Curriculum Map: Mathematics Year 9

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Content Declarative knowledge 'I Know'	Integers and Indices Index notation Powers and roots Four rules Inverse operations Factors and Multiples Definitions and terms Prime numbers Highest Common Factor (HCF) and Lowest Common Multiple (LCM) Priority of operations Expressions and Formulae Algebraic terms Substitution into formulae Collecting like terms in sums and differences of terms Simplifying products and quotients Multiplying out brackets Factorising Products of two binomials Equations Linear equations	Angles Angles at a point and on a line Angles between intersecting and parallel lines Properties of triangles and quadrilaterals including symmetry Angles in a triangle Fractions and Decimals Equivalent fractions Calculations with fractions Exact calculations Fractions of a quantity One quantity as a fraction of another Decimals, fractions and percentage conversions Ordinality and symbols Addition, subtraction multiplication and division of decimals	Sequences Generating terms of a sequence nth term of a linear sequence Special sequences Functions, Graphs and Gradients Functions x- and y-coordinates Graphs of linear functions Graphs of quadratic functions Straight line graphs Gradients 2D and 3D Shapes Polygons Polyhedra and other 3-dimensional solids Plans and elevations	Estimation and Approximation Rounding Estimation Ratio and Proportion Equivalent ratios Division in a given ratio Ratios and fractions Transformations Reflection Rotation Translation	Percentages Percentage calculations Percentage change Growth and decay Perimeter, Area and Volume Perimeter of rectilinear shapes Perimeter of composite shapes Area of a triangle Area of a parallelogram Area of a trapezium Area of composite shapes ==Polyhedra== Circles Circle nomenclature Circumference of a circle Area of a circle	Charts and Averages Categorical and numerical data Misrepresenting data Summary statistics Compound units Speed Density
Skills Procedural Knowledge 'I know how to'	Integers and Indices Write repeated multiplication calculations using index notation Calculate positive integer powers Find square roots and cube roots of integers Estimate powers and roots Use non-calculator methods to calculate the sum, difference, product and	Angles Know and use the terms acute, obtuse, right and reflex angles. Know and use the terms point, line and line segment. Know and use the sum of the angles at a point (360°).	Sequences Generate a sequence by spotting a pattern or using a term-to-term rule given algebraically or in words. Find, algebraically or in words, a position-to-term rule for simple arithmetic sequences. Find the nth term of a linear sequence.	Estimation and Approximation Round numbers to the nearest whole number, ten, hundred and so on. Round numbers to a given number of decimal places (d.p.). Round numbers to a given number of significant figures (s.f.).	Percentages Understand percentage is the 'number of parts per hundred'. Calculate a percentage of a quantity and express one quantity as a percentage of another. Increase or decrease a quantity by a simple percentage.	Charts and Averages Interpret and construct charts appropriate to the data type, including frequency tables, bar charts, pie charts and vertical line charts. Interpret multiple and composite bar charts. Recognise graphical misrepresentation, for

quotient of positive and negative whole numbers. Understand that addition and subtraction, multiplication and division, and powers and roots, are respective inverse operations.

Factors and Multiples
Understand and use the terms odd, even, prime, factor (divisor), multiple, common factor (common divisor), common multiple, square, cube and root. Identify prime numbers less than 20.
Express a whole number as a product of its prime factors.

Find the HCF and LCM of two whole numbers from their prime factorisations.

Know the conventional order for performing calculations involving brackets, four rules and powers, roots and reciprocals.

Expressions and Formulae
Use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors. Substitute positive numbers into simple expressions and formulae to find the value of the subject.

Know and use the sum of the angles at a point on a line (180°).
Use the standard conventions for labelling and referring to the sides and angles of triangles.
Know the basic properties of isosceles, equilateral and right-angled triangles.
Know the basic properties of the square, rectangle, parallelogram, trapezium, kite and rhombus.
Identify reflection and rotation symmetries of triangles and quadrilaterals.
Know and use the sum of the interior angles of a triangle (180°).

Fractions and Decimals
Express a simple fraction as a terminating decimal or vice versa.

Convert between fractions, decimals and percentages.
Understand and use place value in decimals.

Order integers, fractions, decimals and percentages.

Add, subtract, multiply and decimals without a calculator.

Divide a decimal by a whole number.

Recognise sequences of triangular, square and cube numbers and simple arithmetic progressions.
Recognise sequences presented diagrammatically and tabulate results.
Find a position-to-term rule for simple arithmetic sequences algebraically and describe more complex sequences in words.

Functions, Graphs and Gradients
Interpret simple expressions as functions with inputs and outputs.

Work with x- and y-coordinates in all four quadrants.
Use tables of values to plot graphs of linear functions.
Use tables of values to plot graphs of quadratic functions.

Find and interpret the gradient and intercept of straight lines, graphically and from using $y = mx + c$.
Understand the relationship between gradient and ratio.

2D and 3D Shapes
Know and use the terms for 2D and 3D shapes.

Estimate or check, without a calculator, the result of a calculation by using suitable approximations.

Ratio and Proportion
Find the ratio of quantities in the form $a{:}b$ and simplify.
Find the ratio of quantities where the parts are given in different units.
Find the ratio of quantities in the form $1{:}n$.

Split a quantity into two parts, given the ratio of the parts.
Express the division of a quantity into two parts as a ratio.

Calculate one quantity from another, given the ratio of the two quantities.
Interpret a ratio of two parts as a fraction of a whole.

Transformations
Reflect a simple shape in a given mirror line.

Apply decimal multipliers to solve simple original value problems.
Apply decimal multipliers to solve simple interest and depreciation problems, including multiple and partial time periods.
Calculate simple interest.

Perimeter, Area and Volume
Calculate the perimeter of rectilinear shapes.
Apply perimeter formulae in calculations involving the perimeter of composite 2D shapes.

Know and apply the formulae for the area of rectangles, right angled triangles and parallelogram.
Know and apply the formula for the area of a triangle.
Calculate the area of a trapezium.

Calculate the surface area of cuboids and composite prisms.
Calculate the volume of cuboids and other right prisms.

Work out missing dimensions of a polyhedron, given the surface area or volume of the polyhedron.

instance through incorrect scales or labels.
Calculate the mean, mode, median and range for ungrouped data.
Find the modal class, and calculate estimates of the range, mean and median for grouped data.

Compound units
Use and convert simple compound units (e.g. for speed, rates of pay and unit pricing).
Know and apply standard compound measurement formulae:
speed = distance ÷ time,
density = mass ÷ volume

	Simplify algebraic expressions by collecting like terms. Simplify algebraic products and quotients. Simplify algebraic expressions by collecting like terms involving indices. Simplify algebraic expressions by multiplying a single term over a bracket. Take out common factors. Expand products of two binomials. **Equations** Form linear equations. Solve linear equations.		Draw diagrams from written descriptions. Sketch 3D solids on plain paper. On isometric paper represent composite solids composed of cubes. Know and use the terms face, surface, edge, vertex (vertices) and plane. Recognise and know the properties of 3D shapes. Interpret plans and elevations of simple 3D solids.	Identify the mirror line from a shape and its image. Rotate a simple shape clockwise or anti-clockwise through a multiple of 90° about a given centre of rotation. Use a column vector to describe a translation of a simple shape. Perform a specified translation.	**Circles** Understand and use the terms centre, radius, chord, diameter and circumference. Know and apply the formula to calculate the circumference of a circle. Know and apply the formula to calculate the area of a circle. Find areas of simple composite shapes involving semicircles or quadrants.	

Strategies
 	
Conditional Knowledge
 	
'I know when to'
	Integers and Indices
	Use inverse operations to simplify and check calculations, for example in reversing arithmetic in 'I'm thinking of a number' or 'missing digit' problems.
	e.g. 223 - 98
	    = 223 + 2 - 100
	    = 125
	or 25 x 12
	    = 50 x 6
	    = 100 x 3.
	
	Factors and Multiples
	Understand that each whole number can be expressed as a product of prime factors in only one way.
	
	Use a different method to achieve a given answer and critically evaluate which is
		Angles
		Derive the fact that the sum of the interior angles of a triangle is 180°.
		
		Use and select angle properties to calculate unknown angles.
		
		Fractions and Decimals
		Understand the difference between mathematical equivalence as opposed to full simplification.
		
		Investigate whether a fraction will give a terminating or a recurring decimal.
		
		Solve problems set in a range of contexts using
			Sequences
			Study sequences from a range of real-life contexts, representing solutions in words, pictorially, graphically and algebraically.
			
			Functions, Graphs and Gradients
			Find and interpret the gradient and intercept of straight lines using $y = mx + c$ for more complex linear equations.
			
			2D and 3D Shapes
			Make and use connections between different parts of mathematics, e.g. calculating the surface area and volume of different cuboids and
				Estimation and Approximation
				Make and use connections between different parts of mathematics, e.g. rounding measurements when estimating areas
				
				Ratio and Proportion
				Solve ratio and proportion problems.
				
				Understand the relationship between ratio and linear functions.
				
				Transformations
					Percentages
					Evaluate which method is most efficient when calculating percentage increase or decrease.
					
					Translate non-mathematical contexts into a process or a series of mathematical processes, e.g. comparing the performance of different savings accounts.
					
					Solve percentage problems in a range of contexts, including graphical or pictorial form.
					
					Make and use connections between
						Charts and Averages
						Understand why there are estimates of the range, mean and median for grouped data.
						Use statistics to make simple comparisons or describe population characteristics.
						Compare data sets using 'like for like' summary values.
						Understand the advantages and disadvantages of summary values.
						Use summary statistics to make deductions and comparisons about different data sets.
						
						Compound units
						Perform calculations involving speed and

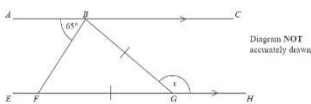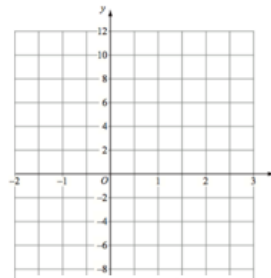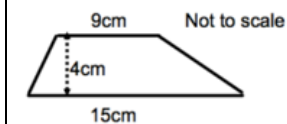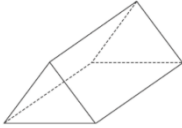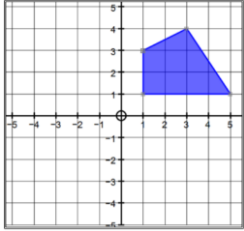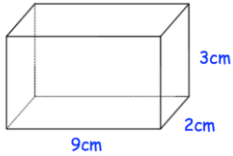|						
	the most suitable method for a given problem, e.g. using prime factor decomposition. **Expressions and Formulae** Understand the difference between mathematical equivalence as opposed to full ==simplification== or factorisation	the appropriate operations.	other simple compound solids.	Explore the link between transformations and congruency. Determine whether pairs of shapes could be transformations of each other by considering lengths, angles and areas. Construct clear mathematical deductions about transforming an image back to its original object position. Describe how to transform a simple shape to produce a tessellation. Make and use connections between transformations and symmetry. Make and use connections between ==transformations== and equations of horizontal and vertical lines.	percentages and fractions, ratios or proportions. **Perimeter, Area and Volume** Apply area formulae in calculations involving the area of composite 2D shapes. Make and use connections between surface area and nets and between volume and isometric 2D representations. **Circles** Use inverse operations to find any unknown in circle calculations. Solve area and volume problems from a range of contexts. Round answers to the appropriate degree of accuracy.	density in problem solving contexts.
Key Questions	1) Evaluate $7 + 8 \div 4$. 2) Expand and simplify $5(y - 2) + 2(y - 3)$ 3) Factorise $6 + 9x$ 4) Solve $7x + 18 = 74$ 5) Solve $7p + 2 = 5p + 8$ 6) I think of a number and multiply it by 3. I then add 5. The result is 29. What was the original number?	1) Work out the size of the angle marked x. Give reasons for your answer. Diagram NOT accurately drawn 2) Complete the table below: 	Fraction	Decimal	Percentage
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$\frac{1}{2}$		
	0.8	
$\frac{2}{3}$		
		30%		1) (a) Complete the table of values for $y = 2x + 4$. | x	-1	0	1	2	3
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y		4			10 | (b) On the grid, draw the graph of $y = 2x + 4$ for values of x from -1 to 3. 	1) Estimate the value of $$\frac{702.1 + 299.3}{1.9 \times 5.1}$$ 2) Simplify the ratio $12 : 32$. 3) Ed has 30 sweets. The ratio of red to yellow sweets is 2:3. a) How many yellow sweets does Ed have? b) What fraction of the sweets are red?	1) Increase 360 by 15%. 2) Decrease 244 by 7%. Give your answer to one decimal place. 3) Calculate the area of the trapezium below: 9cm Not to scale 4cm 15cm	1) Thirty students were asked how many cats they owned. The results are shown in the table. | Number of cats	Number of children
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0	6
1	13
2	7
3	3
4	1	 Calculate the mean number of cats owned per student.

	7) Use index notation to express 3 x 3 x 3 x 3 x 3. 8) Express 60 as a product of prime factors.	3) Write 2 days as a fraction of one week. 4) Calculate 0.2 x 0.3.	2) The first five terms of an arithmetic sequence are 2, 9, 16, 23 and 30. Find, in terms of n, an expression for the nth term of this sequence. 3) (a) What is the name of the solid shape? (b) Write down the number of vertices. 	4) Rotate the shape below 180° about the point (3,1). 	4) Work out the total surface area of the cuboid below: 3cm 2cm 9cm 5) The radius of a circle is 9.7 cm. Work out the area of the circle.	2) A car travels 60 miles in 30 minutes. Calculate the average speed of the car. 3) A car travels at a speed of 50 mph for 4 hours. Calculate the distance travelled.
Assessment topics	Mini assessments of all topics	Mini assessments End of term tests	Mini assessments of all topics	Mini assessments End of term tests	Mini assessments of all topics	Mini assessments End of term tests
Cross curricular links/ Character Education	**Computing** – use of formulae (coding), substitution (CAS system) **History** – the history of number (zero and negative numbers) **MFL** – mathematical vocabulary	**Music** – equivalent fractions (rhythm) **History** – angles (origins) DT – angles (constructions)	**Computing** – generating terms in a sequence (programming), linear graphs (GeoGebra) **History** – sequences (Fibonacci) **Design Technology** – properties of 2D and 3D shapes (structures), plans and elevations	**Art** – transformations (patterns), equivalent ratios (mixing colours) **Geography** – scales (map scales) **Design Technology** – measure and construction (scale drawings), scale and scale factors (models) **Food** – scale (recipes)	**Food** – percentages (healthy eating) **Design Technology** – area (constructions)	**Music** – compound units (tempo) **Geography** – categorical and numerical data (survey outcomes), representing data, interpreting data, bivariate data **History** – measure (origins)