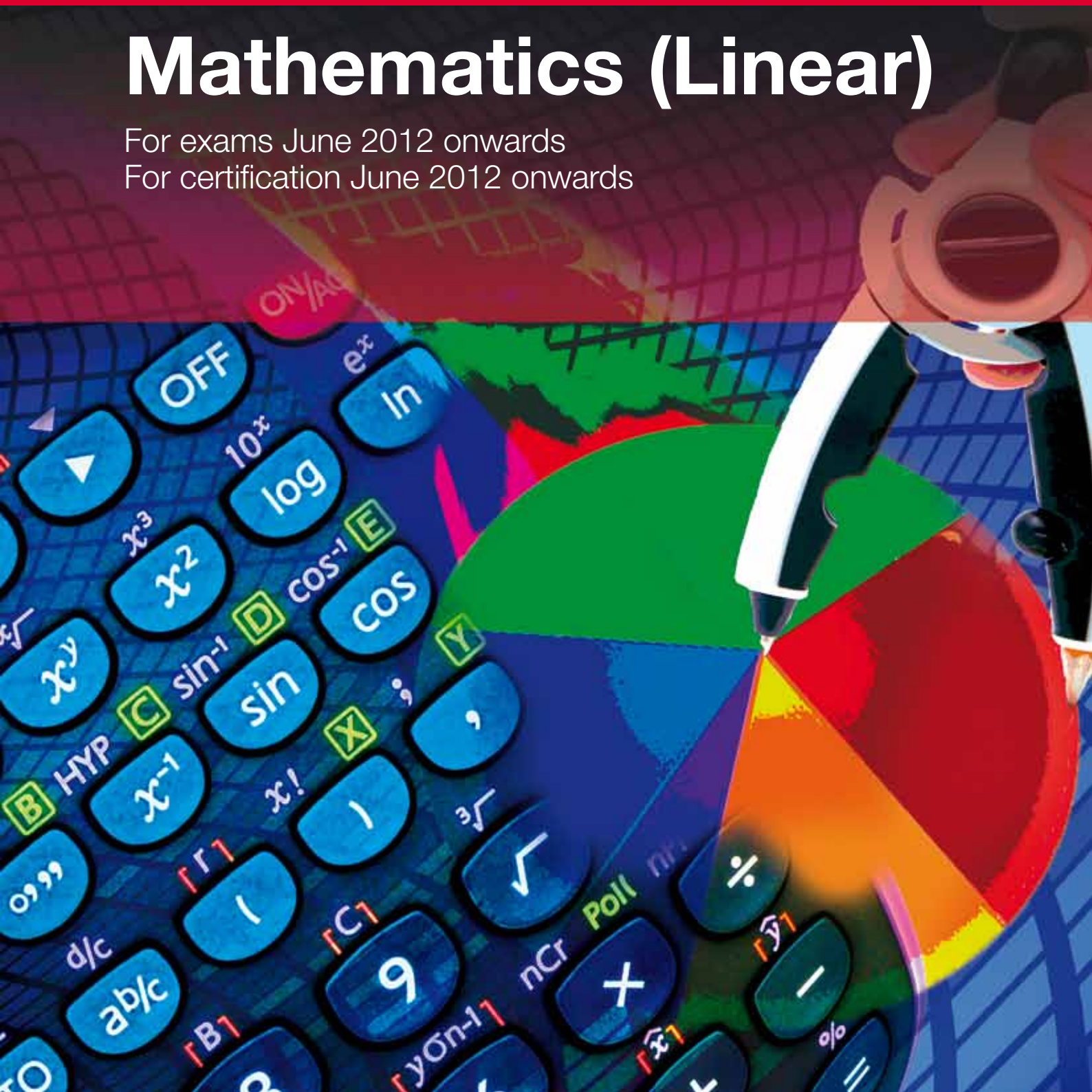
AQA

GCSE
Specification

Mathematics (Linear)

For exams June 2012 onwards
For certification June 2012 onwards



GCSE

Specification

Mathematics (Linear) B 4365

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1 Introduction

1a Why choose AQA?

We, AQA, are the United Kingdom's favourite exam board and more students get their academic qualifications from us than from any other board. But why are we so popular?

We understand the different requirements of each subject by working with teachers. Our GCSEs

- help students achieve their full potential
- are relevant for today's challenges
- are manageable for schools and colleges
- are easy to understand by students of all levels of ability
- lead to accurate results, delivered on time
- are affordable and value for money.

We provide a wide range of support services for teachers, including

- access to subject departments
- training for teachers, including practical teaching strategies and methods that work, presented by senior examiners
- 24-hour support through our website and online with **Ask AQA**
- past question papers and mark schemes
- a wide range of printed and electronic resources for teachers and students
- free online results analysis, with Enhanced Results Analysis.

We are an educational charity focused on the needs of the learner. All our income is spent on improving the quality of our specifications, examinations and support services. We don't aim to profit from education, we want you to.

If you are already a customer we thank you for your support. If you are thinking of joining us we look forward to welcoming you.

1b Why choose this linear GCSE in Mathematics?

What are the big changes?

This specification is designed to reflect the change of emphasis in mathematics teaching set out in the revised Programme of study for key stage 4. This means an increased focus on

- applying mathematics in context
- problem solving
- reasoning
- the functional elements of mathematics.

Focus on learning

Assessment at the end of the course means that learners have time to develop a mature understanding of the subject before being assessed and will be familiar with all areas of the curriculum before advancing to further study in the subject

- There are ample opportunities for learners to demonstrate their knowledge of mathematics across the whole range of topic areas. In both tiers of assessment, it will be possible for learners to apply their knowledge, reason mathematically and communicate clearly.
- A course of study based on this specification will allow learners to develop and refine their problem solving strategies and build the confidence and skills required to tackle unfamiliar challenges.
- This approach builds on key stage 3 mathematics and cross-curricular initiatives on thinking skills and independent working.
- It prepares learners to function mathematically in the world and provides a thorough grounding for further study in mathematics.

Covering the basics

This specification has been developed in consultation with practising teachers and members of the wider mathematics community, including subject associations. Teachers have told us the importance of sound technique in working with numbers and understanding fractions, decimals, percentage and basic ratio. These feature across both examination papers and across both tiers, giving learners opportunities to apply these fundamental skills in a variety of ways, which may be in real world, everyday contexts, statistical problems or more abstract, mathematical scenarios.

Focus on teaching

- This specification will encourage a teaching approach that is enriching and engaging for all learners.
- All assessment is at the end of the course so you can concentrate on teaching mathematics as a coherent subject in the order, and with the curricular approach, that best suits you and your students
- It concentrates on the mathematical knowledge and applications that are most accessible and relevant.
- It is a traditional, linear approach to assessment which minimises administration and allows you to concentrate on teaching
- All content can be assessed on either paper at the end of the course. This allows you to plan and deliver the teaching course of your choice and to encourage an holistic approach to the subject with emphasis on the connections across different topic areas within the subject

A structure that is straightforward

- Two question papers, differently weighted so that 60% of the assessment allows the use of a calculator
- Two assessment opportunities per year in January and June.
- Allows Functional Maths qualifications or GCSE Statistics to be easily incorporated into a course.
- Designed to be taken over a one- or two-year course of study.
- All assessment is covered in two examinations taken within the same series. No examination paper is overly long with a maximum of two hours at the Higher tier
- This specification offers excellent preparation for GCE mathematics.

1c How do I start using this specification?

To ensure you receive all the teaching and examination material, it is important that the person responsible for making the decision to teach AQA informs both AQA and their Exam Officer.

Step One:

To confirm you will be teaching this specification go to **www.aqa.org.uk/signup** and complete the online form. You will then receive your free GCSE Mathematics (linear) welcome pack that contains teaching and support material.

Step Two:

Inform your Exam Officer of your choice to ensure you receive all your examination material. Your Exam Officer will make sure that your centre is registered with AQA and will complete the Intention to Enter and Estimated Entries when required to do so.

If your centre has not used AQA for any examinations in the past, please contact our centre approval team at **centreapproval@aqa.org.uk**.

1d How can I find out more?

You can choose to find out more about this specification or the services that AQA offer in a number of ways.

Ask AQA

You have 24-hour access to useful information and answers to the most commonly asked questions at **www.aqa.org.uk/askaqa.php**.

If the answer to your question is not available, you can submit a query through **Ask AQA** for our team. We will respond within two working days.

Speak to your subject team

You can talk directly to the Mathematics subject team about this specification either by e-mailing **mathematicsgcse@aqa.org.uk** or by calling 0161 957 3852.

Teacher Support Meetings

Details of the full range of our Teacher Support meetings are available on our website at **www.aqa.org.uk/support/teachers.php**

There is also a link to our fast and convenient online booking system for Teacher Support meetings at **events.aqa.org.uk/ebooking**.

If you need to contact the Teacher Support team, you can call us on 01483 477860 or e-mail us at **teachersupport@aqa.org.uk**.

Latest information online

You can find out more including the latest news, how to register to use Enhanced Results Analysis, support and downloadable resources on our website at **www.aqa.org.uk**

2 Specification at a Glance

The Scheme of Assessment is linear with two question papers at each tier to be taken in the same examination series as detailed below.

Paper 1:

Written paper (Non-Calculator)
40% of the GCSE mathematics assessment

Foundation tier – 1 hour 15 mins – 70 marks

Higher tier – 1 hour 30 mins – 70 marks

PLUS

Paper 2:

Written paper (Calculator)
60% of the GCSE mathematics assessment

Foundation tier – 1 hour 45 mins – 105 marks

Higher tier – 2 hours – 105 marks

Foundation Tier grades C – G available

Higher Tier grades A* – D available (E allowed)

Summary of Assessment

A question paper/answer book is provided for each paper. All questions are compulsory. Some questions in each paper assess the functional elements of mathematics. More detail about how these will be assessed in this specification can be found in Sections 3 and 4.

The detailed content for the specification is provided in Section 3. All content within a particular tier can be assessed on either paper.

Each paper addresses all three Assessment Objectives. Details of the Assessment Objectives can be found in Section 4 of this specification.

3 Subject Content

The subject content of this specification is common to all awarding bodies and is consistent with the statutory Programme of study for mathematics in key stage 4 for England. This content was issued by Ofqual in the *GCSE subject criteria for mathematics* in March 2009.

The content has been organised into broad topic areas and given a reference as follows:

- number and algebra references start with N
- geometry and measures references start with G
- statistics and probability references start with S.

As all content can be assessed on either examination paper within this specification, some questions will draw together elements of content from different topic areas.

Within this specification, the assessment will reflect the key concepts of the subject as articulated in the Programme of study, giving learners the opportunity to see discrete content within a bigger, holistic view of the concepts which underpin the whole subject. The ways in which this curricular approach may be reflected in the assessment are developed in section 3b of this specification

The tables of content in each unit have four columns.

- Column 1 gives the AQA reference number for the content.
- Column 2 lists the core content which may be assessed in both Foundation and Higher tier papers.
- Column 3 lists the additional content which may be assessed in the Higher tier papers.
- Column 4 features notes from senior examiners giving more detail on how the particular reference may be assessed.

Ref	Foundation and Higher	Higher tier only	Notes
Number and Algebra			
N1 Working with numbers and the number system			
N1.1	Understand integers and place value to deal with arbitrarily large positive numbers.		Including questions where the answer to one calculation can be used to work out the answer to a related calculation.
N1.2	Add, subtract, multiply and divide any number.		
N1.3	Understand and use number operations and the relationships between them, including inverse operations and hierarchy of operations.		
N1.4 N1.4h	Approximate to a given power of 10, up to three decimal places and one significant figure.	Approximate to specified or appropriate degrees of accuracy including a given number of decimal places and significant figures.	Nearest ten, hundred or thousand at Foundation tier.
N1.5	Order rational numbers.		
N1.6	The concepts and vocabulary of factor (divisor), multiple, common factor, highest common factor, least common multiple, prime number and prime factor decomposition.		Abbreviations will not be used in examinations. Candidates will be expected to identify eg multiples, factors and prime numbers from lists.
N1.7	The terms square, positive and negative square root, cube and cube root.		Square numbers up to 15 by 15 and the cubes of 1, 2, 3, 4, 5 and 10 and the corresponding roots should be known. Questions involving square and cube numbers and their roots more widely will also be set

Continued

Ref	Foundation and Higher	Higher tier only	Notes
N1.8	Index notation for squares, cubes and powers of 10.		Candidates should know, for example, that 1 million = 10^6
N1.9 N1.9h	Index laws for multiplication and division of integer powers.	Fractional and negative powers.	
N1.10h		Interpret, order and calculate numbers written in standard index form.	Including using a calculator.
N1.11h		Surds and π in exact calculations.	Simplification of surds. Rationalise a denominator. Formulae will be given in the question if needed.
N1.12h		Rules of arithmetic applied to calculations and manipulations with surds.	
N1.13h		Calculate and use upper and lower bounds.	Including maximum and minimum. Questions will be set in context and could be linked to statistical problems.
N1.14 N1.14h	Use calculators effectively and efficiently, including statistical functions.	Including trigonometrical functions.	Candidates should know not to round off values during the intermediate steps of a calculation.
N2 Fractions, Decimals and Percentages			
N2.1	Understand equivalent fractions, simplifying a fraction by cancelling all common factors.		
N2.2	Add and subtract fractions.		
N2.3	Use decimal notation and recognise that each terminating decimal is a fraction.		
N2.4	Recognise that recurring decimals are exact fractions, and that some exact fractions are recurring decimals.		
N2.5	Understand that 'percentage' means 'number of parts per 100' and use this to compare proportions.		
N2.6	Interpret fractions, decimals, percentages as operators.		The term common denominator will not be used. Candidates should be able to interpret percentage problems using a multiplier.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
N2.7 N2.7h	Calculate with fractions, decimals and percentages.	Including reverse percentage calculations.	Candidates should be able to use a calculator to apply the four rules to fractions and decimals in problems Including compound interest and probability questions at Higher tier. Candidates should be able to calculate 1% and 10% of quantities without a calculator as a starting point.
N3 Ratio and Proportion			
N3.1	Use ratio notation, including reduction to its simplest form and its various links to fraction notation.		
N3.2	Divide a quantity in a given ratio.		
N3.3 N3.3h	Solve problems involving ratio and proportion, including the unitary method of solution.	Repeated proportional change. Direct and indirect proportion and exponential growth.	
N4 The Language of Algebra			
N4.1	Distinguish the different roles played by letter symbols in algebra, using the correct notation.		
N4.2 N4.2h	Distinguish in meaning between the words 'equation', 'formula', and 'expression'.	And 'identity'.	Candidates should understand the words Candidates should also know the meaning of the word 'term'. Higher tier candidates should understand the identity symbol.
N5 Expressions and Equations			
N5.1 N5.1h	Manipulate algebraic expressions by collecting like terms, by multiplying a single term over a bracket, and by taking out common factors.	Multiply two linear expressions.	Including $(x \pm a)(x \pm b)$ and $(cx \pm a)(dx \pm b)$ at Higher tier.
N5.2h		Factorise quadratic expressions including the difference of two squares.	

Continued

Ref	Foundation and Higher	Higher tier only	Notes
N5.3h		Simplify rational expressions.	Candidates should be able to cancel rational expressions and apply the four rules to algebraic fractions.
N5.4 N5.4h	Set up and solve simple linear equations.	Including simultaneous equations in two unknowns.	Questions will be restricted to two linear equations or one linear and one of the form $y = ax^2 + bx + c$ where a, b and c are integers. Questions will include geometrical problems, problems set in a functional context and questions requiring a graphical solution.
N5.5h		Solve quadratic equations.	By factorising or completing the square. Equations may be derived from rational expressions. Using the quadratic formula. Problems that lead to a quadratic equation which can be solved by factorisation. Use of trial and improvement to solve a quadratic equation is not an acceptable method.
N5.6	Derive a formula, substitute numbers into a formula and change the subject of a formula.		At Foundation tier, formulae to be rearranged will need at most two operations. Formulae where a power appears will not be tested at Foundation tier. In Higher tier questions the subject may appear twice.
N5.7 N5.7h	Solve linear inequalities in one variable and represent the solution set on a number line.	Solve linear inequalities in two variables, and represent the solution set on a suitable diagram.	Candidates should know and use the symbols $>$, $<$, $\geq$, $\leq$. Candidates should know the convention of an open circle on a number line for a strict inequality and a closed circle for an included boundary. Higher tier candidates should identify regions on a 2D coordinate grid using, as necessary, the convention of a dashed line for strict inequalities and a solid line for an included inequality.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
N5.8	Use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them.		
N5.9 N5.9h	Use algebra to support and construct arguments.	Use algebra to construct simple proofs.	
N6 Sequences, Functions and Graphs			
N6.1	Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence.		
N6.2	Use linear expressions to describe the nth term of an arithmetic sequence.		
N6.3 N6.3h	Use the conventions for coordinates in the plane and plot points in all four quadrants, including using geometric information.	3D coordinate systems.	
N6.4	Recognise and plot equations that correspond to straight-line graphs in the coordinate plane, including finding their gradients		Foundation tier candidates will not be expected to plot graphs using the gradient-intercept method.
N6.5h		Understand that the form $y = mx + c$ represents a straight line and that m is the gradient of the line and c is the value of the y- intercept.	
N6.6h		Understand the gradients of parallel and perpendicular lines.	
N6.7h		Find the intersection points of the graphs of a linear and quadratic function, knowing that these are the approximate solutions of the corresponding simultaneous equations representing the linear and quadratic functions.	Questions requiring the approximate solution of a quadratic equation by drawing a straight line to intersect with another (given) quadratic equation may be set.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
N6.8h		Draw, sketch, recognise graphs of simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, the function $y = k^x$ for integer values of x and simple positive values of k, the circular functions $y = \sin x$ and $y = \cos x$.	Candidates should be able to draw, sketch and recognise graphs of the form $y = \frac{k}{x}$ where k is a positive integer.
N6.9h		Transformation of functions.	
N6.10h		Construct the graphs of simple loci.	
N6.11h		Construct quadratic and other functions from real life problems and plot their corresponding graphs.	
N6.11	Construct linear functions from real-life problems and plot their corresponding graphs.		
N6.12	Discuss, plot and interpret graphs (which may be non-linear) modelling real situations, including statistics contexts.		For example distance-time graphs See also S3.2
N6.13	Generate points and plot graphs of simple quadratic functions, and use these to find approximate solutions.		Foundation tier questions will be restricted to finding the approximate value of y for a given value of x or the approximate values of x for a given value of y.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
Geometry and Measures			
G1 Properties of angles and shapes			
G1.1	Recall and use properties of angles at a point, angles at a point on a straight line (including right angles), perpendicular lines, and opposite angles at a vertex.		
G1.2	Understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals.		Candidates should know the meaning and properties of 'alternate', 'corresponding', 'interior' and 'vertically opposite' angles. Colloquial terms such as 'Z angles' should not be used. Candidates should know the names and properties of isosceles, equilateral and scalene triangles, and also right-angled, acute-angled and obtuse-angled triangles.
G1.3	Calculate and use the sums of the interior and exterior angles of polygons.		Candidates should be able to calculate the values of the interior angle, exterior angle and angle at the centre of regular polygons.
G1.4	Recall the properties and definitions of special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus.		
G1.5 G1.5h	Distinguish between centre, radius, chord, diameter, circumference, tangent, arc, sector and segment.	Know and use circle theorems.	Higher tier includes cyclic quadrilaterals; angle at centre is equal to twice angle at circumference; angle in a semi-circle is 90°; angles in the same segment are equal; opposite angles in cyclic quadrilateral sum to 180°; alternate segment theorem.
G1.6	Recognise reflection and rotation symmetry of 2D shapes.		

Continued

Ref	Foundation and Higher	Higher tier only	Notes
G1.7 G1.7h	Describe and transform 2D shapes using single or combined rotations, reflections, translations, or enlargements by a positive scale factor and distinguish properties that are preserved under particular transformations.	Use positive fractional and negative scale factors.	Single transformations only will be assessed in Foundation tier. Translations will be specified by a vector.
G1.8	Understand congruence and similarity.	Use similarity. Understand and use conditions for congruent triangles.	
G2 Geometrical reasoning and calculation			
G2.1 G2.1h	Use Pythagoras' theorem.	Extend to use in 3D.	
G2.2h		Use the trigonometrical ratios and the sine and cosine rules to solve 2D and 3D problems.	
G2.3 G2.3h	Justify simple geometrical properties.	Simple geometrical proofs.	On Higher tier, proofs involving congruent triangles and circle theorems may be set.
G2.4	Use 2D representations of 3D shapes.		
G3 Measures and Construction			
G3.1	Use and interpret maps and scale drawings.		
G3.2 G3.2h	Understand the effect of enlargement for perimeter, area and volume of shapes and solids.	Use the effect of enlargement for perimeter, area and volume in calculations.	Questions at Foundation tier will always include a diagram.
G3.3	Interpret scales on a range of measuring instruments and recognise the inaccuracy of measurements.		
G3.4	Convert measurements from one unit to another.		Metric conversions should be known. Imperial to metric conversions will be limited to 5 miles ≈ 8 kilometres, 4.5 litres ≈ 1 gallon, 2.2 pounds ≈ 1 kilogram and 1 inch ≈ 2.5 centimetres.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
G3.5	Make sensible estimates of a range of measures.		
G3.6	Understand and use bearings.		
G3.7	Understand and use compound measures.		Including area, volume and speed at Foundation tier. Including density at Higher tier. Other measures will be defined in the question.
G3.8	Measure and draw lines and angles.		
G3.9	Draw triangles and other 2D shapes using a ruler and protractor.		
G3.10	Use straight edge and a pair of compasses to do constructions.		Foundation tier will be restricted to perpendicular bisector and angle bisector. Higher tier will also include perpendicular from a point to a line, perpendicular at a point on a line and an angle of 60°.
G3.11	Construct loci.		Foundation tier will be restricted to at most two constraints.
G4 Mensuration			
G4.1 G4.1h	Calculate perimeters and areas of shapes made from triangles and rectangles.	Extend to other compound shapes.	eg shapes made from circles or part circles with other known shapes.
G4.2h		Calculate the area of a triangle using $\frac{1}{2}ab\sin C$.	
G4.3 G4.3h	Calculate circumferences and areas of circles.	Calculate lengths of arcs and areas of sectors.	
G4.4	Calculate volumes of right prisms and of shapes made from cubes and cuboids.		Including cylinders.
G4.5h		Solve mensuration problems involving more complex shapes and solids.	Including cones and spheres. Including compound shapes and frustums.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
G5 Vectors			
G5.1 G5.1h	Understand and use vector notation for translations.	Understand and use vector notation; calculate, and represent graphically the sum of two vectors, the difference of two vectors and a scalar multiple of a vector; calculate the resultant of two vectors; understand and use the commutative and associative properties of vector addition; solve simple geometrical problems in 2D using vector methods.	

Statistics and Probability

S1 The Handling Data Cycle			
S1	Understand and use the statistical problem solving process which involves • specifying the problem and planning • collecting data • processing and presenting the data • interpreting and discussing the results.		Including knowing and using the term 'hypothesis' for a general prediction which is to be tested. Higher tier candidates will be expected to choose suitable sampling methods, discuss bias, provide sophisticated and rigorous interpretations of their data and provide an analysis of how significant their findings are.
S2 Data Collection			
S2.1	Types of data: qualitative, discrete, continuous. Use of grouped and ungrouped data.		
S2.2	Identify possible sources of bias.		
S2.3	Design an experiment or survey.		An understanding of the terms 'primary data' and 'secondary data' is expected.
S2.4	Design data-collection sheets distinguishing between different types of data.		Includes observation, controlled experiment, data logging, questionnaires and surveys.
S2.5	Extract data from printed tables and lists.		

Continued

Ref	Foundation and Higher	Higher tier only	Notes
S3 Data presentation and analysis			
S3.1	Design and use two-way tables for grouped and ungrouped data.		
S3.2 S3.2h	Produce charts and diagrams for various data types. Scatter graphs, stem-and-leaf, tally charts, pictograms, bar charts, dual bar charts, pie charts, line graphs, frequency polygons, histograms with equal class intervals.	Histograms with unequal class intervals, box plots, cumulative frequency diagrams, relative frequency diagrams.	Candidates should be able to read information from and interpret these charts and diagrams.
S3.3 S3.3h	Calculate median, mean, range, mode and modal class.	Quartiles and inter-quartile range.	From charts, diagrams, lists and tables of data.
S4 Data Interpretation			
S4.1	Interpret a wide range of graphs and diagrams and draw conclusions.		Including median and range from a stem-and-leaf diagram.
S4.2	Look at data to find patterns and exceptions.		For example, identifying a 'rogue' value from a scatter diagram.
S4.3	Recognise correlation and draw and/or use lines of best fit by eye, understanding what these represent.		Candidates will be required to recognise when correlation is weak or strong, positive or negative, but will not be asked to comment on the reliability of the data. Candidates should understand that using a line of best fit outside the plotted range may not be valid.
S4.4	Compare distributions and make inferences.		Comparisons of average and range at tier F, and average and interquartile range at tier H.

Continued

Ref	Foundation and Higher	Higher tier only	Notes
S5 Probability			
S5.1	Understand and use the vocabulary of probability and the probability scale.		Words used will be 'impossible', 'very unlikely', 'unlikely', 'evens', 'likely', 'very likely' and 'certain'.
S5.2	Understand and use estimates or measures of probability from theoretical models (including equally likely outcomes), or from relative frequency.		Probabilities should be written as fractions, decimals or percentages. Cancelling a fraction to its simplest form may be required.
S5.3	List all outcomes for single events, and for two successive events, in a systematic way and derive related probabilities.		
S5.4	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.		The phrase 'mutually exclusive' will not be used in the examination.
S5.5h		Know when to add or multiply two probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is P(A) + P(B), whereas if A and B are independent events, the probability of A and B occurring is P(A) × P(B).	Includes conditional probability.
S5.6h		Use tree diagrams to represent outcomes of compound events, recognising when events are independent.	
S5.7	Compare experimental data and theoretical probabilities.		Knowledge of the term 'relative frequency'.
S5.8	Understand that if an experiment is repeated, this may – and usually will – result in different outcomes.		Knowledge that the more trials carried out then the better the reliability of the results.
S5.9	Understand that increasing sample size generally leads to better estimates of probability and population characteristics.		

3a Functional Elements

The functional elements of mathematics are embedded in this specification.

The following percentages of questions will assess the functional elements of the subject:

- 20–30% of questions on the Higher tier and
- 30–40% of questions on the Foundation tier.

The term 'functional' should be considered in the broad sense of providing learners with the skills and abilities they need to take an active and responsible role in their communities, everyday life, the workplace and educational settings. Functional mathematics requires learners to use mathematics effectively in a wide range of contexts.

The functional elements focus on the following key processes.

- **Representing:** this is about understanding 'real-world' problems and selecting the mathematics to solve them.
- **Analysing:** this is about applying a range of mathematics within realistic contexts.
- **Interpreting:** this is about communicating and justifying solutions and linking solutions back to the original context of the problem.

Within this specification, there will be opportunities to demonstrate the functional elements of mathematics. A question may assess just one of the above key processes or may cover all three but the style of question will be appropriate to a GCSE examination. Questions assessing functional elements are more likely to cover topic areas that particularly lend themselves to contextualisation such as statistics, number and measures, but will not be restricted to any specific content areas. Further, questions addressing the functional elements can target any of the three assessment objectives described in Section 4b of this specification.

Within AO1, straightforward questions will be asked set within realistic contexts. The mathematics required will generally be clear to candidates and any interpretation of the result will be simple.

Within AO2, candidates will be expected to choose the mathematics and/or select the steps required to reach a solution to questions set within realistic contexts. They may also be required to interpret or communicate the result with reference to the context.

Within AO3, candidates will be expected to solve problems using mathematical skills in context, combining the skills of representing, analysing and interpreting to produce a solution. Contexts may be novel or unfamiliar.

3b Key concepts

The key concepts which underpin the study of mathematics are central to the curriculum approach expected of this specification.

Within the assessment, these key concepts will be treated as follows;

- **Competence:** Fluency in the full range of mathematical techniques and processes defined in section 3 of this specification will be tested within Assessment Objective (AO) 1 of the specification. The ability to apply skills and knowledge accurately and communicate clearly will be fully assessed within AO2.
- **Creativity:** Questions will be set which combine different areas of mathematics and which expect knowledge from one area of the subject to be applied in a different area. Within AO3, candidates will be expected to tackle unfamiliar problems and offer convincing, mathematical arguments to justify results
- **Applications and Implications of mathematics:** An appreciation of the importance of mathematics as a tool for making decisions and solving problems in realistic settings is an essential part of any course of study in the subject and this will be reflected in the assessment of the functional elements (section 3a) within this specification. Further to this, it is important that mathematics is seen as a way to understand and appreciate the world through, for example, an understanding of how symmetry pervades the natural and constructed environment or the ways in which mathematical models and concepts have shaped society, in recent years and through history. Thus, a course of study based on this specification affords many opportunities for rich and extended cross curricular work. Within the assessment, use of such contexts is likely but no specific knowledge over and above the mathematical content in section 3 of this specification will be expected.
- **Critical Understanding:** Through a course of study based on this specification, learners should begin to appreciate that mathematics can be used to represent and interpret situations and they should begin to realise the possible limitations of any mathematical model. For example, they should be able to comment on a statistical or geometric model of a situation, explaining why the solutions it offers may not be accurate

4 Scheme of Assessment

4a Aims and learning outcomes

GCSE courses based on this specification should encourage candidates to be inspired, moved and changed by following a broad, coherent, satisfying and worthwhile course of study. They should help learners to develop confidence in, and a positive attitude towards, mathematics and to recognise the importance of mathematics in their own lives and to society. They should prepare learners to make informed decisions about the use of technology, the management of money, further learning opportunities and career choices.

GCSE courses based on this specification must enable candidates to:

- develop knowledge, skills and understanding of mathematical methods and concepts
- acquire and use problem-solving strategies
- select and apply mathematical techniques and methods in mathematical, everyday and real-world situations
- reason mathematically, make deductions and inferences and draw conclusions
- interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

4b Assessment Objectives (AOs)

The examination papers will assess the following Assessment Objectives in the context of the content and skills set out in Section 3 (Subject Content).

A course based on this specification requires learners to demonstrate their ability to

AO1	recall and use their knowledge of the prescribed content
AO2	select and apply mathematical methods in a range of contexts
AO3	interpret and analyse problems and generate strategies to solve them.

Quality of Written Communication (QWC)

In GCSE specifications which require candidates to produce written material in English, candidates must do the following.

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

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

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

However, some questions will explicitly assess QWC. These will be listed on the front cover of each examination paper and marked with an asterisk alongside the question number within the body of the examination paper.

Weighting of Assessment Objectives for GCSE full course

The table below shows the approximate weighting of each of the Assessment Objectives.

Assessment Objectives	Overall weighting of AOs (%)
AO1	45–55
AO2	25–35
AO3	15–25
	100

4c National criteria

This specification complies with

- the Subject Criteria for Mathematics
- the Code of Practice
- the GCSE Qualification Criteria
- the Arrangements for the Statutory Regulation of External Qualifications in England, Wales and Northern Ireland: Common Criteria
- the requirements for qualifications to provide access to Levels 1 and 2 of the National Qualification Framework.

4d Previous learning requirements

There are no previous learning requirements.

However, any requirements for entry to a course based on this specification are at your centre's discretion.

4e Access to assessment: diversity and inclusion

GCSEs often need to assess a wide range of competences. This is because they are general qualifications designed to prepare candidates for a wide range of occupations and further study.

The revised GCSE qualification and subject criteria were reviewed to see whether any of the skills or knowledge needed by the subject presented a possible difficulty to any candidates, whatever their ethnic background, religion, sex, age, disability or sexuality. If there were difficulties, the situation was reviewed again to make sure that such tests of specific competences were only included if they were important to the subject. The findings were discussed with groups who represented the interests of a diverse range of candidates.

Arrangements are made for candidates with special needs to help them access the assessments as long as the competences being tested are not changed. Because of this, most candidates will be able to access any part of the assessment. More details are given in Section 5d.

5 Administration

5a Availability of examination and certification

This specification is designed to be taken over a one- or two-year course of study with all assessment at the end of the course.

Examinations and certification for this specification are available for the first time in June 2012 and then every January and June thereafter throughout the life of the specification.

5b Entries

Please check the current version of **Entry Procedures and Codes** for up-to-date entry procedures. You should use the following entry codes for both examination and certification at the required tier

Foundation	4365F
Higher	4365H

A single entry is all that is needed for both examination papers and certification.

5c Private candidates

This specification is available to private candidates. Private candidates should write to us for a copy of **Supplementary Guidance for Private Candidates** (for specifications without controlled assessment).

5d Access arrangements, reasonable adjustments and special consideration

We have taken note of the equality and discrimination legislation and the interests of minority groups in developing and administering this specification.

We follow the guidelines in the Joint Council for Qualifications (JCQ) document **'Access Arrangements, Reasonable Adjustments and Special Consideration'**. This is published on the JCQ website (**www.jcq.org.uk**) or you can follow the link from our website **www.aqa.org.uk**

Access arrangements

We can arrange for candidates with special needs to access an assessment. These arrangements must be made **before** the examination. For example, we can produce a Braille paper for a candidate with sight problems.

Reasonable adjustments

An access arrangement which meets the needs of a particular disabled candidate would be a reasonable adjustment for that candidate. For example a Braille paper would be a reasonable adjustment for a Braille reader but not for a candidate who did not read Braille. The Disability Discrimination Act requires us to make reasonable adjustments to remove or lessen any disadvantage affecting a disabled candidate.

Special consideration

We can give special consideration to candidates who have had a temporary illness, injury or serious problem such as death of a relative, at the time of the examination. We can only do this **after** the examination.

The Examinations Officer at the centre should apply online for access arrangements and special consideration by following the eAQA link from our website (**www.aqa.org.uk**)

5e Examination language

We will only provide examination papers for this specification in English.

5f Qualification titles

Qualifications based on this specification are:

- AQA GCSE in Mathematics.

5g Awarding grades and reporting results

The GCSE qualification will be graded on an eight-grade scale: A*, A, B, C, D, E, F and G. Candidates who fail to reach the minimum standard for grade G will be recorded as 'U' (unclassified) and will not receive a qualification certificate.

We will publish the minimum raw mark for each grade, for each paper and for the overall qualification, when we issue candidates' results. We will report a candidate's results to your centre in terms of overall grade and marks for each paper. A candidate's grade is determined solely by their overall mark. There is no requirement to achieve the grade boundary in each paper in order to achieve a particular grade overall. Hence, a strong performance in one paper can compensate for a weaker performance in the other.

Candidates must be entered for either the Foundation tier or Higher tier. For candidates entered for the Foundation tier, grades C – G are available. For candidates entered for the Higher tier, grades A* - D are available. There is a safety net for candidates entered for the Higher tier, where an allowed grade E will be awarded where candidates just fail to achieve grade D. Candidates who fail to achieve a grade E on the Higher tier or grade G on the Foundation tier will be reported as U (unclassified).

5h Re-sits

This is a traditional linear specification and, as such, results for individual examination papers cannot be carried forward or re-used.

Candidates can re-sit the qualification as many times as they wish.

Candidates' grades are based on the work they submit for assessment.

Appendices

A Grade descriptions

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates who were awarded particular grades. The descriptions should be considered in relation to the content outlined in the specification – they are not designed to define that content.

The grade awarded will depend on how well the candidate has met the assessment objectives (see Section 4). If a candidate has performed less well in some areas this may be balanced by better performances in others.

Grade	Description
A	Candidates use a wide range of mathematical techniques, terminology, diagrams and symbols consistently, appropriately and accurately. Candidates are able to use different representations effectively and they recognise equivalent representations: for example, numerical, graphical and algebraic representations. Their numerical skills are sound, they use a calculator effectively and they demonstrate algebraic fluency. They use trigonometry and geometrical properties to solve problems. Candidates identify and use mathematics accurately in a range of contexts. They evaluate the appropriateness, effectiveness and efficiency of different approaches. Candidates choose methods of mathematical communication appropriate to the context. They are able to state the limitations of an approach or the accuracy of results. They use this information to inform conclusions within a mathematical or statistical problem. Candidates make and test hypotheses and conjectures. They adopt appropriate strategies to tackle problems (including those that are novel or unfamiliar), adjusting their approach when necessary. They tackle problems that bring together different aspects of mathematics and may involve multiple variables. They can identify some variables and investigate them systematically; the outcomes of which are used in solving the problem. Candidates communicate their chosen strategy. They can construct a rigorous argument, making inferences and drawing conclusions. They produce simple proofs and can identify errors in reasoning.
C	Candidates use a range of mathematical techniques, terminology, diagrams and symbols consistently, appropriately and accurately. Candidates are able to use different representations effectively and they recognise some equivalent representations: for example, numerical, graphical and algebraic representations of linear functions; percentages, fractions and decimals. Their numerical skills are sound and they use a calculator accurately. They apply ideas of proportionality to numerical problems and use geometric properties of angles, lines and shapes. Candidates identify relevant information, select appropriate representations and apply appropriate methods and knowledge. They are able to move from one representation to another, in order to make sense of a situation. Candidates use different methods of mathematical communication. Candidates tackle problems that bring aspects of mathematics together. They identify evidence that supports or refutes conjectures and hypotheses. They understand the limitations of evidence and sampling, and the difference between a mathematical argument and conclusions based on experimental evidence. They identify strategies to solve problems involving a limited number of variables. They communicate their chosen strategy, making changes as necessary. They construct a mathematical argument and identify inconsistencies in a given argument or exceptions to a generalisation.

Grade	Description
F	Candidates use some mathematical techniques, terminology, diagrams and symbols from the Foundation tier consistently, appropriately and accurately. Candidates use some different representations effectively and can select information from them. They complete straightforward calculations competently with and without a calculator. They use simple fractions and percentages, simple formulae and some geometric properties, including symmetry. Candidates work mathematically in everyday and meaningful contexts. They make use of diagrams and symbols to communicate mathematical ideas. Sometimes, they check the accuracy and reasonableness of their results. Candidates test simple hypotheses and conjectures based on evidence. Candidates are able to use data to look for patterns and relationships. They state a generalisation arising from a set of results and identify counter-examples. They solve simple problems, some of which are non-routine.

B Spiritual, moral, ethical, social, legislative, sustainable development, economic and cultural issues, and health and safety considerations

We have taken great care to make sure that any wider issues (for example, spiritual, moral, ethical, social, legal, sustainable development, economic and cultural issues), including those relevant to the education of students at key stage 4, have been taken into account when preparing this specification. They will only form part of the assessment requirements where they are relevant to the specific content of the specification and have been identified in Section 3: Content.

European dimension

We have taken the 1988 Resolution of the Council of the European Community into account when preparing this specification and associated specimen papers.

Environmental education

We have taken the 1988 Resolution of the Council of the European Community and the Report 'Environmental Responsibility: An Agenda for Further and Higher Education' 1993 into account when preparing this specification and associated specimen papers.

Avoiding bias

We have taken great care to avoid bias of any kind when preparing this specification and specimen papers.

C Overlaps with other qualifications

The subject content of this specification is identical, though differently structured, to that of AQA GCSE Mathematics (4360). There is some overlap between this specification and GCSE Statistics.

There is considerable overlap of skills and content between the units of this specification, Free Standing Mathematics qualifications (FSMQ) and the Functional skills qualification in mathematics at Level 1 and Level 2.

Candidates preparing for this GCSE specification will address the functional elements of mathematics but will not be awarded a qualification for Functional mathematics.

The Functional Skills Certificate in Mathematics is available as a separate, stand-alone qualification.

D Wider Key Skills – Teaching, developing and providing opportunities for generating evidence

Introduction

The Key Skills Qualification requires candidates to demonstrate levels of achievement in the Key Skills of Communication, Application of Number and Information and Communication Technology. The Wider Key Skills of Improving own Learning and

Performance, Working with Others and Problem Solving are also available. The acquisition and demonstration of ability in these 'wider' Key Skills is deemed highly desirable for all candidates.

The units for each key skill comprise three sections:

- What you need to know
- What you must do
- Guidance.

Candidates following a course of study based on this specification for GCSE Mathematics (Linear) B can be offered opportunities to develop and generate evidence of attainment in aspects of the Key Skills of:

- Communication
- Application of Number
- Information and Communication Technology
- Working with Others
- Improving own Learning and Performance
- Problem Solving.

Areas of study and learning that can be used to encourage the acquisition and use of Key Skills, and to provide opportunities to generate evidence for Part B of units, are provided in the Teachers' Resource Bank for this specification.

The above information is given in the context of the knowledge that Key Skills at levels 1 and 2 will be available until 2010 with last certification in 2012.

Key Skills Qualifications of Communication, Application of Number and Information and Communication Technology will be phased out and replaced by Functional Skills qualifications in English, Mathematics and ICT from September 2010 onwards. For further information see the AQA website: **http://web.aqa.org.uk/qual/keyskills/com04.php**.

GCSE Mathematics (Linear) from 2010 onwards.

Qualification Accreditation Number: 500/8495/1

Every specification is assigned a national classification code indicating the subject area to which it belongs. The classification code for this specification is 2210.

Centres should be aware that candidates who enter for more than one GCSE qualification with the same classification code will have only one grade counted for the purpose of the School and College Performance Tables. In the case of a candidate taking two qualifications with the same classification code that are of the same size and level, eg two full course GCSEs, the higher grade will count.

Centres may wish to advise candidates that, if they take two specifications with the same classification code, schools and colleges are very likely to take the view that they have achieved only one of the two GCSEs. The same view may be taken if candidates take two GCSE specifications that have different classification codes but have significant overlap of content. Candidates who have any doubts about their subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

To obtain specification updates, access our searchable bank of frequently asked questions, or to ask us a question, register with Ask AQA:

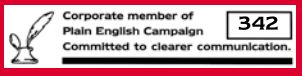
aqa.org.uk/ask-aqa/register

You can also download a copy of the specification and support materials from our website:

aqa.org.uk/mathszone

Free launch meetings are available in 2010 followed by further support meetings through the life of the specification. Further information is available at:

http://events.aqa.org.uk/ebooking



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