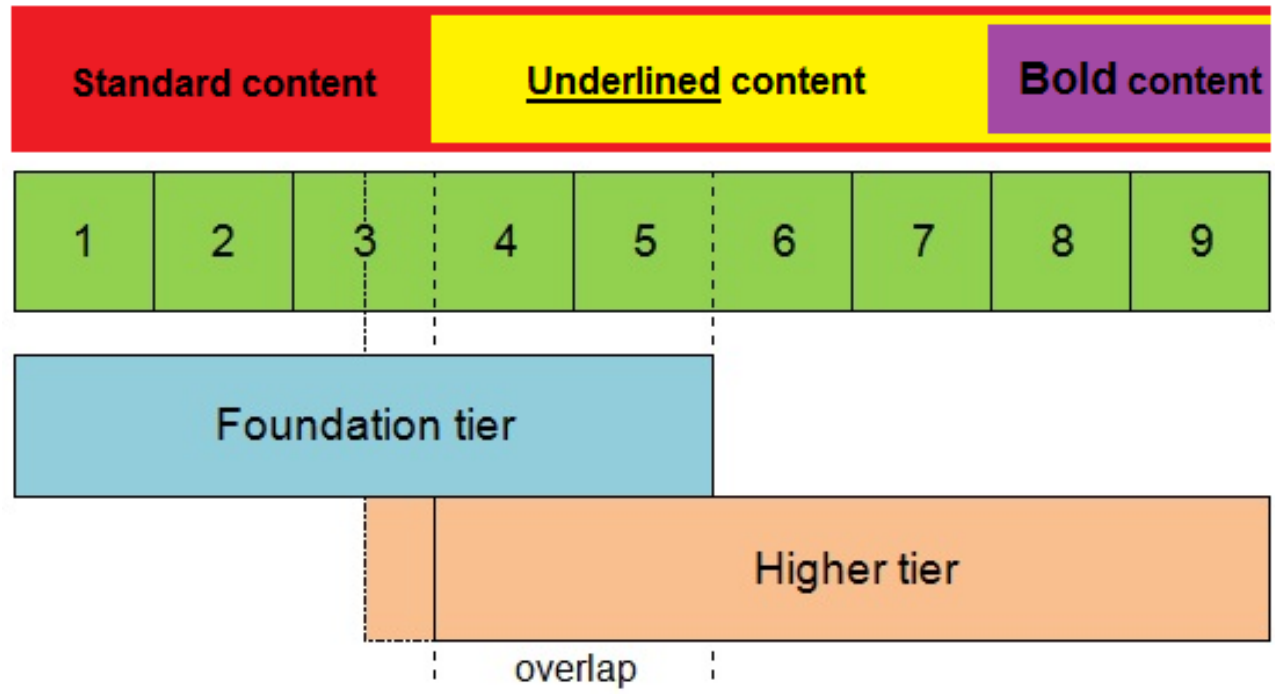
OCR GCSE Mathematics (J560) now accredited – ocr.org.uk/gcsemaths

Introducing the new Mathematics GCSE for first teaching from 2015

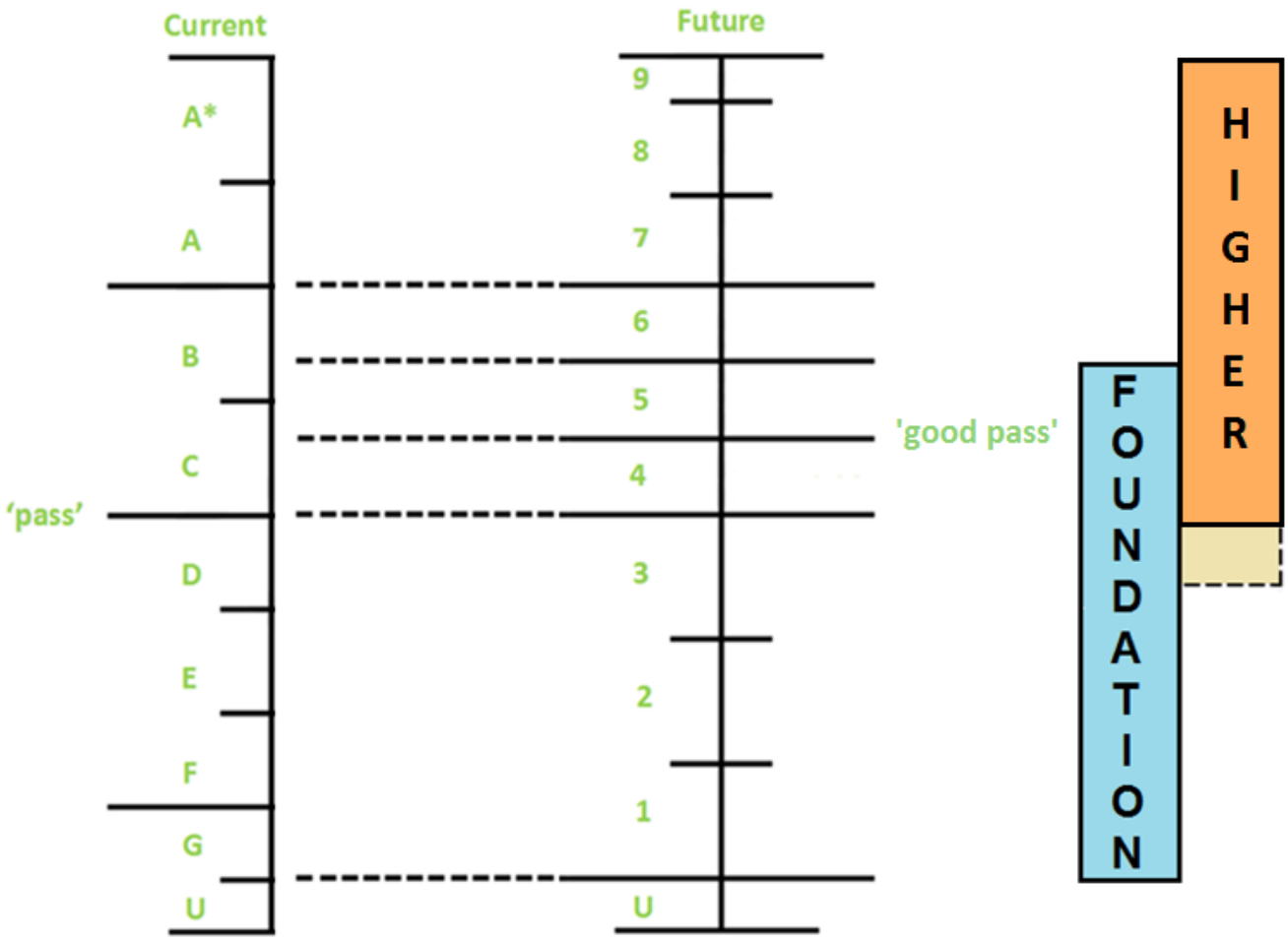
In February 2013, the Secretary of State for Education Michael Gove wrote to Ofqual asking them to implement changes leading to new GCSEs. We now know that, for first teaching in September 2015, we'll have reformed GCSEs in Maths and English – followed by more subjects for first teaching a year later. We've been busy developing specifications to engage and enthuse you and your students, and working hard to create high-quality resources.

Changes to GCSE assessment across subjects

- Linear GCSEs, with assessment to be taken at the end of the course in June. Re-sit opportunities in November for Maths and English Language only.
- A new grading scale that uses the number 1-9 to identify levels of performance (with 9 being the top level).
- Tiering used for subjects only where 'untiered papers will not allow student at the lower end of the ability range to demonstrate their knowledge and skills, or will not stretch the most able'.



- Maths will be tiered with an overlapping tiers model.
- Foundation tier covers grades 5, 4, 3, 2, 1 (U).
- Higher tier covers grades 9, 8, 7, 6, 5, 4, (3), (U).
- Overlap at grades 5 and 4.
- Higher tier also to include a grade 3, for candidates a 'small number of marks' below grade 4.



- Ofqual has confirmed that for grading with the new scale in 2017:
  - The bottom of grade 1 will be aligned with the bottom of grade G.
  - Broadly the same proportion of students will achieve a grade 4 and above as currently achieve a grade C and above.
  - Grade 5 will be positioned in the top third of the marks for a current grade C and bottom third of the marks for a current grade B. This will mean it will be of greater demand than the present grade C, and broadly in line with what the best available evidence tells us is the average PISA performance in countries such as Finland, Canada, the Netherlands and Switzerland.
  - Broadly the same proportion of students will achieve a grade 7 and above as currently achieve an A and above.
  - A formula will be used that means about 20% of all GCSE grades at 7 or above *across all subjects* will be a grade 9. This is a slight change on the position previously announced by Ofqual, which was that the top 20% of grades at 7 or above *in each subject* would be a grade 9. More information on this is available from https://www.gov.uk/government/consultations/setting-the-grade-standards-of-new-gcses-in-england-2017-2018.

- Assessment by external exam only, except where non-exam assessment is the only way to provide valid assessment of the skills required.
  - Maths will be externally assessed.

- The first assessment of the new two-year GCSE course that starts in September 2015 will be in June 2017.

Changes to GCSE assessment in maths

- A minimum of four and a half hours assessment time at both tiers.
- Increased teaching time.
    - ‘The new mathematics GCSE will be more demanding and we anticipate that schools will want to increase the time spent teaching mathematics. On average secondary schools in England spend only 116 hours per year teaching mathematics, which international studies show is far less time than that spent on this vital subject by our competitors. Just one extra lesson each week would put England closer to countries like Australia or Singapore who teach 143 and 138 hours a year of mathematics respectively.’ – Michael Gove, 1 November 2013

- GCSE maths will be double weighted in secondary school performance measures from 2016.
- A revised subject content.
    - Subject content is fixed for all awarding bodies by DfE, published and available to download from https://www.gov.uk.
    - All content across topics is broken down in the DfE document into standard, underlined and **bold** areas. This defines the grades that questions on any given content can be asked at.

Standard content is to be covered in questions across grade range 1-9.

Underlined content is to be covered in questions targeting the grade range 4-9.

Bold content is to be covered in questions targeting the grade range 8-9.

All students will develop confidence and competence with the content identified by standard type.

All students will be assessed on the content identified by the standard and the underlined type.
More highly attaining students will develop confidence and competence with all of this content.

Only the more highly attaining students will be assessed on the content identified by **bold** type.
The highest attaining students will develop confidence and competence with this content.

For the Foundation tier
- 50% of the paper must be targeted at grades 1, 2, 3
- 50% of the paper must be targeted at grades 3, 4, 5

For the Higher tier
- 50% of the paper must be targeted at grades 4, 5, 6
- 50% of the paper must be targeted at grades 7, 8, 9

20% of the marks must be in common questions appearing on both tiers

- The weightings of each content area are set by Ofqual at each tier:

	Foundation tier	Higher tier
Number	**25%**	**15%**
Algebra	**20%**	**30%**
Ratio, proportion and rates of change	**25%**	**20%**
Geometry and measures	**15%**	**20%**
Probability	**15%**	**15%**
Statistics		

- The subject content document introduces many content areas not previously included at GCSE and an increase in content to be covered at Foundation tier.

Subject content introduced in the new GCSE includes:

- know the exact values of sinθ and cosθ for $\theta = 0°, 30°, 45°, 60°$ and $90°$; know the exact value of tanθ for $\theta = 0°, 30°, 45°$ and $60°$ (Foundation and Higher tier)
- use inequality notation to specify simple error intervals due to truncation or rounding (Foundation and Higher tier)
- Venn diagrams (Foundation and Higher tier)
- work with percentages greater than 100% (Foundation and Higher tier)
- recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point (Higher tier only)
- find approximate solutions to equations numerically using iteration (Higher tier only)
- interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts (Higher tier only)

Previously Higher tier content now included at Foundation tier includes:

- trigonometric ratios
- calculate with and interpret standard form ($A \times 10^n$), where $1 \leq A < 10$ and n is an integer
- apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors
- factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares
- using $y = mx + c$ to work with straight lines on graphs

- A document mapping the current J567 specification to the new GCSE maths subject content is available from the 'Mapping guides' section of **http://www.ocr.org.uk/gcsemaths**.

- 33% - 50% of the assessment must be a non-calculator paper.
- A greatly increased expectation for candidates to memorise key mathematical formulae by heart, with few formula allowed to be provided to candidates in the exam.

Formulae required at the Foundation tier that are **not** to be provided on a formula sheet include:	• Pythagoras' theorem	$a^2 = b^2 + c^2$
	• trigonometric ratios	$\sin\theta = \frac{o}{h}, \cos\theta = \frac{a}{h}, \tan\theta = \frac{o}{a}$
	• area of a trapezium	$\frac{1}{2}(a+b)h$
	• volume of a prism	(area of cross section) × length

Formulae required at the Higher tier that are **not** to be provided on a formula sheet include:	• the quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
	• the sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
	• the cosine rule	$a^2 = b^2 + c^2 - 2bc\cos A$
	• area of a triangle	$\frac{1}{2}ab\sin C$

  - Those that can be provided are four geometry formulae (Curved surface area of a cone, Surface area of a sphere, Volume of a sphere, Volume of a cone) and three kinematics formulae ($v = u + at$, $s = ut + \frac{1}{2}at^2$, $v^2 = u^2 + 2as$).

- A revised set of Assessment Objectives, with an emphasis on decreasing rote learning and more problem solving, that will often require multi-step solutions. Questions in assessments will be less clearly structured and more open ended, frequently set within real world contexts.
  - GCSE maths will no longer have marks allocated to Quality of Written Communication (QWC) in selected questions, but 'communicate information accurately' is a part of AO2.

Previous 2010 GCSE Assessment Objectives:

Assessment Objectives		Weighting (%)
AO1	Recall and use their knowledge of the prescribed content	45-55
AO2	Select and apply mathematical methods in a range of contexts	25-35
AO3	Interpret and analyse problems and generate strategies to solve them	15-25

From 2015 Assessment Objectives:

Assessment Objectives		Weighting	
		Higher	Foundation
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	40%	50%
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 Where problems require candidates to 'use and apply standard techniques' or to independently 'solve problems' a proportion of those marks should be attributed to the corresponding Assessment Objective	30%	25%
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 Where problems require candidates to 'use and apply standard techniques' or to 'reason, interpret and communicate mathematically' a proportion of those marks should be attributed to the corresponding Assessment Objective.	30%	25%

The new OCR J560 GCSE in mathematics

Question papers

- A simple assessment model.
  - 3 papers at each tier, all equal length and equally weighted towards the qualification.
  - Subject content and AO weightings are equal across papers at each tier.
  - Two papers at each tier where candidates are allowed access to a calculator.
  - One non-calculator paper at each tier.
  - 100 marks per paper, giving us a large scope for awarding more method marks within questions, so candidates can be rewarded for each correct step on the way towards an answer, even if their final answer is incorrect.

Foundation tier	**Paper 1** $1\frac{1}{2}$ hour Calculator Grades 1-5	**Paper 2** $1\frac{1}{2}$ hour Non-calculator Grades 1-5	**Paper 3** $1\frac{1}{2}$ hour Calculator Grades 1-5
	↕overlap	↕overlap	↕overlap
Higher tier	**Paper 4** $1\frac{1}{2}$ hour Calculator Grades 4-9	**Paper 5** $1\frac{1}{2}$ hour Non-calculator Grades 4-9	**Paper 6** $1\frac{1}{2}$ hour Calculator Grades 4-9

- Professional language modifiers review all OCR GCSE maths papers and attend setting meetings to ensure that wording used is as clear and simple as possible for students.

- Contexts used are kept succinct, without excess wording.

- All OCR GCSE maths papers begin with the simpler questions targeting the lower grades at each tier, before moving on and building steadily through the paper to questions targeting the upper grades at each tier, developing candidate's confidence as they go.

- Mathematical formula that can be provided to candidates in question papers will be provided to them when relevant in each question in OCR GCSE maths papers; they won't be all supplied together on a formula sheet at the front of the question paper booklet for the candidate to then have to pick and choose from.

- **Accredited** specimen papers are now available for both Foundation tier and Higher tier, available to download from http://www.ocr.org.uk/qualifications/gcse-mathematics-j560-from-2015.

Specification

- A syllabus developed by teachers specifically for teachers, laying out the required content clearly in terms of both topic area and difficulty, facilitating candidates' progression through the content.

- Foundation and Higher tier topic content set out next to next to each other on the same page, so the progression of content is clear.

- A column of required content suitable for initial learning is set out, ensuring that the basics can be established with learners before moving on to more difficult areas.

GCSE (9-1) content Ref.	**Subject content**	**Initial learning for this qualification will enable learners to…**	**Foundation tier learners should also be able to…**	**Higher tier learners should additionally be able to…**	DfE Ref.
2.04	**Ordering fractions, decimals and percentages**				
2.04a	Ordinality	Order integers, fractions, decimals and percentages. e.g. $\frac{4}{5}$, $\frac{3}{4}$, 0.72, $^{-}0.9$			N1, N2, R9
2.04b	Symbols	Use $<$, $>$, $\leq$, $\geq$, $=$, $\neq$			N1
OCR 3	**Indices and Surds**				
3.01	**Powers and roots**				
3.01a	Index notation	Use positive integer indices to write, for example, $2\times2\times2\times2=2^4$	Use negative integer indices to represent reciprocals.	Use fractional indices to represent roots and combinations of powers and roots.	N6, N7
3.01b	Calculation and estimation of powers and roots	Calculate positive integer powers and exact roots. e.g. $2^4=16$ $\sqrt{9}=3$ $\sqrt[3]{8}=2$ Recognise simple powers of 2, 3, 4 and 5. e.g. $27=3^3$ *[see also Inverse operations,1.04a]*	Calculate with integer powers. e.g. $2^{-3}=\frac{1}{8}$ Calculate with roots.	Calculate fractional powers. e.g. $16^{-\frac{3}{4}}=\frac{1}{\sqrt[4]{16}^{\,3}}=\frac{1}{8}$ Estimate powers and roots. e.g. $\sqrt{51}$ to the nearest whole number	N6, N7
3.01c	Laws of indices	*[see also Simplifying products and quotients,6.01c]*	Know and apply: $a^m\times a^n=a^{m+n}$ $a^m\div a^n=a^{m-n}$ $(a^m)^n=a^{mn}$ *[see also Calculations with numbers in standard form, 3.02b, Simplifying products and quotients,6.01c]*		N7, A4

GCSE (9-1) content Ref.	**Subject content**	**Initial learning for this qualification will enable learners to…**	**Foundation tier learners should also be able to…**	**Higher tier learners should additionally be able to…**	DfE Ref.
6.06	**Sequences**				
6.06a	Generate terms of a sequence	Generate a sequence by spotting a pattern or using a term-to-term rule given algebraically or in words. e.g. Continue the sequences 1, 4, 7, 10, ... 1, 4, 9, 16, ... Find a position-to-term rule for simple arithmetic sequences, algebraically or in words. e.g. 2, 4, 6, … $2n$ 3, 4, 5, … $n+2$	Generate a sequence from a formula for the nth term. e.g. nth term = n^2+2n gives 3, 8, 15, … Find a formula for the nth term of an arithmetic sequence. e.g. 40, 37, 34, 31, … $43-3n$	Use subscript notation for position-to-term and term-to-term rules. e.g. $x_n=n+2$ $x_{n+1}=2x_n-3$ Find a formula for the nth term of a quadratic sequence. e.g. 0, 3, 10, 21, … $u_n=2n^2-3n+1$	A23, A25
6.06b	Special sequences	Recognise sequences of triangular, square and cube numbers, and simple arithmetic progressions.	Recognise Fibonacci and quadratic sequences, and simple geometric progressions (r^n where n is an integer and r is a rational number > 0).	Generate and find nth terms of other sequences. e.g. 1, $\sqrt{2}$, 2, $2\sqrt{2}$, … $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, …	A24
OCR 7	**Graphs of Equations and Functions**				
7.01	**Graphs of equations and functions**				
7.01a	x- and y-coordinates	Work with x- and y- coordinates in all four quadrants.			A8
7.01b	Graphs of equations and functions	Use a table of values to plot graphs of linear and quadratic functions. e.g. $y=2x+3$ $y=2x^2+1$	Use a table of values to plot other polynomial graphs and reciprocals. e.g. $y=x^3-2x$ $y=x+\frac{1}{x}$ $2x+3y=6$	Use a table of values to plot exponential graphs. e.g. $y=3\times1.1^x$	A9, A14

- The **Accredited** J560 specification is now available to download from http://www.ocr.org.uk/qualifications/gcse-mathematics-j560-from-2015.

Supporting you all the way

We recognise that the introduction of a new specification can bring challenges for implementation and teaching. Our aim is to help you at every stage and we're working in close consultation with teachers and other maths experts from a variety of fields to provide a practical package of support to help you make the change.

For a start, we'll provide a range of free, high-quality creative resources, which we are currently developing in conjunction with teachers and through research by Cambridge Assessment. These will take students from KS3 learning right the way through GCSE and can be adapted as required by teachers and shaped to their students' needs. Tailored to the needs of each subject, their focus is on supporting creative teaching approaches and progression for all students. We see our resources as a body of knowledge that will grow throughout the lifetime of the specifications, built on the best practice we've identified from our discussions with the teaching community since the reforms were announced. We've now published an initial sample of our new resources for the qualifications currently being redeveloped for first teaching in 2015 and these are now available to download from **www.ocr.org.uk/reformresources**. Along with subject-specific resources, you'll also have access to a flexible teachers support package, formed through listening to teachers' needs, allowing teachers to easily understand the requirements of the qualification and present the qualification to students.

Skills guides - we have produced a set of Skills Guides that are not specific to maths, but cover a topic that could be relevant to a range of qualifications - for example communication, legislation and research.

Active results - a free online GCSE results analysis service to help you review the performance of individual students or your whole school. It provides access to detailed results data, enabling more comprehensive analysis of result in order to give you a more accurate measure of the achievements of your centre and individual students.

Why choose OCR?

Choose OCR and you've got the reassurance that you're working with one of the UK's leading awarding bodies. Our new GCSE Mathematics qualification has been developed in consultation with teachers, employers and higher education to provide students with a qualification that's relevant to them and meets their needs.

We're part of the Cambridge Assessment Group, Europe's largest assessment agency and a department of the University of Cambridge. Cambridge Assessment plays a leading role in developing and delivering assessments throughout the world, operating in over 150 countries.

We work with a range of education providers, including schools, colleges, workplaces and other institutions in both the public and private sectors. Over 13,000 centres choose our A Levels, GCSEs and vocational qualifications including OCR Nationals, NVQs and Basic Skills.

We believe in developing specifications that help you bring the subject to life and inspire your students to achieve more. They're designed to be straightforward and accessible, so you can tailor the delivery of the course to suit your students' needs.

Why choose OCR GCSE Maths?

It’s worthwhile

• Research, international comparisons and engagement with both teachers and the wider education community have been used to enhance the reliability, validity and appeal of our assessment tasks in Mathematics.

It’s student-focused

• Our syllabus and assessment will consist of maths fit for the modern world and presented in authentic contexts.

• It will allow students to develop mathematical independence built on a sound base of conceptual learning and understanding.

• We’ll target support and resources to develop fluency, reasoning and problem-solving skills.

• It will be a springboard for future progress and achievement.

It’s teacher-centred

• We’ll provide clear communication about the changes and an extensive teacher support package, including high-quality flexible resources, particularly for the new subject areas and Assessment Objectives.
• Our support and resources will focus on empowering teachers, exploring teaching methods and classroom innovation alongside more direct content-based resources.

• Our assessment will be solid and dependable, recognising positive achievement in student learning and ability.

• We use sophisticated online marking systems that ensure a greater degree of reliability as individual questions are marked by separate assessors, so you can have greater confidence your students will receive the results they deserve.

It’s dependable

• Our high-quality assessments will be backed up by sound educational principles and a belief that the utility, richness and power of mathematics should be made evident and accessible to all students.

• There’ll be an emphasis on learning and understanding mathematical concepts underpinned by a sound, reliable and valid assessment.

It’s reassuring

• We’ll maintain continuity with the old GCSE where appropriate and we’ve kept much of the parts of the ‘old’ specification you liked, as well as providing support to guide you through the requirements of the changes.