Medium Term Planning – AC2

Curriculum: Mathematics

Excellence. No Excuses.

Year	Topic Detail and Sequence	Pre-requisite Knowledge	Key Vocabulary	Demonstrable Skills
7	<u>Number 2</u> Primes, factors, multiples HCF/LCM Prime factorisation Squares/cubes/Roots <u>Algebra 2</u> Solve linear including x's on both sides Inequalities, linear, number line <u>Length, area, volume and similarity</u> Length Area of shapes Volume of prisms <u>Angles</u> Angle basics (straight line, around a point, opposite, right angles Angle in shapes (basics – triangle, quadrilaterals, simple proof)	Basic number skills covered in AC1 and KS2. Multiplication and division. Algebra 1 from AC1 Length of shapes, units for measurement. Area – what it is and calculated for basic shapes. What volume is and understand you can measure it in cubes. What is an angle (measure of turn). Different types of angles at ks2.	Multiples Factors Prime numbers Common (multiples and factors) Integer Solve Linear Inverse operation Equation Brackets Triangle/rectangle/parallelogram/ trapezium Area Compound Cube/cuboid/prism Cylinder Point Straight line Vertically opposite Right angle Equilateral Isosceles Scalene	<u>Number 2</u> • Identify multiples, factors and prime numbers from lists of numbers • Write out lists of multiples and factors to identify common multiples or common factors of two or more integers • Write a number as the product of its prime factors and use formal (eg using Venn diagrams) and informal methods (eg trial and error) for identifying highest common factors (HCF) and lowest common multiples (LCM) • Work out a root of a number from a product of prime factors • recall squares of numbers up to 15 x 15 and the cubes of 1, 2, 3, 4, 5 and 10, also knowing the Corresponding roots • Calculate and recognise powers of 2, 3, 4, 5 and 10 • Understand the notation and be able to work out the value of squares, cubes and powers of 10, also the square root <u>Algebra 2</u> • Solve simple linear equations by using inverse operations or by transforming both sides in the same way • Solve simple linear equations with integer coefficients where the unknown appears on one or both sides of the equation or where the equation involves brackets • Solve simple linear inequalities in one variable • Represent the solution set of an inequality on a number line, knowing the correct conventions of an open circle for a strict inequality eg $x < 3$ and a closed circle for an inclusive inequality eg $x \leqslant 3$ <u>Length, area, volume and similarity</u> • Work out the perimeter of a rectangle/triangle/compound shapes • Calculate the perimeter of shapes drawn on a grid • Calculate the perimeter of simple shapes • Recall and use the formulae for the area of a rectangle, triangle, parallelogram and trapezium • Work out the area of a rectangle/triangle/parallelogram/trapezium • Calculate the area of compound shapes made from triangles and rectangles (including L and T shapes) • Calculate the area of shapes drawn on a grid • Calculate the area of simple shapes • Work out the surface area of nets made up of rectangles and triangles • Recall and use the formula for the volume of a cube or cuboid <u>Angles</u> • work out the size of missing angles at a point • work out the size of missing angles at a point on a straight line • know that vertically opposite angles are equal • justify an answer with explanations such as 'angles on a straight line', etc. • use angle properties of equilateral, isosceles and right-angled triangles use the fact that the angle sum of a quadrilateral is 360^{o}

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8	<u>Number 2</u> Primes, factors, multiples HCF/LCM Prime factorisation Squares/cubes/Roots Indices <u>Algebra 2</u> Solve linear including x's on both sides Inequalities, linear, number line Circle formulae Change the subject <u>Length, area, volume and similarity</u> Length Area of shapes Volume of prisms Congruence Circles, area and circumference <u>Angles</u> Angle basics (straight line, around a point, opposite, right angles Angle in shapes (basics – triangle, quadrilaterals, simple proof) Properties of triangles/quadrilaterals	Primes, factors, multiples HCF/LCM Prime factorisation Squares/cubes/Roots Circles – parts of. Algebra 1 and 2 year 7 and 8. Length Area of shapes Volume of prisms Circles in the algebra 2 section above. Angle basics (straight line, around a point, opposite, right angles) Angle in shapes (basics – triangle, quadrilaterals, simple proof)	Product Prime factor Venn Lowest common multiple (LCM) Highest common factor (HCF) Formula (formulae) Subject of a formula (change) Congruence Rotate Reflect Quadrilateral Symmetry Isosceles Equilateral Scalene Right-angled Acute Obtuse Pentagon Hexagon Octagon Decagon.	<u>Number 2</u> • use index laws for multiplication and division of integer powers • calculate with positive integer indices <u>Algebra 2</u> • understand and use formulae from maths and other subjects expressed initially in words and then using letters and symbols. For example formula for area of a triangle, area of a parallelogram, area of a circle, volume of a prism, conversions between measures, wage earned = hours worked x hourly rate + bonus • change the subject of a formula • solve equations such as $x^2 = 25$, giving both the positive and negative roots <u>Length, area, volume and similarity</u> • understand congruence • identify shapes that are congruent • recognise congruent shapes when rotated, reflected or in different orientations • recall and use the formula for the circumference of a circle • work out the circumference of a circle, given the radius or diameter • work out the radius or diameter of a circle, given the circumference • use π = 3.14 or the π button on a calculator • recall and use the formula for the area of a circle • work out the area of a circle, given the radius or diameter • work out the radius or diameter of a circle, given the area <u>Angles</u> • recall the properties and definitions of special types of quadrilaterals/triangles • name a given shape • identify and use symmetries of special types of quadrilaterals/triangles • identify a shape given its properties • list the properties of a given shape • draw a sketch of a named shape • identify quadrilaterals that have common properties • classify quadrilaterals using common geometric properties *Notes: Including knowing names and properties of isosceles, equilateral, scalene, right-angled, acute-angled and obtuse-angled triangles.* *Including knowing names: pentagon, hexagon, octagon and decagon.*

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9	<u>Number 2</u> Primes, factors, multiples HCF/LCM (Venn diagram introduction) Prime factorisation Squares/cubes/Roots Indices **Index laws (Multiplication law, division law, negative index law)** <u>Algebra 2</u> Solve linear including x's on both sides Inequalities, linear, number line Circle drawing / Circle formulae Use of Formula Change the subject **Using algebra to solve problems** **Simultaneous linear equations** <u>Length, area, volume and similarity</u> Length Area of shapes Volume of prisms Congruence Circles, area and circumference **Sector/arc length – angle problems (NC KS4! Here to make sense with the circles topic)** <u>Angles</u> Angle basics (straight line, around a point, opposite, right angles Angle in shapes (basics – triangle, quadrilaterals, simple proof) Properties of triangles/quadrilaterals **Parallel lines** **Polygons**	Primes, factors, multiples HCF/LCM (Venn diagram introduction) Prime factorisation Squares/cubes/Roots Indices Solve linear equations including x's on both sides Inequalities, linear, number line Circle drawing / Circle formulae Use of Formula Change the subject Length Area of shapes Volume of prisms Congruence Circles, area and circumference Angle basics (straight line, around a point, opposite, right angles Angle in shapes (basics – triangle, quadrilaterals, simple proof) Properties of triangles/quadrilaterals	Product of prime factors Simultaneous equations Circumference Radius Diameter π Parallel lines Alternate Corresponding Parallelogram Interior angle Exterior angle Polygon	<u>Number 2</u> • Use index laws for multiplication and division of integer powers • Calculate with positive/negative integer indices. <u>Algebra 2</u> • Set up simple linear equations • Rearrange simple linear equations • Set up simple linear equations to solve problems • Set up a pair of simultaneous linear equations to solve problems • Interpret solutions of equations in context. <u>Length, area, volume and similarity</u> • Work out the perimeter/area of semicircles, quarter circles or other fractions of a circle • Calculate the length/area of arcs of circles • Given the lengths or areas of arcs, calculate the angle subtended at the centre <u>Angles</u> • Understand and use the angle properties of parallel lines • Recall and use the terms alternate angles and corresponding angles • Work out missing angles using properties of alternate angles, corresponding angles and interior angles • Understand the consequent properties of parallelograms • Derive and use the proof that the angle sum of a triangle is 180^o • Derive and use the proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices • Use angle properties of equilateral, isosceles and right-angled triangles • Use the fact that the angle sum of a quadrilateral is 360^o • Calculate and use the sums of interior angles of polygons • Recognise and name regular polygons: pentagons, hexagons, octagons and decagons use the angle sum of irregular polygons • Calculate and use the angles of regular polygons • Use the fact that the sum of the interior angles of an n-sided polygon is $180(n - 2)$ use the fact that the sum of the exterior angles of any polygon is 360^o • Use the relationship interior angle + exterior angle = 180^o • Use the sum of the interior angles of a triangle to deduce the sum of the interior angles of any polygon

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10	<u>Number 2</u> Primes, factors, multiples HCF/LCM (Venn diagram introduction) Prime factorisation Squares/cubes/Roots Indices Index laws (including negatives) **Fractional indices and laws (H*)** **Listing Strategies** **Standard form** **Exact values (fractions/pi) + surds (H*)** <u>Algebra 2</u> Solve linear including x's on both sides Inequalities, linear, number line Use of Formula Change the subject Using algebra to solve problems Simultaneous linear equations **Solving quadratics** **Simultaneous equations (Quadratic) (H*)** **Algebraic problem solving** <u>Length, area, volume and similarity</u> Length Area of shapes Volume of prisms Congruence Circles, area and circumference Parts of circle – angle problems **Volume/surface area cones and pyramids** **Congruence proof** <u>Angles</u> Angle basics (straight line, around a point, opposite, right angles Angle in shapes (basics – triangle, quadrilaterals, simple proof) Properties of triangles/quadrilaterals Parallel lines Polygons **Circle theorems (H*)** **Angle problems**	Primes, factors, multiples. HCF/LCM (Venn diagram introduction). Prime factorisation. Squares/cubes/Roots. Indices. Index laws (including negatives). Solve linear including x's on both sides. Inequalities, linear, number line. Use of Formulae. Change the subject. Using algebra to solve problems. Simultaneous linear equations. Length Area of shapes Volume of prisms Congruence Circles, area and circumference. Parts of circle – angle problems. Angle basics (straight line, around a point, opposite, right angles Angle in shapes (basics – triangle, quadrilaterals, simple proof). Properties of triangles/quadrilaterals. Parallel lines. Polygons.	Permutation Square Cube Root Power Index Standard form Quadratic equation Quadratic formula Simultaneous Elimination Substitution Intersection Sphere Pyramid Cone Compound solid Semicircle Arc Subtended Tangent Perpendicular Chord Congruent triangles Alternate segment Polygon	<u>Number 2</u> • Identify all permutations and combinations and represent them in a variety of formats • Know and understand why if there are x ways to do task 1 and y ways to do task 2, then there are xy ways to do both tasks in sequence • Estimate the value of a power/root of a given positive number • Identify between which two integers the square/cube root of a positive number lies • Calculate values using fractional indices • Use index laws for multiplication and division of positive, negative and fractional indices • Know, use and understand the term standard from, write an ordinary number in standard form and vice versa • Order and calculate with numbers written in standard form • Solve simple equations where the numbers are written in standard form • Interpret calculator displays and use a calculator effectively for standard form calculations • Solve standard form problems with and without a calculator • Simplify surds • Rationalise a denominator • Simplify expressions/expanding brackets/solving equations with surds <u>Algebra 2</u> • Solve quadratic equations by factorising, completing the square or using the quadratic formula • Solve geometry problems that lead to a quadratic equation that can be solved by using the quadratic formula • Read approximate solutions from a graph. • Solve simultaneous linear equations by elimination or substitution or any other valid method • Find approximate solutions using the point of intersection of two straight lines • Solve simultaneous equations when one is linear and the other quadratic • Appreciate that the solution of f(x) = ax + b is found where y = ax + b intersects with y = f(x) • Set up /rearrange and solve simple linear equations • Set up a pair of simultaneous linear equations to solve problems • Interpret solutions of equations in context <u>Length, area, volume and similarity</u> • Work out the surface area/volume of spheres, pyramids, cones and compound solids constructed from cubes, cuboids, cones, pyramids, cylinders, spheres and hemispheres • Solve real-life problems using known solid shapes • Understand and use conditions for congruent triangles: SSS, SAS, ASA and RHS • Recognise congruent shapes when rotated, reflected or in different orientations • Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and compass constructions. <u>Angles</u> • Recall the definition of a circle and understand related terms of a circle • Recall/identify/name and draw the parts of a circle • Understand that the tangent at any point on a circle is perpendicular to the radius at that point • Understand and use the fact that tangents from an external point are equal in length • Use congruent triangles to explain why the perpendicular from the centre to a chord bisects the chord • Understand that inscribed regular polygons can be constructed by equal division of a circle • Prove/use 1) angle subtended by an arc twice that at any point on the circumference 2) angle subtended at the circumference by a semicircle is a right angle 3) angles in the same segment are equal 4) opposite angles of a cyclic quadrilateral sum to 180° 5) prove and use the alternate segment theorem. • Understand similarity and of triangles (Pythagoras in AC3 cover that bit there) and of other plane figures, and use this to make geometric inferences • Identify shapes that are similar, including all squares, all circles or all regular polygons with equal number of sides • Recognise similar shapes when rotated, reflected or in different orientations • Show step-by-step deduction in solving a geometrical problem • State constraints and give starting points when making deductions

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11	<u>Number 2</u> Primes, factors, multiples HCF/LCM (Venn diagram introduction) Prime factorisation Squares/cubes/Roots Indices Index laws Fractional/negative indices and laws (H*) Listing Strategies Standard form Exact values (fractions/pi) + surds (H*) <u>Algebra 3 (</u>From ac3 algebra 3) Coordinates in 1 and 4 quadrants Shape using coordinates Midpoints Application of coordinates y = mx + c, finding grad and y intercept Table of vales of y = mx + c Plotting functions (inc. straight line) Grad from two points Recognise (inc rearranging) lines that are parallel Find eqn of line (two points or 1 pt and grad) Show lines are parallel/perp (neg reciprocal) Quadratic graphs – finding features of QTS and use for turning point Plot graphs –inc linear/quad/reciprocal – finding approx. values Trig graphs Eqn of a circle Intersection circle/straight line, eqn tangent to graph **Transformations of graphs (H*)** **Distance time** **Velocity Time graphs (H*)** **Complex graphs (exponential, circle etc) (H*)** **Gradients and rates of change (tangents, perpendicular, chords) (H*)** **Formal Direct/Inverse Proportion (H*)** <u>Length, area, volume and similarity</u> Length Area of shapes Volume of prisms Congruence Circles, area and circumference Sector/arc length Volume/surface area cones and pyramids Congruence proof **Compare length – ratio/similarity** **Similar shapes – length/area/volume (H*)**	y = mx + c, Find eqn of line Plot graphs –inc linear/quad/reciprocal – finding approx. values Length Area of shapes Volume of prisms Congruence Circles, area and circumference. Sector/arc length. Volume/surface area. Ratio.	Surd Rational Irrational Rationalise the denominator Transformation Translation Reflection Kinematics Rate (rates of change) Reciprocal Exponential Velocity Gradient Proportion (direct and indirect) Tangent Chord Similar Enlargement	<u>Algebra 3</u> • Transform the graph of any function f(x) and recognise transformations of functions and be able to write down the function of a transformation given the original function. • Plot a graph representing a real-life problem from information given in words, in a table or as a formula • Identify the correct equation of a real-life graph from a drawing of the graph • Read from graphs representing real-life situations; for example, work out the cost of a bill for so many units of gas or the number of units for a given cost, and also understand that the intercept of such a graph represents the fixed charge • Interpret linear graphs representing real-life situations; for example, graphs representing financial situations (eg gas, electricity, water, mobile phone bills, council tax) with or without fixed charges and also understand that the intercept represents the fixed charge or deposit • Plot and interpret distance-time graphs • Interpret line graphs from real-life situations (conversion graphs etc…) • Interpret graphs showing real-life situations in geometry, such as the depth of water in containers as they are filled at a steady rate • Interpret non-linear graphs showing real-life situations, such as the height of a ball plotted against time • Draw an exponential graph • Understand the main features of an exponential graph • Calculate the area under a graph consisting of straight lines • Estimate the gradient at a point on a curve by drawing a tangent at that point and working out its gradient • Interpret the meaning (and give the units) of the gradient at a point on a curve • Use the areas of trapezia, triangles and rectangles to estimate the area under a curve • Interpret the meaning of the area calculated as the product of the units of the variable on the vertical axis and the units of the variable on the horizontal axis. *The trapezium rule need not be known but it is recommended as the most efficient means of calculating the area under a curve.* *Students should know that the area under a speed-time graph represents distance.* *Students should know that if the vertical axis represents distance on a distance-time graph, then the gradient will represent speed.* *Students should know that if the vertical axis represents velocity on a velocity-time graph, then the gradient will represent acceleration.* *Students should understand the difference between positive and negative gradients as increasing speed and decreasing speed on a distance-time graph.* *Students should know that the rate of change at a particular instant in time is represented by the gradient of the tangent to the curve at that point.* • Interpret the meaning of the gradient as the rate of change of the variable on the vertical axis compared to the horizontal axis • Match direct and inverse proportion graphs to their equations and vice versa • Draw graphs to represent direct and inverse proportion. • Draw a tangent at a point on a curve and measure the gradient • Interpret the meaning of the gradient as the rate of change of the variable on the vertical axis compared to the horizontal axis • Understand that if the vertical axis represents speed/velocity and the horizontal axis represents time then the gradient will represent acceleration • Understand that if the vertical axis represents distance and the horizontal axis represents time then the gradient will represent speed/velocity • Understand the difference between positive and negative gradients as rates of change • Understand that the rate of change at a particular instant in time is represented by the gradient of the tangent to the curve at that point • Understand that the average rate of change is represented by a chord. <u>Length, area, volume and similarity</u> • Compare lengths, areas or volumes of similar shapes • Understand, recall and use trigonometry ratios in right-angled triangles • Understand the effect of enlargement on perimeter • Work out the side of one shape that is similar to another shape given the ratio or scale factor of lengths • Understand the effect of enlargement on areas/surface areas/volumes of shapes, using ratio to work compare • Work out the area or volume of one of the shape/solid given the area or volume of a similar shape/solid and the ratio or scale factor of lengths of the shape/solid