have created 12 Steps representing low to high challenge. There are descriptors to describe a student's achievement in each of the Mathematics specification strands at each step.

- The 1st Step is roughly indicative of old NC Level 3.
- The 12th Step represents the highest level of skill and work a student might achieve at GCSE.

How does the scale work?

Students are expected to make one Step of progress per year. That typically means three Steps at KS3 (Years 7, 8, 9) and two Steps at GCSE (Years 10, 11). We anticipate that the average student will enter Year 7 working at the 3rd or 4th Step. For extra clarification, in terms of Summer 2015 Year 6 reporting (i.e. the Y7 cohort starting in September 2015), the 3rd Step represents a secure old NC Level 4 while the 4th Step pushes into old NC Level 5. For the following Y7 cohort (i.e. starting in September 2016), the 4th Step represents students who are meeting the Age Related Expectations (A.R.E.) set out by the new primary National Curriculum.

How does progression get reported on?

- Students making expected progress are ‘On track’.
- Making more than one step of progress per year indicates that the student is working ‘Above expectations’.
- Making less than one step of progress per year indicates that the student is working ‘Below expectations’.
- Making little or no progress per year means the student is working ‘Well below expectations’.

In some situations, schools may also want to report on a student’s position on a step with more detail, as:

- Red (first quarter of the step)
- Amber (second quarter of the step),
- Green (third quarter of the step)
- Gold (step complete)

Baseline tests are also provided for the start of Year 7 (pre-KS3) and for the end of KS3 (pre-GCSE) to assist in determining the correct pathway for each student.