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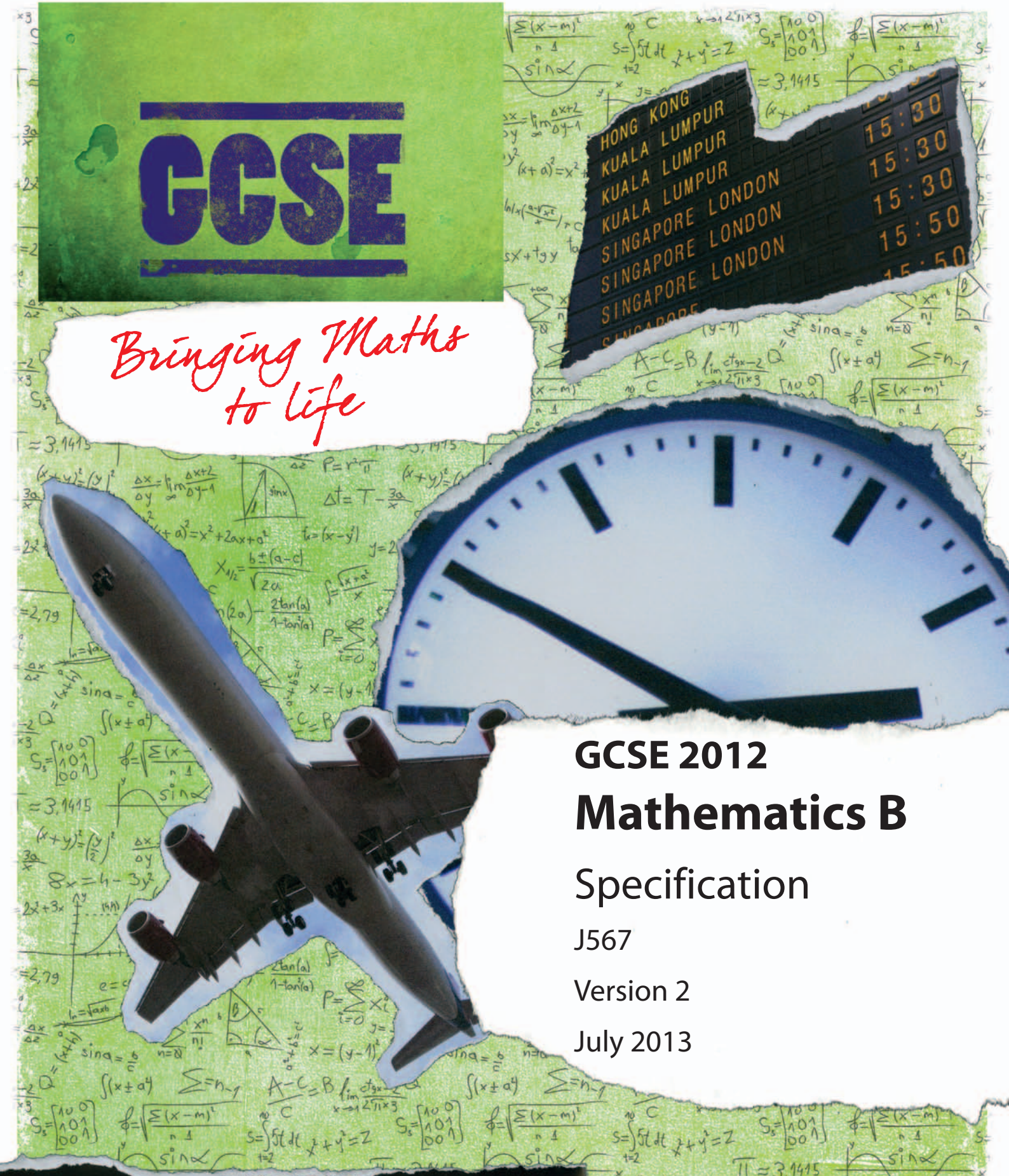

GCSE 2012

Mathematics B

Specification

J567

Version 2

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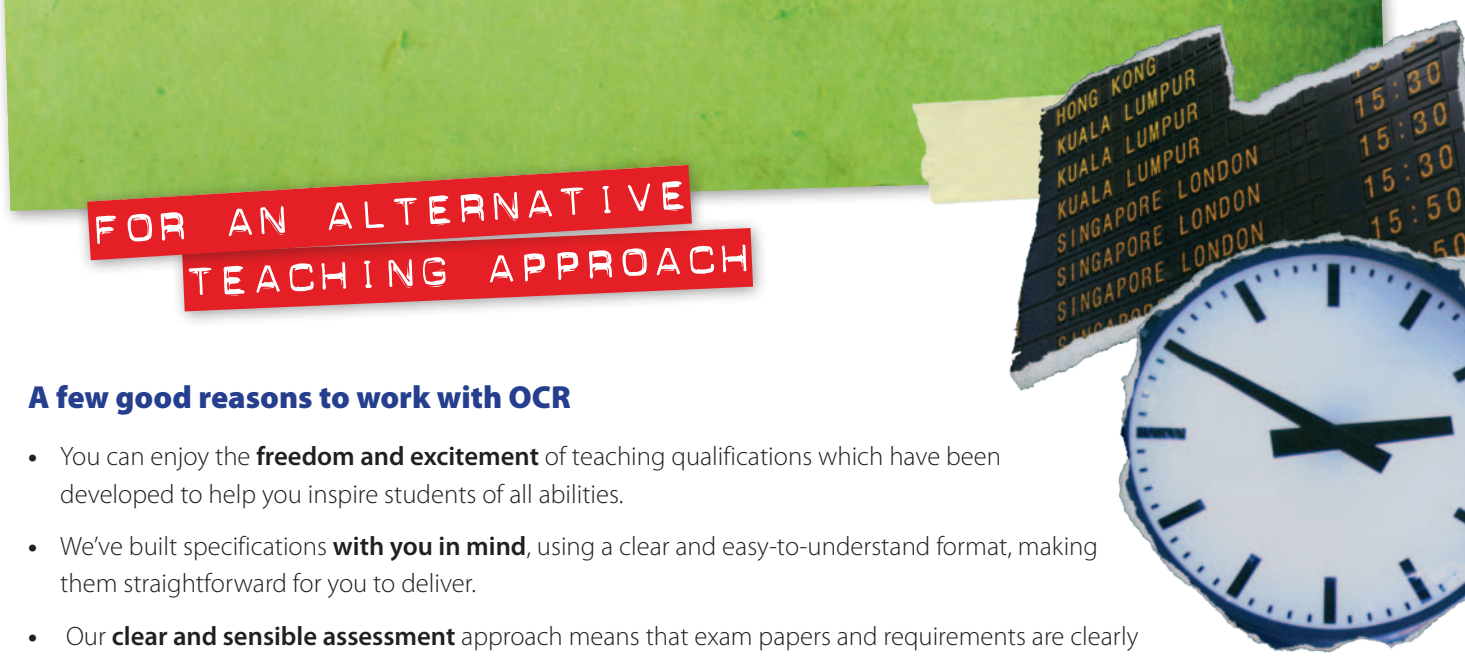

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Contents

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1.1 Overview of GCSE Mathematics B

Foundation tier, grades C to G	
J567/01 **Mathematics Paper 1** ***(Foundation)***	Written paper 1 hour 30 mins 100 marks Calculator **not** permitted 50% of the qualification
J567/02 **Mathematics Paper 2** ***(Foundation)***	Written paper 1 hour 30 mins 100 marks Calculator permitted 50% of the qualification

OR

Higher tier, grades A* to D (E)	
J567/03 **Mathematics Paper 3** ***(Higher)***	Written paper 1 hour 45 mins 100 marks Calculator **not** permitted 50% of the qualification
J567/04 **Mathematics Paper 4** ***(Higher)***	Written paper 1 hour 45 mins 100 marks Calculator permitted 50% of the qualification

1.2 Guided learning hours

GCSE Mathematics B requires 120−140 guided learning hours in total.

1.3 Aims and learning outcomes

GCSE specifications in Mathematics should encourage learners 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. Specifications should prepare learners to make informed decisions about the use of technology, the management of money, further learning opportunities and career choices.

The aims of this specification are to 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.

1.4 Prior learning

Candidates entering this course should have achieved a general educational level equivalent to National Curriculum Level 3, or an Entry 3 at Entry Level within the National Qualifications Framework.

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2.1 About the content of this specification

- The content for the Foundation tier is listed in section 2.2, and the content for the Higher tier is listed in section 2.3.
- This is a linear GCSE. Paper 1 and Paper 2 together assess the content for the Foundation tier. Paper 3 and Paper 4 together assess the content for the Higher tier. Candidates must take both papers for the appropriate tier in the same series.
  - Centres are therefore free to teach candidates the content for the appropriate tier in whichever order they choose.
  - The specification content is listed in a conventional order in the Appendix, for centres wishing to plan their own programme of study.
- However, in this section, the content is arranged in four stages within each tier: Initial, Bronze, Silver and Gold. The stages are graduated in content and level of difficulty. These stages:
  - allow teachers to take account of the fact that different students, or groups, start a GCSE Mathematics course at different points. They allow teachers to identify content in which students may already be secure
  - give teachers the opportunity to target teaching appropriately to the needs of different students or groups
  - promote assessment for learning by providing a series of progressive, accessible targets throughout the GCSE course
  - allow teachers to use formative assessments provided by OCR at the end of each stage. These help to identify strengths and areas for improvement, as well as give an indication of the current level of performance in relation to the whole tier. They can be used objectively to give students Stage Certificates (which do not contribute to the GCSE). The certificates link students' attainment to criteria, give them a sense of achievement and progress, and provide both the students and the teacher with an indication of current performance.
- Note that the Foundation Silver Stage is identical to the Higher Initial Stage, and the Foundation Gold Stage is identical to the Higher Bronze stage.
- Please see the Teachers' Guide for further details about how to use the stages of the specification.

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2.2 J567/01 and J567/02: *Mathematics Paper 1 (Foundation)* and *Mathematics Paper 2 (Foundation)*

2.2.1 Foundation Initial Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
FIN1	*N1.1*	Round numbers to a given power of 10.	
FIN2	*N1.3 N2.2*	Add and subtract three-digit numbers, without the use of a calculator. Add and subtract using numbers with up to two decimal places without the use of a calculator.	
FIN3	*N3.2 N.3.3*	Multiply and divide numbers with no more than one decimal digit by an integer between 1 and 10, without the use of a calculator. Multiply and divide any number by 10, 100 and 1000 without the use of a calculator.	
FIN4	*N4.3*	Multiply and divide a three-digit number by a two-digit number. Multiply numbers with up to two decimal places by an integer.	With or without a calculator, e.g. (1) Multiply 142 by 58; (2) Find the cost of 12 bottles of cordial at £2·95 each.
FIN5	*N2.6 N3.4*	Calculate a fraction of a given quantity. Identify fractions of a shape.	
FIN6	*N2.6 N4.2*	Recall the fraction to decimal conversions of familiar simple fractions (tenths, hundredths, half, quarters, fifths). Convert simple fractions of a whole to percentages of the whole and vice versa.	This includes the conversion of simple decimals to percentages and vice versa.
FIN7	*N2.5 N3.5*	Calculate simple percentages of quantities, without the use of a calculator.	Simple percentages include multiples of 5%.
FIN8	*N4.2*	Order decimals (ordering up to five decimals and knowing that, e.g. 5·07 is smaller than 5·3).	
FIN9	*N4.5*	Solve problems using the four operations on integer and decimal numbers using a calculator	Up to three decimal places.
FIN10	*N3.6*	Work out starting times, finishing times and intervals.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
FIN11	*N3.7*	Perform calculations involving the use of brackets and the order of operations.	
FIN12	*N2.1*	Order positive and negative temperatures. Solve problems involving temperature changes.	

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
FIA1	*A1.1 A2.1*	Continue simple sequences. Explain how to find the next number in a simple pattern. Recognise and describe patterns in number	e.g. 1, 4, 7, 10... or 1, 2, 4, 8 ...; or continue the pattern 11 × 11 = 121, 111 × 111 = 12321, 1111 × ... = 1234321 etc
FIA2	*A2.2 A3.2*	Use formulae expressed in words or symbols, substituting positive numbers into the formula to find the value of the subject (usually in context).	
FIA3	*A1.2 A3.1*	Use simple function machines to deal with inputs and outputs, recognising basic inverse functions. Solve simple equations involving one operation.	
FIA4	*S4.4*	Use axes and coordinates in four quadrants, including using points identified by geometrical information.	May include types of triangle, square, rectangle and parallelogram but not other quadrilaterals in general.
FIA5	*A3.3*	Construct and interpret simple graphs, including conversion graphs.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
FIG1	*S1.1 S2.2 S3.2*	Use: kilometres, metres, centimetres and millimetres; kilograms and grams; litres and millilitres. Convert measurements from one metric unit to another. Interpret scales on a range of measuring instruments.	
FIG2	*S3.1*	Make sensible estimates of a range of measures in everyday settings.	e.g. (1) the height of a car given a diagram with a person standing next to the car, whose height is given; (2) the length of a bench seating three people; (3) how much a loaf of bread weighs, choosing from 80g, 800g, 8kg, 80kg
FIG3	*S2.3 S4.2*	Measure and draw angles to the nearest degree. Identify acute, obtuse, reflex and right angles. 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.	
FIG4	*S1.5 S2.4*	Recognise regular polygons (pentagon, hexagon, octagon). Recognise simple solids (cube, cuboid, sphere, cylinder, cone). Recognise the terms circle, centre, radius, diameter and circumference. Recognise types of triangle (isosceles, equilateral, scalene).	
FIG5	*S1.3 S1.4 S4.3*	Find the perimeter of straight-sided shapes. Find areas of irregular shapes and volumes of simple solids. Find the area of a rectangle.	
FIG6	*S2.6 S1.7*	Use and interpret street plans and simple maps, including: simple grid references (of the form A6, J3 etc), left and right, clockwise and anticlockwise and compass directions.	The compass directions N, E, S, W, NE, SE, NW and SW are included.
FIG7	*S2.5*	Recognise and complete reflection symmetry of 2-D shapes.	With or without a grid, as appropriate.
FIG8	*S4.5*	Understand that reflections are specified by a mirror line. Transform triangles and other 2-D shapes by reflection, using a given line.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
FIS1	*D1.1 D2.1*	Understand and use the vocabulary of probability, including terms such as 'fair', 'evens', 'certain', 'likely', 'unlikely' and 'impossible'. Understand and use the probability scale.	
FIS2	*D1.2*	Find all possible ways of listing up to four objects.	
FIS3	*D2.2 D3.2*	Calculate the mean, median, mode and range of discrete data.	
FIS4	*D1.3 D3.3*	Draw and interpret simple frequency tables, charts, pictograms and bar charts for discrete data.	e.g. use a tally chart to draw a bar chart
FIS5	*D2.3*	Extract and use information from common two-way tables including timetables.	

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2.2.2 Foundation Bronze Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
FBN1	*N4.4*	Understand the concepts and vocabulary of factor, multiple and common factor and prime number.	
FBN2	*N5.1*	Round numbers to the nearest integer or to any given number of significant figures or decimal places. Estimate answers to one-stage calculations, particularly calculations involving measurement or money.	Candidates will be expected to round to one significant figure for these estimates, recognising where this makes the estimate greater or less than the actual value.
FBN3	*N3.1 N5.2*	Use the terms square and square root (positive square roots only) and the correct notation. Find squares and square roots. Use the term cube and find cubes of numbers, appreciating the link to the volume of a cube. Use index notation for simple integer powers.	
FBN4	*N5.3 NEW*	Understand equivalent fractions, simplifying a fraction by cancelling all common factors. Write improper fractions as mixed numbers and vice versa.	
FBN5	*N6.4 NEW*	Order fractions using a common denominator. Add and subtract simple fractions (using a common denominator).	Candidates will not be expected to add or subtract mixed numbers, but will be expected to write answers as mixed numbers where necessary.
FBN6	*N5.4*	Use the equivalence between fractions, decimals and percentages.	
FBN7	*NEW*	Find a percentage of a quantity, interpreting percentage as an operator.	
FBN8	*N5.6*	Use the four operations with positive and negative integers.	
FBN9	*N4.5*	Use simple proportion, particularly in the context of recipes.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
FBA1	*A4.2*	Continue and explain patterns in number and spatial arrangements. Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence.	
FBA2	*A5.1 A4.1*	Substitute positive numbers into simple algebraic formulae. Derive a simple formula.	e.g. find a formula for the perimeter, P, of a regular hexagon of side *a*
FBA3	*A5.3*	Manipulate algebraic expressions by collecting like terms.	
FBA4	*NEW*	Solve simple equations involving two steps.	
FBA5	*A4.3*	Interpret information presented in a range of linear and non-linear graphs, including travel (distance/time) graphs.	Speed calculations will not be required.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
FBG1	*S4.2*	Understand and use the angle properties of triangles, including equilateral, isosceles, right-angled and scalene triangles.	Questions may involve the exterior angle angle of a triangle, but knowledge of the property that the exterior angle of a triangle is equal to the sum of the two interior opposite angles is not required.
FBG2	*NEW*	Understand that the sum of the interior angles of a quadrilateral is 360° and how this result is obtained. Use this angle property of a quadrilateral.	
FBG3	*S3.3*	Use isometric drawings and nets of 3-D shapes.	
FBG4	*S5.4 S6.5*	Find the volumes of cubes and cuboids, recalling the formula. Calculate volumes of shapes made from cubes and cuboids.	The generic formula for the volume of a prism is given on the formulae sheet.
FBG5	*S5.3*	Recall the geometric properties and definitions of the special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus.	
FBG6	*S5.2*	Construct and interpret maps and scale drawings, including estimating distances and areas. Understand and use bearings to specify direction.	
FBG7	*S4.6 S5.5*	Recognise and visualise the rotation symmetry of 2-D shapes. Identify the order of rotation symmetry. Complete shapes and patterns to give a specified order of rotation symmetry.	A 2-D shape has rotation symmetry of order n when n is the largest positive integer for which a rotation of $360° \div n$ produces an identical looking shape in the same position. Hence the order of rotation symmetry is the number of ways the shape will map on to itself in a rotation of 360°. Shapes with rotation symmetry order 1 are said to have no rotation symmetry.
FBG8	*S3.5 NEW*	Understand positive integer scale factors. Use such scale factors to produce scaled-up images on a grid without a specified centre. Understand that an enlarged shape is mathematically similar to the original shape. Understand and recognise the congruence of simple shapes.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
FBS1	*D3.1 D5.1*	Understand and use measures of probability from equally likely outcomes. List all outcomes for two successive events in a systematic way and derive related probabilities.	
FBS2	*D5.2*	Use and interpret the statistical measures: mode, median, mean and range for discrete and continuous data, including comparing distributions.	
FBS3	*D5.3*	Construct and interpret pie charts.	
FBS4	*D4.3*	Interpret graphs representing real data, including recognising misleading diagrams.	

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2.2.3 Foundation Silver Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
FSN1	*N6.4*	Multiply and divide simple fractions. Add and subtract mixed numbers.	This does not include multiplication and division of mixed numbers.
FSN2	*N5.5*	Express one quantity as a fraction or percentage of another.	
FSN3	*N5.4*	Increase and decrease quantities by a percentage.	
FSN4	*N6.3*	Use the four operations on decimals without the use of a calculator.	
FSN5	*N6.2 N7.4*	Use ratio notation including reduction to its simplest form. Understand and use ratio and proportion, including dividing a quantity in a given ratio.	
FSN6	*N6.1 N6.5*	Use a calculator effectively and efficiently, entering a range of measures including 'time', interpreting the display and rounding off a final answer to a reasonable degree of accuracy. Perform calculations using the order of operations.	This includes using the memory and bracket keys, and function keys for squares and powers where appropriate.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
FSA1	*A7.1 A6.3*	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression.	e.g. (1) $4x - 2$; (2) $3x^2 + 4$; (3) $V = 2a^3$
FSA2	*A6.2 A7.2*	Set-up and solve linear equations with integer coefficients. This will include equations in which the unknown appears on both sides of the equation, or with brackets.	
FSA3	*A6.1*	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.	
FSA4	*A5.4*	Use tables to plot graphs of linear functions given explicitly.	
FSA5	*A7.7*	Use trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them.	e.g. (1) $x^3 - 2x = 2$; (2) The positive solution of $x^2 - 4 = \frac{1}{x}$; (3) I think of two numbers. They add together to equal 6. They multiply together to equal 8·64. Find the two numbers.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
FSG1	*S6.1*	Understand and use the angle properties of parallel and intersecting lines.	
FSG2	*S6.3*	Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles. Use a straight edge and a pair of compasses to do constructions. Construct inscribed regular polygons. Construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.	
FSG3	*S6.2*	Recall the meaning of circle, chord, tangent, arc, sector and segment. Recall and use the formulae for the circumference and the area of a circle.	Candidates may be required to give answers in terms of π.
FSG4	*S6.4*	Recall and use the formula for the area of a parallelogram and a triangle. Use the formula for the area of a trapezium. Calculate perimeters and areas of shapes made from triangles and rectangles. Find the surface area of simple solid shapes using the area formulae for triangles and rectangles.	The formula for the area of a trapezium is given on the formulae sheet.
FSG5	*S6.6*	Use 2-D representations of 3-D shapes, including plans and elevations.	
FSG6	*S6.8*	Transform triangles and other 2-D shapes by rotation, reflection, or translation using column vectors. Recognise and visualise rotations, reflections and translations. Understand the properties preserved by these transformations; understand the congruence of these transformations.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
FSS1	*D6.1*	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.	
FSS2	*D6.3*	Identify the modal class of grouped data. Calculate the mean of grouped discrete data.	
FSS3	*D6.3*	Draw and interpret a wide range of graphs and diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams. Compare distributions and make inferences, using the shapes of the distributions and measures of average and range.	
FSS4	*NEW*	Design and use two-way tables for discrete and grouped data.	
FSS5	*NEW*	Design and criticise questions for use in a survey, taking possible bias into account.	

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2.2.4 Foundation Gold Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
FGN1	*N7.2*	Use the index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers. Use the terms cube root and negative square root.	
FGN2	*N8.4*	Use the four operations on fractions, including mixed numbers.	
FGN3	*N6.3 N7.1*	Convert a simple fraction to a decimal using division. Use and understand terminating and recurring decimals including exact fraction equivalents.	This excludes converting a recurring decimal to a fraction (see HGN3).
FGN4	*N7.6*	Use percentages to compare proportion. Use and find percentage change.	e.g. in financial contexts
FGN5	*N7.3*	Check solutions to calculations using various methods including approximating, using inverse operations and recognising the effect of multiplying and dividing by numbers less than one and greater than one. Estimate answers using appropriate techniques.	
FGN6	*N7.7*	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number. Find the prime factor decomposition of positive integers.	

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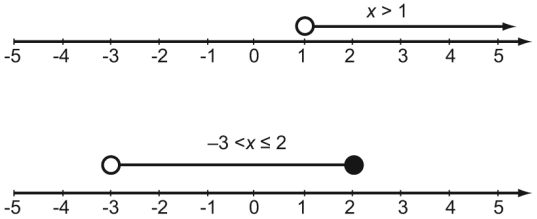
Ref	J517 ref	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
FGA1	*A7.8*	Generate integer sequences using a rule for the *n*th term. Use linear expressions to describe the *n*th term of an arithmetic sequence.	
FGA2	*A7.6*	Solve simple linear inequalities in one variable and represent the solution set on a number line, using the convention for distinguishing ≤ and ≥ from < and >.	For example, for these solution sets: 
FGA3	*A7.3*	Change the subject of a formula in cases where the subject only appears once.	
FGA4	*A6.4 NEW*	Plot graphs of linear functions in which *y* is given explicitly or implicitly in terms of *x*. Find the gradient of linear graphs.	
FGA5	*A6.5*	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.	
FGA6	*A7.5*	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.	Simple quadratic functions such as $y = 3x^2$, $y = x^2 + 5x$. Simple equations such as solving (1) $x^2 – 3 = 0$ having drawn the graph of $y = x^2 – 3$; (2) $x^2 + 5x = 2$, having drawn the graph of $y = x^2 + 5x$.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
FGG1	*S7.1*	Recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half of a unit in either direction.	
FGG2	*S7.8*	Understand and use rates and compound measures, for example speed, density, rate of flow.	
FGG3	*S6.1*	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.	
FGG4	*S7.3*	Understand, recall and use Pythagoras' theorem in 2-D contexts.	
FGG5	*S7.5*	Calculate the surface area and volume of right prisms, including cylinders. Convert between measures for area or for volume/capacity, for example between mm^2 and cm^2 or between cm^3 and litres.	The generic formula for the volume of a prism is given on the formulae sheet.
FGG6	*S7.7*	Construct loci to show paths and shapes. Use straight edge and a pair of compasses to produce standard constructions, including the midpoint and perpendicular bisector of a line segment and the bisector of an angle.	
FGG7	*S6.7*	Recognise, visualise and construct enlargements of objects using positive integer scale factors and a centre of enlargement. Identify the centre and the scale factor of an enlargement. Understand the implications of enlargement for perimeter/length.	
FGG8	*NEW*	Transform 2-D shapes by simple combinations of transformations.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
FGS1	*D7.1 NEW*	Understand and use estimates of probability from theoretical models or relative frequency. Compare experimental data and theoretical probabilities. Understand that if an experiment is repeated, the outcomes may - and usually will - be different, and that increasing the sample size generally leads to better estimates of probability and population characteristics.	
FGS2	*D7.2*	Calculate the mean from grouped continuous data.	
FGS3	*D7.3 D6.2 NEW*	Draw and interpret scatter graphs for discrete and continuous variables, including using and understanding lines of best fit. Understand the vocabulary of correlation, including: positive, negative and zero correlation; weak, strong and moderate correlation. Look at data to find patterns and exceptions.	

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2.3 J567/03 and J567/04: *Mathematics Paper 3 (Higher)* and *Mathematics Paper 4 (Higher)*

The Higher tier subsumes the Foundation tier. The content of the Foundation tier Initial and Bronze stages will not be the focus of a question in Higher tier papers, but knowledge of them will be assumed.

2.3.1 Higher Initial Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
HIN1	*N6.4*	Multiply and divide simple fractions. Add and subtract mixed numbers	This does not include multiplication and division of mixed numbers.
HIN2	*N5.5*	Express one quantity as a fraction or percentage of another.	
HIN3	*N5.4*	Increase and decrease quantities by a percentage.	
HIN4	*N6.3*	Use the four operations on decimals without the use of a calculator.	
HIN5	*N6.2 N7.4*	Use ratio notation including reduction to its simplest form. Understand and use ratio and proportion, including dividing a quantity in a given ratio.	
HIN6	*N6.1 N6.5*	Use a calculator effectively and efficiently, entering a range of measures including 'time', interpreting the display and rounding off a final answer to a reasonable degree of accuracy. Perform calculations using the order of operations.	This includes using the memory and bracket keys, and function keys for squares and powers where appropriate.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
HIA1	*A7.1 A6.3*	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression.	e.g. (1) $4x - 2$; (2) $3x^2 + 4$; (3) $V = 2a^3$
HIA2	*A6.2 A7.2*	Set-up and solve linear equations with integer coefficients. This will include equations in which the unknown appears on both sides of the equation, or with brackets.	
HIA3	*A6.1*	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.	
HIA4	*A5.4*	Use tables to plot graphs of linear functions given explicitly.	
HIA5	*A7.7*	Use trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them.	e.g. (1) $x^3 - 2x = 2$; (2) The positive solution of $x^2 - 4 = \frac{1}{x}$; (3) I think of two numbers. They add together to equal 6. They multiply together to equal 8·64. Find the two numbers.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
HIG1	*S6.1*	Understand and use the angle properties of parallel and intersecting lines.	
HIG2	*S6.3*	Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles. Use a straight edge and a pair of compasses to do constructions. Construct inscribed regular polygons. Construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.	
HIG3	*S6.2*	Recall the meaning of circle, chord, tangent, arc, sector and segment. Recall and use the formulae for the circumference and the area of a circle.	Candidates may be required to give answers in terms of π.
HIG4	*S6.4*	Recall and use the formula for the area of a parallelogram and a triangle. Use the formula for the area of a trapezium. Calculate perimeters and areas of shapes made from triangles and rectangles. Find the surface area of simple solid shapes using the area formulae for triangles and rectangles.	The formula for the area of a trapezium is given on the formulae sheet.
HIG5	*S6.6*	Use 2-D representations of 3-D shapes, including plans and elevations.	
HIG6	*S6.8*	Transform triangles and other 2-D shapes by rotation, reflection, or translation using column vectors. Recognise and visualise rotations, reflections and translations. Understand the properties preserved by these transformations; understand the congruence of these transformations.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
HIS1	*D6.1*	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.	
HIS2	*D6.3*	Identify the modal class of grouped data. Calculate the mean of grouped discrete data.	
HIS3	*D6.3*	Draw and interpret a wide range of graphs and diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams. Compare distributions and make inferences, using the shapes of the distributions and measures of average and range.	
HIS4	*NEW*	Design and use two-way tables for discrete and grouped data.	
HIS5	*NEW*	Design and criticise questions for use in a survey, taking possible bias into account.	

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2.3.2 Higher Bronze Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
HBN1	*N7.2*	Use the index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers. Use the terms cube root and negative square root.	
HBN2	*N8.4*	Use the four operations on fractions, including mixed numbers.	
HBN3	*N6.3 N7.1*	Convert a simple fraction to a decimal using division. Use and understand terminating and recurring decimals including exact fraction equivalents.	This excludes converting a recurring decimal to a fraction (see HGN3).
HBN4	*N7.6*	Use percentages to compare proportion. Use and find percentage change.	e.g. in financial contexts
HBN5	*N7.3*	Check solutions to calculations using various methods including approximating, using inverse operations and recognising the effect of multiplying and dividing by numbers less than one and greater than one. Estimate answers using appropriate techniques.	
HBN6	*N7.7*	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number. Find the prime factor decomposition of positive integers.	

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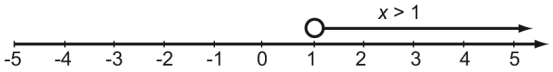
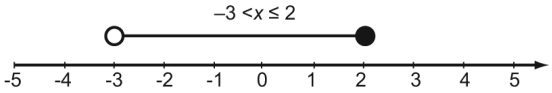
Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
HBA1	*A7.8*	Generate integer sequences using a rule for the *n*th term. Use linear expressions to describe the *n*th term of an arithmetic sequence.	
HBA2	*A7.6*	Solve simple linear inequalities in one variable and represent the solution set on a number line, using the convention for distinguishing ≤ and ≥ from < and >.	For example, for these solution sets:  
HBA3	*A7.3*	Change the subject of a formula in cases where the subject only appears once.	
HBA4	*A6.4 NEW*	Plot graphs of linear functions in which *y* is given explicitly or implicitly in terms of *x*. Find the gradient of linear graphs.	
HBA5	*A6.5*	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.	
HBA6	*A7.5*	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.	Simple quadratic functions such as $y = 3x^2$, $y = x^2 + 5x$. Simple equations such as solving (1) $x^2 – 3 = 0$ having drawn the graph of $y = x^2 – 3$; (2) $x^2 + 5x = 2$, having drawn the graph of $y = x^2 + 5x$.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
HBG1	*S7.1*	Recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half of a unit in either direction.	
HBG2	*S7.8*	Understand and use rates and compound measures, for example speed, density, rate of flow.	
HBG3	*S6.1*	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.	
HBG4	*S7.3*	Understand, recall and use Pythagoras' theorem in 2-D contexts.	
HBG5	*S7.5*	Calculate the surface area and volume of right prisms, including cylinders. Convert between measures for area or for volume/capacity, for example between mm^2 and cm^2 or between cm^3 and m^3.	The generic formula for the volume of a prism is given on the formulae sheet.
HBG6	*S7.7*	Construct loci to show paths and shapes. Use straight edge and a pair of compasses to produce standard constructions, including the midpoint and perpendicular bisector of a line segment and the bisector of an angle.	
HBG7	*S6.7*	Recognise, visualise and construct enlargements of objects using positive integer scale factors. Identify the centre and the scale factor of enlargement. Understand the implications of enlargement for perimeter/length.	
HBG8	*NEW*	Transform 2-D shapes by simple combinations of transformations.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
HBS1	*D7.1 NEW*	Understand and use estimates of probability from theoretical models or relative frequency. Compare experimental data and theoretical probabilities. Understand that if an experiment is repeated, the outcomes may - and usually will - be different, and that increasing the sample size generally leads to better estimates of probability and population characteristics.	
HBS2	*D7.2*	Calculate the mean from grouped continuous data.	
HBS3	*D7.3 D6.2 NEW*	Draw and interpret scatter graphs for discrete and continuous variables, including using and understanding lines of best fit. Understand the vocabulary of correlation, including: positive, negative and zero correlation; weak, strong and moderate correlation. Look at data to find patterns and exceptions.	

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2.3.3 Higher Silver Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
HSN1	*N8.1*	Use a multiplier to solve percentage increase and decrease problems. Calculate the original amount when given the transformed amount after a percentage change.	e.g. compound interest, population change, depreciation, etc
HSN2	*N8.2*	Use repeated proportional or percentage changes. Represent repeated proportional change using a multiplier raised to a power.	
HSN3	*N8.3*	Use standard index form expressed in conventional notation and on a calculator display. Convert between ordinary and standard index form representations. Calculate with standard index form.	
HSN4	*N9.2*	Check the order of magnitude of compound calculations using estimation methods, without the use of a calculator.	Methods to include rounding numbers of any size to one significant figure and simplifying calculations using standard index form.

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Ref	J517 ref	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
HSA1	*A8.3*	Solve harder linear equations including those with fractional coefficients.	
HSA2	*A9.3* *A8.2*	Manipulate algebraic expressions by expanding the product of two linear expressions, simplifying the result. Factorise quadratic expressions, including the difference of two squares. Solve quadratic equations of the form $ax^2 + bx + c = 0$ by factorisation. Simplify algebraic expressions by taking out common factors. Simplify rational expressions.	Solving quadratic equations by factorisation includes both the cases where where $a = 1$ and where $a \neq 1$.
HSA3	*A9.1*	Rearrange formulae, including cases where the subject appears twice, or where a power of the subject appears.	
HSA4	*A8.4*	Set up two linear simultaneous equations. Find the exact solution of two linear simultaneous equations in two unknowns by eliminating a variable; interpret the equations as lines and their common solution as the point of intersection.	Graphical solution of simultaneous equations is also included.
HSA5	*A8.5*	Plot, sketch and recognise graphs of quadratics, simple cubic functions, and reciprocal functions $y = \frac{k}{x}$; with $x \neq 0$, including graphs arising from real situations and their interpretation.	e.g. (1) $y = 2x^2 - 6x + 3$; (2) $y = x^3 - 2x$
HSA6	*A8.6*	Solve several linear inequalities in two variables and find the solution set, representing this on a suitable diagram. Shade such regions on a graph, using the convention for distinguishing ≤ and ≥ from < and >. Construct the graphs of simple loci.	Where a line is included in the region, it will be solid; where it is not included, it will be dashed.
HSA7	*A8.7*	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. Write the equation of a straight line in the form $y = mx + c$. Understand the gradients of parallel lines.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
HSG1	*S7.2 S9.1*	Understand and construct geometrical proofs using circle theorems: Understand that the tangent at any point on a circle is perpendicular to the radius at that point; understand that tangents from an external point are equal in length; understand that the angle subtended by an arc at the centre of the circle is twice the angle subtended at any point on the circumference; understand that the angle subtended at the circumference by a semicircle is a right angle; understand that angles in the same segment in a circle are equal; understand that opposite angles in a cyclic quadrilateral sum to 180°; understand the alternate segment theorem.	
HSG2	*S7.6*	Understand and use 3-D coordinates.	
HSG3	*S7.6 S9.2*	Find the coordinates of the midpoint of a line segment AB given points A and B in 2-D. Use Pythagoras' theorem to find the length of a line segment AB given the points A and B in 2-D.	
HSG4	*S8.3*	Understand, recall and use trigonometrical ratios in right-angled triangles in 2-D.	Questions in context may include the use of bearings.
HSG5	*S8.4*	Understand similarity of triangles and other plane figures and use this to make geometrical inferences.	
HSG6	*S8.2*	Construct enlargements using any scale factor, including positive fractional and negative scale factors; identify scale factors.	
HSG7	*S9.4*	Understand and use the effect of enlargement on the area and volume of shapes and solids.	
HSG8	*S8.2*	Fully describe combinations of transformations (rotation, reflection, translation, enlargement) using a single transformation.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
HSS1	*D8.1*	Use tree diagrams to represent outcomes of combined events, recognising when events are independent. Find probabilities using tree diagrams.	
HSS2	*D8.2*	Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data. Find the median, quartiles and interquartile range.	
HSS3	*D8.3*	Compare distributions and make inferences, using the shapes of the distributions and measures of average and spread, including median and quartiles.	
HSS4	*D8.4 D10.2*	Calculate an appropriate moving average. Identify seasonality and trends in time series, from tables or diagrams.	

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2.3.4 Higher Gold Stage

Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Number	
HGN1	*N9.3*	Use the index laws with fractional, negative and zero powers in simplifying numerical and algebraic expressions.	
HGN2	*NEW N10.2*	Use surds in exact calculations, without a calculator. Simplify expressions involving surds including rationalising a denominator.	
HGN3	*N10.2*	Convert a recurring decimal to a fraction and vice versa.	
HGN4	*N9.1*	Use a calculator to find the upper and lower bounds of calculations, particularly in the context of measurement.	
HGN5	*N10.1*	Use calculators to explore exponential growth and decay.	

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Ref	J517 ref	Subject content - Candidates should be able to...	Notes and examples
		Algebra	
HGA1	*A9.2*	Form and use equations involving direct or inverse proportion (for $y \propto x$, $y \propto x^2$, $y \propto \frac{1}{x}$, $y \propto \frac{1}{x^2}$).	
HGA2	*A10.2*	Solve quadratic equations by completing the square and using the quadratic equation formula.	The quadratic formula is given on the formulae sheet. The technique of completing the square may also be used to write quadratic expressions in the form $(x + a)^2 + b$ and hence to find the minimum value of the expression and the value of x at which this occurs.
HGA3	*A10.3*	Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns, one of which is linear, the other equation quadratic in one unknown. Find the points of intersection of straight lines with quadratic curves, knowing that these are the approximate solutions of the corresponding simultaneous equations.	
HGA4	*A10.1 NEW*	Manipulate algebraic expressions including fractions and solve the related equations. Understand the difference between an equation and an identity.	
HGA5	*A10.5* *S10.4*	Draw, sketch and recognise the function $y = k^x$ for integer values of x and simple positive values of k, the trigonometric functions $y = \sin x$ and $y = \cos x$ for any angle.	Trigonometric graphs may be used to find solutions of simple equations such as $\sin x = 0{\cdot}4$, within a given interval.
HGA6	*A10.4*	Apply to the graph of $y = f(x)$, for linear and quadratic $f(x)$, the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$.	Notation such as $y = f(x)$, $y = f(x - 2)$, $y = f(x) + 3$ may be used in questions.

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Geometry and measures	
HGG1	*S10.2*	Understand and use SSS, SAS, ASA and RHS condition to prove the congruence of triangles.	
HGG2	*S9.2*	Use Pythagoras' theorem and trigonometrical relationships in 3-D contexts, including using 3-D coordinates and finding the angles between a line and a plane.	
HGG3	*S10.3*	Calculate the area of a triangle using ½ *ab* sin C. Use the sine and cosine rules in 2-D and 3-D contexts.	These are given on the formulae sheet.
HGG4	*S9.3 S10.1*	Find the lengths of arcs, areas of sectors and segments of circles, and the surface areas and volumes of pyramids, cones and spheres; use pi in exact calculations. Solve mensuration problems involving more complex shapes and solids	The formulae sheet includes: volume of a sphere and a cone, and the surface area of a cone. Examples of mensuration problems include: (1) Finding the area of an arched window; (2) Finding the volume of a frustum.
HGG5	*S10.5*	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. Use vector methods in 2-D.	

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Ref	*J517 ref*	Subject content - Candidates should be able to...	Notes and examples
		Statistics	
HGS1	*D9.1 D10.3*	Know when to add or multiply probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is P(A) + P(B). If A and B are independent events, the probability of A and B occurring is P(A) × P(B).	Harder questions may include the use of conditional probabilities and/or more than two successive events.
HGS2	*D9.2*	Draw and interpret histograms for grouped data. Understand frequency density.	
HGS3	*D10.1*	Interpret and compare a wide range of data sets (including grouped discrete and continuous data) and draw conclusions.	
HGS4	*D9.3*	Select a representative sample from a population using random and stratified sampling. Criticise sampling methods.	

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3 Assessment of GCSE Mathematics B

3.1 Overview of the assessment in GCSE Mathematics B

For GCSE Mathematics B candidates must take **either** Foundation tier Paper 1 and Paper 2 **or** Higher tier Paper 3 and Paper 4.

GCSE Mathematics B (J567)	
J567/01: ***Mathematics Paper 1 (Foundation)*** 50% of the total GCSE marks Written paper Calculator **not** permitted 1 hour 30 mins 100 marks	• All papers are externally assessed. • Candidates answer **all** questions on each paper. • Candidates are not permitted to use a calculator for Papers 1 and 3. • Candidates are permitted to use a scientific or graphical calculator for Papers 2 and 4. Calculators are subject to the rules in the document *Instructions for Conducting Examinations*, published annually by the Joint Council for Qualifications (www.jcq.org.uk). • In some questions, candidates will have to decide for themselves what mathematics they need to use. • In each question paper, candidates are expected to support their answers with appropriate working. • Functional elements of mathematics are assessed in this specification. The weightings are 30−40% at Foundation tier and 20−30% at Higher tier. • Candidates should have the usual geometric instruments available. Tracing paper may also be used to aid with transformations etc.
J567/02: ***Mathematics Paper 2 (Foundation)*** 50% of the total GCSE marks Written paper Calculator permitted 1 hour 30 mins 100 marks	
J567/03: ***Mathematics Paper 3 (Higher)*** 50% of the total GCSE marks Written paper Calculator **not** permitted 1 hour 45 mins 100 marks	
J567/04: ***Mathematics Paper 4 (Higher)*** 50% of the total GCSE marks Written paper Calculator permitted 1 hour 45 mins 100 marks	

3.2 Tiers

This scheme of assessment consists of **two** tiers: Foundation tier and Higher tier. Foundation tier assesses grades G to C and Higher tier assesses grades D to A*. An allowed grade E may be awarded on the Higher tier components. Candidates will be entered for either the Foundation tier or the Higher tier.

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3.3 Assessment Objectives (AOs)

Candidates are expected to demonstrate their ability to:

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

AO weightings – GCSE Mathematics B

The relationship between the question papers and the assessment objectives in terms of **raw marks** is shown in the following grid.

Question paper	AO1	AO2	AO3	Total
J567/01: *Mathematics Paper 1 (Foundation)*	45-55	25-35	15-25	**100**
J567/02: *Mathematics Paper 2 (Foundation)*	45-55	25-35	15-25	**100**
J567/03: *Mathematics Paper 3 (Higher)*	45-55	25-35	15-25	**100**
J567/04: *Mathematics Paper 4 (Higher)*	45-55	25-35	15-25	**100**

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3.4 Grading and awarding grades

GCSE results are awarded on the scale A* to G. Grades are indicated on certificates. However, results for candidates who fail to achieve the minimum grade for the tier will be recorded as *unclassified* (U) and this is **not** certificated.

This GCSE is a linear scheme. Candidates must take both of the components for the tier in the same series.

Awarding grades

The written papers have a total weighting of 100%.

A candidate's mark for each paper is weighted and combined to give a total weighted mark for the specification. The candidate's grade is determined by the total weighted mark. (In this GCSE specification, the total raw mark equals the total weighted mark).

3.5 Grade descriptions

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The descriptions must be interpreted in relation to the content in the specification; they are not designed to define that content. The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of the assessment may be balanced by better performance in others.

The grade descriptors have been produced by the regulatory authorities in collaboration with the awarding bodies.

Grade 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.

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Grade 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 e.g. 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 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

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3.6 Quality of written communication

Quality of written communication is assessed in all papers and is integrated in the marking criteria.

Candidates are expected to:

- ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
- present information in a form that suits its purpose
- use an appropriate style of writing and, where applicable, specialist terminology.

Questions assessing QWC will be indicated by an asterisk (*).

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4.1 Free resources available from the OCR website

The following materials will be available on the OCR website:

- GCSE Mathematics B specification
- specimen assessment materials for each paper
- sample schemes of work and lesson plans.

Additional sample assessment materials for each paper and two sets of Stage Tests can be found on OCR Interchange.

4.2 Other resources

OCR offers centres a wealth of quality published support with a choice of 'Official Publisher Partner' and 'Approved Publication' resources, all endorsed by OCR for use with OCR specifications.

4.2.1 Publisher partners

OCR works in close collaboration with Publisher Partners to ensure centres have access to:

- Published support materials available when you need them, tailored to OCR specifications.
- High quality resources produced in consultation with OCR subject teams, which are linked to OCR's teacher support materials.

OCR RECOGNISING ACHIEVEMENT HODDER EDUCATION
Official Publisher Partnership

Hodder Education is the publisher partner for OCR GCSE Mathematics B.

We're working with our publisher partner Hodder Education to produce an exciting new range of resources. These have been written and edited by experienced examiners and authors, combining their teaching and examining expertise to provide relevant and meaningful coverage of the course.

The resources will include three Student Books, three Teacher and Assessment Packs, and three Homework Books. You'll also be able to access full digital support. This includes interactive online assessment that allows you to track learners' progress, highlighting the best way to achieve success. The reports not only identify students' areas of strength and weakness, but provide links to print and digital resources that will help them improve their knowledge and skills.

Visit www.hoddereducation.co.uk/ocrgcsemathsb to find out more.

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GCSE Mathematics B publisher pack:

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Student Books

- OCR Mathematics for GCSE Specification B – Higher Silver & Gold Student Book
- OCR Mathematics for GCSE Specification B – Foundation Silver & Gold / Higher Initial & Bronze Student Book
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Dynamic Learning

- Support for each stage in the shape of Personal Tutor presentations
- Interactive Assessment Tasks with associated reporting and remediation
- Additional assessment resources for teachers

4.2.2 Endorsed publications

OCR endorses a range of publisher materials to provide quality support for centres delivering its qualifications. You can be confident that materials branded with OCR's "Official Publishing Partner" or "Approved publication" logos have undergone a thorough quality assurance process to achieve endorsement. All responsibility for the content of the publisher's materials rests with the publisher.

These endorsements do not mean that the materials are the only suitable resources available or necessary to achieve an OCR qualification.

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4.3 Training

OCR will offer a range of support activities for practitioners throughout the lifetime of the qualification to ensure they have the relevant knowledge and skills to deliver the qualification.

Please see Event Booker for further information.

4.4 OCR support services

4.4.1 Active Results

activeresults

Active Results is available to all centres offering OCR's GCSE Mathematics specifications.
Active Results is a free results analysis service to help teachers review the performance of individual candidates or whole schools.

Data can be analysed using filters on several categories such as gender and other demographic information, as well as providing breakdowns of results by question and topic.

Active Results allows you to look in greater detail at your results:

- richer and more granular data will be made available to centres including item level data available from e-marking
- you can identify the strengths and weaknesses of individual candidates and your centre's cohort as a whole
- our systems have been developed in close consultation with teachers so that the technology delivers what you need.

Further information on Active Results can be found on the OCR website.

4.4.2 OCR Mathematics Support Team

A direct number gives access to a dedicated and trained support team handling all queries relating to GCSE Mathematics and other Mathematics qualifications − 0300 456 3142.

4.4.3 OCR Interchange

OCR Interchange has been developed to help you to carry out day-to-day administration functions online, quickly and easily. The site allows you to register and enter candidates online. In addition, you can gain immediate and free access to candidate information at your convenience. Sign up at https://interchange.ocr.org.uk

5 Equality and Inclusion in GCSE Mathematics B

5.1 Equality Act information relating to GCSE Mathematics B

GCSEs often require assessment of a broad range of competences. This is because they are general qualifications and, as such, prepare candidates for a wide range of occupations and higher level courses.

The revised GCSE qualification and subject criteria were reviewed by the regulators in order to identify whether any of the competences required by the subject presented a potential barrier to any disabled candidates. If this was the case, the situation was reviewed again to ensure that such competences were included only where essential to the subject. The findings of this process were discussed with disability groups and with disabled people.

Reasonable adjustments are made for disabled candidates in order to enable them to access the assessments and to demonstrate what they know and can do. For this reason, very few candidates will have a complete barrier to the assessment. Information on reasonable adjustments is found in *Access Arrangements, Reasonable Adjustments and Special Consideration* by the Joint Council www.jcq.org.uk.

Candidates who are unable to access part of the assessment, even after exploring all possibilities through reasonable adjustments, may still be able to receive an award based on the parts of the assessment they have taken.

The access arrangements permissible for use in this specification are in line with Ofqual's GCSE subject criteria equalities review and are as follows:

	Yes/No	Type of Assessment
Readers	Yes	All assessments
Scribers	Yes	All assessments
Practical assistants	Yes	All assessments
Word processors	Yes	All assessments
Transcripts	Yes	All assessments
Oral language modifiers	Yes	All assessments
BSL signers	Yes	All assessments
Modified question papers	Yes	All assessments
Extra time	Yes	All assessments

5.2 Arrangements for candidates with particular requirements (including Special Consideration)

All candidates with a demonstrable need may be eligible for access arrangements to enable them to show what they know and can do. The criteria for eligibility for access arrangements can be found in the JCQ document *Access Arrangements, Reasonable Adjustments and Special Consideration*.

Candidates who have been fully prepared for the assessment but who have been affected by adverse circumstances beyond their control at the time of the examination may be eligible for special consideration. As above, centres should consult the JCQ document *Access Arrangements, Reasonable Adjustments and Special Consideration*.

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Administration of GCSE Mathematics B

6

The sections below explain in more detail the rules that apply from the June 2014 examination series onwards.

6.1 Availability of assessment

There will be:

- one examination series available each year in June to **all** candidates
- one retake opportunity available in November each year for candidates who have already certificated in GCSE Mathematics with any awarding body.

	June 2014	November 2014	June 2015	November 2015
J567 (all components)	✓	Re-take only	✓	Re-take only

6.2 Certification rules

A 100% terminal rule applies. Candidates must take both components for the appropriate tier in the series in which the qualification is certified.

6.3 Rules for re-taking

Candidates may enter for the qualification an unlimited number of times.

Where a candidate re-takes a qualification, **both** components for the appropriate tier must be re-taken in the same series as the qualification is re-certificated. This does not have to be the same tier as for any previous entries. The new results for these components will be used to calculate the new qualification grade. Any results previously achieved cannot be re-used.

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6.4 Making entries

Centres must be approved to offer OCR qualifications before they can make any entries, including estimated entries. It is recommended that centres apply to OCR to become an approved centre well in advance of making their first entries. Centres must have made an entry in order for OCR to supply the appropriate forms and administrative materials.

It is essential that correct entry codes are used when making entries.

Candidates may enter for:

- OCR GCSE in Mathematics B – J567

All candidates must be entered for J567 and either option F or option H. Centres must enter each of their candidates for ONE of the options. It is not possible for centres to offer both options to the same candidate in the same series. Entering candidates for one of the options automatically enters them for the two assessments for the tier, as shown below.

Entry code and option	Assessment type	Assessment codes and titles
J567 option F	Written paper	J567/01: *Mathematics Paper 1 (Foundation)*
	Written paper	J567/02: *Mathematics Paper 2 (Foundation)*
J567 option H	Written paper	J567/03: *Mathematics Paper 3 (Higher)*
	Written paper	J567/04: *Mathematics Paper 4 (Higher)*

6.5 Enquiries about results

Under certain circumstances, a centre may wish to query the result issued to one or more candidates. Enquiries about results for GCSE examinations must be made immediately following the series in which the assessment was taken and by the enquiries about results deadline for that series.

Please refer to the *JCQ Post-Results Services* booklet and the *OCR Admin Guide: 14-19 Qualifications* for further guidance on enquiries about results and deadlines. Copies of the latest versions of these documents can be obtained from the OCR website.

6.6 Prohibited qualifications and classification code

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 (the highest) counted for the purpose of the School and College Performance Tables.

Centres may wish to advise candidates that, if they take two specifications with the same classification code, 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 seek advice, either from their centre or from the institution to which they wish to progress.

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Other information about GCSE Mathematics B 7

7.1 Overlap with other qualifications

There is a small degree of overlap between the content of this specification and that for GCSE Statistics and Free Standing Mathematics Qualifications.

7.2 Progression from this qualification

GCSE qualifications are general qualifications that enable candidates to progress either directly to employment, or to proceed to further qualifications.

Progression to further study from GCSE will depend upon the number and nature of the grades achieved. Broadly, candidates who are awarded mainly Grades D to G at GCSE could either strengthen their base through further study of qualifications at Level 1 within the National Qualifications Framework or could proceed to Level 2. Candidates who are awarded mainly Grades A* to C at GCSE would be well prepared for study at Level 3 within the National Qualifications Framework.

This specification provides progression from the OCR Entry Level Certificate in Mathematics specification R448.

7.3 Avoidance of bias

OCR has taken great care in preparation of this specification and the assessment materials to avoid bias of any kind. Special focus is given to the 9 strands of the Equality Act with the aim of ensuring both direct and indirect discrimination is avoided.

7.4 Regulatory requirements

This specification complies in all respects with the current: *General Conditions of Recognition; GCSE, GCE, Principal Learning and Project Code of Practice* and the *GCSE subject criteria for Mathematics*. All documents are available on the Ofqual website.

7.5 Language

This specification and associated assessment materials are in English only. Only answers written in English will be assessed.

7.6 Spiritual, moral, ethical, social, legislative, economic and cultural issues

This specification offers opportunities which can contribute to an understanding of these issues in the following topics.

Issue	Opportunities for developing an understanding of the issue during the course
Spiritual issues	Spiritual development: helping candidates obtain an insight into the infinite, and through explaining the underlying mathematical principles behind natural forms and patterns.
Moral issues	Moral development: helping candidates recognise how logical reasoning can be used to consider the consequences of particular decisions and choices and helping them learn the value of mathematical truth.
Social issues	Social development: helping candidates work together productively on complex mathematical tasks and helping them see that the result is often better than any of them could achieve separately.
Economic issues	Economic development: helping candidates make informed decisions about the management of money.
Cultural issues	Cultural development: helping candidates appreciate that mathematical thought contributes to the development of our culture and is becoming increasingly central to our highly technological future, and through recognising that mathematicians from many cultures have contributed to the development of modern day mathematics.

7.7 Sustainable development, health and safety considerations and European developments, consistent with international agreements

This specification supports these issues, consistent with current EU agreements, through questions set in relevant contexts.

- Sustainable development issues could be supported through questions set on carbon emissions or life expectancy, for example.
- Health and safety considerations could be supported through questions on maximum safe loads or a nutrition analysis, for example.
- European developments could be supported through questions on currency and foreign exchange, for example.

OCR encourages teachers to use appropriate contexts in the delivery of the subject content.

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7.8 Key Skills

This specification provides opportunities for the development of the Key Skills of *Communication*, *Application of Number, Information and Communication Technology, Working with Others, Improving Own Learning* and *Performance and Problem Solving* at Levels 1 and/or 2. However, the extent to which this evidence fulfils the Key Skills criteria at these levels will be totally dependent on the style of teaching and learning adopted.

The following table indicates where opportunities may exist for at least some coverage of the various Key Skills criteria at Levels 1 and/or 2 .

	C		AoN		ICT		WwO		IoLP		PS	
	1	2	1	2	1	2	1	2	1	2	1	2
J567	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

7.9 ICT

In order to play a full part in modern society, candidates need to be confident and effective users of ICT. Where appropriate, candidates should be given opportunities to use ICT in order to further their study of mathematics.

The assessment of this course requires candidates to:

- use calculators effectively and efficiently, knowing how to
  - enter complex calculations,
  - use an extended range of function keys, including trigonometrical and statistical functions relevant to the programme of study.

Questions will be set in Papers 2 and 4 that specifically test the use of calculators.

In addition, the programme of study requires candidates to:

- become familiar with a range of resources, including ICT such as spreadsheets, dynamic geometry, graphing software and calculators, to develop mathematical ideas.

7.10 Citizenship

Since September 2002, the National Curriculum for England at Key Stage 4 has included a mandatory programme of study for Citizenship. Parts of the programme of study for Citizenship (2007) may be delivered through an appropriate treatment of other subjects.

This section offers examples of opportunities for developing knowledge, skills and understanding of citizenship issues during this course.

This Mathematics specification aids candidates in analysing **how information is used in public debate and policy formation, including information from the media and from pressure and interest groups**, through its statistical content.

The key process of **critical thinking and enquiry** can be developed, for example, where candidates have to decide for themselves how to solve a mathematical problem, or decide which information is relevant and redundant.

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A Appendix

A.1 Conventional presentation of specification content

GCSE Mathematics B is a linear scheme. The content is listed in section 2 in four stages within each of the two tiers. The stages are graduated in the level of demand of the content. This allows teachers to use the stages to target teaching to the level of ability of the students.

This Appendix is for teachers who want to use the scheme in a more traditional linear way. The content for each tier is listed in four main sections (Number, Algebra, Geometry and Measures, Statistics). Within each of these the content is grouped under sub-headings that reflect previous linear GCSE Mathematics specifications.

Some statements within a heading may repeat or extend certain aspects. For example, in foundation tier Number (Powers and roots) FBN3 states *"Use the terms square and square root (positive square roots only) and the correct notation."* Within the same heading there is also FGN1 *"Use the terms cube root and negative square root."* This is entirely deliberate and the statements both appear in order to give an indication of demand.

- For the foundation tier, statements prefaced by FI or FB address content in the lower stages of the foundation tier. Statements prefaced by FS or FG show the more challenging content of the foundation tier; such content also "overlaps" with the higher tier.
  - For the foundation tier question papers, approximately 70 marks will assess FI and FB statements and approximately 30 marks will assess FS and FG statements.
- For the higher tier, statements prefaced by HI or HB address material in the lower stages of the tier. This is the same content as that labelled FS and FG respectively (i.e. the "overlapping" content). Statements prefaced by HS or HG show the content which is exclusive to the higher tier; this is shown in **bold** type.
  - For the higher tier question papers, approximately 50 marks will assess HI and HB statements and approximately 50 marks will assess HS and HG statements.
  - The higher tier subsumes the foundation tier. Statements prefaced by FI or FB in the foundation tier will not be the focus of a question in higher tier papers, but knowledge of them will be assumed.

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A.2 J567/01 and J567/02: *Mathematics Paper 1 (Foundation)* and *Mathematics Paper 2 (Foundation)*

Number Topic	Ref	Subject content - Candidates should be able to...
Number operations	FIN2	Add and subtract three-digit numbers, without the use of a calculator.
		Add and subtract using numbers with up to two decimal places without the use of a calculator.
	FIN3	Multiply and divide numbers with no more than one decimal digit by an integer between 1 and 10, without the use of a calculator.
		Multiply and divide any number by 10, 100 and 1000 without the use of a calculator.
	FIN4	Multiply and divide a three-digit number by a two-digit number.
		Multiply numbers with up to two decimal places by an integer, with or without a calculator. (e.g. (1) Multiply 142 by 58; (2) Find the cost of 12 bottles of cordial at £2·95 each).
	FIN11	Perform calculations involving the use of brackets and the order of operations.
	FIN10	Work out starting times, finishing times and intervals.
	FIN1	Round numbers to a given power of 10.
	FBN2	Round numbers to the nearest integer or to any given number of significant figures or decimal places.
		Estimate answers to one-stage calculations, particularly calculations involving measurement or money. (Candidates will be expected to round to one significant figure for these estimates, recognising where this makes the estimate greater or less than the actual value).
	FGN5	Check solutions to calculations using various methods including approximating, using inverse operations and recognising the effect of multiplying and dividing by numbers less than one and greater than one.
		Estimate answers using appropriate techniques.
	FIN12	Order positive and negative temperatures.
		Solve problems involving temperature changes
	FBN8	Use the four operations with positive and negative integers.
	FBN1	Understand the concepts and vocabulary of factor, multiple and common factor and prime number.
	FGN6	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number.
		Find the prime factor decomposition of positive integers.

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Number Topic	Ref	Subject content - Candidates should be able to...
Powers and roots	FBN3	Use the terms square and square root (positive square roots only) and the correct notation.
		Find squares and square roots.
		Use the term cube and find cubes of numbers, appreciating the link to the volume of a cube.
		Use index notation for simple integer powers.
	FGN1	Use the index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.
		Use the terms cube root and negative square root.
Fractions	FIN5	Calculate a fraction of a given quantity.
		Identify fractions of a shape.
	FBN4	Understand equivalent fractions, simplifying a fraction by cancelling all common factors.
		Write improper fractions as mixed numbers and vice versa.
	FBN5	Order fractions using a common denominator.
		Add and subtract simple fractions (using a common denominator).
	FSN1	Multiply and divide simple fractions (not mixed numbers).
		Add and subtract mixed numbers.
	FSN2	Express one quantity as a fraction of another.
	FGN2	Use the four operations on fractions, including mixed numbers.
Decimals	FIN6	Recall the fraction to decimal conversions of familiar simple fractions (tenths, hundredths, half, quarters, fifths).
	FIN8	Order decimals (ordering up to five decimals and knowing that, e.g. 5·07 is smaller than 5·3).
	FSN4	Use the four operations on decimals without the use of a calculator.
	FGN3	Convert a simple fraction to a decimal using division.
		Use and understand terminating and recurring decimals including exact fraction equivalents (this excludes converting a recurring decimal to a fraction).

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Number Topic	Ref	Subject content - Candidates should be able to...
Percentages	FIN6	Convert simple fractions of a whole to percentages of the whole and vice versa. (Includes the conversion of simple decimals to percentages and vice versa).
	FIN7	Calculate simple percentages (includes multiples of 5%) of quantities, without the use of a calculator.
	FBN6	Use the equivalence between fractions, decimals and percentages.
	FBN7	Find a percentage of a quantity, interpreting percentage as an operator.
	FSN2	Express one quantity as a percentage of another.
	FSN3	Increase and decrease quantities by a percentage.
	FGN4	Use percentages to compare proportion.
		Use and find percentage change.
Ratio and proportion	FBN9	Use simple proportion, particularly in the context of recipes.
	FSN5	Use ratio notation including reduction to its simplest form.
		Understand and use ratio and proportion, including dividing a quantity in a given ratio.
Use of calculators	FIN9	Solve problems using the four operations on integer and decimal numbers using a calculator (up to three decimal places).
	FSN6	Use a calculator effectively and efficiently, entering a range of measures including 'time', interpreting the display and rounding off a final answer to a reasonable degree of accuracy. (This includes using the memory and bracket keys, and function keys for squares and powers where appropriate).

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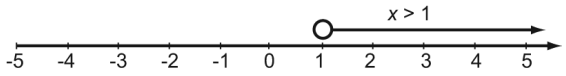
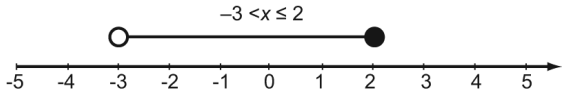
Algebra Topic	Ref	Subject content - Candidates should be able to...
Use of symbols	FBA3	Manipulate algebraic expressions by collecting like terms.
	FSA3	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.
Inequalities	FGA2	Solve simple linear inequalities in one variable and represent the solution set on a number line, using the convention for distinguishing ≤ and ≥ from < and >. For example, for these solution sets:  
Linear equations	FIA3	Use simple function machines to deal with inputs and outputs, recognising basic inverse functions. Solve simple equations involving one operation.
	FBA4	Solve simple equations involving two steps.
	FSA2	Set-up and solve linear equations with integer coefficients. This will include equations in which the unknown appears on both sides of the equation, or with brackets.
Formulae and expressions	FIA2	Use formulae expressed in words or symbols, substituting positive numbers into the formula to find the value of the subject (usually in context).
	FBA2	Substitute positive numbers into simple algebraic formulae. Derive a simple formula (e.g. find a formula for the perimeter, P, of a regular hexagon of side a).
	FSA1	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression (e.g. (1) $4x - 2$; (2) $3x^2 + 4$; (3) $V = 2a^3$).
	FGA3	Change the subject of a formula in cases where the subject only appears once.

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Algebra Topic	Ref	Subject content - Candidates should be able to...
Numerical methods	FSA5	Use trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them. (e.g. (1) $x^3 - 2x = 2$; (2) The positive solution of $x^2 - 4 = \frac{1}{x}$; (3) I think of two numbers. They add together to equal 6. They multiply together to equal 8·64. Find the two numbers).
Direct and inverse proportion		**Not included in the foundation tier**
Simultaneous linear equations		**Not included in the foundation tier**
Quadratic equations		**Not included in the foundation tier**
Simultaneous linear and quadratic equations		**Not included in the foundation tier**
Sequences	FIA1	Continue simple sequences. Explain how to find the next number in a simple pattern. Recognise and describe patterns in number (e.g. 1, 4, 7, 10... or 1, 2, 4, 8 ...; or continue the pattern $11 \times 11 = 121$, $111 \times 111 = 12321$ etc).
	FBA1	Continue and explain patterns in number and spatial arrangements. Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence.
	FGA1	Generate integer sequences using a rule for the *n*th term. Use linear expressions to describe the *n*th term of an arithmetic sequence.

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Algebra Topic	Ref	Subject content - Candidates should be able to...
Graphs of linear functions	FIA4	Use axes and coordinates in four quadrants, including using points identified by geometrical information.
	FSA4	Use tables to plot graphs of linear functions given explicitly.
	FGA4	Plot graphs of linear functions in which y is given explicitly or implicitly in terms of x.
		Find the gradient of linear graphs.
Interpreting graphical information	FIA5	Construct and interpret simple graphs, including conversion graphs.
	FBA5	Interpret information presented in a range of linear and non-linear graphs, including travel (distance/time) graphs.
	FGA5	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.
Quadratic functions	FGA6	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations. (Simple quadratic functions such as $y = 3x^2$, $y = x^2 + 5x$. Simple equations such as solving (1) $x^2 - 3 = 0$ having drawn the graph of $y = x^2 - 3$; (2) $x^2 + 5x = 2$, having drawn the graph of $y = x^2 + 5x$).
Other functions		**Not included in the foundation tier**
Transformation of functions		**Not included in the foundation tier**
Graphs of loci		**Not included in the foundation tier**

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Angles	FIG3	Measure and draw angles to the nearest degree.
		Identify acute, obtuse, reflex and right angles.
		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.
	FSG1	Understand and use the angle properties of parallel and intersecting lines.
Properties of triangles and other rectilinear shapes	FIG4	Recognise regular polygons (pentagon, hexagon, octagon).
		Recognise types of triangle (isosceles, equilateral, scalene).
	FBG5	Recall the geometric properties and definitions of the special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus.
	FGG3	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.
	FGG4	Understand, recall and use Pythagoras' theorem in 2-D contexts.
	FBG1	Understand and use the angle properties of triangles, including equilateral, isosceles, right-angled and scalene triangles. (Questions may involve the exterior angle of a triangle, but knowledge of the property that the exterior angle of a triangle is equal to the sum of the two interior opposite angles is not required).
	FBG2	Understand that the sum of the interior angles of a quadrilateral is 360° and how this result is obtained. Use this angle property of a quadrilateral.
Properties of circles	FIG4	Recognise the terms circle, centre, radius, diameter and circumference.
	FSG3	Recall the meaning of chord, tangent, arc, sector and segment.
		Recall and use the formulae for the circumference and the area of a circle (candidates may be required to give answers in terms of π).
Properties of 3-D shapes	FIG4	Recognise simple solids (cube, cuboid, sphere, cylinder, cone).
	FBG3	Use isometric drawings and nets of 3-D shapes.
	FSG5	Use 2-D representations of 3-D shapes, including plans and elevations.

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Mensuration	FIG5	Find the perimeter of straight-sided shapes.
		Find areas of irregular shapes and volumes of simple solids.
		Find the area of a rectangle.
	FSG4	Recall and use the formula for the area of a parallelogram and a triangle.
		Use the formula for the area of a trapezium (the formula for the area of a trapezium is given on the formulae sheet).
		Calculate perimeters and areas of shapes made from triangles and rectangles.
		Find the surface area of simple solid shapes using the area formulae for triangles and rectangles.
	FBG4	Find the volumes of cubes and cuboids, recalling the formula.
		Calculate volumes of shapes made from cubes and cuboids.
	FGG5	Calculate the surface area and volume of right prisms, including cylinders. (The generic formula for the volume of a prism is given on the formulae sheet).
		Convert between measures for area or for volume/capacity, for example between mm^2 and cm^2 or between cm^3 and litres.
Maps, scales and bearings	FIG6	Use and interpret street plans and simple maps, including: simple grid references (of the form A6, J3 etc), left and right, clockwise and anticlockwise and compass directions. (The compass directions N, E, S, W, NE, SE, NW and SW are included).
	FBG6	Construct and interpret maps and scale drawings, including estimating distances and areas.
		Understand and use bearings to specify direction.
Vectors	–	*See FSG6 (in Symmetry, transformations and their properties) for vector content on foundation tier.*

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Measures	FIG1	Use: kilometres, metres, centimetres and millimetres; kilograms and grams; litres and millilitres.
		Convert measurements from one metric unit to another.
		Interpret scales on a range of measuring instruments.
	FIG2	Make sensible estimates of a range of measures in everyday settings (e.g. (1) The height of a car given a diagram with a person standing next to the car, whose height is given. (2) The length of a bench seating three people; (3) How much a loaf of bread weighs, choosing from 80 g, 800 g, 8 kg, 80 kg).
	FGG1	Recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half of a unit in either direction.
	FGG2	Understand and use rates and compound measures, for example speed, density, rate of flow.
Constructions and loci	FSG2	Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles.
		Use a straight edge and a pair of compasses to do constructions.
		Construct inscribed regular polygons.
		Construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.
	FGG6	Construct loci to show paths and shapes.
		Use straight edge and a pair of compasses to produce standard constructions, including the midpoint and perpendicular bisector of a line segment and the bisector of an angle.

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Symmetry, transformations and their properties	FIG7	Recognise and complete reflection symmetry of 2-D shapes. (With or without a grid, as appropriate).
	FIG8	Understand that reflections are specified by a mirror line.
		Transform triangles and other 2-D shapes by reflection, using a given line.
	FBG7	Recognise and visualise the rotation symmetry of 2-D shapes.
		Identify the order of rotation symmetry.
		Complete shapes and patterns to give a specified order of rotation symmetry.
		(A 2-D shape has rotation symmetry of order *n* when *n* is the largest positive integer for which a rotation of 360° ÷ *n* produces an identical looking shape in the same position. Hence the order of rotation symmetry is the number of ways the shape will map on to itself in a rotation of 360°. Shapes with rotation symmetry order 1 are said to have no rotation symmetry).
	FBG8	Understand positive integer scale factors. Use such scale factors to produce scaled-up images on a grid without a specified centre.
		Understand that an enlarged shape is mathematically similar to the original shape.
		Understand and recognise the congruence of simple shapes.
	FSG6	Transform triangles and other 2-D shapes by rotation, reflection, or translation using column vectors.
		Recognise and visualise rotations, reflections and translations.
		Understand the properties preserved by these transformations; understand the congruence of these transformations.
	FGG7	Recognise, visualise and construct enlargements of objects using positive integer scale factors and a centre of enlargement.
		Identify the centre and the scale factor of an enlargement.
		Understand the implications of enlargement for perimeter/length.
	FGG8	Transform 2-D shapes by simple combinations of transformations.
Coordinates	–	*See FIA4 (in Graphs of linear functions, in Algebra) for coordinates content on foundation tier.*

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Statistics Topic	Ref	Subject content - Candidates should be able to...
Probability	FIS1	Understand and use the vocabulary of probability, including terms such as 'fair', 'evens', 'certain', 'likely', 'unlikely' and 'impossible'.
		Understand and use the probability scale.
	FIS2	Find all possible ways of listing up to four objects.
	FBS1	Understand and use measures of probability from equally likely outcomes.
		List all outcomes for two successive events in a systematic way and derive related probabilities.
	FSS1	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.
	FGS1	Understand and use estimates of probability from theoretical models or relative frequency.
		Compare experimental data and theoretical probabilities.
		Understand that if an experiment is repeated, the outcomes may - and usually will - be different, and that increasing the sample size generally leads to better estimates of probability and population characteristics.
Collecting data	FSS5	Design and criticise questions for use in a survey, taking possible bias into account.
Statistical calculations	FIS3	Calculate the mean, median, mode and range of discrete data.
	FBS2	Use and interpret the statistical measures: mode, median, mean and range for discrete and continuous data, including comparing distributions.
	FSS2	Identify the modal class of grouped data.
		Calculate the mean of grouped discrete data.
	FSS4	Design and use two-way tables for discrete and grouped data.
	FGS2	Calculate the mean from grouped continuous data.

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Statistics Topic	Ref	Subject content - Candidates should be able to...
Representing data	FIS4	Draw and interpret simple frequency tables, charts, pictograms and bar charts for discrete data (e.g. use a tally chart to draw a bar chart).
	FIS5	Extract and use information from common two-way tables including timetables.
	FBS3	Construct and interpret pie charts.
	FBS4	Interpret graphs representing real data, including recognising misleading diagrams.
	FSS3	Draw and interpret a wide range of graphs and diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams. Compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
	FGS3	Draw and interpret scatter graphs for discrete and continuous variables, including using and understanding lines of best fit.
		Understand the vocabulary of correlation, including: positive, negative and zero correlation; weak, strong and moderate correlation.
		Look at data to find patterns and exceptions.

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A.3 J567/03 and J567/04: *Mathematics Paper 3 (Higher)* and *Mathematics Paper 4 (Higher)*

Number Topic	Ref	Subject content - Candidates should be able to...
Number operations	HBN5	Check solutions to calculations using various methods including approximating, using inverse operations and operations recognising the effect of multiplying and dividing by numbers less than one and greater than one.
		Estimate answers using appropriate techniques.
	HSN4	**Check the order of magnitude of compound calculations using estimation methods, without the use of a calculator. (Methods to include rounding numbers of any size to one significant figure and simplifying calculations using standard index form).**
	HBN6	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number.
		Find the prime factor decomposition of positive integers.
	HGN4	**Use a calculator to find the upper and lower bounds of calculations, particularly in the context of measurement.**
Powers and roots	HBN1	Use the index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.
		Use the terms cube root and negative square root.
	HSN3	**Use standard index form expressed in conventional notation and on a calculator display.**
		Convert between ordinary and standard index form representations.
		Calculate with standard index form.
	HGN1	**Use the index laws with fractional, negative and zero powers in simplifying numerical and algebraic expressions.**
	HGN2	**Use surds in exact calculations, without a calculator.**
		Simplify expressions involving surds including rationalising a denominator.
Fractions	HIN1	Multiply and divide simple fractions (not mixed numbers).
		Add and subtract mixed numbers.
	HIN2	Express one quantity as a fraction of another.
	HBN2	Use the four operations on fractions, including mixed numbers.

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Number Topic	Ref	Subject content - Candidates should be able to...
Decimals	HIN4	Use the four operations on decimals without the use of a calculator.
	HBN3	Convert a simple fraction to a decimal using division.
		Use and understand terminating and recurring decimals including exact fraction equivalents.
	HGN3	**Convert a recurring decimal to a fraction and vice versa.**
Percentages	HIN2	Express one quantity as a percentage of another.
	HIN3	Increase and decrease quantities by a percentage.
	HBN4	Use percentages to compare proportion.
		Use and find percentage change.
	HSN1	**Use a multiplier to solve percentage increase and decrease problems (e.g. compound interest, population change, depreciation, etc).**
		Calculate the original amount when given the transformed amount after a percentage change.
Ratio and proportion	HIN5	Use ratio notation including reduction to its simplest form.
		Understand and use ratio and proportion, including dividing a quantity in a given ratio.
	HSN2	**Use repeated proportional or percentage changes.**
		Represent repeated proportional change using a multiplier raised to a power.
Use of calculators	HIN6	Use a calculator effectively and efficiently, entering a range of measures including 'time', interpreting the display and rounding off a final answer to a reasonable degree of accuracy. (This includes using the memory and bracket keys, and function keys for squares and powers where appropriate).
	HGN5	**Use calculators to explore exponential growth and decay.**

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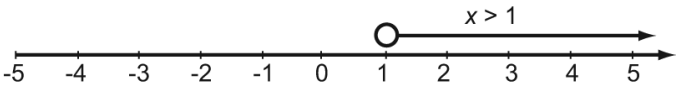
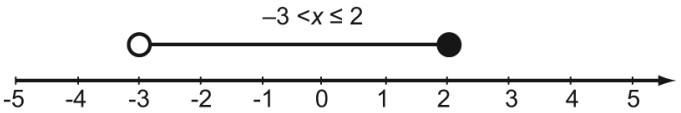
Algebra Topic	Ref	Subject content - Candidates should be able to...
Use of symbols	HIA3	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.
	HSA2	**Manipulate algebraic expressions by expanding the product of two linear expressions, simplifying the result.**
		Factorise quadratic expressions, including the difference of two squares (includes both the cases where $a = 1$ and where $a \neq 1$).
		Simplify algebraic expressions by taking out common factors. Simplify rational expressions.
	HGA4	**Manipulate algebraic expressions including fractions and solve the related equations.** *(Also listed in Linear equations).*
		Understand the difference between an equation and an identity.
Inequalities	HBA2	Solve simple linear inequalities in one variable and represent the solution set on a number line, using the convention for distinguishing ≤ and ≥ from < and >. For example, for these solution sets:  
	HSA6	**Solve several linear inequalities in two variables and find the solution set, representing this on a suitable diagram. Shade such regions on a graph, using the convention for distinguishing ≤ and ≥ from < and > (where a line is included in the region, it will be solid; where it is not included, it will be dashed).**
Linear equations	HIA2	Set-up and solve linear equations with integer coefficients. This will include equations in which the unknown appears on both sides of the equation, or with brackets.
	HSA1	**Solve harder linear equations including those with fractional coefficients.**
	HGA4	**Manipulate algebraic expressions including fractions and solve the related equations.** *(Also listed in Use of symbols).*

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Algebra Topic	Ref	Subject content - Candidates should be able to...
Formulae and expressions	HIA1	Use and generate formulae.
		Substitute positive and negative numbers into a formula or an expression (e.g. (1) $4x - 2$; (2) $3x^2 + 4$; (3) $V = 2a^3$).
	HBA3	Change the subject of a formula in cases where the subject only appears once.
	HSA3	**Rearrange formulae, including cases where the subject appears twice, or where a power of the subject appears.**
Numerical methods	HIA5	Use trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them (e.g. (1) $x^3 - 2x = 2$; (2) The positive solution of $x^2 - 4 = \frac{1}{x}$; (3) I think of two numbers. They add together to equal 6. They multiply together to equal 8·64. Find the two numbers).
Direct and inverse proportion	HGA1	**Form and use equations involving direct or inverse proportion (for $y \propto x$, $y \propto x^2$, $y \propto \frac{1}{x}$, $y \propto \frac{1}{x^2}$).**
Simultaneous linear equations	HSA4	**Set up two linear simultaneous equations.**
		Find the exact solution of two linear simultaneous equations in two unknowns by eliminating a variable; interpret the equations as lines and their common solution as the point of intersection. (Graphical solution of simultaneous equations is also included).
Quadratic equations	HSA2	**Solve quadratic equations of the form $ax^2 + bx + c = 0$ by factorisation (includes both the cases where $a = 1$ and where $a \neq 1$).**
	HGA2	**Solve quadratic equations by completing the square and using the quadratic equation formula (the quadratic equation formula is given on the formulae sheet). The technique of completing the square may also be used to write quadratic expressions in the form $(x + a)^2 + b$ and hence to find the minimum value of the expression and the value of x at which this occurs.**
Simultaneous linear and quadratic equations	HGA3	**Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns, one of which is linear, the other equation quadratic in one unknown.**
		Find the points of intersection of straight lines with quadratic curves, knowing that these are the approximate solutions of the corresponding simultaneous equations.

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Algebra Topic	Ref	Subject content - Candidates should be able to...
Sequences	HBA1	Generate integer sequences using a rule for the *n*th term. Use linear expressions to describe the *n*th term of an arithmetic sequence.
Graphs of linear functions	HIA4	Use tables to plot graphs of linear functions given explicitly.
	HBA4	Plot graphs of linear functions in which y is given explicitly or implicitly in terms of x. Find the gradient of linear graphs.
	HSA7	**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.** **Write the equation of a straight line in the form $y = mx + c$.** **Understand the gradients of parallel lines.**
Interpreting graphical information	HBA5	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.
Quadratic functions	HBA6	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations. (Simple quadratic functions such as $y = 3x^2$, $y = x^2 + 5x$. Simple equations such as solving (1) $x^2 - 3 = 0$ having drawn the graph of $y = x^2 - 3$; (2) $x^2 + 5x = 2$, having drawn the graph of $y = x^2 + 5x$).
Other functions	HSA5	**Plot, sketch and recognise graphs of quadratics, simple cubic functions, and reciprocal functions $y = \frac{k}{x}$ with $x \neq 0$, including graphs arising from real situations and their interpretation (e.g. (1) $y = 2x^2 - 6x + 3$; (2) $y = x^3 - 2x$).**
	HGA5	**Draw, sketch and recognise the function $y = k^x$ for integer values of x and simple positive values of k, the trigonometric functions $y = \sin x$ and $y = \cos x$ for any angle. (Trigonometric graphs may be used to find solutions of simple equations such as $\sin x = 0{\cdot}4$, within a given interval).**
Transformation of functions	HGA6	**Apply to the graph of $y = f(x)$, for linear and quadratic $f(x)$, the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$ (notation such as $y = f(x)$, $y = f(x - 2)$, $y = f(x) + 3$ may be used in questions).**
Graphs of loci	HSA6	**Construct the graphs of simple loci.**

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Angles	HIG1	Understand and use the angle properties of parallel and intersecting lines.
Properties of triangles and other rectilinear shapes	HBG3	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.
	HSG5	**Understand similarity of triangles and other plane figures and use this to make geometrical inferences.**
	HGG1	**Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles.**
	HBG4	Understand, recall and use Pythagoras' theorem in 2-D contexts.
	HSG3	**Use Pythagoras' theorem to find the length of a line segment AB given the points A and B in 2-D.**
	HSG4	**Understand, recall and use trigonometrical ratios in right-angled triangles in 2-D (questions in context may include the use of bearings).**
	HGG2	**Use Pythagoras' theorem and trigonometrical relationships in 3-D contexts, including using 3-D coordinates and finding the angles between a line and a plane.**
	HGG3	**Calculate the area of a triangle using ½ *ab* sin C (given on the formulae sheet).**
		Use the sine and cosine rules in 2-D and 3-D contexts (given on the formulae sheet).
Properties of circles	HIG3	Recall the meaning of chord, tangent, arc, sector and segment. Recall and use the formulae for the circumference and the area of a circle (candidates may be required to give answers in terms of π).
	HSG1	**Understand and construct geometrical proofs using circle theorems: Understand that the tangent at any point on a circle is perpendicular to the radius at that point; understand that tangents from an external point are equal in length; understand that the angle subtended by an arc at the centre of the circle is twice the angle subtended at any point on the circumference; understand that the angle subtended at the circumference by a semicircle is a right angle; understand that angles in the same segment in a circle are equal; understand that opposite angles in a cyclic quadrilateral sum to 180°; understand the alternate segment theorem.**
Properties of 3-D shapes	HIG5	Use 2-D representations of 3-D shapes, including plans and elevations.

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Mensuration	HIG4	Recall and use the formula for the area of a parallelogram and a triangle.
		Use the formula for the area of a trapezium (the formula for the area of a trapezium is given on the formulae sheet).
		Calculate perimeters and areas of shapes made from triangles and rectangles.
		Find the surface area of simple solid shapes using the area formulae for triangles and rectangles.
	HBG5	Calculate the surface area and volume of right prisms, including cylinders (the generic formula for the volume of a prism is given on the formulae sheet).
	HGG4	**Find the lengths of arcs, areas of sectors and segments of circles, and the surface areas and volumes of pyramids, cones and spheres; use pi in exact calculations. Solve mensuration problems involving more complex shapes and solids. (The formulae sheet includes: volume of a sphere and a cone, and the surface area of a cone. Examples of mensuration problems include: (1) Finding the area of an arched window; (2) Finding the volume of a frustum).**
	HBG5	Convert between measures for area or for volume/capacity, for example between mm^2 and cm^2 or between cm^3 and litres.
Maps, scales and bearings		*No additional content at Higher tier, but bearings may be used as a context for trigonometry.*
Vectors	HGG5	**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.
		Use vector methods in 2-D.
Measures	HBG1	Recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half of a unit in either direction.
	HBG2	Understand and use rates and compound measures, for example speed, density, rate of flow.

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Geometry and Measures Topic	Ref	Subject content - Candidates should be able to...
Constructions and loci	HIG2	Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles.
		Use a straight edge and a pair of compasses to do constructions.
		Construct inscribed regular polygons.
		Construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.
	HBG6	Construct loci to show paths and shapes.
		Use straight edge and a pair of compasses to produce standard constructions, including the midpoint and perpendicular bisector of a line segment and the bisector of an angle.
Symmetry, transformations and their properties	HIG6	Transform triangles and other 2-D shapes by rotation, reflection, or translation using column vectors.
		Recognise and visualise rotations, reflections and translations.
		Understand the properties preserved by these transformations; understand the congruence of these transformations.
	HBG7	Recognise, visualise and construct enlargements of objects using positive integer scale factors and a centre of enlargement.
		Identify the centre and the scale factor of an enlargement.
		Understand the implications of enlargement for perimeter/length.
	HBG8	Transform 2-D shapes by simple combinations of transformations.
	HSG6	**Construct enlargements using any scale factor, including positive fractional and negative scale factors; identify scale factors.**
	HSG7	**Understand and use the effect of enlargement on the area and volume of shapes and solids.**
	HSG8	**Fully describe combinations of transformations (rotation, reflection, translation, enlargement) using a single transformation.**
Coordinates	HSG2	**Understand and use 3-D coordinates.**
	HSG3	**Find the coordinates of the midpoint of a line segment AB given points A and B in 2-D.**

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Statistics Topic	Ref	Subject content - Candidates should be able to...
Probability	HIS1	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.
	HBS1	Understand and use estimates of probability from theoretical models or relative frequency.
		Compare experimental data and theoretical probabilities.
		Understand that if an experiment is repeated, the outcomes may - and usually will - be different, and that increasing the sample size generally leads to better estimates of probability and population characteristics.
	HSS1	**Use tree diagrams to represent outcomes of combined events, recognising when events are independent.**
		Find probabilities using tree diagrams.
	HGS1	**Know when to add or multiply probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is P(A) + P(B). If A and B are independent events, the probability of A and B occurring is P(A) × P(B). (Harder questions may include the use of conditional probabilities and/or more than two successive events).**
Collecting data	HIS5	Design and criticise questions for use in a survey, taking possible bias into account.
	HGS4	**Select a representative sample from a population using random and stratified sampling.**
		Criticise sampling methods.
Statistical calculations	HIS2	Identify the modal class of grouped data.
		Calculate the mean of grouped discrete data.
	HIS4	Design and use two-way tables for discrete and grouped data.
	HBS2	Calculate the mean from grouped continuous data.
	HSS4	**Calculate an appropriate moving average.**

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Statistics Topic	Ref	Subject content - Candidates should be able to...
Representing data	HIS3	Draw and interpret a wide range of graphs and diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams. Compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
	HBS3	Draw and interpret scatter graphs for discrete and continuous variables, including using and understanding lines of best fit.
		Understand the vocabulary of correlation, including: positive, negative and zero correlation; weak, strong and moderate correlation.
		Look at data to find patterns and exceptions.
	HSS2	**Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data.**
		Find the median, quartiles and interquartile range.
	HSS3	**Compare distributions and make inferences, using the shapes of the distributions and measures of average and spread, including median and quartiles.**
	HSS4	**Identify seasonality and trends in time series, from tables or diagrams.**
	HGS2	**Draw and interpret histograms for grouped data. Understand frequency density.**
	HGS3	**Interpret and compare a wide range of data sets (including grouped discrete and continuous data) and draw conclusions.**

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