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OCR
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GCSE (9–1)
Teacher Guide

MATHEMATICS

J560
For first teaching in 2015

Specification Comparison

Mapping the DfE new GCSE (9–1) Mathematics Subject Content to the OCR J567 Mathematics B linear GCSE specification

Version 2

www.ocr.org.uk/maths

Contents

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A guide to using this document

Subject statements in the pink, left column are those published by the Department for Education (DfE) for the new GCSE (9–1) mathematics, for first teaching from 2015.

In November 2013, the DfE published 'GCSE mathematics: subject content and assessment objectives', which lists the subject content and assessment objectives for the new GCSE (9–1) mathematics assessment. It also lists the formulae that can and cannot be provided to candidates in the exam. The full document is available to download from www.gov.uk.

The document breaks down the new GCSE (9–1) mathematics subject content in Number (16 statements), Algebra (25 statements), Ratio, proportion and rates of change (16 statements), Geometry and measures (25 statements), Probability (9 statements) and Statistics (6 statements).

Content expectations within these sections is indicated by standard type, underlined type and **bold type**, defined as:

- All students will develop confidence and competence* with the content identified by standard type.
- All students will be assessed on the content identified by the standard and the underlined type; more highly attaining students will develop confidence and competence* with all of this content.
- Only the more highly attaining students will be assessed on the content identified by **bold type**. The highest attaining students will develop confidence and competence* with the bold content.

*Students will be said to have confidence and competence with mathematical content when they can apply it flexibly to solve problems.

Subject statements in the grey, right column are those from the OCR J567 Mathematics B linear GCSE Specification, which was first taught in 2010 and first assessed in 2012. The full Specification can be downloaded from www.ocr.org.uk/qualifications/gcse-mathematics-b-j567-from-2012, along with a Teachers' Handbook, J567 past papers with mark schemes, reports, support materials and further related documents.

The J567 Specification sets out its content for teaching, broken down by both topic area and content stage, enabling a clear method of progression through both. The DfE's new GCSE (9–1) maths subject content document is not intended to be used as a teaching syllabus and the increasing expectations for candidates with content (indicated by standard, underlined or **bold** text - please see the column to the left for further information) are frequently included within single statements. A direct mapping of the new DfE subject content statements to the J567 statements is therefore problematic, but the following document is an indication of the ways in which the new GCSE content was previously specified in J567 and also serves to highlight the differences between the two (for example where entirely new content is to be introduced and where content that was Higher tier only in J567 will be assessed at both tiers in the new GCSE (9–1) mathematics).

J567 subject statements are each labelled with a code, for example **FIN10** or **HBG8**:

- The first letter of the code (F or H) indicates the tier, Foundation or Higher, that the content is to be assessed at.
- The second letter (I, B, S or G) refers to the four content stages that make up each J567 tier - Initial, Bronze, Silver or Gold. These indicate the progression of difficulty through each individual tier, moving up from Initial learning to Gold (note that there is an overlap between the stages of content common to both tiers, where the Foundation Silver Stage is identical to the Higher Initial Stage and the Foundation Gold Stage is identical to the Higher Bronze stage. For these common J567 statements, this document notes both the Foundation tier code and the Higher tier code).
- The third letter (N, A, G or S) shows the four J567 topic areas - N for Number, A for Algebra, G for Geometry and measures and S for Statistics.

OCR has developed a GCSE (9–1) mathematics teaching syllabus based on the November 2013 DfE subject content document, published as part of the Specification document available to download from www.ocr.org.uk/gcsemaths.

Free resources and support for our GCSE (9–1) mathematics qualification, developed through collaboration between our Maths Subject Specialists, teachers and other subject experts, are available from www.ocr.org.uk/gcsemaths. You can use our online form to send us your feedback and ideas, or recommend a resource you've used.

Number

Structure and calculation

1. Order positive and negative integers, decimals and fractions; use the symbols =, ≠[i], <, >, ≤, ≥	**FIN8**	Order decimals (ordering up to five decimals and knowing that, eg 5·07 is smaller than 5·3).
	FIN12	Order positive and negative temperatures.
	FBN5	Order fractions using a common denominator.
	FGA2 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 >.
2. Apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all[ii] both positive and negative; understand and use place value (eg when working with very large or very small numbers, and when calculating with decimals).	**FIN1**	Round numbers to a given power of 10.
	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.
	FIN9	Solve problems using the four operations on integer and decimal numbers using a calculator (up to three decimal places).
	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.
	FBN5	Add and subtract simple fractions (using a common denominator).
	FBN8	Use the four operations with positive and negative integers.
	FSN1 HIN1	Multiply and divide simple fractions. Add and subtract mixed numbers.
	FSN4 HIN4	Use the four operations on decimals without the use of a calculator.
	FGN2 HBN2	Use the four operations on fractions, including mixed numbers.
3. Recognise and use relationships between operations, including inverse operations (eg cancellation), to simplify calculations and expressions; use conventional notation for priority of operations, including brackets, powers, roots and reciprocals.	**FIN11**	Perform calculations involving the use of brackets and the order of operations.
	FIA3	Use simple function machines to deal with inputs and outputs, recognising basic inverse functions.
	FBN3	Use the terms square and square root (positive square roots only) and the correct notation… Use index notation for simple integer powers.
	FBN4	Simplifying a fraction by cancelling all common factors.
	FSN6 HIN6	Perform calculations using the order of operations.
	FGN6 HBN6	Use and understand the terms reciprocal.

[i] The symbol ≠ is not included in J567

[ii] J567 did not specify knowledge of negative decimals or negative fractions

Number

Structure and calculation

4. Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem[iii].	**FBN1**	Understand the concepts and vocabulary of factor, multiple and common factor and prime number.
	FGN6 HBN6	Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number. Find the prime factor decomposition of positive integers.
5. Apply systematic listing strategies, **including use of the product rule[iv] for counting**.	**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.
6. Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5[v]; **estimate powers and roots of any given positive number**.	**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 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.
	FGN5 HBN5	Estimate answers using appropriate techniques.
7. Calculate with roots, and with integer **and fractional** indices.	**FBN3**	Find squares and square roots. Use index notation for simple integer powers.
	FGN1 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.
	HGN1	Use the index laws with fractional, negative and zero powers in simplifying numerical and algebraic expressions.
8. Calculate exactly with fractions, **surds** and multiples of π[vi]; **simplify surd expressions involving squares (eg $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators.**	**FGN3 HBN3**	Convert a simple fraction to a decimal using division. Use and understand terminating and recurring decimals including exact fraction equivalents.
	HGN2	Use surds in exact calculations, without a calculator. Simplify expressions involving surds including rationalising a denominator.
	HGG4	Use pi in exact calculations.
9. Calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer.[vii]	**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.
	HSN4	Simplifying calculations using standard index form.

[iii] The terms 'product notation' and 'unique factorisation theorem' are not mentioned in J567
[iv] The term 'product rule' is not mentioned in J567
[v] 'recognise powers of 2, 3, 4, 5' is not included in J567
[vi] 'multiples of π' is Higher tier only in J567
[vii] Standard form is Higher tier only in J567

Number

Fractions, decimals and percentages

10. Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$); **change recurring decimals into their corresponding fractions and vice versa.**	**FIN6**		Recall the fraction to decimal conversions of familiar simple fractions (tenths, hundredths, half, quarters, fifths).
	FBN6		Use the equivalence between fractions, decimals and percentages.
	FGN3	**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.
11. Identify and work with fractions in ratio problems.	**FBN9**		Use simple proportion, particularly in the context of recipes.
	FSN5	**HIN5**	Use ratio notation including reduction to its simplest form. Understand and use ratio and proportion, including dividing a quantity in a given ratio.
12. Interpret fractions and percentages as operators.	**FIN5**		Calculate a fraction of a given quantity. Identify fractions of a shape.
	FIN6		Convert simple fractions of a whole to percentages of the whole and vice versa.
	FIN7		Calculate simple percentages of quantities, without the use of a calculator.
	FBN4		Understand equivalent fractions, simplifying a fraction by cancelling all common factors. Write improper fractions as mixed numbers and vice versa.
	FBN6		Use the equivalence between fractions, decimals and percentages.
	FBN7		Find a percentage of a quantity, interpreting percentage as an operator.
	FSN2	**HIN2**	Express one quantity as a fraction or percentage of another.
	FSN3	**HIN3**	Increase and decrease quantities by a percentage.
	FGN4	**HBN4**	Use percentages to compare proportion. Use and find percentage change.
		HSN1	Use a multiplier to solve percentage increase and decrease problems. Calculate the original amount when given the transformed amount after percentage change.
		HSN2	Use repeated proportional or percentage changes. Represent repeated proportional change using a multiplier raised to a power.

Number

Measures and accuracy

13. Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate.	**FIN10**		Work out starting times, finishing times and intervals.
	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.
	FSN6	**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.
	FGG2	**HBG2**	Understand and use rates and compound measures, for example speed, density, rate of flow.
14. Estimate answers; check calculations using approximation and estimation, including answers obtained using technology.	**FIG1**		Interpret scales on a range of measuring instruments.
	FIG2		Make sensible estimates of a range of measures in everyday settings.
	FBN2		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	**HBN5**	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.
		HSN4	Check the order of magnitude of compound calculations using estimation methods, without the use of a calculator.
15. Round numbers and measures to an appropriate degree of accuracy (eg to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding.[viii]	**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.
	FSN6	**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.
16. Apply and interpret limits of accuracy, **including upper and lower bounds.**	**FGG1**	**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.
		HGN4	Use a calculator to find the upper and lower bounds of calculations, particularly in the context of measurement.

[viii] Use inequality notation to specify simple error intervals due to truncation or rounding is not included on J567

Algebra

Notation, vocabulary and manipulation

1. Use and interpret algebraic notation , including: • ab in place of $a \times b$ • $3y$ in place of $y + y + y$ and $3 \times y$ • a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ • $\frac{a}{b}$ in place of $a \div b$ • coefficients written as fractions rather than as decimals • brackets.		This content is assumed in J567 and not included under a specific J567 reference.
2. Substitute numerical values into formulae and expressions, including scientific formulae.	**FIA2**	Use formulae expressed in words or symbols, substituting positive numbers into the formula to find the value of the subject (usually in context).
	FIA3	Use simple function machines to deal with inputs and outputs, recognising basic inverse functions. Solve simple equations involving one operation.
	FBA2	Substitute positive numbers into simple algebraic formulae. Derive a simple formula.
	FSA1 **HIA1**	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression.
3. Understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors.		With the exception of the below, this content is assumed in J567 and not included under a specific J567 reference.
	HGA4	Understand the difference between an equation and an identity.
4. Simplify and manipulate algebraic expressions (including those involving surds[ix] **and algebraic fractions**) by: • collecting like terms • multiplying a single term over a bracket • taking out common factors • expanding products of two **or more** binomials • factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares[x]; **factorising quadratic expressions of the form** $ax^2 + bx + c$ • simplifying expressions involving sums, products and powers, including the laws of indices.	**FBA3**	Manipulate algebraic expressions by collecting like terms.
	FSA3 **HIA3**	Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out common factors.
	FGN1 **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.
	HSA2	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.
	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.
	HGA4	Manipulate algebraic expressions including fractions and solve the related equations.

[ix] surds were Higher tier only in J567

[x] factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares is Higher tier only in J567

Algebra

Notation, vocabulary and manipulation

5. Understand and use standard mathematical formulae; rearrange formulae to change the subject.	**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.
	FSA1 **HIA1**	Use and generate formulae. Substitute positive and negative numbers into a formula or an expression.
	FGA3 **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.
6. Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments **and proofs**.	**FSA2** **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.
	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.
	HGA4	Understand the difference between an equation and an identity.
7. Where appropriate, interpret simple expressions as functions with inputs and outputs; **interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function'**.[xi]	**FIA3**	Use simple function machines to deal with inputs and outputs, recognising basic inverse functions.
	FGA3 **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.

Algebra

Graphs

8. Work with coordinates in all four quadrants.	**FIA4**	Use axes and coordinates in four quadrants, including using points identified by geometrical information.

[xi] 'interpret the succession of two functions as a 'composite function' is not included in J567

Algebra

Graphs

9. Plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form $y = mx + c$[xii] to identify parallel **and perpendicular lines**[xiii]; find the equation of the line through two given points, or through one point with a given gradient[xiv].	**FIA5**	Construct and interpret simple graphs, including conversion graphs.
	FSA4 **HIA4**	Use tables to plot graphs of linear functions given explicitly.
	FGA4 **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.
10. Identify and interpret gradients and intercepts[xv] of linear functions graphically and algebraically.	**FGA4** **HBA4**	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.
11. Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically[xvi] **and turning points**[xvii] **by completing the square**.	**FGA6** **HBA6**	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.
	HGA2	Solve quadratic equations by completing the square and using the quadratic equation formula. The quadratic formula is given on the formulae sheet[xviii]. 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	Find the points of intersection of straight lines with quadratic curves, knowing that these are the approximate solutions of the corresponding simultaneous equations.
12. Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$[xix], **exponential functions $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$**[xx] **for angles of any size**.	**FSA4** **HIA4**	Use tables to plot graphs of linear functions given explicitly.
	FGA4 **HBA4**	Find the gradient of linear graphs.
	FGA6 **HBA6**	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.
	HSA5	Plot, sketch and recognise graphs of quadratics, simple cubic functions, and reciprocal functions $y = k \div x$; with $x \neq 0$, including graphs arising from real situations and their interpretation.
	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.

[xii] knowledge of $y = mx + c$ was Higher tier only in J567
[xiii] perpendicular lines are not included in J567
[xiv] Finding the equation of a line passing through two points, or through one point with a given gradient, was Higher tier only in J567
[xv] Intercepts of lines was Higher tier only in J567
[xvi] deducing quadratic roots algebraically was Higher tier only in J567
[xvii] The term 'turning points' is not included in J567
[xviii] The quadratic formula will not be provided on the formula sheet for the new GCSE Mathematics
[xix] simple cubic and reciprocal functions were Higher tier only in J567
[xx] knowledge of the graph of $y = \tan x$ was not included in J567

Algebra

Graphs

13. **Sketch translations and reflections of a given function.**	**HGA6**	Apply to the graph of $y = f(x)$, for linear and quadratic $f(x)$, the transformations $y = f(x) + a$, $y = f(ax)$, $y = f(x + a)$, $y = af(x)$.
14. Plot and interpret graphs (including reciprocal graphs [xxi] **and exponential graphs**) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration.	**FBA5**	Interpret information presented in a range of linear and non-linear graphs, including travel (distance/time) graphs.
	FGA5 **HBA5**	Draw and interpret graphs modelling real situations, which may be non-linear, including simple quadratic graphs.
	FGA6 **HBA6**	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.
	HSA5	Plot, sketch and recognise graphs of quadratics, simple cubic functions, and reciprocal functions $y = k \div x$; with $x \neq 0$, including graphs arising from real situations and their interpretation.
	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.
15. **Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts[xxii].**	**FBA5**	Interpret information presented in a range of linear and non-linear graphs, including travel (distance/time) graphs.
	FGA4 **HBA4**	Find the gradient of linear graphs.
16. **Recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point.**	**This content is not included in J567.**	

[xxi] reciprocal graphs are Higher tier only in J567

[xxii] Gradients of quadratic and other non-linear graphs and areas under graphs, along with their interpretation, were not included in J567

Algebra

Solving equations and inequalities

17. Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph.	**FSA2**	**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.
	FBA4		Solve simple equations involving two steps.
	FGA4	**HBA4**	Plot graphs of linear functions in which y is given explicitly or implicitly in terms of x. Find the gradient of linear graphs.
		HSA1	Solve harder linear equations including those with fractional coefficients.
18. Solve quadratic equations (**including those that require rearrangement**) algebraically[xxiii] by factorising, **by completing the square and by using the quadratic formula**; find approximate solutions using a graph.	**FGA6**	**HBA6**	Generate points and plot graphs of simple quadratic functions and use these to find approximate solutions of simple related equations.
		HSA2	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.
		HGA2	Solve quadratic equations by completing the square and using the quadratic equation 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.
19. Solve two simultaneous equations in two variables (linear/linear **or linear/quadratic)** algebraically; find approximate solutions using a graph.		**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.
		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.
20. **Find approximate solutions to equations numerically using iteration.**	**This content is not included in J567**		
21. Translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution.	**FSA2**	**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.
		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.

[xxiii] solving quadratic equations algebraically by factorising was Higher tier only in J567

Algebra

Solving equations and inequalities

22. Solve linear inequalities in one **or two** variable**(s)**, **and quadratic inequalities in one variable**[xxiv]; represent the solution set on a number line, **using set notation**[xxv] **and on a graph**.	**FGA2** **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 >.
	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 >. Construct the graphs of simple loci.

Algebra

Sequences

23. Generate terms of a sequence from either a term-to-term or a position-to-term rule.	**FIA1**	Continue simple sequences. Explain how to find the next number in a simple pattern. Recognise and describe patterns in number.
	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 **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.
24. Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a rational number > 0 **or a surd) and other sequences**.[xxvi]	**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.
25. Deduce expressions to calculate the *n*th term of linear **and quadratic**[xxvii] sequences.	**FGA1** **HBA1**	Use linear expressions to describe the *n*th term of an arithmetic sequence.

[xxiv] Solving quadratic inequalities in one variable is not included in J567
[xxv] set notation is not included in J567
[xxvi] Fibonacci type sequences, quadratic sequences, and simple geometric progressions are not included in J567
[xxvii] Quadratic sequences are not included in J567

Ratio, proportion and rates of change

1. Change freely between related standard units (eg time, length, area, volume/capacity, mass) and compound units (eg speed, rates of pay, prices, density, pressure) in numerical and algebraic[xxviii] contexts.	**FIG1**		Convert measurements from one metric unit to another. Interpret scales on a range of measuring instruments.
	FGG2	**HBG2**	Understand and use rates and compound measures, for example speed, density, rate of flow.
	FGG5	**HBG5**	Convert between measures for area or for volume/capacity, for example between mm^2 and cm^2 or between cm^3 and litres.
2. Use scale factors, scale diagrams and maps.	**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.
	FBG6		Construct and interpret maps and scale drawings, including estimating distances and areas. Understand and use bearings to specify direction.
	FBG8		Understand positive integer scale factors. Use such scale factors to produce scaled-up images on a grid without a specified centre.
	FGG7	**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.
		HSG6	Construct enlargements using any scale factor, including positive fractional and negative scale factors; identify scale factors.
3. Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1.	**FIN5**		Calculate a fraction of a given quantity. Identify fractions of a shape.
	FSN2	**HIN2**	Express one quantity as a fraction or percentage of another.
4. Use ratio notation, including reduction to simplest form.	**FSN5**	**HIN5**	Use ratio notation including reduction to its simplest form.
5. Divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations).	**FSN5**	**HIN5**	Understand and use ratio and proportion, including dividing a quantity in a given ratio.

[xxviii] conversion between units in algebraic contexts was not included in J567

Ratio, proportion and rates of change

6. Express a multiplicative relationship between two quantities as a ratio or a fraction.	**FSN5**	**HIN5**	Understand and use ratio and proportion, including dividing a quantity in a given ratio.
7. Understand and use proportion as equality of ratios.	**FBN9**		Use simple proportion, particularly in the context of recipes.
	FSN5	**HIN5**	Understand and use ratio and proportion, including dividing a quantity in a given ratio.
8. Relate ratios to fractions and to linear functions.	**This content is not included in J567.**		
9. Define percentage as 'number of parts per hundred'; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; work with percentages greater than 100%[xxix]; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics.	**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 of quantities (includes multiples of 5%), 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	**HIN2**	Express one quantity as a fraction or percentage of another.
	FSN3	**HIN3**	Increase and decrease quantities by a percentage.
	FGN4	**HBN4**	Use percentages to compare proportion. Use and find percentage change.
		HSN1	Use a multiplier to solve percentage increase and decrease problems. Calculate the original amount when given the transformed amount after percentage change.
10. Solve problems involving direct and inverse proportion, including graphical[xxx] and algebraic representations.	**FBN9**		Use simple proportion, particularly in the context of recipes.
	FSN5	**HIN5**	Understand and use ratio and proportion, including dividing a quantity in a given ratio.
	FGN4	**HBN4**	Use percentages to compare proportion. Use and find percentage change.
		HSN2	Use repeated proportional or percentage changes. Represent repeated proportional change using a multiplier raised to a power.
		HGA1	Form and use equations involving direct or inverse proportion (for $y \propto x$, $y \propto x^2$, $y \propto \frac{1}{x}$, $y \propto \frac{1}{x^2}$).

[xxix] work with percentages greater than 100%' is not stated in J567
[xxx] graphical representations of proportion are not included in J567

Ratio, proportion and rates of change

11. Use compound units such as speed, rates of pay, unit pricing, density and pressure.	**FGG2** **HBG2**	Understand and use rates and compound measures, for example speed, density, rate of flow.
12. Compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors.	**FBG8**	Understand positive integer scale factors.
	FSN5 **HIN5**	Understand and use ratio and proportion, including dividing a quantity in a given ratio.
	HSG4	Understand, recall and use trigonometrical ratios in right-angled triangles in 2-D.
13. Understand that *X* is inversely proportional to *Y* is equivalent to *X* is proportional to $\frac{1}{Y}$; **construct and** interpret equations that describe direct and inverse proportion.	**HGA1**	Form and use equations involving direct or inverse proportion (for $y \propto x$, $y \propto x^2$, $y \propto \frac{1}{x}$, $y \propto \frac{1}{x^2}$).
14. Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion.	**This content is not included in J567.**	
15. **Interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of instantaneous and average rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts.**	**This content is not included in J567.**	
16. Set up, solve and interpret the answers in growth and decay problems, including compound interest **and working with general iterative**[xxxi] **processes**.	**HSN1**	Use a multiplier to solve percentage increase and decrease problems. Calculate the original amount when given the transformed amount after percentage change eg compound interest, population change, depreciation, etc.
	HSN2	Use repeated proportional or percentage changes. Represent repeated proportional change using a multiplier raised to a power.
	HGN5	Use calculators to explore exponential growth and decay.

[xxxi] The term 'iterative' is not mentioned in J567

Geometry and measures

Properties and constructions

1. Use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; use the standard conventions for labelling and referring to the sides and angles of triangles ; draw diagrams from written description.		This content is assumed in J567 and not included under a specific J567 reference.
2. Use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line[xxxii].	**FSG2** **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.
	FGG6 **HBG8**	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.
3. Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles; understand and use alternate and corresponding angles on parallel lines; derive and use the sum of angles in a triangle (eg to deduce and use the angle sum in any polygon, and to derive properties of regular polygons).	**FIG3**	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.
	FBG1	Understand and use the angle properties of triangles, including equilateral, isosceles, right-angled and scalene triangles.
	FSG1 **HIG1**	Understand and use the angle properties of parallel and intersecting lines.
	FGG3 **HBG3**	Calculate and use the sums of the interior and exterior angles of polygons, for both regular and irregular polygons.
4. Derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language.	**FBG1**	Understand and use the angle properties of triangles, including equilateral, isosceles, right-angled and scalene triangles.
	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.
	FBG5	Recall the geometric properties and definitions of the special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus.
5. Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)[xxxiii].	**FBG8**	Understand and recognise the congruence of simple shapes.
	HGG1	Understand and use SSS, SAS,ASA and RHS condition to prove the congruence of triangles.

[xxxii] know that the perpendicular distance from a point to a line is the shortest distance to the line is not included in J567

[xxxiii] 'Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)' was Higher tier only in J567

Geometry and measures

Properties and constructions

6. Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs.	**FBG1**		Understand and use the angle properties of triangles, including equilateral, isosceles, right-angled and scalene triangles.
	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.
	FBG5		Recall the geometric properties and definitions of the special types of quadrilateral, including square, rectangle, parallelogram, trapezium, kite and rhombus.
	FBG8		Understand and recognise the congruence of simple shapes.
	FGG4	**HBG4**	Understand, recall and use Pythagoras' theorem in 2-D contexts.
7. Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional **and negative** scale factors).	**FIG7**		Recognise and complete reflection symmetry of 2-D shapes.
	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.
	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	**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.
	FGG7	**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.
		HSG5	Understand similarity of triangles and other plane figures and use this to make geometrical inferences.
		HSG6	Construct enlargements using any scale factor, including positive fractional and negative scale factors; identify scale factors.
8. **Describe the changes and invariance achieved by combinations of rotations, reflections and translations**.	**FGG8**	**HBG8**	Transform 2-D shapes by simple combinations of transformations.
		HSG8	Fully describe combinations of transformations (rotation, reflection, translation, enlargement) using a single transformation.
9. Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment.	**FIG4**		Recognise the terms circle, centre, radius, diameter and circumference.
	FSG3	**HIG3**	Recall the meaning of circle, chord, tangent, arc, sector and segment.

Geometry and measures

Properties and constructions

10. **Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results**.		**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.
11. Solve geometrical problems on coordinate axes.	**FIA4**		Use axes and coordinates in four quadrants, including using points identified by geometrical information.
12. Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres.	**FIG4**		Recognise the terms circle, centre, radius, diameter and circumference.
	FSG4	**HIG4**	Find the surface area of simple solid shapes using the area formulae for triangles and rectangles.
		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.
13. Construct and interpret plans and elevations of 3D shapes.	**FBG3**		Use isometric drawings and nets of 3-D shapes.
	FSG5	**HIG5**	Use 2-D representations of 3-D shapes, including plans and elevations.
14. Use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc).	**FIN10**		Work out starting times, finishing times and intervals.
	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.
	FBN2		Estimate answers to one-stage calculations, particularly calculations involving measurement or money.
	FGG2	**HBG2**	Understand and use rates and compound measures, for example speed, density, rate of flow.
15. Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings.	**FIG1**		Interpret scales on a range of measuring instruments.
	FIG3		Measure and draw angles to the nearest degree.
	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.
	FBG6		Construct and interpret maps and scale drawings, including estimating distances and areas. Understand and use bearings to specify direction.

Geometry and measures

Mensuration and calculation

16. Know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other prisms (including cylinders).	**FBG4**	Find the volumes of cubes and cuboids, recalling the formula. Calculate volumes of shapes made from cubes and cuboids.
	FSG4 **HIG4**	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.
	FGG5 **HBG5**	Calculate the surface area and volume of right prisms, including cylinders.
17. Know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes; surface area and volume of spheres, pyramids, cones and composite solids.	**FIG5**	Find the perimeter of straight-sided shapes. Find areas of irregular shapes and volumes of simple solids.
	FSG3 **HIG3**	Recall and use the formulae for the circumference and the area of a circle.
	FSG4 **HIG4**	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.
	FGG5 **HBG5**	Calculate the surface area and volume of right prisms, including cylinders.
	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.
18. Calculate arc lengths, angles and areas of sectors of circles.	**HGG4**	Find the lengths of arcs, areas of sectors and segments of circles.
19. Apply the concepts of congruence and similarity, including the relationships between lengths, **areas and volumes** in similar figures.	**FBG8**	Understand that an enlarged shape is mathematically similar to the original shape. Understand and recognise the congruence of simple shapes.
	FSG6 **HIG6**	Recognise and visualise rotations, reflections and translations. Understand the properties preserved by these transformations; understand the congruence of these transformations.
	FGG7 **HBG7**	Understand the implications of enlargement for perimeter/length.
	HSG5	Understand similarity of triangles and other plane figures and use this to make geometrical inferences.
	HSG7	Understand and use the effect of enlargement on the area and volume of shapes and solids.
20. Know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$, and the trigonometric ratios: $\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$, $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$ and $\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$[xxxiv]; apply them to find angles and lengths in right-angled triangles **and, where possible, general triangles** in two **and three** dimensional figures.	**FGG4** **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.
	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.

[xxxiv] Trigonometric ratios are Higher tier only in J567

Geometry and measures

Mensuration and calculation

21. Know the exact values of $\sin\theta$ and $\cos\theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90°, know the exact value of $\tan\theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$.	**This content is not included in J567.**
22. **Know and apply the sine rule**, $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$, **and cosine rule**, $a^2 = b^2 + c^2 - 2bc\cos A$, **to find unknown lengths and angles**.	**HGG3** Use the sine and cosine rules in 2-D and 3-D contexts.
23. **Know and apply Area = $\frac{1}{2}$ *ab* sin *C* to calculate the area, sides or angles of any triangle.**	**HGG3** Calculate the area of a triangle using ½ *ab* sin *C*.

Geometry and measures

Vectors

24. Describe translations as 2D vectors.	**FSG6** **HIG6** Transform triangles and other 2-D shapes by rotation, reflection, or translation using column vectors.
25. Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors[xxxv]; **use vectors to construct geometric arguments and proofs**.	**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.

[xxxv] Working with vectors in these ways was Higher tier only in J567

Probability

1. Record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees.[xxxvi]	**FIS2**	Find all possible ways of listing up to four objects.
	FIS4	Draw and interpret simple frequency tables, charts, pictograms and bar charts for discrete data.
	HSS1	Use tree diagrams to represent outcomes of combined events, recognising when events are independent. Find probabilities using tree diagrams.
2. Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments.	**FIS1**	Understand and use the vocabulary of probability, including terms such as 'fair', 'evens', 'certain', 'likely', 'unlikely' and 'impossible'.
	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.
3. Relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale.	**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.
4. Apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one.	**FSS1** **HIS1**	Identify different mutually exclusive outcomes and know that the sum of the probabilities of all these outcomes is 1.
5. Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size.	**FGS1** **HBS1**	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.
6. Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams[xxxvii] and tree diagrams.[xxxviii]	**FIS2**	Find all possible ways of listing up to four objects.
	HSS1	Use tree diagrams to represent outcomes of combined events, recognising when events are independent. Find probabilities using tree diagrams.
7. Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities.	**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.
	FGS1 **HBS1**	Understand and use estimates of probability from theoretical models or relative frequency. Compare experimental data and theoretical probabilities.

[xxxvi] Frequency trees are not included in J567
[xxxvii] Venn diagrams are not included in J567
[xxxviii] Tree diagrams are Higher tier only in J567

Probability

8. Calculate the probability of independent and dependent combined events, including tree diagrams and other representations and know the underlying assumptions.	**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).
9. **Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams**[xxxix].	**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.

[xxxix] Venn diagrams are not included in J567

Statistics

1. Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling.	**FSS3**	**HIS3**	Compare distributions and make inferences, using the shapes of the distributions and measures of average and range.
	FSS5	**HIS5**	Design and criticise questions for use in a survey, taking possible bias into account.
	FGS1	**HBS1**	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.
		HSS3	Compare distributions and make inferences, using the shapes of the distributions and measures of average and spread, including median and quartiles.
		HGS4	Select a representative sample from a population using random and stratified sampling. Criticise sampling methods.
2. Interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use.	**FIS4**		Draw and interpret simple frequency tables, charts, pictograms and bar charts for discrete data eg 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	**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.
	FSS4	**HIS4**	Design and use two-way tables for discrete and grouped data.
		HSS4	Identify seasonality and trends in time series, from tables or diagrams.
3. **Construct and interpret diagrams for grouped discrete data and continuous data, ie histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use**.	**FSS3**	**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.
		HSS2	Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data. Find the median, quartiles and interquartile range.
		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.

Statistics

4. Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: • appropriate graphical representation involving discrete, continuous and grouped data, **including box plots** • appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, **quartiles and inter-quartile range**).	**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 **HIS2**	Identify the modal class of grouped data. Calculate the mean of grouped discrete data.
	FGS2 **HBS2**	Calculate the mean from grouped continuous data.
	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.
	HGS3	Interpret and compare a wide range of data sets (including grouped discrete and continuous data) and draw conclusions.
5. Apply statistics to describe a population.	**FSS3** **HIS3**	Compare distributions and make inferences, using the shapes of the distributions and measures of average and 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.
	HGS3	Interpret and compare a wide range of data sets (including grouped discrete and continuous data) and draw conclusions.
	HGS4	Select a representative sample from a population using random and stratified sampling. Criticise sampling methods.
6. Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.	**FGS3** **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.

The small print

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