

# Content mapping: GCSE Mathematics B (J567) to legacy GCSE Mathematics C (J517) Modules

## **GCSE Mathematics B**

OCR GCSE in Mathematics: J567

This mapping document is designed to accompany the OCR GCSE Mathematics B specification J567 (for teaching from September 2010), for teachers currently using GCSE Mathematics C (J517) – Graduated Assessment.

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# Introduction

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This document is to assist teachers using the Mathematics C (Graduated Assessment) J517 specification in starting to teach the new Mathematics B J567 specification, for first teaching from September 2010. It will help you see how the content of the Stages in the new specification relates to the legacy Module Tests.

Content for the Stages is listed as it appears in the Mathematics B specification but with the notes and examples column removed. “Best-fit” statements from the legacy Module Tests appear in the right-hand column.

- In some cases the statements have a one-to-one mapping with the Mathematics C Module Tests’ statements.
- In other cases, statements have been brought together where appropriate: this is because there were ten Module Tests in the legacy Mathematics C specification, but six different Stages in the new Mathematics B specification (note that Foundation Silver is the same as Higher Initial, and Foundation Gold is the same as Higher Bronze).

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

### Foundation Initial Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>FIN1</b>	Round numbers to a given power of 10.	<b>N1.1</b> Write and order whole numbers up to 10 000; round numbers to the nearest 10 or 100.
<b>FIN2</b>	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.	<b>N1.3</b> Add and subtract <b>two</b> -digit numbers; multiply and divide using multiplication facts to $10 \times 10$ , without the use of a calculator. <b>N2.2</b> Solve addition and subtraction problems using numbers with up to <b>two</b> decimal places in the context of measurement or money, without the use of a calculator.
<b>FIN3</b>	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.	<b>N3.2</b> Multiply and divide numbers with no more than <b>one</b> decimal digit by an integer between 1 and 10 without the use of a calculator. <b>N3.3</b> Multiply and divide any number (with up to <b>two</b> decimal places) by powers of <b>ten</b> without the use of a calculator.
<b>FIN4</b>	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.	<b>N4.3</b> Use written methods to multiply and divide a <b>three</b> -digit number by a <b>two</b> -digit number; add, subtract and multiply numbers with up to <b>two</b> decimal places.
<b>FIN5</b>	Calculate a fraction of a given quantity. Identify fractions of a shape.	<b>N2.6</b> Identify fractions; recall the fraction to decimal conversions of familiar simple fractions. <b>N3.4</b> Construct and interpret scale drawings using simple scale factors.
<b>FIN6</b>	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.	<b>N2.6</b> Identify fractions; recall the fraction to decimal conversions of familiar simple fractions. <b>N4.2</b> Use decimal notation and recognise that each terminating decimal is a fraction; order decimals; convert simple fractions of a whole to percentages of the whole and vice versa.
<b>FIN7</b>	Calculate simple percentages of quantities, without the use of a calculator.	<b>N2.5</b> Convert $\frac{1}{2}$ and $\frac{1}{4}$ to and from percentage form and calculate 25%, 50% of simple quantities, including money; read and estimate percentages from percentage scales and scaled pie charts. <b>N3.5</b> Calculate simple percentages (10%, 20%, 30%, 5%, 15%) of quantities without the use of a calculator.
<b>FIN8</b>	Order decimals (ordering up to five decimals and knowing that, eg, 5.07 is smaller than 5.3).	<b>N4.2</b> Use decimal notation and recognise that each terminating decimal is a fraction; order decimals; convert simple fractions of a whole to percentages of the whole and vice versa.

<b>FIN9</b>	Solve problems using the four operations on integer and decimal numbers using a calculator.	<b>N4.5</b> Solve simple ratio and proportion problems particularly in the context of recipes
<b>FIN10</b>	Work out starting times, finishing times and intervals.	<b>N3.6</b> Work out starting times, finishing times and intervals without the use of a calculator.
<b>FIN11</b>	Perform calculations involving the use of brackets and the order of operations.	<b>N3.7</b> Perform calculations involving the use of brackets and the hierarchy of operations.
<b>FIN12</b>	Order positive and negative temperatures. Solve problems involving temperature changes.	<b>N2.1</b> Order positive and negative temperatures; solve problems involving temperature changes.
	<b>Algebra</b>	
<b>FIA1</b>	Continue simple sequences. Explain how to find the next number in a simple pattern. Recognise and describe patterns in number.	<b>A1.1</b> Continue simple sequences; explain how to find the next number in a simple pattern. <b>A2.1</b> Recognise and describe patterns in number.
<b>FIA2</b>	Use formulae expressed in words or symbols, substituting positive numbers into the formula to find the value of the subject (usually in context).	<b>A2.2</b> Use word formulae in context; substitute positive integers into the formula to find the value of the subject. <b>A3.2</b> In context, use formulae expressed in words or symbols; substitute positive numbers into the formula to find the value of the subject.
<b>FIA3</b>	Use simple function machines to deal with inputs and outputs, recognising basic inverse functions. Solve simple equations involving one operation.	<b>A1.2</b> Understand the use of symbols to represent unknowns; use simple function machines to deal with inputs and outputs, recognising basic inverse functions. <b>A3.1</b> Solve simple equations involving <b>one</b> operation.
<b>FIA4</b>	Use axes and coordinates in four quadrants, including using points identified by geometrical information.	<b>S4.4</b> Use axes and coordinates to specify or locate points in all <b>four</b> quadrants; find the coordinates of points identified by geometrical information.
<b>FIA5</b>	Construct and interpret simple graphs, including conversion graphs.	<b>A3.3</b> Construct and interpret simple graphs, including conversion graphs.
	<b>Geometry and measures</b>	
<b>FIG1</b>	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.	<b>S1.1</b> Use metres, centimetres and millimetres and convert measurements from one to another. <b>S2.2</b> Use kilograms and grams and convert measurements from one unit to another. <b>S3.2</b> Use litres and millilitres and convert measurements from one unit to another; interpret scales on a range of measuring instruments.
<b>FIG2</b>	Make sensible estimates of a range of measures in everyday settings.	<b>S3.1</b> Make sensible estimates of a range of measures in everyday settings.

<b>FIG3</b>	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.	<b>S2.3</b> Measure and draw angles to the nearest degree; distinguish between acute, obtuse, reflex and right angles. <b>S4.2</b> Use decimal notation and recognise that each terminating decimal is a fraction; order decimals; convert simple fractions of a whole to percentages of the whole and vice versa.
<b>FIG4</b>	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).	<b>S1.5</b> Recognise regular polygons (pentagon, hexagon, octagon); recognise the terms circle, centre, radius, diameter and circumference and follow instructions to construct inscribed regular polygons. <b>S2.4</b> Recognise simple solids and their nets.
<b>FIG5</b>	Find the perimeter of straight-sided shapes. Find areas of irregular shapes and volumes of simple solids. Find the area of a rectangle.	<b>S1.3</b> Measure and draw lines to the nearest millimetre; find the perimeter of simple straight-sided shapes. <b>S1.4</b> Find areas of simple shapes (including irregular shapes) by counting squares, and volumes of simple shapes by counting cubes. <b>S4.3</b> Find the area of a rectangle.
<b>FIG6</b>	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.	<b>S2.6</b> Use and interpret street plans (including simple grid references, left and right, clockwise and anticlockwise, and compass directions). <b>S1.7</b> Understand and use the compass directions N, S, E, W, NE, NW, SE, SW.
<b>FIG7</b>	Recognise and complete reflection symmetry of 2-D shapes.	<b>S2.5</b> Recognise and complete reflection symmetry of 2-D shapes.
<b>FIG8</b>	Understand that reflections are specified by a mirror line. Transform triangles and other 2-D shapes by reflection, using a given line.	<b>S4.5</b> Understand that reflections are specified by a mirror line; transform triangles and other 2-D shapes by reflection, using a line parallel to an axis.
	<b>Statistics</b>	
<b>FIS1</b>	Understand and use the vocabulary of probability, including terms such as 'fair', 'evens', 'certain', 'likely', 'unlikely' and 'impossible'. Understand and use the probability scale.	<b>D1.1</b> Understand and use the vocabulary of probability, including terms such as 'fair', 'evens', 'certain', 'likely', 'unlikely' and 'impossible'. <b>D2.1</b> Understand and use the probability scale.
<b>FIS2</b>	Find all possible ways of listing up to four objects.	<b>D1.2</b> Find all possible ways of listing up to <b>four</b> objects.
<b>FIS3</b>	Calculate the mean, median, mode and range of discrete data.	<b>D2.2</b> Find the mode and median value of a small set of discrete data. <b>D3.2</b> Calculate the mean and the range of discrete data.
<b>FIS4</b>	Draw and interpret simple frequency tables, charts, pictograms and bar charts for discrete data.	<b>D1.3</b> Draw and interpret simple graphs and pictograms. <b>D3.3</b> Draw and interpret simple frequency tables, charts and bar charts for discrete data.
<b>FIS5</b>	Extract and use information from common two-way tables including timetables.	<b>D2.3</b> Extract and use information from common <b>two</b> -way tables including timetables.

## Foundation Bronze Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>FBN1</b>	Understand the concepts and vocabulary of factor, multiple and common factor and prime number.	<b>N4.4</b> Understand the concepts and vocabulary of factor (divisor), multiple and common factor and prime number.
<b>FBN2</b>	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.	<b>N5.1</b> Round numbers to the nearest integer, to a given power of ten, to <b>one</b> significant figure and to <b>one</b> or <b>two</b> decimal places; estimate answers to <b>one</b> - stage calculations including problems involving money and measurement.
<b>FBN3</b>	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.	<b>N3.1</b> Use the terms square, positive square root; recall the squares of 2 to 12; use index notation for squares; use a calculator to find squares and square roots. <b>N5.2</b> Use the term cube; recall the cubes of 2, 3, 4, 5, and 10; use index notation for simple integer powers.
<b>FBN4</b>	Understand equivalent fractions, simplifying a fraction by cancelling all common factors. Write improper fractions as mixed numbers and vice versa.	<b>N5.3</b> Understand equivalent fractions, simplifying a fraction (including mixed numbers) by cancelling all common factors; multiply a fraction by an integer or a unit fraction.  NEW
<b>FBN5</b>	Order fractions using a common denominator. Add and subtract simple fractions (using a common denominator).	<b>N6.4</b> Use the [four operations] with fractions; order fractions using a common denominator.
<b>FBN6</b>	Use the equivalence between fractions, decimals and percentages.	<b>N5.4</b> Use the equivalence between fractions, decimals and percentages in context; solve simple percentage problems including increase and decrease.
<b>FBN7</b>	Find a percentage of a quantity, interpreting percentage as an operator.	NEW
<b>FBN8</b>	Use the four operations with positive and negative integers.	<b>N5.6</b> Use the <b>four</b> operations with positive and negative integers.
<b>FBN9</b>	Use simple proportion, particularly in the context of recipes.	<b>N4.5</b> Solve simple ratio and proportion problems particularly in the context of recipes.
	<b>Algebra</b>	
<b>FBA1</b>	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.	<b>A4.2</b> 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.
<b>FBA2</b>	Substitute positive numbers into simple algebraic formulae. Derive a simple formula.	<b>A5.1</b> Solve problems involving substitution of positive numbers into simple algebraic formulas. <b>A4.1</b> Derive a simple formula.
<b>FBA3</b>	Manipulate algebraic expressions by collecting like terms.	<b>A5.3</b> Manipulate algebraic expressions by collecting like terms.
<b>FBA4</b>	Solve simple equations involving two steps.	NEW

<b>FBA5</b>	Interpret information presented in a range of linear and non-linear graphs, including travel (distance/time) graphs.	<b>A4.3</b> Interpret information presented in a range of linear and non-linear graphs, including travel (distance/time) graphs; calculate speed in simple cases.
	<b>Geometry and measures</b>	
<b>FBG1</b>	Understand and use the angle properties of triangles, including equilateral, isosceles, right-angled and scalene triangles.	<b>S4.2</b> Recall and use properties of angles at a point, angles on a straight line, perpendicular lines and opposite angles at a vertex; use angle properties of equilateral, isosceles and right-angled triangles.
<b>FBG2</b>	Understand that the sum of the interior angles of a quadrilateral is $360^\circ$ and how this result is obtained. Use this angle property of a quadrilateral.	NEW
<b>FBG3</b>	Use isometric drawings and nets of 3-D shapes.	<b>S3.3</b> Use 2-D representations of 3-D shapes including views and isometric drawings.
<b>FBG4</b>	Find the volumes of cubes and cuboids, recalling the formula. Calculate volumes of shapes made from cubes and cuboids.	<b>S5.4</b> Explore the geometry of cuboids (including cubes) and shapes made from cuboids; find the volumes of cuboids, recalling the formula; draw and interpret the net of a cuboid. <b>S6.5</b> Calculate volumes of shapes made from cubes and cuboids.
<b>FBG5</b>	Recall the geometric properties and definitions of the special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus.	<b>S5.3</b> Classify quadrilaterals by their geometric properties.
<b>FBG6</b>	Construct and interpret maps and scale drawings, including estimating distances and areas. Understand and use bearings to specify direction.	<b>S5.2</b> Use and interpret maps and scale drawings, including <b>four</b> -figure grid references and estimating distances and areas; use bearings to specify direction.
<b>FBG7</b>	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.	<b>S4.6</b> Recognise and visualise rotation symmetry of 2-D shapes; identify the order of rotation symmetry. <b>S5.5</b> Understand that rotations are specified by a centre and an angle; complete the rotation symmetry of 2-D shapes; measure the angle of rotation using right angles and simple fractions of a turn.
<b>FBG8</b>	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.	<b>S3.5</b> Understand and use positive integer scale factors for enlargements on a grid. NEW
	<b>Statistics</b>	
<b>FBS1</b>	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.	<b>D3.1</b> Understand and use measures of probability from equally likely outcomes. <b>D5.1</b> List all outcomes for single events, and for two successive events, in a systematic way; find probabilities. Use the fact that the probability of not happening is $1 - \text{probability of happening}$ .
<b>FBS2</b>	Use and interpret the statistical measures: mode, median, mean and range for discrete and continuous data, including comparing distributions.	<b>D5.2</b> Use and interpret the statistical measures mode, median, mean and range for discrete and continuous data, including comparing distributions.



<b>FBS3</b>	Construct and interpret pie charts.	<b>D5.3</b> Construct and interpret pie charts.
<b>FBS4</b>	Interpret graphs representing real data, including recognising misleading diagrams.	<b>D4.3</b> Interpret graphs representing real data, including recognising misleading diagrams.

## Foundation Silver Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>FSN1</b>	Multiply and divide simple fractions. Add and subtract mixed numbers.	<b>N6.4</b> Use the <b>four</b> operations with fractions; order fractions using a common denominator.
<b>FSN2</b>	Express one quantity as a fraction or percentage of another.	<b>N5.5</b> Express one quantity as a fraction or percentage of another.
<b>FSN3</b>	Increase and decrease quantities by a percentage.	<b>N5.4</b> Use the equivalence between fractions, decimals and percentages in context; solve simple percentage problems including increase and decrease.
<b>FSN4</b>	Use the four operations on decimals without the use of a calculator.	<b>N6.3</b> Solve problems involving the <b>four</b> operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division.
<b>FSN5</b>	Use ratio notation including reduction to its simplest form. Understand and use ratio and proportion, including dividing a quantity in a given ratio.	<b>N6.2</b> Use ratio notation, including reduction to its simplest form; solve word problems involving ratio and proportion. <b>N7.4</b> Understand and use ratios in appropriate contexts including dividing a quantity in a given ratio.
<b>FSN6</b>	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.	<b>N6.1</b> Use a calculator effectively and efficiently, including using the memory and bracket keys, and function keys for reciprocals, squares and powers; enter a range of measures including 'time'; interpret the display; round off a final answer to a reasonable degree of accuracy. <b>N6.5</b> Perform calculations using the hierarchy of operations.
	<b>Algebra</b>	
<b>FSA1</b>	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression.	<b>A7.1</b> Use and generate formulae in context; substitute positive and negative numbers into a formula. <b>A6.3</b> Solve problems involving the <b>four</b> operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division.
<b>FSA2</b>	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.	<b>A6.2</b> Use ratio notation, including reduction to its simplest form; solve word problems involving ratio and proportion. <b>A7.2</b> Use the terms cube root, negative square root; recall the squares to $15^2$ and the corresponding square roots; recall the cubes of 2, 3, 4, 5, and 10; use index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.
<b>FSA3</b>	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.	<b>A6.1</b> Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out single term common factors.
<b>FSA4</b>	Use tables to plot graphs of linear functions given explicitly.	<b>A5.4</b> Use tables to plot graphs of linear functions given explicitly.

<b>FSA5</b>	Use trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them.	<b>A7.7</b> Use trial and improvement to find approximate solutions of equations.
	<b>Geometry and measures</b>	
<b>FSG1</b>	Understand and use the angle properties of parallel and intersecting lines.	<b>S6.1</b> Use parallel lines, alternate angles and corresponding angles; calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; calculate and use the angles of regular polygons; understand simple proofs involving triangles and quadrilaterals.
<b>FSG2</b>	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.	<b>S6.3</b> Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles; construct inscribed regular polygons; construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.
<b>FSG3</b>	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.	<b>S6.2</b> Recall the meaning of circle, chord, tangent, arc, sector, segment; find circumferences and areas enclosed by circles, recalling relevant formulae.
<b>FSG4</b>	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.	<b>S6.4</b> 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 shapes using the area formulae for triangles and rectangles.
<b>FSG5</b>	Use 2-D representations of 3-D shapes, including plans and elevations.	<b>S6.6</b> Analyse 3-D shapes through 2-D projections and cross-sections, including plans and elevations.
<b>FSG6</b>	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.	<b>S6.8</b> Transform triangles and other 2-D shapes by rotation or reflection or translation using vectors; recognise and visualise rotations, reflections and translations including reflection symmetry of 3-D shapes; understand the properties preserved by these transformations; understand congruence in the context of transformations.
	<b>Statistics</b>	
<b>FSS1</b>	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.	<b>D6.1</b> Identify different mutually-exclusive outcomes and know that the sum of the probabilities of all these outcomes is one.
<b>FSS2</b>	Identify the modal class of grouped data. Calculate the mean of grouped discrete data.	<b>D6.3</b> Use and interpret diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams; identify the modal class; calculate the mean of grouped discrete data compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
<b>FSS3</b>	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.	<b>D6.3</b> Use and interpret diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams; identify the modal class; calculate the mean of grouped discrete data compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
<b>FSS4</b>	Design and use two-way tables for discrete and grouped data.	NEW – was previously assessed in Terminal Papers only
<b>FSS5</b>	Design and criticise questions for use in a survey, taking possible bias into account.	NEW – was previously assessed in Terminal Papers only

## Foundation Gold Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>FGN1</b>	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.	<b>N7.2</b> Use the terms cube root, negative square root; recall the squares to $15^2$ and the corresponding square roots; recall the cubes of 2, 3, 4, 5, and 10; use index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.
<b>FGN2</b>	Use the four operations on fractions, including mixed numbers.	<b>N8.4</b> Find the exact solution of <b>two</b> simultaneous equations in <b>two</b> unknowns by eliminating a variable, and interpret the equations as lines and their common solution as the point of intersection.
<b>FGN3</b>	Convert a simple fraction to a decimal using division. Use and understand terminating and recurring decimals including exact fraction equivalents.	<b>N6.3</b> Solve problems involving the <b>four</b> operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division. <b>N7.1</b> Use and understand terminating and recurring decimals including exact fraction equivalents; solve problems involving multiplication and division by decimals with up to <b>two</b> decimal places.
<b>FGN4</b>	Use percentages to compare proportion. Use and find percentage change.	<b>N7.6</b> Use percentages to compare proportion; solve percentage problems involving increase and decrease including using a multiplier.
<b>FGN5</b>	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.	<b>N7.3</b> Check solutions to calculations using various methods including approximating, using inverse operations and recognising the effect of multiplying and dividing by numbers less than <b>one</b> and greater than <b>one</b> ; estimate answers using appropriate techniques.
<b>FGN6</b>	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number. Find the prime factor decomposition of positive integers.	<b>N7.7</b> Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number; find the prime number decomposition of positive integers.
	<b>Algebra</b>	
<b>FGA1</b>	Generate integer sequences using a rule for the $n$ th term. Use linear expressions to describe the $n$ th term of an arithmetic sequence.	<b>A7.8</b> Generate common integer sequences; use and justify linear expressions to describe the $n$ th term of an arithmetic sequence.
<b>FGA2</b>	Solve simple linear inequalities in one variable and represent the solution set on a number line, using the convention for distinguishing $\leq$ and $\geq$ from $<$ and $>$ .	<b>A7.6</b> Form and solve simple linear inequalities in <b>one</b> variable and represent the solution set on a number line.
<b>FGA3</b>	Change the subject of a formula in cases where the subject only appears once.	<b>A7.3</b> Change the subject of a formula in cases where the subject only appears once.
<b>FGA4</b>	Plot graphs of linear functions in which $y$ is given explicitly or implicitly in terms of $x$ . Find the gradient of linear graphs.	<b>A6.4</b> Plot graphs of linear functions in which $y$ is given explicitly or implicitly in terms of $x$ . NEW

<b>FGA5</b>	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.	<b>A6.5</b> Draw and interpret graphs modelling real situations.
<b>FGA6</b>	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.	<b>A7.5</b> Generate points and plot graphs of quadratic functions; find approximate solutions to a quadratic equation from the graph of the corresponding quadratic function.
	<b>Geometry and measures</b>	
<b>FGG1</b>	Recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half of a unit in either direction.	<b>S7.1</b> Know that measurements using real numbers depend on the choice of unit; recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half in either direction.
<b>FGG2</b>	Understand and use rates and compound measures, for example speed, density, rate of flow.	<b>S7.8</b> Understand and use rates and compound measures, including speed and density.
<b>FGG3</b>	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.	<b>S6.1</b> Use parallel lines, alternate angles and corresponding angles; calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; calculate and use the angles of regular polygons; understand simple proofs involving triangles and quadrilaterals.
<b>FGG4</b>	Understand, recall and use Pythagoras' theorem in 2-D contexts.	<b>S7.3</b> Understand, recall and use Pythagoras' theorem.
<b>FGG5</b>	Calculate the surface area and volume of right prisms, including cylinders. Convert between measures for area or for volume/capacity, for example between mm <sup>2</sup> and cm <sup>2</sup> or between cm <sup>3</sup> and litres.	<b>S7.5</b> Solve problems involving the surface area and volume of prisms, including cylinders; convert between area measures and volume measures.
<b>FGG6</b>	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.	<b>S7.7</b> Apply loci to spatial problems involving shapes and paths; use straight edge and compasses to produce standard constructions including the midpoint and perpendicular bisector of a line segment, the perpendicular from a point to a line, and the bisector of an angle.
<b>FGG7</b>	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.	<b>S6.7</b> Recognise, visualise and construct enlargements of objects using positive integer and fractional scale factors; identify the centre and the scale factor of enlargement; understand the implications of enlargement for perimeter.
<b>FGG8</b>	Transform 2-D shapes by simple combinations of transformations.	NEW
	<b>Statistics</b>	
<b>FGS1</b>	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.	<b>D7.1</b> Solve probability problems involving theoretical models or relative frequency. NEW
<b>FGS2</b>	Calculate the mean from grouped continuous data.	<b>D7.2</b> Calculate the mean from grouped continuous data.

<p><b>FGS3</b></p>	<p>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.</p>	<p><b>D7.3</b> Interpret scatter graphs for discrete and continuous variables, including using lines of best fit; understand the vocabulary of correlation, including positive, negative and zero correlation.</p> <p><b>D6.2</b> Draw and interpret scatter graphs including using lines of best fit; have a basic understanding of correlation, identifying 'correlation' or 'no correlation'.</p> <p>NEW</p>
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## 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.

### Higher Initial Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>HIN1</b>	Multiply and divide simple fractions. Add and subtract mixed numbers.	<b>N6.4</b> Use the <b>four</b> operations with fractions; order fractions using a common denominator.
<b>HIN2</b>	Express one quantity as a fraction or percentage of another.	<b>N5.5</b> Express one quantity as a fraction or percentage of another.
<b>HIN3</b>	Increase and decrease quantities by a percentage.	<b>N5.4</b> Use the equivalence between fractions, decimals and percentages in context; solve simple percentage problems including increase and decrease.
<b>HIN4</b>	Use the four operations on decimals without the use of a calculator.	<b>N6.3</b> Solve problems involving the <b>four</b> operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division.
<b>HIN5</b>	Use ratio notation including reduction to its simplest form. Understand and use ratio and proportion, including dividing a quantity in a given ratio.	<b>N6.2</b> Use ratio notation, including reduction to its simplest form; solve word problems involving ratio and proportion. <b>N7.4</b> Understand and use ratios in appropriate contexts including dividing a quantity in a given ratio.
<b>HIN6</b>	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.	<b>N6.1</b> Use a calculator effectively and efficiently, including using the memory and bracket keys, and function keys for reciprocals, squares and powers; enter a range of measures including 'time'; interpret the display; round off a final answer to a reasonable degree of accuracy. <b>N6.5</b> Perform calculations using the hierarchy of operations.
	<b>Algebra</b>	
<b>HIA1</b>	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression.	<b>A7.1</b> Use and generate formulae in context; substitute positive and negative numbers into a formula. <b>A6.3</b> Solve problems involving the <b>four</b> operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division.

<b>HIA2</b>	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.	<b>A6.2</b> Use ratio notation, including reduction to its simplest form; solve word problems involving ratio and proportion. <b>A7.2</b> Use the terms cube root, negative square root; recall the squares to $15^2$ and the corresponding square roots; recall the cubes of 2, 3, 4, 5, and 10; use index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.
<b>HIA3</b>	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.	<b>A6.1</b> Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out single term common factors.
<b>HIA4</b>	Use tables to plot graphs of linear functions given explicitly.	<b>A5.4</b> Use tables to plot graphs of linear functions given explicitly.
<b>HIA5</b>	Use trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them.	<b>A7.7</b> Use trial and improvement to find approximate solutions of equations.
	<b>Geometry and measures</b>	
<b>HIG1</b>	Understand and use the angle properties of parallel and intersecting lines.	<b>S6.1</b> Use parallel lines, alternate angles and corresponding angles; calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; calculate and use the angles of regular polygons; understand simple proofs involving triangles and quadrilaterals.
<b>HIG2</b>	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.	<b>S6.3</b> Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles; construct inscribed regular polygons; construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.
<b>HIG3</b>	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.	<b>S6.2</b> Recall the meaning of circle, chord, tangent, arc, sector, segment; find circumferences and areas enclosed by circles, recalling relevant formulae.
<b>HIG4</b>	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.	<b>S6.4</b> 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 shapes using the area formulae for triangles and rectangles.
<b>HIG5</b>	Use 2-D representations of 3-D shapes, including plans and elevations.	<b>S6.6</b> Analyse 3-D shapes through 2-D projections and cross-sections, including plans and elevations.
<b>HIG6</b>	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.	<b>S6.8</b> Transform triangles and other 2-D shapes by rotation or reflection or translation using vectors; recognise and visualise rotations, reflections and translations including reflection symmetry of 3-D shapes; understand the properties preserved by these transformations; understand congruence in the context of transformations.
	<b>Statistics</b>	
<b>HIS1</b>	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.	<b>D6.1</b> Identify different mutually-exclusive outcomes and know that the sum of the probabilities of all these outcomes is one.



<b>HIS2</b>	Identify the modal class of grouped data. Calculate the mean of grouped discrete data.	<b>D6.3</b> Use and interpret diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams; identify the modal class; calculate the mean of grouped discrete data compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
<b>HIS3</b>	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.	<b>D6.3</b> Use and interpret diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams; identify the modal class; calculate the mean of grouped discrete data compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
<b>HIS4</b>	Design and use two-way tables for discrete and grouped data.	NEW – was previously assessed in Terminal Papers only
<b>HIS5</b>	Design and criticise questions for use in a survey, taking possible bias into account.	NEW – was previously assessed in Terminal Papers only

## Higher Bronze Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>HBN1</b>	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.	<b>N7.2</b> Use the terms cube root, negative square root; recall the squares to $15^2$ and the corresponding square roots; recall the cubes of 2, 3, 4, 5, and 10; use index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.
<b>HBN2</b>	Use the four operations on fractions, including mixed numbers.	<b>N8.4</b> Find the exact solution of <b>two</b> simultaneous equations in <b>two</b> unknowns by eliminating a variable, and interpret the equations as lines and their common solution as the point of intersection.
<b>HBN3</b>	Convert a simple fraction to a decimal using division. Use and understand terminating and recurring decimals including exact fraction equivalents.	<b>N6.3</b> Solve problems involving the <b>four</b> operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division. <b>N7.1</b> Use and understand terminating and recurring decimals including exact fraction equivalents; solve problems involving multiplication and division by decimals with up to <b>two</b> decimal places.
<b>HBN4</b>	Use percentages to compare proportion. Use and find percentage change.	<b>N7.6</b> Use percentages to compare proportion; solve percentage problems involving increase and decrease including using a multiplier.
<b>HBN5</b>	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.	<b>N7.3</b> Check solutions to calculations using various methods including approximating, using inverse operations and recognising the effect of multiplying and dividing by numbers less than <b>one</b> and greater than <b>one</b> ; estimate answers using appropriate techniques.
<b>HBN6</b>	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number. Find the prime factor decomposition of positive integers.	<b>N7.7</b> Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number; find the prime number decomposition of positive integers.
	<b>Algebra</b>	
<b>HBA1</b>	Generate integer sequences using a rule for the $n$ th term. Use linear expressions to describe the $n$ th term of an arithmetic sequence.	<b>A7.8</b> Generate common integer sequences; use and justify linear expressions to describe the $n$ th term of an arithmetic sequence.
<b>HBA2</b>	Solve simple linear inequalities in one variable and represent the solution set on a number line, using the convention for distinguishing $\leq$ and $\geq$ from $<$ and $>$ .	<b>A7.6</b> Form and solve simple linear inequalities in <b>one</b> variable and represent the solution set on a number line.
<b>HBA3</b>	Change the subject of a formula in cases where the subject only appears once.	<b>A7.3</b> Change the subject of a formula in cases where the subject only appears once.
<b>HBA4</b>	Plot graphs of linear functions in which $y$ is given explicitly or implicitly in terms of $x$ . Find the gradient of linear graphs.	<b>A6.4</b> Plot graphs of linear functions in which $y$ is given explicitly or implicitly in terms of $x$ .  NEW

<b>HBA5</b>	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.	<b>A6.5</b> Draw and interpret graphs modelling real situations.
<b>HBA6</b>	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.	<b>A7.5</b> Generate points and plot graphs of quadratic functions; find approximate solutions to a quadratic equation from the graph of the corresponding quadratic function.
	<b>Geometry and measures</b>	
<b>HBG1</b>	Recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half of a unit in either direction.	<b>S7.1</b> Know that measurements using real numbers depend on the choice of unit; recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half in either direction.
<b>HBG2</b>	Understand and use rates and compound measures, for example speed, density, rate of flow.	<b>S7.8</b> Understand and use rates and compound measures, including speed and density.
<b>HBG3</b>	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.	<b>S6.1</b> Use parallel lines, alternate angles and corresponding angles; calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; calculate and use the angles of regular polygons; understand simple proofs involving triangles and quadrilaterals.
<b>HBG4</b>	Understand, recall and use Pythagoras' theorem in 2-D contexts.	<b>S7.3</b> Understand, recall and use Pythagoras' theorem.
<b>HBG5</b>	Calculate the surface area and volume of right prisms, including cylinders. Convert between measures for area or for volume/capacity, for example between $\text{mm}^2$ and $\text{cm}^2$ or between $\text{cm}^3$ and $\text{m}^3$ .	<b>S7.5</b> Solve problems involving the surface area and volume of prisms, including cylinders; convert between area measures and volume measures.
<b>HBG6</b>	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.	<b>S7.7</b> Apply loci to spatial problems involving shapes and paths; use straight edge and compasses to produce standard constructions including the midpoint and perpendicular bisector of a line segment, the perpendicular from a point to a line, and the bisector of an angle.
<b>HBG7</b>	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.	<b>S6.7</b> Recognise, visualise and construct enlargements of objects using positive integer and fractional scale factors; identify the centre and the scale factor of enlargement; understand the implications of enlargement for perimeter.
<b>HBG8</b>	Transform 2-D shapes by simple combinations of transformations.	NEW
	<b>Statistics</b>	
<b>HBS1</b>	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.	<b>D7.1</b> Solve probability problems involving theoretical models or relative frequency. NEW

<b>HBS2</b>	Calculate the mean from grouped continuous data.	<b>D7.2</b> Calculate the mean from grouped continuous data.
<b>HBS3</b>	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.	<p><b>D7.3</b> Interpret scatter graphs for discrete and continuous variables, including using lines of best fit; understand the vocabulary of correlation, including positive, negative and zero correlation.</p> <p><b>D6.2</b> Draw and interpret scatter graphs including using lines of best fit; have a basic understanding of correlation, identifying 'correlation' or 'no correlation'.</p> <p>NEW</p>

## Higher Silver Stage

Ref	Subject content – Candidates should be able to...	J517 ref
	<b>Number</b>	
<b>HSN1</b>	Use a multiplier to solve percentage increase and decrease problems. Calculate the original amount when given the transformed amount after a percentage change.	<b>N8.1</b> Solve efficiently problems involving percentage increase and decrease; calculate the original amount when given the transformed amount after a percentage change.
<b>HSN2</b>	Use repeated proportional or percentage changes. Represent repeated proportional change using a multiplier raised to a power.	<b>N8.2</b> Solve problems involving repeated proportional or percentage changes, including compound interest; represent repeated proportional change using a multiplier raised to a power.
<b>HSN3</b>	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.	<b>N8.3</b> 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; check solutions by converting to standard index form.
<b>HSN4</b>	Check the order of magnitude of compound calculations using estimation methods, without the use of a calculator.	<b>N9.2</b> Check the order of magnitude of a compound calculation using estimation methods, including rounding numbers of any size to <b>one</b> significant figure and simplifying calculations using standard index form, without the use of a calculator.
	<b>Algebra</b>	
<b>HSA1</b>	Solve harder linear equations including those with fractional coefficients.	<b>A8.3</b> Solve harder linear equations including those with fractional coefficients.
<b>HSA2</b>	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.	<b>A9.3</b> Manipulate algebraic expressions by expanding the product of <b>two</b> linear expressions, by taking out common factors and by cancelling common factors in rational expressions; factorise quadratic expressions, including the difference of <b>two</b> squares; solve quadratic equations of the form $ax^2 + bx + c = 0$ by factorisation.  <b>A8.2</b> Multiply expressions of the form $(x + 3)(x - 7)$ and simplify the resulting expression; solve quadratic equations of the form $x^2 +/ - \dots$ by factorisation, including the difference of two squares.
<b>HSA3</b>	Rearrange formulae, including cases where the subject appears twice, or where a power of the subject appears.	<b>A9.1</b> Rearrange harder formulae, including cases where the subject appears twice, or where a power of the subject appears.
<b>HSA4</b>	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.	<b>A8.4</b> Find the exact solution of <b>two</b> simultaneous equations in <b>two</b> unknowns by eliminating a variable, and interpret the equations as lines and their common solution as the point of intersection.

<b>HSA5</b>	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.	<b>A8.5</b> Plot graphs of simple cubic functions and the reciprocal function $y = 1/x$ with $x \neq 0$ ; recognise the characteristic shapes of these functions.
<b>HSA6</b>	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 $\leq$ and $\geq$ from $<$ and $>$ .  Construct the graphs of simple loci.	<b>A8.6</b> Solve linear inequalities in <b>one</b> variable; solve several linear inequalities in <b>two</b> variables and find the solution set.
<b>HSA7</b>	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.	<b>A8.7</b> Find the gradient of straight lines given by equations of the form $y = mx + c$ : understand that $y = mx + c$ represents a straight line, interpret the values of $m$ and $c$ ; know when lines are parallel.
	<b>Geometry and measures</b>	
<b>HSG1</b>	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 $180^\circ$ ; understand the alternate segment theorem.	<b>S9.1</b> Use and prove angle and tangent properties of circles, including the alternate segment theorem.
<b>HSG2</b>	Understand and use 3-D coordinates.	<b>S7.6</b> Understand and use 3-D coordinates; find the coordinates of the midpoint of a line segment AB given points AB in 2-D.
<b>HSG3</b>	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.	<b>S7.6</b> Understand and use 3-D coordinates; find the coordinates of the midpoint of a line segment AB given points AB in 2-D.  <b>S9.2</b> 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; use Pythagoras' theorem to find the length AB given the points A and B in 2-D.
<b>HSG4</b>	Understand, recall and use trigonometrical ratios in right-angled triangles in 2-D.	<b>S8.3</b> Understand, recall and use trigonometrical relationships in right-angled triangles and use these to solve problems, including those involving bearings.
<b>HSG5</b>	Understand similarity of triangles and other plane figures and use this to make geometrical inferences.	<b>S8.4</b> Understand similarity of triangles and other plane figures and use this to make geometrical inferences.
<b>HSG6</b>	Construct enlargements using any scale factor, including positive fractional and negative scale factors; identify scale factors.	<b>S8.2</b> Transform triangles and other 2-D shapes by combinations of reflection, rotation (of any angle about any point) and translation, including the use of vector notation; construct enlargements using any scale factors; identify scale factors.
<b>HSG7</b>	Understand and use the effect of enlargement on the area and volume of shapes and solids.	<b>S9.4</b> Understand and use the effect of enlargement on length, area and volume of shapes and solids, including the use of negative scale factors.

<b>HSG8</b>	Fully describe combinations of transformations (rotation, reflection, translation, enlargement) using a single transformation.	<b>S8.2</b> Transform triangles and other 2-D shapes by combinations of reflection, rotation (of any angle about any point) and translation, including the use of vector notation; construct enlargements using any scale factors; identify scale factors.
	<b>Statistics</b>	
<b>HSS1</b>	Use tree diagrams to represent outcomes of combined events, recognising when events are independent. Find probabilities using tree diagrams.	<b>D8.1</b> Use tree diagrams to represent outcomes of combined events, recognising when events are independent; find probabilities.
<b>HSS2</b>	Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data. Find the median, quartiles and interquartile range.	<b>D8.2</b> Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data; find the median, quartiles, percentiles and interquartile range.
<b>HSS3</b>	Compare distributions and make inferences, using the shapes of the distributions and measures of average and spread, including median and quartiles.	<b>D8.3</b> Compare distributions and make inferences, using the shapes of the distributions and measures of average and spread, including median and quartiles.
<b>HSS4</b>	Calculate an appropriate moving average. Identify seasonality and trends in time series, from tables or diagrams.	<b>D8.4</b> Calculate an appropriate moving average. <b>D10.2</b> Identify seasonality and trends in time series, from tables or diagrams; interpret graphs modelling real situations.

## Higher Gold Stage

Ref		J517 ref
	<b>Number</b>	
HGN1	Use the index laws with fractional, negative and zero powers in simplifying numerical and algebraic expressions.	<b>N9.3</b> Use fractional, negative and zero powers in simplifying numerical expressions, including using inverse operations.
HGN2	Use surds in exact calculations, without a calculator. Simplify expressions involving surds including rationalising a denominator.	NEW <b>N10.2</b> Convert a recurring decimal to a fraction and vice versa; use prime factors to identify fractions which represent terminating decimals; simplify expressions involving powers or surds including rationalising a denominator.
HGN3	Convert a recurring decimal to a fraction and vice versa.	<b>N10.2</b> Convert a recurring decimal to a fraction and vice versa; use prime factors to identify fractions which represent terminating decimals; simplify expressions involving powers or surds including rationalising a denominator.
HGN4	Use a calculator to find the upper and lower bounds of calculations, particularly in the context of measurement.	<b>N9.1</b> Use calculators or written methods to calculate the upper and lower bounds of calculations, particularly in the context of measurement.
HGN5	Use calculators to explore exponential growth and decay.	<b>N10.1</b> Use calculators to explore exponential growth and decay.
	<b>Algebra</b>	
HGA1	Form and use equations involving direct or inverse proportion (for $y \propto x$ , $y \propto x^2$ , $y \propto \frac{1}{x}$ , $y \propto \frac{1}{x^2}$ ).	<b>A9.2</b> Form and use equations to solve word and other problems involving direct or inverse proportion (for example, $y \propto x$ , $y \propto x^2$ , $y \propto 1/x$ , $y \propto 1/x^2$ ) including relating algebraic solutions to graphical representations of the equations.
HGA2	Solve quadratic equations by completing the square and using the quadratic equation formula.	<b>A10.2</b> Solve quadratic equations by completing the square and using the quadratic formula.
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.	<b>A10.3</b> Solve exactly, by elimination of an unknown, <b>two</b> simultaneous equations in <b>two</b> unknowns, <b>one</b> of which is linear, the other equation quadratic in <b>one</b> unknown or of the form $x^2 + y^2 = r^2$ .
HGA4	Manipulate algebraic expressions including fractions and solve the related equations. Understand the difference between an equation and an identity.	<b>A10.1</b> Manipulate algebraic expressions including fractions; solve related equations. NEW
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.	<b>A10.5</b> Construct graphs of exponential function, and of the circle $x^2 + y^2 = r^2$ ; solve problems involving the intersection of straight lines with a curve (including a circle).
HGA6	Apply to the graph of $y = f(x)$ , for linear and quadratic $f(x)$ , the transformations $y = f(x) + a$ , $y = f(ax)$ , $y = f(x + a)$ , $y = af(x)$ .	<b>A10.4</b> Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$ , $y = f(ax)$ , $y = f(x + a)$ , $y = af(x)$ , for linear, quadratic, sine and cosine functions $f(x)$ .



<b>Geometry and measures</b>		
<b>HGG1</b>	Understand and use SSS, SAS, ASA and RHS condition to prove the congruence of triangles.	<b>S10.2</b> Understand and use SSS, SAS, ASA and RHS condition to prove the congruence of triangles; verify standard ruler and compass constructions; use congruence to show that translations, reflections and rotations preserve length and angle.
<b>HGG2</b>	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.	<b>S9.2</b> 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; use Pythagoras' theorem to find the length AB given the points A and B in 2-D.
<b>HGG3</b>	Calculate the area of a triangle using $\frac{1}{2} ab \sin C$ . Use the sine and cosine rules in 2-D and 3-D contexts.	<b>S10.3</b> Calculate the area of a triangle using $\frac{1}{2}ab\sin C$ ; use the sine and cosine rules to solve 2-D and 3-D problems.
<b>HGG4</b>	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.	<b>S9.3</b> Solve problems involving the lengths of arcs, areas of sectors and the volume of pyramids, cones and spheres. <b>S10.1</b> Solve problems involving surface areas and volumes of pyramids, cylinders, cones and spheres, and problems involving more complex shapes including segments of circles and frustums of cones.
<b>HGG5</b>	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.	<b>S10.5</b> Understand and use vector notation; calculate, and represent graphically the sum of <b>two</b> vectors, the difference of <b>two</b> vectors and a scalar multiple of a vector; calculate the resultant of <b>two</b> vectors; understand and use the commutative and associative properties of vector addition; solve simple geometrical problems in 2-D using vector methods.
<b>Statistics</b>		
<b>HGS1</b>	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 $P(A) \times P(B)$ .	<b>D9.1</b> Compare data sets (including grouped discrete and continuous data); draw conclusions.
<b>HGS2</b>	Draw and interpret histograms for grouped data. Understand frequency density.	<b>D9.2</b> Draw and interpret histograms for grouped data; understand frequency density.
<b>HGS3</b>	Interpret and compare a wide range of data sets (including grouped discrete and continuous data) and draw conclusions.	<b>D10.1</b> Compare data sets (including grouped discrete and continuous data); draw conclusions.
<b>HGS4</b>	Select a representative sample from a population using random and stratified sampling. Criticise sampling methods.	<b>D9.3</b> Select a representative sample from a population using random and stratified sampling; criticize sampling methods.