



Unit context	Topic name	Term	Skills developed	Prior Learning	Next link in curriculum
1	Simultaneous equations	Autumn	- Solving simultaneous equations algebraically using elimination and substitution - Solving simultaneous equations graphically - Forming and solving simultaneous equations from contextual problems - Solving simultaneous equations involving one linear and one quadratic equation - Solving simultaneous equations involving three variables - Selecting and applying efficient solution methods in multi-step problems	- KS4 (Year 10): solving linear equations and rearranging formulae - KS4: quadratic equations and graphs - KS4: straight line graphs and graphical solutions of equations - KS3: substitution into expressions and formulae - KS3: algebraic manipulation and simplifying expressions - KS3: coordinates and graph interpretation - KS3: solving one- and two-step equations	- KS4: functions and graphical modelling - KS4: algebraic proof and advanced algebraic manipulation - KS4: non-linear graphs and intersections of functions - KS5 (A-level): systems of equations, matrices, numerical methods, simultaneous equations involving functions, and mathematical modelling
2a 2b	Vectors	Autumn	- Using column vector notation in geometric proof - Solving multi-step vector problems in shapes and coordinate geometry - Proving points are collinear using vectors - Using vectors to prove and solve geometric properties (parallelograms, midpoints, ratios) - Applying vectors in formal geometric reasoning and “show that” style proofs - Interpreting and manipulating vectors algebraically in complex diagrams	- KS4: addition and subtraction of column vectors - KS4: scalar multiplication of vectors - KS4: representing vectors in 2D grids and shapes - KS3: coordinates in all four quadrants - KS3: properties of parallel lines and quadrilaterals - KS3: solving linear equations and ratio problems - KS3: basic geometric reasoning and transformations	- KS5: vector equations of lines and planes in 3D space - KS5: scalar and vector products - KS5: mechanics (forces, motion, equilibrium using vectors) - KS5: advanced coordinate geometry and proof - KS5: calculus applications in parametric/vector form
3	Non-linear graphs	Autumn	- Sketching and interpreting quadratic, cubic, reciprocal and exponential graphs - Identifying key features of non-linear graphs (turning points, intercepts, symmetry, asymptotes) - Solving equations graphically using non-linear graphs	- KS4: quadratic graphs and their basic shapes - KS4: straight line graphs ($y = mx + c$) and gradient interpretation - KS4: substitution into tables of values and graph plotting - KS3: coordinates in all four quadrants	- KS5: functions and transformations (including composite and inverse functions) - KS5: exponential and logarithmic functions - KS5: calculus (differentiation and integration of polynomial and exponential



			• Comparing linear and non-linear models in context • Interpreting real-life graphs (distance-time, growth/decay, inverse relationships) • Recognising and using exponential growth and decay graphs • Using graphs to estimate roots and solutions of equations	• KS3: algebraic substitution and solving linear equations • KS3: understanding indices and square numbers • KS3: recognising patterns in sequences and basic graph interpretation	- functions) • KS5: parametric equations and modelling real-world systems • KS5: advanced curve sketching and rate of change analysis
4	Ratio and proportion	Autumn	• Solving ratio problems in a range of contexts (including sharing and comparison) • Working with proportional reasoning (direct proportion) • Solving complex ratio problems including multi-step contexts • Using scale factors in similarity and enlargement problems • Solving inverse proportion problems • Setting up and solving proportion equations • Using compound measures (speed, density, pressure) in proportional contexts • Interpreting and using real-life proportional relationships	• KS3: simplifying ratios and sharing in a given ratio • KS3: fraction, decimal and percentage equivalence • KS3: multiplication and division fluency • KS3: solving linear equations • KS3: basic scale drawings and similarity ideas • KS3: understanding multiplicative relationships	• KS4: similarity and congruence proofs • KS4: trigonometry and geometric reasoning (scale and similarity links) • KS4: graphs of proportional relationships (direct and inverse) • KS4: further compound measures and algebraic modelling • KS5: calculus-based modelling of rates of change, exponential growth and decay, mechanics (forces, motion, equilibrium), and algebraic manipulation in applied contexts
5	Area and volume	Autumn	• Calculating perimeter and area of compound shapes • Finding area of triangles, trapezia and circles • Calculating circumference and area of circles • Solving problems involving surface area of prisms and cylinders • Calculating volume of prisms, cylinders and composite solids	• KS4: area of triangles, rectangles and compound shapes • KS4: volume of cuboids and basic 3D shape calculations • KS3: area and perimeter of 2D shapes • KS3: properties of circles (radius, diameter, circumference intro) • KS3: multiplication and fraction fluency in measurement contexts	• KS4: Pythagoras' theorem and trigonometry in 2D and 3D contexts • KS4: similarity and enlargement (area and volume scale factors) • KS4: circle theorems and geometric proof • KS4: vectors in geometric modelling • KS5: integration (area under curves, volumes of revolution), mechanics



			• Solving multi-step problems involving area and volume in context • Using formulae fluently and accurately in geometric reasoning • Converting units in area and volume problems	• KS3: unit conversion (length, area, volume)	(density, forces in 3D), and advanced modelling of real-world geometry
6	Similarity and congruence	Autumn	• Identifying and proving congruent triangles using SSS, SAS, ASA, AAS and RHS • Applying CPCTC (corresponding parts of congruent triangles are equal) • Proving and solving problems involving similar shapes and triangles • Using scale factors to find unknown lengths in similar shapes • Solving area and volume problems using similarity (scale factor² and scale factor³) • Using similarity in geometric proof and multi-step reasoning • Solving complex “show that” geometry problems involving similarity and congruence	• KS4: basic similarity (scale factors in simple shapes) • KS4: enlargement and basic ratio reasoning in geometry • KS3: angle rules (parallel lines, polygons, triangles) • KS3: ratio and proportion • KS3: algebraic manipulation and solving equations • KS3: properties of triangles and quadrilaterals • KS3: transformations (translation, reflection, rotation, enlargement)	• KS4: circle theorems and geometric proof • KS4: trigonometry and Pythagoras in non-right-angled contexts • KS4: vectors and coordinate geometry proof • KS5: proof (including vector proof and algebraic proof), similarity in advanced geometry, mechanics (resolving forces), and calculus-based modelling of change
7	Sequences and proof	Autumn	• Finding and using the nth term of linear sequences • Recognising and generating quadratic sequences • Working with geometric sequences and common ratios • Using recursive and position-to-term rules • Solving problems involving sequences in context • Understanding and applying mathematical proof • Constructing algebraic proofs using	• KS4: linear sequences and nth term rules • KS4: expanding brackets and factorising expressions • KS4: solving linear equations • KS4: index laws and powers • KS3: patterns in sequences and arithmetic reasoning • KS3: algebraic notation and substitution • KS3: basic number properties (odd, even, multiples)	• KS5: proof by induction • KS5: advanced sequences and series (arithmetic and geometric series in depth) • KS5: binomial expansion • KS5: functions and algebraic structure (including proof techniques in algebra and calculus) • KS5: mathematical reasoning in pure mathematics (formal proof, contradiction, algebraic structure)



			expressions and identities • Proving results about numbers (e.g. even/odd, consecutive integers) • Using counterexamples to disprove statements		
8	Standard form	Autumn	• Converting numbers between standard form and ordinary numbers • Multiplying and dividing numbers in standard form • Adding and subtracting numbers in standard form • Solving multi-step problems involving standard form • Using standard form in real-life and scientific contexts • Interpreting very large and very small numbers in context (scientific notation)	• KS4: understanding powers of 10 and index notation • KS4: multiplying and dividing by powers of 10 • KS3: place value (large and small numbers) • KS3: rounding and estimation • KS3: indices and square/cube numbers • KS3: calculator fluency and BIDMAS • KS3: basic understanding of scale in context	• KS4: compound measures (speed, density, pressure) using standard form • KS4: error intervals and bounds in scientific contexts • KS4: surds and indices in algebraic manipulation • KS5: logarithms and exponential functions • KS5: modelling growth and decay (including calculus-based applications) • KS5: mechanics and physics-based applications of standard form
9	Circle theorems	Spring	• Applying and combining circle theorems to solve multi-step problems • Proving and using angle relationships in circles • Using angles in the same segment, semicircle, and centre/circumference relationships • Applying the alternate segment theorem in problem solving • Using the relationship between radius and tangent (90°) • Solving problems involving cyclic quadrilaterals • Constructing formal geometric proofs using circle theorems	• KS4: basic circle properties and introduction to circle theorems • KS4: angle facts (straight lines, triangles, polygons) • KS4: parallel line angle rules • KS3: angle rules and geometric reasoning • KS3: properties of triangles and quadrilaterals • KS3: algebraic substitution and solving equations	• KS5: advanced geometric proof and reasoning • KS5: coordinate geometry of circles (equations of circles, tangents) • KS5: vectors and proof in geometry • KS5: calculus-based curve analysis (tangents and rates of change) • KS5: mechanics (angles, forces, equilibrium in applied contexts)



			• Solving “show that” and algebraic circle theorem problems		
10	Set notation and Venn diagrams	Spring	• Using set notation to represent outcomes (including union, intersection and complement) • Interpreting and completing Venn diagrams for probability problems • Solving multi-step problems using Venn diagrams and set diagrams • Using set notation alongside probability (including conditional probability in context) • Representing and interpreting relationships between sets using diagrams and written notation • Solving exam-style probability problems involving two sets	• KS4: basic probability (including combined events and tree diagrams) • KS4: interpretation of frequency tables and data • KS4: Venn diagrams (intro level and simple two-set problems) • KS3: basic probability language (fractional probability, likelihood) • KS3: number fluency with fractions, decimals and percentages • KS3: logical reasoning and set-based classification in simple contexts	• KS4: conditional probability (formal notation and tree diagrams) • KS4: independent and dependent events in probability • KS4: statistical reasoning and data interpretation (box plots, histograms, cumulative frequency) • KS5: probability distributions (binomial and normal), hypothesis testing, set theory formalisation, and mathematical proof in statistics
11	Functions and graphs	Spring	• Using and interpreting function notation ($f(x)$) • Evaluating functions for given values of x • Finding inverse functions • Finding composite functions • Sketching and interpreting quadratic, cubic, reciprocal and exponential graphs • Solving equations graphically using functions • Interpreting transformations of graphs (translations and reflections of $y = f(x)$) • Linking algebraic expressions, functions and graphs fluently	• KS4: straight line graphs ($y = mx + c$) • KS4: quadratic graphs and basic curve sketching • KS4: substitution into expressions and formulae • KS4: rearranging simple equations • KS3: coordinates in all four quadrants • KS3: algebraic notation and simplifying expressions • KS3: understanding indices and basic graph interpretation	• KS5: advanced function theory (domain and range, transformations) • KS5: calculus (differentiation and integration of functions) • KS5: exponential and logarithmic functions • KS5: parametric and composite modelling • KS5: proof and algebraic structure of functions and transformations
12	Equations and formulae	Spring	• Solving linear equations, including unknowns on both sides • Solving equations involving brackets and	• KS4: solving linear equations (including brackets and unknowns on both sides) • KS4: basic inequalities and number line	• KS4: quadratic equations (factorising, completing the square, formula) • KS4: algebraic fractions and advanced



			fractions • Solving linear inequalities and representing solutions on number lines • Rearranging formulae, including more complex multi-step formulae • Substituting into formulae and interpreting results in context • Forming and solving equations from worded problems • Solving simultaneous equations (linear-linear and linear-non-linear introduction where appropriate) • Using algebra to support reasoning and problem solving	representation • KS4: expanding brackets and simplifying expressions • KS4: substitution into formulae • KS3: algebraic notation and simplifying expressions • KS3: inverse operations and solving one/two-step equations • KS3: basic number skills (fractions, negatives, BIDMAS)	rearranging • KS4: functions and graphical solutions to equations • KS4: simultaneous equations (full algebraic and graphical methods) • KS5: algebraic proof, functions, calculus (differentiation and integration), modelling and iterative methods
13	Rates	Spring	• Understanding and using speed, distance and time relationships • Solving problems involving compound measures (speed, density, pressure) • Converting units in rate problems (including km/h, m/s, etc.) • Interpreting and solving real-life rate of change problems • Using direct proportion in rate contexts • Solving multi-step problems involving rates and proportional reasoning • Using formulae to model real-world situations involving change over time	• KS4 (Year 10): ratio and proportion reasoning • KS4: rearranging formulae and substitution • KS4: unit conversion (length, mass, time, area, volume) • KS3: basic speed, distance and time calculations • KS3: multiplication and division fluency with fractions and decimals • KS3: algebraic substitution and simple equations • KS3: understanding of proportional reasoning in simple contexts	• KS4: inverse proportion and more complex proportional models • KS4: kinematics graphs (distance-time, velocity-time) • KS4: similarity and scale factor problems in geometry • KS4: exponential growth and decay (rates of change in context) • KS5 (A-level): calculus (rates of change, differentiation), mechanics (motion, forces, acceleration), and mathematical modelling of dynamic systems
14	Angles, bearings and trigonometry	Spring	• Using angle rules in parallel lines, polygons and circles to solve complex problems • Solving bearings problems using scale drawings and trigonometric methods • Interpreting and drawing bearings	• KS4 (Year 10): angle rules in parallel lines, polygons and triangles • KS4: basic trigonometry in right-angled triangles (SOHCAHTOA) • KS4: Pythagoras' theorem in 2D geometry	• KS5 (A-level): trigonometric identities and equations • KS5: radians and advanced trig graphs • KS5: vectors in 2D and 3D (including geometry and mechanics) • KS5: calculus applications (rates of



			accurately (three-figure notation) • Applying Pythagoras' theorem in non-right-angled contexts via decomposition • Using trigonometric ratios (SOHCAHTOA) in multi-step problems • Solving 2D and 3D trigonometry problems in context (including elevation/depression) • Combining geometry, algebra and trigonometry in structured reasoning problems • Selecting appropriate methods (angles, trig, Pythagoras) for complex exam problems	• KS4: scale drawings and similarity basics • KS3: angle facts (lines, triangles, quadrilaterals) • KS3: ratio and proportion reasoning • KS3: coordinates and basic geometric construction • KS3: algebraic substitution and rearranging formulae	change, optimisation, modelling motion) • KS5: advanced geometric proof and coordinate geometry
15	Constructions and loci	Spring	• Performing accurate constructions using ruler and compasses • Constructing triangles using SSS, SAS and ASA methods • Constructing perpendicular and angle bisectors • Constructing perpendicular lines from a point to a line • Constructing loci based on distance from points, lines and shapes • Solving loci problems in two dimensions • Using constructions to solve geometric reasoning problems • Interpreting and combining loci regions in problem solving contexts	• KS4 (Year 10): angle rules in triangles and parallel lines • KS4: properties of triangles and quadrilaterals • KS4: Pythagoras' theorem and basic geometric reasoning • KS3: ruler and protractor construction skills • KS3: properties of perpendicular and parallel lines • KS3: basic circle and distance reasoning • KS3: algebraic and spatial reasoning in simple geometric contexts	• KS4: circle theorems and formal geometric proof • KS4: similarity and congruence proof problems • KS4: vectors and coordinate geometry proof • KS5 (A-level): geometric proof and loci in coordinate geometry • KS5: vectors in 2D and 3D space (geometry and mechanics applications) • KS5: calculus-based optimisation and geometric modelling
16	Transformations	Summer	• Describing and performing transformations on shapes in the coordinate plane • Performing translations using vector notation	• KS4 (Year 10): basic transformations (translation, reflection, rotation, enlargement) • KS4: coordinates in all four quadrants • KS4: vectors as translations in simple	• KS5 (A-level): matrices for transformations • KS5: vectors in 2D and 3D geometry • KS5: proof and geometric reasoning in coordinate geometry



		• Reflecting shapes in lines (including x-axis, y-axis and lines such as $y = x$) • Rotating shapes about a point, including multiple 90° rotations • Performing enlargements, including fractional and negative scale factors • Identifying and describing combinations of transformations • Recognising invariant points and lines under transformation • Solving multi-step geometric reasoning problems involving transformations	form • KS4: properties of shapes and symmetry • KS3: basic transformations on grids • KS3: angle facts and geometric reasoning • KS3: multiplication and ratio reasoning	• KS5: calculus applications in modelling change and motion • KS5: complex transformations in functions and graphs
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Number	Geometry	Ratio & proportion	Algebra	Statistics
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