

Mathematics		<i>Curriculum Checkpoints: What do students know and what can they do?</i>				MW Clips (KS4)	Knowledge Organiser
Year 9		Developing	Securing	Mastering	Excelling		
Summative Comment							
AF1	3D Shapes	Sketching and recognising nets of 3D shapes.	Creating accurate nets of various 3D shapes.	Creating accurate and complex nets of 3D shapes.	Exploring volumes of complex 3D shapes and their properties.	171 172 173 174	3D Shapes
		Interpreting plans/elevations and calculating surface area.	Interpreting complex plans/elevations and calculating surface area/volume.	Analysing plans/elevations with attention to detail and calculating surface area/volume accurately.	Applying advanced techniques to calculate volumes, compare shapes, and solve challenging problems.		
AF2	Testing Conjectures	Determining if statements are true or false, categorizing them as "always," "sometimes," or "never" true.	Formulating conjectures about numbers based on patterns and observations.	Formulating conjectures involving algebraic expressions and equations.	Developing and proving advanced conjectures and theorems related to numbers.	156	Testing conjectures
		Showing mathematical statements to be true through logical reasoning or counterexamples.	Expanding a pair of binomials using the distributive property.	Expanding three binomials using the distributive property.	Applying advanced techniques to expand and simplify expressions with multiple binomials.		
AF3	Line graphs	Understanding and using the equation $y = mx + c$, where m represents the gradient and c represents the y-intercept.	Finding the equation of a line from a graph, using the gradient and y-intercept.	Modelling real-life graphs involving inverse proportion, understanding the relationship between variables and their graphical representation.	Applying advanced concepts of linear equations and functions to solve complex problems involving $y = mx + c$.	96 a7	Straight line

AF3	Straight Lines	Writing equations in the form $y = mx + c$, given information about the gradient and y-intercept.	Interpreting gradients and intercepts of real-life graphs, understanding their meaning in context.	Exploring perpendicular lines, recognizing their properties and understanding how to identify and work with them.	Extending the understanding of perpendicular lines to more intricate scenarios, such as finding equations of lines that are perpendicular to a given line or exploring the properties of perpendicular bisectors.	159a	graphs
AF4	Forming and solving equations	Understanding and solving inequalities involving negative numbers.	Applying equations and inequalities in various mathematical contexts, such as geometry, statistics, or algebraic expressions.	Rearranging formulae using one-step operations, such as isolating a variable or simplifying expressions.	Mastering the skill of rearranging complex formulae involving multiple variables and intricate expressions.	135a 135b 136 137 191 192	Forming and Solving Equations
		Solving equations and inequalities with unknowns on both sides of the equation.	Understanding and using formulae and equations to represent relationships between variables.	Rearranging formulae using two-step operations, involving multiple variables and complex expressions.	Applying advanced techniques, such as substitution or simultaneous equations, to manipulate and rearrange complex formulae effectively.		
AF5	Constructions & Congruency	Understanding and applying the concept of loci, including identifying and sketching loci based on given conditions.	Identifying congruent figures, recognizing when two figures have the same shape and size.	Applying advanced techniques to construct loci in more complex situations.	Exploring and applying advanced concepts in loci, including loci in coordinate geometry or loci involving more complex shapes.	145a 145b 145c 147	Constructions & congruency
		Constructing an angle bisector using basic geometric tools.	Identifying congruent triangles, recognizing when two triangles have the same shape and size.	Demonstrating a deep understanding of congruent figures and triangles, including using congruence criteria and congruence postulates.	Analyzing and proving congruence of figures and triangles using advanced geometric reasoning and theorems.		
AF6	Numbers	Understanding and distinguishing between integers, real numbers, and rational numbers.	Understanding and using surds (square roots of non-perfect square numbers) in calculations and simplifications.	Applying advanced techniques to solve problems involving surds, such as rationalizing denominators or simplifying expressions with surds.	Applying surds in more complex mathematical contexts, such as solving equations or proving mathematical properties.	1 28	Numbers

AF6	Num	Solving problems that involve integers and decimals, including addition, subtraction, multiplication, and division.	Solving problems that involve fractions, including addition, subtraction, multiplication, and division	Demonstrating a deep understanding of numbers in standard form, including converting between standard form and decimal form and performing calculations with numbers in standard form.	Applying advanced techniques and concepts to solve complex problems involving fractions, decimals, and numbers in standard form.	81 156	Numbers
AF7	Using percentages	Understanding the equivalence between fractions, decimals, and percentages.	Calculating percentage increase and decrease, comprehending how to determine the difference and express it as a percentage of the original value.	Solving reverse percentage problems, determining the original value given a final value and the percentage change.	Solving problems involving repeated percentage change, understanding how to calculate the overall percentage change after multiple changes.	40 86 87 88	Using Percentages
		Recognising and using the relationship between fractions, decimals, and percentages in basic calculations.	Expressing a change as a percentage, comprehending how to calculate the percentage change from an original and final value.	Recognising and solving various types of percentage problems, such as finding a percentage of a quantity, percentage discounts, or percentage markups.	Applying advanced strategies and techniques to solve complex percentage problems and real-world applications involving percentages.	89 109 110	
AF8	Maths and money	Solving problems related to bills and bank statements, including calculating totals, making payments, and understanding transaction records.	Solving problems involving Value Added Tax (VAT), such as calculating VAT amounts, determining final prices, and understanding VAT rates.	Calculating compound interest in more complex financial situations, considering factors like compounding periods and interest rates.	Applying advanced techniques and formulas to solve complex unit pricing problems, comparing prices of different quantities and products.	105 106	Maths and Money
		Understanding and calculating simple interest in basic financial scenarios.	Calculating wages and taxes, including deductions for income tax and National Insurance contributions.	Solving problems with exchange rates, such as converting currencies, calculating exchange fees, and understanding fluctuations in rates.	Analysing and evaluating financial scenarios involving bills, bank statements, interest, taxes, and exchange rates to make informed decisions and recommendations.	111 162	
AF9	Reasoning	Understanding and applying the properties of angles in parallel lines, such as corresponding angles, alternate angles, and interior angles.	Solving angle problems using chains of reasoning, connecting multiple angle relationships and using deductive reasoning to find missing angles.	Developing and proving conjectures about angles, including general patterns and relationships between angles in different geometric configurations.	Making connections between constructions and geometric reasoning, using geometric constructions as a tool to understand and prove geometric properties.	156	Reasoning

AF9	Deduction	Solving angle problems by using basic reasoning and identifying angle relationships.	Applying algebraic techniques to solve angle problems, including setting up and solving equations involving angle measures.	Developing and proving conjectures about shapes, including properties and relationships between angles and sides in different polygons.	Applying advanced geometric reasoning and proof techniques to analyse and solve complex angle and shape problems, including using transformational geometry or coordinate geometry to support arguments.	187	Deduction
AF10	Rotation and Translation	Understanding rotational symmetry and line symmetry and identifying their similarities and differences.	Translating points and shapes by a given vector, understanding how to move objects in a specified direction and distance.	Analysing and predicting the outcome of a series of transformations, including rotations, translations, and reflections, applied to a given shape.	Exploring and utilising advanced concepts in transformations, such as scaling or shearing, in addition to rotations, translations, and reflections.	49 50	Rotations and Translations
		Rotating a shape about a given point by a specified angle.	Comparing rotation and reflection of shapes, recognising their effects on the orientation and position of the shapes.	Applying advanced concepts and techniques to determine the result of complex sequences of transformations.	Applying a deep understanding of transformations to create artistic or mathematical designs, considering the effects of multiple transformations and exploring creative possibilities.		
AF11	Pythagoras theorem	Understanding squares and square roots, including their properties and relationships.	Calculating the hypotenuse of a right-angled triangle using the Pythagorean theorem.	Applying the Pythagorean theorem on coordinate axes, solving problems involving distance and coordinates.	Applying the Pythagorean theorem in three-dimensional shapes, such as finding the lengths of diagonals or distances in 3D objects.	150a 150b 150c 170	Pythagoras
		Determining whether a triangle is right-angled based on its given side lengths or angle measures.	Calculating missing side lengths in right-angled triangles using the Pythagorean theorem.	Exploring and understanding different proofs of the Pythagorean theorem, including geometric and algebraic proofs.	Applying advanced concepts related to the Pythagorean theorem, such as using it to derive other mathematical formulas or exploring its connections to trigonometry and geometric constructions.		
AF12	Enlargement & Similarity	Recognising enlargement and similarity in geometric shapes, understanding the relationship between similar figures.	Enlarging a shape using a positive fractional scale factor, understanding how it affects the size and proportions of the shape.	Enlarging a shape by a negative scale factor, understanding how it results in a reflection or rotation of the shape.	Exploring ratios in right-angled triangles, understanding the relationships between sides, angles, and trigonometric functions.	148 144 141	Enlargement

AF12	Enlargement	Enlarging a shape using a positive integer scale factor from a given point.	Understanding and applying the concept of similar triangles to determine missing sides and angles in a given pair of similar shapes.	Solving problems involving similar triangles, including finding corresponding sides, angles, and using proportional relationships to determine missing measurements.	Applying advanced techniques and concepts to solve complex problems involving similar triangles, such as proving similarity using angle-angle or side-angle-side criteria and using similarity to find unknowns.	171 202a 202b	& Similarity
AF13	Ratio and proportion	Solving problems involving direct proportion, understanding how two quantities vary in relation to each other.	Solving problems with inverse proportion, understanding how two quantities vary in an inverse relationship.	Solving ratio problems given the whole or a part, using ratios to determine unknown quantities in various contexts.	Solving problems involving ratios and algebra, applying algebraic techniques to solve complex ratio problems.	38 39 106	Ratio and Proportion
		Recognising and interpreting conversion graphs that represent direct proportion relationships.	Graphing and interpreting graphs of inverse relationships, understanding the characteristics of their graphs.	Solving best buy problems, analysing and comparing different options based on their value or cost-effectiveness.	Applying advanced strategies and mathematical reasoning to solve intricate problems involving ratio relationships, such as combining ratios with other concepts like percentages or fractions.	200a 200b 200c	
AF14	Rates	Recognising the relationship between speed, distance, and time in simple problems.	Solving more complex speed, distance, and time problems, including scenarios with varying speeds or distances.	Applying advanced techniques to solve intricate speed, distance, and time problems, such as problems involving multiple segments with different speeds or time intervals.	Solving challenging speed, distance, and time problems involving advanced concepts, such as relative motion, acceleration, or complex time intervals.	165c 212	Rates
		Applying basic formulas (e.g., speed = distance ÷ time) to solve straightforward speed, distance, and time problems.	Applying different formulas (e.g., distance = speed × time, time = distance ÷ speed) based on the given information to find the missing variable.	Analysing real-world situations and applying mathematical reasoning to determine the appropriate formula and solve speed, distance, and time problems accurately.	Applying mathematical modelling and advanced problem-solving strategies to solve complex, real-world speed, distance, and time problems.		
AF15	Probability	Understanding and calculating single event probability, including determining the likelihood of an event occurring based on the ratio of favorable outcomes to total outcomes.	Understanding and applying the concept of expected outcomes, including calculating the expected value of an event by multiplying each outcome by its corresponding probability.	Using tree diagrams to represent and calculate probabilities of multiple events, understanding how to determine the overall probability by multiplying individual probabilities along the branches.	Applying diagrams, such as Venn diagrams or probability grids, to work out probabilities of events involving multiple conditions or variables.	14 58 59 60 61	Probability

AF15	Probability	Understanding the concept of relative frequency and its relationship to probability, including recognising how the frequency of an event approaches its theoretical probability with more trials.	Recognising and working with independent events, understanding that the outcome of one event does not affect the outcome of another event.	Utilising tree diagrams to solve problems involving events without replacement, recognising the impact of removing objects or outcomes from the sample space.	Applying advanced probability concepts and techniques, such as conditional probability or Bayes' theorem, to solve complex problems and analyse real-world scenarios.	127a 127b 185 194	Probability
AF15	Algebraic Representation	Drawing and interpreting quadratic graphs, understanding the key features such as vertex, axis of symmetry, and direction of opening.	Investigating graphs of simultaneous equations, understanding how the graphs of two or more equations can intersect or be parallel.	Applying advanced techniques to draw and interpret quadratic graphs with complex features, such as transformations, multiple roots, or asymmetry.	Exploring and investigating graphs of simultaneous equations with non-linear functions, recognising the possibilities of multiple intersections or special cases.	24 25 26 39 59 101	Algebraic Representation
		Interpreting various types of graphs, including reciprocal functions and piecewise defined functions.	Representing inequalities graphically, understanding how to plot and shade regions that satisfy the given inequality.	Analysing and solving systems of simultaneous equations graphically, understanding how the solution corresponds to the intersection points of the graphs.	Applying graphical methods to solve and analyse complex systems of inequalities involving multiple variables and regions in the coordinate plane.	103 104 136 137 156 157	