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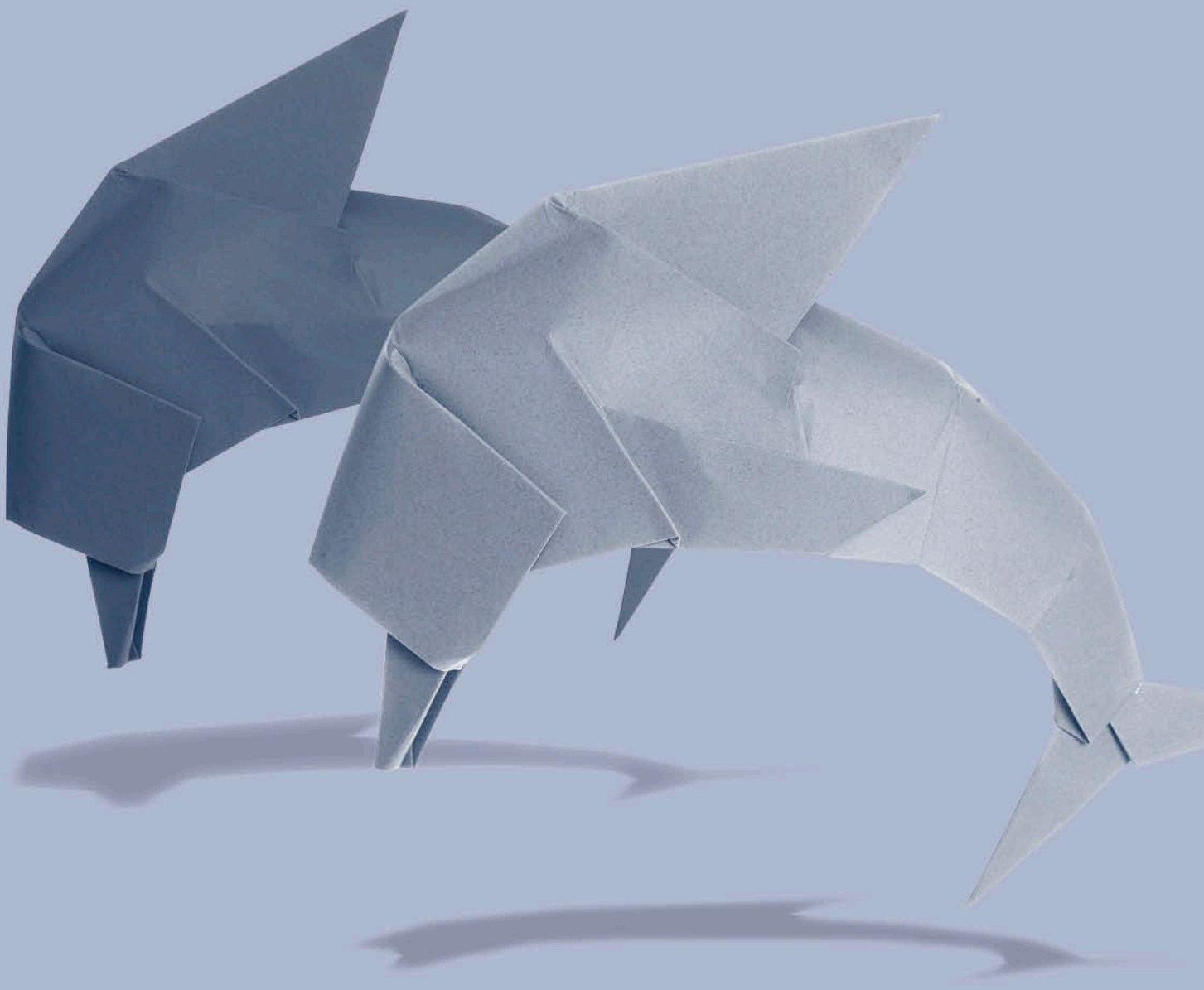
GCSE (9–1) Mathematics



Getting Started Guide

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

First teaching from September 2015
First certification from June 2017

Issue 2

ALWAYS LEARNING

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Getting Started: GCSE (9–1) Mathematics 2015

Contents

Introduction

This Getting Started guide provides an overview of the new GCSE (9–1) Mathematics specification. It will help you get to grips with the changes to content and assessment, and to understand what these mean for you and your students.

We are providing a package of support to help you plan and implement the new specification. This includes the following.

- **Planning**: we are providing a range of tools and resources to help you plan your teaching of the new GCSE qualification. We will support you in understanding the content with content mappings, guidance and FAQs. We are also dedicated to making the whole planning process easier, with ready-to-use schemes of work for delivering the GCSE in one, two or three years, and full five-year secondary schemes of work. We have even developed an Access to Foundation scheme of work to help low-attaining students make the transition to GCSE. To help you plan your teaching based on the new assessment requirements, we have produced some real student exemplars on some of the new style questions assessing reasoning and problem solving questions.
- **Teaching**: we are providing plenty of teaching resources to help you deliver the new content with confidence. Our teaching support starts with our comprehensive teaching guidance, which provides information on each specification point including learning objectives and sample questions. This is complemented by classroom resources, developed by practising teachers, that are aligned to our two- and three-year schemes of work, as well as a teacher support pack for our Access to Foundation scheme of work. You can even get hold of an A2 Formulae Poster to display in your classroom, helping your students memorise those formulae ahead of the exams.
- **Assessing**: we are providing plenty of tools to help you assess your students and track their progress throughout the course. To start you off, we have designed some baseline tests: end of Key Stage 3 tests to help you establish where your students are at the start of the GCSE course. We know understanding the standard expected of students by the time they sit the examination is important, so our newly approved SAMs (published in June 2015) will show you what you can expect. Plenty of examination practice is also key, which is why we are providing two further sets of specimen papers, and for the first three years of the specification we will release a secure set of mock papers. Our end-of-term tests are aligned to the two- and three-year schemes of work; these come with mark schemes and analysis spreadsheets. We will also have fully updated editions of ResultsPlus and examWizard, as well as the Pearson Progression Scale: a new, coherent way of understanding and measuring progress for 11–16 year olds.
- **Training**: attend our free Getting Ready to Teach events (face-to-face and online meetings, available right up to autumn 2015), or join one of our collaborative networks. Receive training on how to mark mock papers and our new continued professional development courses.

  Not forgetting personal and ongoing support through Graham and the Mathematics Emporium.

These support documents will be available via the Teacher Support tab on the GCSE 2015 Mathematics pages at www.edexcel.com/gettingstartedgcsemaths, or directly at www.edexcel.com/gcsemathssupport and on the Mathematics Emporium website at www.edexcelmaths.com

Ten things you need to know about the new GCSE

1. It's bigger

The new GCSE is bigger in size than the current GCSE (carry on reading to see why) and therefore it may require more teaching time in the future. *See page 20 for more guidance on teaching time for the new GCSE.*

2. There's more content at both tiers

There has been an increase in the breadth and depth of content to be covered at both Foundation and Higher tiers. Some content that previously was assessed at Higher tier only will now be assessed at Foundation tier. More content has been added to the Higher tier to stretch and challenge the most able students and to help prepare them for A Level Mathematics. *See pages 7-11 for more information on the changes to content.*

3. There are new Assessment Objectives

The new Assessment Objectives place greater emphasis on mathematical problem solving and mathematical reasoning and communication. These follow on from the teaching and learning aims of the Key Stage 3 and Key Stage 4 programmes of study. *See pages 13-14 for more information on the new Assessment Objectives.*

4. There are more formulae that students will need to memorise for the examinations

The number of formulae that students can be provided with in the examinations has been reduced, so students will need to memorise some formulae, such as the quadratic formula. *See page 15 for the list of formulae that can be provided to students in the examinations (as part of the relevant questions).*

5. There are more examination papers for students to take

More assessment time is required to assess the larger body of content, therefore the new GCSEs will see students take three examination papers at the end of the course. *See page 12 for more information on the assessment structure of the new GCSE.*

6. There's a new grading system

A new grading system has been introduced using numbers to represent grades instead of letters. The new grades are on a scale of 9–1, with 9 representing the highest grade and 1 the lowest. *See page 17 for more information on the grading scale and how the grades relate to current GCSE grades.*

7. The structure of the papers has changed

The new structure of the papers will see fewer questions targeted at the lowest grades and more questions targeted at the highest grades at both tiers. *See page 4 for the new requirements.*

8. The assessments will be more demanding

The new content added to both tiers, increased emphasis on mathematical problem solving, reasoning and communication, as well as the increased assessment time and change in the structure of the papers, all mean that GCSE Mathematics examinations will be more demanding in the future.

9. There are more rules around examination entries

A number of rules have been introduced to limit inappropriate early entry, resits and double entries. *See page 21 for more information on the rules around examination entries.*

10. There are a lot of things changing, but we want to ensure the things you like stay the same

We have spoken to thousands of teachers since the start of the reforms and, while there are a number of changes that are outside our control (*see page 4 for the new requirements*), there are some things you have told us that you want to keep the same.

We will continue to ramp our papers in difficulty and will continue to place a great deal of importance on the language of our papers. This is not about reducing the number of words but ensuring the language used is simple and that the contexts used help candidates understand and access the mathematics being tested.

There will also be more support available from us to help you teach the new GCSE, driven by all the feedback you have given us. In 2010, we supported schools through the changes. In 2015 we want to do that all over again.

We hope you find this guide helpful, but remember it's only a small part of how we will be supporting you.

The new requirements

All awarding organisations' qualifications for GCSE (9–1) Mathematics must meet the *GCSE Subject Level Conditions and Requirements for Mathematics* and the *GCSE Subject Level Guidance*. These can be found on Ofqual's website and are summarised for you below.

- **Content, assessment objectives and formulae**: all awarding organisations must comply with the requirements set out in the document published by the Secretary of State entitled *GCSE Mathematics: Subject Content and Assessment Objectives*. This document defines the entire body of content for GCSE Mathematics, defines the Assessment Objectives and determines which formulae can be reproduced for candidates in examinations.
- **Content coverage and weightings**: all awarding organisations must comply with the following:
    - All three areas of content must be covered. *See page 6 for more information on the content areas.*
    - The Foundation and Higher tier papers will assess all of the content outlined for each tier in as few successive assessment series as is possible, and in such a way that the content to be targeted in a given assessment series is not unduly predictable.
    - The assessments for a GCSE qualification in mathematics should achieve balance in their coverage of the content domains (number, algebra, etc.) as set out by the weightings published by the Department for Education. An awarding organisation should apply these weightings, subject to a +/–3 per cent tolerance for each domain area, across the assessments for each tier in as few assessment series as is possible. *See page 6 for the content domain weightings*.
- **Interpretation of Assessment Objectives**: awarding organisations must comply with the guidance published by Ofqual which explains how they should interpret the Assessment Objectives in terms of the different strands and elements within each Assessment Objective. *See page 13 for the Assessment Objectives*.
- **Timing of assessments**: all awarding organisations must only make GCSE (9–1) Mathematics examinations available in May/June each year and in November only for students who have reached at least the age of 16 on or before 31 August in the same calendar year as the assessment.
- **Calculators**: all awarding organisations must ensure that between 33 and 50 per cent of the total marks available in assessments are allocated to questions or tasks which must be completed by students without the use of a calculator. *See page 16 for rules regarding use of calculators*.
- **Total assessment time**: the total amount of time spent by each student in taking assessments should be no less than four-and-a-half hours.
- **Tiering requirements**: all awarding organisations must comply with the following:
    - The qualification must be tiered and use an overlapping tiers model, with two tiers – a Foundation tier and a Higher tier. Each learner is permitted to take assessments in either the Foundation tier or the Higher tier only.
    - Foundation tier assessments must be targeted at the level of demand required for the award of GCSE grades 1–5. The questions or tasks in Higher tier assessments must be targeted at the level of demand required for the award of grades 4–9 (with a grade 3 allowable).
    - The marks available for each assessment within the Foundation tier must be targeted as follows:

- 50 of those marks must be targeted at a level of demand consistent with grade 1 to the lower part/half of grade 3.
- 50% of marks must be targeted at a level of demand consistent with the upper part/half of grade 3 to grade 5.

o The marks available for each assessment within the Higher tier are targeted as follows:

- 50% of those marks must be targeted at a level of demand consistent with grades 4 to 6.
- 50% of marks must be targeted at a level of demand consistent with grades 7 to 9.

Refer back to page 2 for more information on the structure of our papers.

o Grades 4 and 5 are the only grades that are designed to be accessible by students who have taken either Foundation or Higher tiers. (Although students taking Higher tier assessments may be awarded a grade 3, as indicated above, this grade is not actively targeted in these assessments.) At least 20 per cent of the marks available in assessments for each tier are made available through questions that are common to both tiers. These questions must be targeted at a level of demand consistent with grades 4 and 5. Therefore, assessments with common questions must be taken simultaneously by all relevant learners.

The specification content

Our specification content for the new GCSE closely matches the content set out in the document published by the Secretary of State entitled *GCSE Mathematics: Subject Content and Assessment Objectives*.

Content areas

There are three areas of content to be covered within the specification.

Area 1

Content with regard to which it is intended that all students taking the qualification should be confident and competent by the end of their GCSE course. This content is shown in standard font in the specification and must be assessed in both Higher and Foundation tier assessments. [S]

Area 2

Content with which all students taking the qualification are intended to be at least familiar by the end of their GCSE course. This content is underlined in the specification and must be assessed in both Higher and Foundation tier assessments. Students taking Higher tier assessments should be expected to be confident and competent with this content by the end of their GCSE course, and those assessments must reflect that expectation. [U]

Area 3

Content with which only the most highly attaining students are expected to be confident and competent by the end of their GCSE course. This content is shown in **bold font** in the specification and must be assessed in Higher tier assessments only. [B]

In summary, the Foundation tier will assess all of the content in areas 1 and 2; the Higher tier will assess all of the content in areas 1, 2 and 3.

Content domains

There are six content domains covered within the specification. The table below shows the content domains and their weighting across both tiers. The weightings reflect the size and demand of the content domains and take into account the ability range for each tier.

Domain	Weighting of marks	
	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		

Changes to content

Below are the main changes to the GCSE Mathematics specification content.

- There is a significant shift in content from the current (2010) Higher tier to the new (2015) Foundation tier, mainly in algebra, geometry and measures, as well as in ratio and proportion – *see Table 1 for details*.
- New content added to both tiers, mainly in ratio, proportion and rates of change – *see Table 4 for details*.
- New content added to the Higher tier, mainly in algebra – *see Table 5 for details*.
- A few topics omitted from both tiers, some of which are now part of Key Stage 3 – *see Table 6 for details*.

Table 1: Topics to be assessed at Foundation tier in 2015 that are Higher tier only in 2010 (new to Foundation)

2010	Topics	2015	Notes
Nf	Index laws: zero and negative powers	**N7**	Fractional integers still Higher only
Ng	Standard form	**N9**	All Ng now also Foundation
Nm / No	Compound interest, depreciation, percentage profit and loss, reverse percentages; use compound interest	**R9 / R16**	Value of profit and loss already Foundation
Nn	Direct and indirect proportion	**R10**	All Nn now also Foundation
Nr	Multiples of π	**N8**	Surds still Higher only
Ab	Identities	**A3**	Selecting identities from a list
Ac	Index laws: zero and negative powers	**A4**	Fractional integers still Higher only
Ac	Expand the product of two linear expressions	**A4**	
Ac	Factorise quadratic expressions, including the difference of two squares	**A4**	$x^2 + bx + c$ now also Foundation ($ax^2 + bx + c$ still Higher only)
Ac	Simplify and manipulate algebraic expressions including surds	**A4**	
Ad	Simultaneous equations (find exact solutions, use elimination/substitution, interpret graphically, set up and solve)	**A19 / A21**	Linear/linear now also Foundation (linear/quadratic still Higher only)
Ae	Solve quadratic equations by factorisation	**A18**	Completing the square still Higher only
Af	Change the subject of the formula where the subject appears on both sides, or with a power of the subject	**A5**	
Al	Find and analyse gradients for graphs in the form $y = mx + c$	**A10**	

2010	Topics	2015	Notes
Al	Find the equation of the line through two given points or through one point with a given gradient	**A9**	
Am	Interpret and analyse straight-line graphs	**A10**	
An	Gradients of parallel lines	**A9**	Perpendicular lines still Higher only
Ap	Plot cubic and reciprocal graphs, recognise the shapes of quadratic and cubic graphs	**A12**	Exponential and trig functions still Higher only
At	Select mathematical techniques to draw quadratics	**A12**	
Au	Direct and inverse proportion	**R10 / R13**	
GMb	Using basic angle properties in more complex problems	**G3**	
GMf	Understand and use congruence and similarity	**G5 / G6 / G19**	
GMh	Using the trigonometric ratios in right-angled triangles to solve problems, angles of elevation and depression	**G20**	3D problems still Higher only
GMl	Fractional scale enlargements in transformations	**G7**	Negative scale factors still Higher only
GMw	Know that the perpendicular distance from a point to a line is the shortest distance to the line	**G2**	Expected knowledge at Higher in 2010
GMx	Perimeter, area and surface area of compound shapes	**G14 / G16 / G17**	Compound shapes made from triangles and rectangles already Foundation
GMz	Lengths of arcs and areas of sectors of circles, including answers in terms of π	**G18 / N8**	Semicircles and quarter-circles already Foundation
GMbb	Solve mensuration problems involving more complex shapes and solids	**G16 / G17 / G18**	Segments of circles, frustrums, surface area and volume of spheres, pyramids, cones and composite solids, real-life solids, area of a segment of a circle
GMcc	Vector notation, sum and difference of vectors, scalar multiple and resultant of vectors	**G25**	Geometric proofs and vectors still Higher only
GMs	Compound measures: density	**N16 / R1 / R11**	Speed already Foundation

2010	Topics	2015	Notes
SPb	Sources of bias and sampling	**S1**	Understanding how sources of data may be biased already Foundation
SPc	Design experiment	**S1**	
SPj	Explain an isolated point on a scatter graph	**S6**	
SPk	Using other than lines of best fit to predict values, and appreciating correlation as measure of the strength of association between two variables	**S4**	
SPq	Selection with or without replacement	**P8**	
SPr	Tree diagrams	**P6 / P8**	Conditional probability still Higher only

Table 2: Concepts and skills to be assessed at Higher tier only in 2015 that are in both tiers in 2010 (now Higher only)

Concepts and skills (2010)	Notes
Distinguish properties that are preserved under particular transformations Recognise that enlargements preserve angle but not length Understand that distances and angles are preserved under rotations, reflections and translations, so that any figure is congruent under any of these transformations (all **GMI**)	**G8**: describe the changes and invariance achieved by combinations of rotations, reflections and translations

Table 3: Content descriptors/concepts and skills included in 2010 that are implicit in 2015 only (omitted but implicit content)

Content descriptors/concepts and skills (2010)	
Ng	Interpret a calculator display using standard form [Higher only]
Nv	Use calculators effectively and efficiently, including statistical functions [Foundation]
Nv	Use calculators effectively and efficiently, including trigonometrical functions [Higher]
SPu	Use calculators efficiently and effectively, including statistical functions

Table 4: New knowledge, skills and understanding to be assessed at both tiers in 2015 (new to both Foundation and Higher)

Knowledge, skills and understanding (2015)	
N15	use inequality notation to specify simple error intervals due to truncation or rounding [U]
A11	identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically [U]
A24	Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a rational number > 0) [U]
R1	and algebraic contexts [U]
R6	express a multiplicative relationship between two quantities as a ratio or a fraction [S]
R8	relate ratios … to linear functions [S]
R14	interpret the gradient of a straight line graph as a rate of change … [U]
G21	know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45° and 60° [U]
P1	record, describe and analyse the frequency of outcomes of probability experiments using … frequency trees [S]
P6	enumerate sets and combinations of sets systematically, using … Venn diagrams [S] …

Key for Table 4:

[S] = standard content [U] = underlined content [B] = bold content

Table 5: New knowledge, skills and understanding to be assessed at Higher tier only in 2015 (new to Higher tier)

Knowledge, skills and understanding (2015)	
N5	including use of the product rule for counting (i.e. if there are m ways of doing one task and for each of these, there are n ways of doing another task, then the total number of ways the two tasks can be done is $m \times n$ ways) [B]
N6	estimate powers and roots of any given positive number [B]
A4	expanding products of more [than two] binomials [B]
A7	interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function' (the use of formal function notation is expected) [B]
A11	and turning points by completing the square [B]
A15	calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance–time graphs, velocity–time graphs and graphs in financial contexts (this does not include calculus) [B]
A20	find approximate solutions to equations numerically using iteration [B]
A22	solve quadratic inequalities in one variable [B]
A24	a surd … and other sequences [B]
A25	quadratic sequences [B]
R15	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 (this does not include calculus) [B]
P9	calculate and interpret conditional probabilities through representation using expected frequencies with … Venn diagrams [B]

Key for Tables 5:

[S] = standard content [U] = underlined content [B] = bold content

Table 6: Concepts and skills included in GCSE 2010 and omitted in GCSE 2015 (omitted content)

Concepts and skills (2010)	Notes
Writing numbers in words (**Na**)	*Foundation tier only* – now part of Key Stage 3
Writing numbers from words (**Na**)	*Foundation tier only* – now part of Key Stage 3
Recognise even and odd numbers (**Nc**)	*Foundation tier only* – now part of Key Stage 3 but could be tested as part of A24 (arithmetic sequences)
Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals (**Nk**)	Now part of Key Stage 3
Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them (**Ah**)	
Understand tessellations of regular and irregular polygons Tessellate combinations of polygons Explain why some shapes tessellate and why other shapes do not (all **GMc**)	Tessellations are not in the 2015 specification but students could be tested on how shapes 'fit together' without using the word tessellate
Use isometric grids (**GMk**)	Now part of Key Stage 3
Convert imperial units to imperial units Know rough metric equivalents of pounds, feet, miles, pints and gallons (**GMp**)	Conversions will be given for any metric–imperial conversion questions, e.g. 5 miles = 8 km
Specify the problem and plan Decide what data to collect and what statistical analysis is needed Collect data from a variety of suitable primary and secondary sources Use suitable data collection techniques (all **SPa**)	The 2015 specification is more about using statistics than collecting data
Identify which primary data they need to collect and in what format, including grouped data Design a question for a questionnaire Criticise questions for a questionnaire (all **SPc**)	The 2015 specification is more about using statistics than collecting data
Use axes and coordinates to specify points in all four quadrants in 2D and 3D Find the coordinates of points identified by geometrical information in 2D and 3D (**Ak**)	*Higher tier only* – 3D coordinates not in 2015 specification
Select and apply the transformations of reflection, rotation, enlargement and translation of functions expressed algebraically Interpret and analyse transformations of functions and write the functions algebraically (**Av**)	*Higher tier only* – rotation and enlargement of functions are not in 2015 specification

The assessment

Assessment structure

The new Edexcel GCSE (9–1) Mathematics qualification will be assessed through three written papers.

<table>
<tr><th>Foundation tier</th><th></th><th>Higher tier</th></tr>
<tr><td rowspan="3">• Grades 1-5 available (students failing to meet the boundary for grade 1 will be awarded a U grade).
• Any content in areas 1 and 2 (standard and underlined) can be assessed in any paper, except for any content which requires use of a calculator and will be reserved for Papers 2 and 3.
• All content domains will be assessed in roughly the same proportions across all three papers. See page 6 for proportions for Foundation tier.
• All Assessment Objectives will be assessed in roughly the same proportions across all three papers. See next page for proportions for Foundation tier.
• Each paper will contain common questions (that also appear in the corresponding paper for the Higher tier) that are targeted at grades 4 and 5. These are likely to be towards the end of the paper.
• On each paper, 50% of marks will be targeted at grades 1, 2 and the lower part of grade 3, and 50% of the marks will be targeted at the upper part of grade 3 and grades 4 and 5. See page 17 for guidance on new grades.</td><td>Paper 1
Non-calculator
80 marks
1 hour 30 minutes</td><td rowspan="3">• Grades 4–9 available (a grade 3 is awarded to students who narrowly miss a grade 4).
• Any content in areas 1, 2 and 3 (standard, underlined and bold) can be assessed in any paper, except for any content which requires use of a calculator which will be reserved for Papers 2 and 3.
• All content domains will be assessed in roughly the same proportions across all three papers. See page 6 for proportions for Higher tier.
• All Assessment Objectives will be assessed in roughly the same proportions across all three papers. See next page for proportions for Foundation tier.
• Each paper will contain common questions (that also appear in the corresponding paper for the Foundation tier) that are targeted at grades 4 and 5. These are likely to be at the start of the paper.
• On each paper, 50% of marks will be targeted at grades 4, 5 and 6, and 50% of the marks will be targeted at grades 7, 8 and 9. See page 17 for guidance on new grades.</td></tr>
<tr><td>Paper 2
Calculator
80 marks
1 hour 30 minutes</td></tr>
<tr><td>Paper 3
Calculator
80 marks
1 hour 30 minutes</td></tr>
</table>

Assessment Objectives

Below are the Assessment Objectives for the new GCSE and the weighting of each in both tiers.

Assessment Objectives		Weighting	
		Higher	Foundation
AO1	Use and apply standard techniques	40%	50%
AO2	Reason, interpret and communicate mathematically	30%	25%
AO3	Solve problems within mathematics and in other contexts	30%	25%

These assessment objectives have been broken down into strands and elements, all of which have to assessed. In the following tables, the references in parenthesis in the elements column refer to the references used to represent these strands and elements in the mark schemes – see the next section of this guide, titled *Mark schemes*, for an explanation.

AO1 Use and apply standard techniques	
Strands	**Elements**
1 Accurately recall facts, terminology and definitions	*1 Accurately recall facts, terminology and definitions (1.1)*
2 Use and interpret notation correctly	*2 Use and interpret notation correctly (1.2)*
3 Accurately carry out routine procedures or set tasks requiring multi-step solutions	3a Accurately carry out routine procedures (1.3a)
	3b Accurately carry out set tasks requiring multi-step solutions (1.3b)
Note: The majority (about 80%) of AO1 marks will be attributed to strand 3 and generally there should be more of element 3a in the Foundation tier and more of 3b in the Higher tier.	

AO2 Reason, interpret and communicate mathematically	
Strands	**Elements**
1 Make deductions, inferences and draw conclusions from mathematical information	1a Make deductions to draw conclusions from mathematical information (2.1a)
	1b Make inferences to draw conclusions from mathematical information (2.1b)
2 Construct chains of reasoning to achieve a given result	*2 Construct chains of reasoning to achieve a given result (2.2)*
3 Interpret and communicate information accurately	3a Interpret information accurately (2.3a)
	3b Communicate information accurately (2.3b)
4 Present arguments and proofs	4a Present arguments (2.4a)
	4b Present proofs **(Higher tier only)** (2.4b)
5 Assess the validity of an argument and critically evaluate a given way of presenting information	5a Assess the validity of an argument (2.5a)
	5b Critically evaluate a given way of presenting information (2.5b)

AO3 Solve problems within mathematics and in other contexts	
Strands	**Elements**
1 Translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes	1a Translate problems in mathematical contexts into a process (3.1a)
	1b Translate problems in mathematical contexts into a series of processes (3.1b)
	1c Translate problems in non-mathematical contexts into a mathematical process (3.1c)
	1d Translate problems in non-mathematical contexts into a series of mathematical processes (3.1d)
2 Make and use connections between different parts of mathematics	*2 Make and use connections between different parts of mathematics (3.2)*
3 Interpret results in the context of the given problem	*3 Interpret results in the context of the given problem (3.3)*
4 Evaluate methods used and results obtained	4a Evaluate methods used (3.4a)
	4b Evaluate results obtained (3.4b)
5 Evaluate solutions to identify how they may have been affected by assumptions made	*5 Evaluate solutions to identify how they may have been affected by assumptions made (3.5)*
Note: There will be a greater emphasis for both tiers on strands 1, 2 and 3 rather than on strands 4 and 5.	

Mark schemes

The new mark schemes are similar to the current ones that you are already familiar with, but there are two things that are new,

We have introduced 'P' marks as a new mark type. The P mark is a mark that can be awarded to a proof, a process (a correct process with the correct result) or a numerical solution to a problem (where the method is shown), or for evaluation of AO3 (strands 4 and 5). Therefore, P marks can only be allocated to AO2 or AO3 marks.

Each mark in the mark scheme for our sample assessment materials is allocated to an Assessment Objective's strand and element. The references used in the mark schemes are shown in parenthesis in the tables in the previous section.

The mark scheme will show a model solution, but alternative and valid solutions will also be rewarded.

Formulae

The following formulae will be provided for students within the relevant examination questions.

Curved surface area of a cone $= \pi rl$

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

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

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

Use of calculators

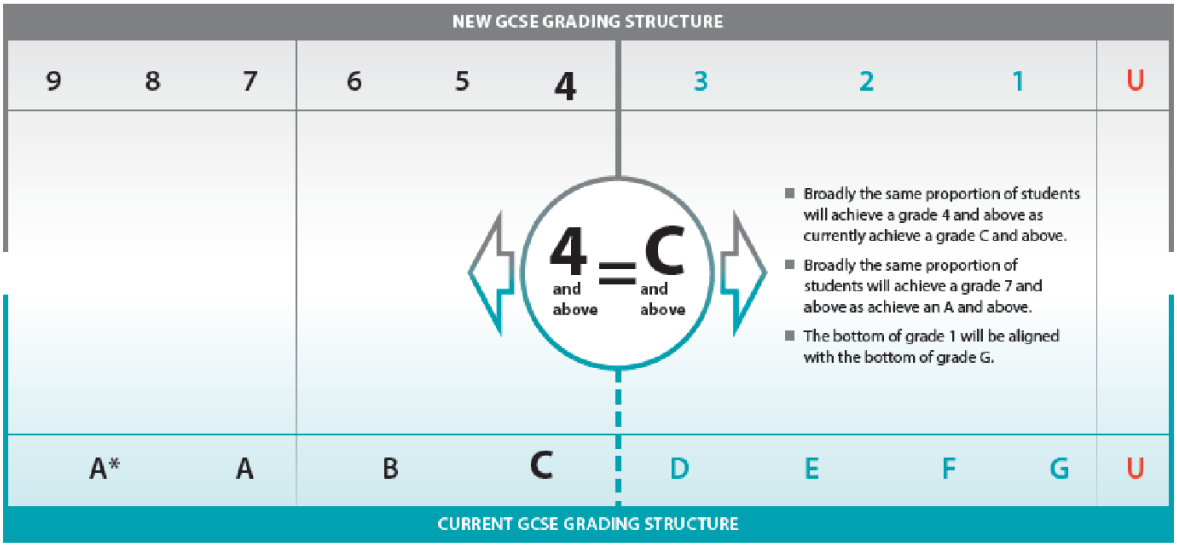
Calculators must be:	Calculators must not:
● of a size suitable for use on the desk ● either battery or solar powered ● free of lids, cases and covers which have printed instructions or formulas.	● be designed or adapted to offer any of these facilities: o language translators o symbolic algebra manipulation o symbolic differentiation or integration o 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): o databanks o dictionaries o mathematical formulas o text.

Grading the new GCSE in 2017

Ofqual have published the following guidance regarding the grading of new GCSEs in 2017.

- Broadly the same proportion of students will achieve a **grade 4** and above as currently achieve a grade C and above.
- Broadly the same proportion of students will achieve a **grade 7** and above as currently achieve an A and above.
- For each exam, the top 20 per cent of those who get grade 7 or above will get a **grade 9** – the very highest performers.
- The bottom of **grade 1** will be aligned with the bottom of grade G.
- **Grade 5** will be positioned in the top third of the marks for a current grade C and in the bottom third of the marks for a current grade B. This will mean it will be more demanding 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.

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



Grade descriptors

Ofqual have published the grade descriptors for the new GCSE (9-1) Mathematics.

These 'grade descriptors' differ from the 'grade descriptions' which apply to GCSEs graded A* to G. The descriptors aim to help teachers understand the likely level of performance expected at a selection of grades in the new GCSEs. They give an indication of the expected mid-point performance at grades 2, 5 and 8.

These grade descriptors are not designed to be used for awarding purposes in 2017. Statistical predictions will be used to set grade outcomes at whole subject level. This is a development of the awarding process used at present for GCSEs graded A* to G. *More information on how grade standards will be set for the new GCSEs can be found in the section directly above this one.*

The grade descriptors for grades 2, 5 and 8 are on the following page.

To achieve **grade 8**, students will be able to:

- perform procedures accurately
- interpret and communicate complex information accurately
- make deductions and inferences and draw conclusions
- construct substantial chains of reasoning, including convincing arguments and formal proofs
- generate efficient strategies to solve complex mathematical and non-mathematical problems by translating them into a series of mathematical processes
- make and use connections, which may not be immediately obvious, between different parts of mathematics
- interpret results in the context of the given problem
- critically evaluate methods, arguments, results and the assumptions made.

To achieve **grade 5**, candidates will be able to:

- perform routine single- and multi-step procedures effectively by recalling, applying and interpreting notation, terminology, facts, definitions and formulae
- interpret and communicate information effectively
- make deductions, inferences and draw conclusions
- construct chains of reasoning, including arguments
- generate strategies to solve mathematical and non-mathematical problems by translating them into mathematical processes, realising connections between different parts of mathematics
- interpret results in the context of the given problem
- evaluate methods and results.

To achieve **grade 2**, candidates will be able to:

- recall and use notation, terminology, facts and definitions; perform routine procedures, including some multi-step procedures
- interpret and communicate basic information; make deductions and use reasoning to obtain results
- solve problems by translating simple mathematical and non-mathematical problems into mathematical processes
- provide basic evaluation of methods or results
- interpret results in the context of the given problem.

Which tier of entry: Foundation or Higher?

There are a number of things you may wish to consider when deciding which tier is suitable for each student.

- The new Foundation tier goes up to a grade 5, which is of a higher level of demand than the current grade C, and the Higher tier starts at grade 4, which is of a higher level of demand than the current grade D.
- Consider how confident and competent your students are with underlined content (area 2).
- The common questions appear towards the end of the Foundation tier sample papers and form the first part of the Higher tier sample papers. How well your students perform on these questions will give you an indication if they are working below, at or above grades 4 and 5, which these questions are targeted at.
- The Assessment Objective weightings indicate that more marks will be allocated to AO1 in the Foundation tier and fewer to AO2 and AO3. In the Higher tier, fewer marks will be allocated to AO1 and more to AO2 and AO3.
- The content domain weightings show that about half of the marks on the Foundation tier will be assessing number, ratio, proportion and rates of change (in comparison with 35 per cent in the Higher tier), and that about 30 per cent of marks in Higher tier papers will be assessing algebra (in comparison with 20 per cent in the Foundation tier).
- Half of the marks in the Higher tier papers will be targeted at grades 7, 8 and 9 (which are broadly aligned to grades A/A*).

Teaching time

> The new mathematics GCSE will demand deeper and broader mathematical understanding … it 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. We announced on 14 October that mathematics, alongside English, will be double weighted in secondary school performance measures from 2016. This will also provide a strong incentive for schools to ensure that they are strengthening their mathematics provision.
>
> *The Rt. Hon. Michael Gove MP, 1 November 2013*

There is no official guidance on the teaching hours required to deliver the new GCSE (9–1) Mathematics qualification. The number of guided learning hours (GLH) for GCSE Mathematics remains at 120–140 GLH, which is in line with all current GCSE qualifications.

We talked to mathematics teachers from a range of different schools, asking how much time is currently dedicated to delivering GCSE Mathematics per week and how much additional time in hours per week they thought would be required to deliver the new GCSE. The findings were:

- teaching time per week ranged from two hours to over five hours, but the vast majority delivered the GCSE using between three and four hours per week (in both Year 10 and 11)
- half of the teachers we consulted said they would need an additional hour per week to deliver the new GCSE – a quarter said that two or more additional teaching hours would be required. Schools on four hours and above mostly responded to say that they did not need additional hours to deliver the new GCSE
- most schools are considering an increase in teaching time or planning to restructure how GCSE is offered, for example by delivering GCSE over a three-year course and reviewing teaching time for mathematics across all secondary years.

Through wider consultation with teachers, heads of mathematics and heads of school, and through analysis of current and new specifications, **we recommend about an extra hour a week of teaching time** to adequately cover the increased content, to embed skills such as reasoning and problem solving into your teaching, and to prepare students for the more demanding assessments in mathematics. The schemes of work we have developed and are developing contain suggested timings to cover units; the total time reflects the extra teaching time requirements.

There is one last point that you may wish to consider: GCSE Mathematics (alongside GCSE English) will be double-weighted in the new Progress 8 performance measures from 2016 onwards, which may help you secure more teaching time for mathematics.

Examination entries: the rules

- **Only a student's first entry to a GCSE examination will count in their school's performance tables (Secretary of State announcement, September 2013)**.
- **From November 2014, entries for GCSE Mathematics will be restricted to re-take candidates (Ofqual, March 2014).**
- **Each student who takes an examination during the month of November (from November 2017) must have reached at least the age of 16 on or before 31 August in the same calendar year as the assessment (Ofqual, May 2014).**
- **The only mathematics qualification that will count in the 2017 secondary school performance tables will be the reformed GCSE (9–1) Mathematics qualifications for first examination in summer 2017 (Department for Education, July 2014).**

  Entries to the current GCSE Mathematics from 2016 or earlier will not count in performance tables in 2017. Schools may still want to early enter for 'legacy' qualifications in 2016 but, if they do, students will need either to take the new GCSE Mathematics again in 2017 or progress to a higher-level qualification, such as an AS Level qualification, for their achievements to count in tables. Only a grade B or higher achieved for AS Level Mathematics will secure more points than a grade 9 achieved at GCSE.
- **There will be no double entry for GCSE Mathematics with two awarding organisations in the same session.**

  Schools 'must not vary the published starting time for an examination if there is a clash between papers of different awarding bodies in the same subject' (JCQ, September 2014).

Useful links

GCSE (9–1) Mathematics homepage: www.edexcel.com/gettingstartedgcsemaths
GCSE (9–1) Mathematics support webpage: www.edexcel.com/gcsemathssupport
Mathematics Emporium website: www.edexcelmaths.com

Get in touch

As you have come to expect, we will provide expert and local support – from Graham, the Mathematics Emporium and the Edexcel maths team. We are here to listen and to help; at the end of a phone, by email, or in person at local network and training events.

Contact details

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