

**The Heathland School**



# **Year 8 Mathematics**

**Scheme of Work**

**2018/19**

## N1 - Place Value, Calculations, Decimals and Estimation

GCSE Band	Starting Points				Place Value BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	<b>Understand place value in numbers to 1000;</b> Read and write whole numbers in figures and words; know what each digit represents.
				A	<b>Use place value to multiply and divide whole numbers by 10 or 100;</b> Understand that multiplying/dividing a number moves the digits left/right. Understand that multiplying by 100 is equivalent to multiplying by 10 and 10 again.
GCSE Band	Starting Points				Written and Mental Methods BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	<b>Add and subtract three digit numbers using written methods</b>
				A	<b>Multiply and divide integers by a single digit</b>
				A	<b>Know the multiplication tables up to 10 x 10 and associated division facts</b>
				A	<b>Add and subtract two-digit numbers mentally</b>
				A	<b>Solve whole-number problems involving multiplication or division, including those that give rise to remainders;</b> Identify appropriate operations to use.
5-3			A	M	<b>Use efficient written methods to add and subtract whole numbers;</b> Include different numbers of digits and totals of more than two numbers.
			A	M	<b>Use efficient written methods to multiply and divide whole numbers;</b> Use a range of different methods, including the grid method, partitioning and repeated subtraction.
			A	M	<b>Use a range of mental methods of computation with all operations</b>
			A	M	<b>Recall multiplication facts up to 12 x 12 and corresponding division facts</b>
7-5		A	M	E	<b>Use efficient written methods to add and subtract integers of any size</b>
GCSE Band	Starting Points				Powers of 10 BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
7-5		A	M	E	<b>Read and write positive integer powers of 10;</b> Know that: 1 hundred is $10 \times 10 = 10^2$ , 1 thousand is $10 \times 10 \times 10 = 10^3$ etc.
9-7	A	M	E		<b>Multiply and divide by any integer power of 10, including negative powers;</b> Know: multiplying by 0.1 has the same effect as multiplying by $1/10$ or dividing by 10 and dividing by 0.1 the same effect as dividing by $1/10$ or multiplying by 10 etc.
9-7	M	E			<b>Understand the effects of multiplying and dividing by numbers between 0 and 1;</b> Multiplying by a number between 0 and 1 makes it smaller and dividing makes it larger. Use this to estimate magnitude of answers.
9-7	E				<b>Convert between ordinary and standard index form numbers</b> Begin to write ordinary numbers in standard form, expressing them as $A \times 10^n$ where $1 \leq A < 10$ , and n is an integer. For example: $734.6 = 7.346 \times 10^2$ and $0.0063 = 6.3 \times 10^{-3}$
	E				<b>Use standard index form for calculations involving multiplication and division.</b>
GCSE Band	Starting Points				Negative Numbers BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	<b>Recognise negative numbers in contexts such as temperature</b> Order positive and negative whole numbers on a number line or thermometer.
5-3			A	M	<b>Add and subtract negative numbers.</b> e.g. $-2 - 8$ and $-4 - -3$
			A	M	<b>Solve problems involving ordering, adding and subtracting negative numbers in context;</b> Understand problems involving temperature and debt/overdrawn balances
7-5		A	M	E	<b>Multiply and divide negative numbers</b>

GCSE Band	Starting Points				Decimals
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
3-1				A	Use decimal notation for tenths and hundredths; Know what each digit represents in numbers with up to two decimal places. Use decimals in contexts such as money. Know that £3.06 equals 306p
5-3			A	M	Understand the different between rational and irrational numbers
			A	M	Use written methods to add and subtract decimals with up to two places; Include sums and differences with different numbers of digits, and totals of more than two numbers
			A	M	Multiply and divide decimals with up to two places by a single digit.
7-5		A	M	E	Use efficient written methods to add and subtract decimals of any size, including numbers with differing numbers of decimals
		A	M	E	Multiply and divide decimals by 10, 100, 1000 and explain the effect. Complete statements: e.g. $0.4 \times \underline{\quad} = 400$ and $0.4 \div \underline{\quad} = 0.004$
9-7	A	M	E		Multiply and divide decimals by 0.1 and 0.01
	A	M	E		Multiply two decimal numbers together
	A	M	E		Divide two decimals together by changing the divisor to an integer
GCSE Band	Starting Points				Ordering
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
3-1				A	Order integers with up to 4 digits
5-3			A	M	Order decimals with up to three decimal places
7-5		A	M	E	Compare and order decimals in different contexts; Know that it is necessary to convert into the same units when comparing
GCSE Band	Starting Points				Rounding and Estimating
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
3-1				A	Round positive whole numbers to the nearest 10, 100 or 1000
5-3			A	M	Round positive numbers to any given power of 10
			A	M	Round decimals to the nearest whole number or one decimal place
			A	M	Round decimals to 2 or 3 decimal places
7-5		A	M	E	Use above rounding to approximate the answer to calculations
		A	M	E	Round integers and decimals to 1 significant number
9-7	A	M	E		Approximate calculations; Approximate by rounding numbers to 1 sig fig before calculating
9-7	M	E			Approximate the result of calculations involving a number less than 1
GCSE Band	Starting Points				Solving Problems
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
7-5	A	M	E		Solve problems using above skills in any context; Know which operations to use, including use of calculator to help
GCSE Band	Starting Points				Using a Calculator
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
5-3			A	M	Use the calculator and interpret the calculator display in different contexts; For example, for money, time or mass
5-3			A	M	Use a calculator to square numbers and to find square roots.
7-5		A	M	E	Use the cube key on a calculator
9-7	A	M	E		Know how to use the $x^y$ key on a calculator to calculate powers.
	A	M	E		Know how to use the reciprocal key on a calculator
	A	M	E		Use a calculator to evaluate more complex expressions
9-7	M	E			Enter numbers and interpret the display on a calculator. Understand how a scientific calculator presents large and small numbers in standard form. Learn to use the ' $\times 10^x$ ' and ' $S \leftrightarrow D$ ' buttons on a calculator to convert to and from index form.

## N2 - BIDMAS, Number Facts and Powers

GCSE Band	Starting Points				<b>BIDMAS/BODMAS</b> BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
5-3			A	M	<b>Know and use the order of operations to work out calculations in correct order;</b> Calculate with mixed operations. For example: a. $16 \div 4 + 8 = 13$ b. $100/4 \times 5 = 5$ c. $(3^2 + 4^2)^2 = 625$
7-5		A	M	E	<b>Know and use the order of operations including brackets;</b> Understand that the position of the brackets is important. a. $3 \times (5 + 3) - (2 \times 7) + 1 = 11$ b. $3 \times (5 + 3) - 2 \times (7 + 1) = 8$
GCSE Band	Starting Points				<b>Number Facts</b> BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Find multiples of whole numbers
				A	Find factors of a numbers less than 100
				A	Identify square numbers up to 100
5-3			A	M	<b>Recognise multiples;</b> Use the divisibility tests to see if numbers are divisible by 2, 3, 4, 5, 6 and 9:
			A	M	Recognise square numbers up to 15 x 15 and their corresponding roots
7-5		A	M	E	Identify the cubes of 2, 3, 4, 5 and 10
		A	M	E	Understand and use prime numbers
9-7	A	M	E		<b>Find the HCF and LCM of a pair of numbers;</b> Solve worded problems that require the use of HCF and LCM
GCSE Band	Starting Points				<b>Powers</b> BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
7-5		A	M	E	<b>Write integers in a simpler form using index notation</b> e.g. $3 \times 3 \times 3 \times 3 \times 3 = 3^5$
9-7	A	M	E		<b>Use the law of indices to multiply and divide numbers written in index form</b> e.g. $p^a \times p^b = p^{a+b}$ , $p^a \div p^b = p^{a-b}$ , $(p^a)^b = p^{ab}$ e.g. $4^3 \times 4^2 = 4^5 = 4^{(3+2)}$ and $4^5 \div 4^2 = 4^3 = 4^{(5-2)}$
	A	M	E		Find the prime factor decomposition of a number
9-7	M	E			Use prime factor decomposition to find the HCF and LCM of two numbers
9-7	E				<b>Begin to extend understanding of index notation to negative and fractional powers</b> Know the notation $5^{1/2} = \sqrt{5}$ , $5^{1/3} = \sqrt[3]{5}$ and $2^{-4} = 1/2^4 = 1/16$

## GM1 - Measures and Mensuration

GCSE Band	Starting Points				Units
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
3-1				A	<b>Estimate, compare and measure lengths, weights and capacities;</b> Choose and use standard units (m, cm, kg, litre) and suitable measuring instruments
3-1				A	<b>Use standard units of time;</b> Read the time in a 24-hour digital clock and use 24-hour clock notation
5-3			A	M	<b>Read and use timetables and calculate journey times</b>
			A	M	<b>Read and interpret scales on a range of measuring instruments.</b>
			A	M	<b>Choose and use names and abbreviations of units of measurement;</b> Find appropriate units to measure, estimate, calculate and solve problems
			A	M	<b>Convert one metric unit to another</b>
			A	M	<b>Convert from one unit to another unit by using a graph</b>
7-5		A	M	E	<b>Convert between area and volume measures;</b> Convert $\text{mm}^2$ to $\text{cm}^2$ , $\text{cm}^2$ to $\text{m}^2$ and vice versa, $\text{mm}^3$ to $\text{cm}^3$ , $\text{cm}^3$ to $\text{m}^3$ and vice versa
		A	M	E	<b>Enter numbers and interpret the display on a calculator in different contexts;</b> Understand that 9.5 for time can mean 9hours and 30mins but for weight can mean 9kg and 500grams
9-7	A	M	E		<b>Plot a conversion graph to convert between two units</b>
	A	M	E		<b>Solve problems involving measurements in a variety of contexts</b>
GCSE Band	Starting Points				Area and Perimeter
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
3-1				A	<b>Estimate the area of an irregular 2D shape by counting squares</b>
				A	<b>Find the area and perimeter of simple shapes by counting squares</b>
5-3			A	M	<b>Find the perimeter of 2-D shapes and compound shapes</b>
			A	M	<b>Know and use the formula for the area of a rectangle</b>
7-5		A	M	E	<b>Use the area of rectangles and triangles to solve problems</b>
	A	M	E		<b>Calculate areas of compound shapes made from rectangles and triangles</b>
9-7	A	M	E		<b>Know and use the formulae for the area of a parallelogram and a trapezium</b>
	A	M	E		<b>Know and use the formulae for the circumference and area of a circle</b>
9-7	M	E			<b>Calculate perimeters and areas of compound shapes made with circles</b>
9-7	E				<b>Calculate arc lengths, areas of sectors and angles of circles</b>
GCSE Band	Starting Points				Surface Area and Volume
	4	3	2	1	BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
7-5		A	M	E	<b>Calculate the surface area of cubes and cuboids</b>
9-7	A	M	E		<b>Calculate the surface area of cuboids and shapes made from cuboids.</b>
	A	M	E		<b>Solve problems involving volume and surface area;</b> Solve problems involving painting of surfaces or capacity of containers
9-7	M	E			<b>Calculate the surface area and volume of prisms.</b>
	M	E			<b>Calculate the surface area and volumes of cylinders.</b>
9-7	E				<b>Know and use the formulae for surface and volume of spheres, pyramids and cones</b>

## N3 – Fractions and Percentages

GCSE Band	Starting Points				Fractions BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Recognise what fraction of a shape has been shaded
				A	Shade a given simple fraction of a shape
				A	Use fraction notation to describe a proportion of a shape; Understand a fraction as part of a whole.
				A	Recognise when two simple fractions are equivalent; Use diagrams to compare simple fractions. Recognise fractions equivalent to $\frac{1}{2}$ .
5-3			A	M	Identify and find equivalent fractions
			A	M	Reduce a fraction to its simplest form by cancelling common factors
			A	M	Convert mixed numbers to improper fractions, and vice versa
			A	M	Find unit fractions of numbers and quantities
			A	M	Calculate fractions of quantities/measurements; Use written methods to calculate simple fractions of a number/quantity e.g. $\frac{3}{8}$ of 400g
			A	M	Add and subtract simple fractions with common denominators
7-5		A	M	E	Add and subtract simple fractions by writing them with a common denominator
		A	M	E	Express a smaller quantity as a fraction of a larger one
		A	M	E	Multiply a fraction by an integer
		A	M	E	Use division to convert a fraction to decimal
		A	M	E	Convert terminating decimals to fractions e.g. $0.23 = \frac{23}{100}$ or $0.125 = \frac{125}{1000}$ then simplify to $\frac{1}{8}$
		A	M	E	Recognise simple recurring decimals as a fraction Know and use simple conversions for recurring decimals to fractions
		A	M	E	Order Fractions
		A	M	E	Solve problems involving fractions;
9-7	A	M	E		Add and subtract more complex fractions, including mixed fractions
	A	M	E		Calculate fractions of quantities with fractional answers
	A	M	E		Multiply a fraction by a fraction
9-7	M	E			Divide an integer by a fraction
9-7	M	E			Divide a fraction by another fraction
GCSE Band	Starting Points				Percentages BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Understand percentage as the number of parts per 100
5-3			A	M	Convert a percentage to a fraction and a decimal and vice versa
			A	M	Calculate percentages of whole number quantities (whole number answers); Use mental calculations and written methods to calculate percentages
7-5		A	M	E	Calculate percentages of numbers, quantities, measurements (fractional answers); Use both non-calculator and calculator methods, with and without the % key
9-7	A	M	E		Express one given number as a percentage of another
	A	M	E		Use percentages to compare simple proportions
	A	M	E		Use the equivalence of fractions, decimals and percentages to compare proportions
	A	M	E		Increase and decrease quantities by a percentage; Use both methods: working out the increase/decrease first or using a multiplier
9-7	M	E			Solve problems involving percentage change; Understand and use percentage change, including using multipliers.
	M	E			Calculate reverse percentages
	M	E			Use percentages in real-life, including percentages greater than 100%
9-7	E				Set up and solve problems with repeated percentage change; Solve and interpret growth and decay problems including compound interest

## GM2 - Lines, Angles, Constructions and Shapes

GCSE Band	Starting Points				Lines
	4	3	2	1	
3-1				A	Use a ruler to draw and measure lines to the nearest centimetre
				A	Use a ruler to measure and draw lines to the nearest millimetre.
				A	Understand the words line segments, intersection, horizontal, vertical and diagonal
				A	Identify parallel and perpendicular lines
GCSE Band	Starting Points				Angles
	4	3	2	1	
3-1				A	Describe position and movement; Use the eight compass directions N, S, E, W, NE, NW, SE, SW
				A	Name the different types of angles – acute, obtuse, reflex; Identify the kind of angle by estimating or measuring size
5-3			A	M	Use ruler and protractor to measure and draw angles to the nearest degree
			A	M	Calculate angles on a straight line and angles around a point; Use vertically opposite angles to help solve problems
			A	M	Understand and know interior and exterior angles of a triangle A pair of complementary angles have a sum of 90° and a pair of supplementary angles have a sum of 180°
7-5		A	M	E	Calculate the size of angles in a triangle
		A	M	E	Calculate the size of angles in a quadrilateral
9-7	A	M	E		Calculate the interior and exterior angles in a polygon of n sides
	A	M	E		Find angles in parallel lines; Identify and use alternate, corresponding and allied angles
9-7	M	E			Use the interior and exterior angles to find the number of sides of a regular polygon
GCSE Band	Starting Points				Bearings
	4	3	2	1	
7-5		A	M	E	Use bearings to specify direction
9-7	A	M	E		Use three-figure bearings
	A	M	E		Solve problems using bearings, including making simple scale drawings
GCSE Band	Starting Points				Construction and Loci
	4	3	2	1	
7-5		A	M	E	Make scale drawings; Use and interpret maps and scale drawings in the context of mathematics and other subjects.
9-7	A	M	E		Construct triangles, using compasses, a protractor and a ruler; Be able to construct all three types: SAS, ASA, and SSS
9-7	M	E			Use a ruler and compasses to construct: Perpendicular and Angle Bisectors and Perpendicular Lines from Points
9-7	E				Draw the loci of points moving according to a rule
GCSE Band	Starting Points				Shapes
	4	3	2	1	
3-1				A	Visualise common 2-D shapes and 3-D solids; Identify shapes from pictures of them in different positions and orientations. Sort, make and describe shapes, referring to their properties.
				A	Use Venn and Carroll diagrams to sort and classify shapes
5-3			A	M	Use correctly the vocabulary, notation and labelling conventions for shapes; Know the labelling convention for equal sides and parallel sides in shapes
			A	M	Recognise congruent shapes
			A	M	Know the definition of a circle and the names of its parts; Be able to draw a circle given its centre and diameter or radius

7-5		A	M	E	<b>Draw and recognise shapes from their nets;</b> e.g. cube, cuboid, triangular prism, square-based pyramid. Describe the faces on familiar 3-D shapes.
		A	M	E	<b>Use ruler and protractor to construct simple nets of 3-D shapes,</b> e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism.
		A	M	E	<b>Draw cuboids on isometric paper</b>
9-7	A	M	E		<b>Draw plans and elevations of 3-D</b>
	A	M	E		<b>Classify quadrilaterals by their geometric properties</b> Know the properties (equal and/or parallel sides, equal angles, right angles, diagonals bisected and/or at right angles, reflection and rotation symmetry) of: an isosceles trapezium, a parallelogram, a rhombus, a kite, an arrowhead or delta
	A	M	E		<b>Solve geometrical problems involving special triangles and quadrilaterals;</b> Use side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals, explaining reasoning with diagrams and text
	M	E			<b>Use Pythagoras' theorem in right-angled triangles</b>
	M	E			<b>Solve problems in 2-D using Pythagoras' theorem</b>
9-7	E				<b>Know the formulae for trigonometric ratios sin, cos and tan, and apply them to find angles and lengths in right angled triangles, in 2 dimensions only</b>



	Starting Points				Expressions BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Use letter symbols to represent unknown numbers or variables; Reinforce the idea of an unknown
5-3			A	M	Know the meanings of the words term, expression and equation.
			A	M	Use letters, numbers and mathematical symbols to write expressions in meaningful contexts; e.g. subtract 4 from a number $n - 4$ , 4 minus a number $4 - n$ , a number multiplied by 2 and then 5 added $(n \times 2) + 5$ or $2n + 5$
			A	M	Use a formula expressed in words
7-5		A	M	E	Simplify algebraic expressions by multiplying terms
		A	M	E	Simplify algebraic expressions by collecting like terms
9-7	A	M	E		Simplify algebraic expressions using index notation e.g. $3ab^2 \times 2a^3b^2$
	A	M	E		Multiply a single term over a bracket
	A	M	E		Factorise simple expressions; 'Reverse' the process of expanding brackets by taking out <b>one</b> common factor from each term in an expression
9-7	M	E			Factorise expressions; 'Reverse' the process of expanding brackets by taking out <b>two</b> common factors from each term in an expression
	M	E			Expand and simplify linear expressions including negative signs
9-7	E				Expanding products of two binomials - expand and simplify the product of two linear expressions of the form $x \pm n$ .
9-7	E				Factorising quadratic expressions of the form $x^2 + bx + c$ , including difference of two squares
GCSE Band	Starting Points				Equations BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Begin to understand the role of the 'equals' sign; e.g. $\blacktriangledown + \blacklozenge = 4$ . What numbers could $\blacktriangledown$ and $\blacklozenge$ be?
5-3			A	M	Solve simple linear equations with integer coefficients; Questions with the unknown on one side only and involving one operation
7-5		A	M	E	Solve simple linear equations with integer coefficients; Questions with the unknown on one side only and involving two operations
		A	M	E	Use equations to solve problems in a range of contexts; Construct equations from a given scenario and solve the equation/problem
9-7	A	M	E		Construct and solve more complex linear equations; Include equations with brackets, unknown on both sides and negative signs anywhere in the equation
9-7	M	E			Solve linear equations with fractional coefficients.
	M	E			Change the subject of a formula by using the same methods as solving equations; Include questions where the subject is on both sides of the formula
	M	E			Solve simple linear inequalities and represent the solution set on a number line.
9-7	E				Solving Quadratics using factorisation where the co-efficient of $x^2$ is 1.
9-7	E				Solve two simultaneous equations in two variables algebraically
GCSE Band	Starting Points				Substitution BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
7-5		A	M	E	Substitute integers into simple linear expressions and formulae.
9-7	A	M	E		Substitute positive and negative numbers into complex expressions and formulae; Include questions involving brackets and powers.

## R1 – Ratio, Proportion and Rates of Change

GCSE Band	Starting Points				Ratios BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
5-3			A	M	Use ratio notation; e.g. given a selection of cubes, write the ratio of red cubes to blue cubes
7-5		A	M	E	Simplify a ratio by cancelling
		A	M	E	Simplify a ratio expressed in different units; e.g. 2 m : 50cm, 450g : 5kg, 500mm : 75cm : 2.5m
		A	M	E	Simplify a ratio expressed in fractions or decimals
9-7	A	M	E		Divide a quantity into two parts in a given ratio and solve problems; e.g. 28 pupils are going on a visit. They are in the ratio of 3 girls to 4 boys. How many boys are there? Potting compost is made from loam, peat and sand in the ratio 7:3:2 respectively. A gardener used 1.5 litres of peat to make compost. How much loam did she use?
	A	M	E		Compare ratios by changing them to the form $m : 1$ or $1 : m$
9-7	M	E			Calculating with ratios when only part of the information is known; e.g. A fruit drink is made by mixing orange squash with water in the ratio 2:3. How much water needs to be added to 5 litres of orange squash to make the drink?
GCSE Band	Starting Points				Proportion BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
5-3			A	M	Understand the relationship between ratio and proportion; Proportion compares part to whole, and is usually expressed as a fraction, decimal or percentage, ratio compares part to part.
7-5		A	M	E	Solve simple problems involving direct proportion; e.g. 3 bars of chocolate cost 90p. How much will six bars cost? 1 litre of fruit drink contains 200 ml of orange juice. How much orange juice is there in 1.5 litres of fruit drink?
9-7	A	M	E		Use the unitary method to solve problems involving ratio and direct proportion
	A	M	E		Find the Best Buys; Find the cost per unit weigh and use the above to find which product is the cheaper
9-7	M	E			Solve direct proportion problems algebraically; Make use of the proportionality sign and constant
9-7	E				Solve inverse proportion problems; Understand that $x$ is inversely proportional to $y$ means $x$ is proportional to $1/x$
GCSE Band	Starting Points				Rates of Change BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
9-7	A	M	E		Recognise the relationship between speed, distance and time; Calculate one variable given the other two.
	A	M	E		Solve problems involving speed, distance and time
9-7	M	E			Solve problems involving other compound measures; Know how to find the density (mass and volume) and pressure (force and area)

## A2 - Sequences, Functions and Graphs

GCSE Band	Starting Points				Sequences BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	<b>Recognise a wider range of sequences;</b> Know and use Fibonacci sequences and the list of triangle numbers.
5-3			A	M	<b>Generate simple integer sequences;</b> Explore and predict terms in sequences generated by counting and from flow charts. Generate sequences by multiplying or dividing by a constant factor. Generate sequences by counting forwards or backwards in increasing or decreasing steps.
			A	M	<b>Generate terms of a sequence by looking at differences;</b> Continue sequences and explain in words how the sequence is formed
7-5		A	M	E	<b>Use given rules to solve problems with sequences;</b> Generate terms. Check if a term is in the sequence and explain how you know.
9-7	A	M	E		<b>Generate sequences from simple practical contexts;</b> Find the first few terms of the sequence arising from patterns or real-life scenarios. Describe the general term, first using words, then symbols.
	A	M	E		<b>Find an algebraic rule for the nth term of a sequence</b>
9-7	M	E			<b>Begin to generate a quadratic sequence given a rule</b>
9-7	M	E			<b>Recognise the difference between an arithmetic and geometric sequence;</b> Understand and use common difference and/or ratio.
9-7	E				<b>Find the nth term of a sequence where the rule is quadratic</b>
GCSE Band	Starting Points				Functions BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
5-3			A	M	<b>Express simple functions in words and using symbols;</b> Explore simple function machines by: finding outputs (y) for different inputs (x) and finding inputs for different outputs. Given inputs and outputs, find the function.
			A	M	<b>Express one-step functions algebraically</b>
7-5		A	M	E	<b>Express two-step functions algebraically</b>
		A	M	E	<b>Represent functions in mapping diagrams</b>
9-7	A	M	E		<b>Find the inverse of a linear function</b>
	A	M	E		<b>Recognise and use reciprocals</b>
GCSE Band	Starting Points				Coordinates BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
5-3			A	M	<b>Use and interpret coordinates in the first quadrant;</b> Given the coordinates of three vertices of a rectangle, find the fourth
7-5		A	M	E	<b>Use and interpret coordinates in all four quadrants</b>
		A	M	E	<b>Given the coordinates of points A and B, find the mid-point of the line segment AB</b>
GCSE Band	Starting Points				Graphs BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
5-3			A	M	<b>Use a graph to convert one unit to another unit</b>
7-5		A	M	E	<b>Recognise straight line graphs parallel to the S-axis or y-axis and <math>y=S</math></b>
9-7	A	M	E		<b>Plot the graphs of linear functions;</b> By completing a table of values when y is given explicitly in terms of S
	A	M	E		<b>Interpret travel graphs;</b> Read information from a travel graph and find an average speed from a travel graph
	A	M	E		<b>Interpret graphs arising from real situations;</b> e.g. sketch a line graph to show the depth of water against time when water runs steadily from a tap into different types of jars.
9-7	M	E			<b>Find the gradient of a given line</b>
	M	E			<b>Draw lines with a given gradient</b>
	M	E			<b>Investigate the gradients of parallel lines</b>

	M	E			<b>Understand and use <math>y = mx + c</math>;</b> Know what $m$ and $c$ represent, on a graph and in real-life situations. e.g. $y$ -intercept is base price and gradient is price for each minute
	M	E			<b>Draw straight line graphs using the gradient-intercept method;</b> e.g. for $y = 3x - 1$ , start at $-1$ on the $y$ -axis, move one square across and three squares up and mark this point with a dot and repeat again.
	M	E			<b>Find the equation of a line by finding its gradient and <math>y</math>-intercept</b>
9-7	M	E			<b>Generate points and plot the graphs of simple quadratic functions;</b> Construct tables of values, including negative values of $x$ , and plot the graphs
9-7	E				<b>Find the equation of a line through one point with a given gradient</b>
9-7	E				<b>Find the equation of a line through two given points</b>

## GM3 - Transformations

GCSE Band	Starting Points				Transformations BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	<b>Identify line symmetry in patterns and 2-D shapes;</b> Draw lines of symmetry on basic shapes
				A	<b>Recognise shapes with reflective symmetry</b>
				A	<b>Draw the reflection of a shape in a mirror line along one side;</b> Be comfortable with both horizontal and vertical mirror lines
5-3			A	M	<b>Recognise shapes with rotational symmetry</b>
			A	M	<b>Find the order of rotational symmetry for a 2-D shape</b>
			A	M	<b>Draw the reflection of a shape in a diagonal mirror line along one side</b>
			A	M	<b>Translate 2-D shapes;</b> Understand translations in words as well as vectors
		A	M	<b>Rotate 2-D shapes in any position;</b> Understand how the orientation of a shape changes with rotation of $90^\circ$ or $180^\circ$	
7-5		A	M	E	<b>Rotate 2-D shapes;</b> Rotate shapes given an angle ( $90^\circ/180^\circ$ ), a direction (acw/cw) and a centre of rotation. Understand how to use tracing paper to help rotations.
		A	M	E	<b>Tessellate a 2-D shape</b>
9-7	A	M	E		<b>Describe transformations in simple cases;</b> Write translations as descriptions and vectors. Identify the mirror line in a reflection. Find the angle, direction or centre of rotation.
	A	M	E		<b>Transform 2-D shapes by combinations of rotations, reflections and translations</b>
	A	M	E		<b>Describe combined transformations</b>
	A	M	E		<b>Enlarge a 2-D shape;</b> Given a centre of enlargement and a positive whole-number scale factor. Know the Ray method, coordinate method and counting squares method.
	A	M	E		<b>Describe an enlargement;</b> Find the centre of enlargement and/or the scale factor from the object and image
9-7	M	E			<b>Identify plane symmetry in 3-D shapes</b>
	M	E			<b>Enlarge 2-D shapes, using fractional and negative scale factors</b>
	M	E			<b>Understand and use the effects of enlargement on areas and volumes</b>
9-7	E				<b>Manipulate vectors arithmetically and diagrammatically;</b> Understand addition and subtraction of vectors, multiplication of vectors by a scalar and diagrammatic and column representations of vectors.

## S1 – The Data Handling Cycle

GCSE Band	Starting Points				Planning and Collecting Data BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Use Venn and Carroll diagrams to sort and classify information
5-3			A	M	Collect and represent discrete data using tally charts and frequency tables
7-5		A	M	E	Collect and represent data using grouped tally charts and frequency tables; Use equal class intervals and discuss appropriate groupings
9-7	A	M	E		Construct frequency tables for gathering continuous data
	A	M	E		Discuss the use of surveys; Design a survey to capture relevant data from one or more sources. Design a suitable data collection sheet.
	A	M	E		Design and criticise questions for questionnaires; Understand the requirements for options; clear, specific, covering all possibilities and no overlap. Know about bias in questionnaires.
	A	M	E		Understand the difference between population and sample; Know the different sampling techniques and discuss limitations. Determine appropriate sample sizes.
9-7	M	E			Use the data-handling cycle to test a hypothesis
GCSE Band	Starting Points				Representing Data BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Read, draw and interpret a simple pictogram
5-3			A	M	Read, draw and interpret a bar chart
			A	M	Read, draw and interpret a dual bar chart
7-5		A	M	E	Construct and interpret simple time series (line) graphs
		A	M	E	Construct simple scatter graphs by plotting points
		A	M	E	Construct and interpret pie charts
		A	M	E	Construct an ordered stem-and-leaf diagram
9-7	A	M	E		Use a stem-and-leaf diagram to find the median, range and mode
	A	M	E		Construct and interpret a back to back stem-and-leaf diagram
	A	M	E		Understand the uses of a scatter diagram; Develop further the understanding of correlation. Draw and use a line of best fit by inspection.
	A	M	E		Construct and use simple two-way tables for discrete data
9-7	M	E			Construct a frequency polygon for continuous data
9-7	E				Construct a cumulative frequency diagram and use it to find the median, quartiles and interquartile range
GCSE Band	Starting Points				Interpreting Data BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Calculate the mode, median and range for small sets of discrete data
5-3			A	M	Calculate the mean for a small set of discrete data using a calculator
7-5		A	M	E	Find the modal class and range from a grouped table of continuous data
9-7	A	M	E		Compare different sets of data using the mean and the range
	A	M	E		Understand the advantages and disadvantages of each type of average; Decide which average to use in different situations.
	A	M	E		Calculate the mean, median and mode from a frequency table of discrete data
9-7	M	E			Calculate an estimate of the mean from a grouped table of continuous data
	M	E			Find the median and modal class from a grouped table
9-7	E				Use averages and range of sets of data to make conclusions

# P1 – Probability

GCSE Band	Starting Points				Probability BY THE END OF THIS TOPIC YOU WILL BE ABLE TO:
	4	3	2	1	
3-1				A	Understand the basic language of probability
5-3			A	M	Understand that the probability scale runs from 0 to 1; Represent events on a probability scale
7-5		A	M	E	Calculate the probability of simple outcomes of events
		A	M	E	Find and justify probabilities based on equally likely outcomes in simple contexts
		A	M	E	Understand experimental probability; Calculate relative frequencies from experiments. Compare experimental and theoretical probabilities in different contexts.
9-7	A	M	E		Identify all the possible mutually exclusive outcomes of a single event; Use the addition rule to find probabilities of outcomes
	A	M	E		Understand and use sample spaces; Find and record all possible outcomes for two events in a systematic way, using diagrams and tables.
	A	M	E		Understand the total probability of all possible outcomes is 1; Calculate the probability of an event happening when the probability that it does not happen is known. Find missing probabilities given a table of outcomes and probabilities.
	A	M	E		Estimate probabilities from experimental data; Understand that if an experiment is repeated there may be different outcomes. Know how to get better estimates of probability.
	A	M	E		Predict the respected number of successes from a given number of trials
	M	E			Recognise the difference between independent and dependent events; Know what mutually exclusive events are
9-7	E				Use the and/or rule to find probabilities of simple combined events
9-7	E				Calculate probabilities of events using tree diagrams and other representations; Solve problems involving independent and dependent events