MATHS
Learning Ladder

Year 7

Key

Learning Ladders

The Learning Ladders are split into Year 7, 8 and 9 on different pages, and are colour coded to indicate the expected progress the students should be making. As students progress through Key Stage 3, their attainment is assessed against the Learning Ladder.
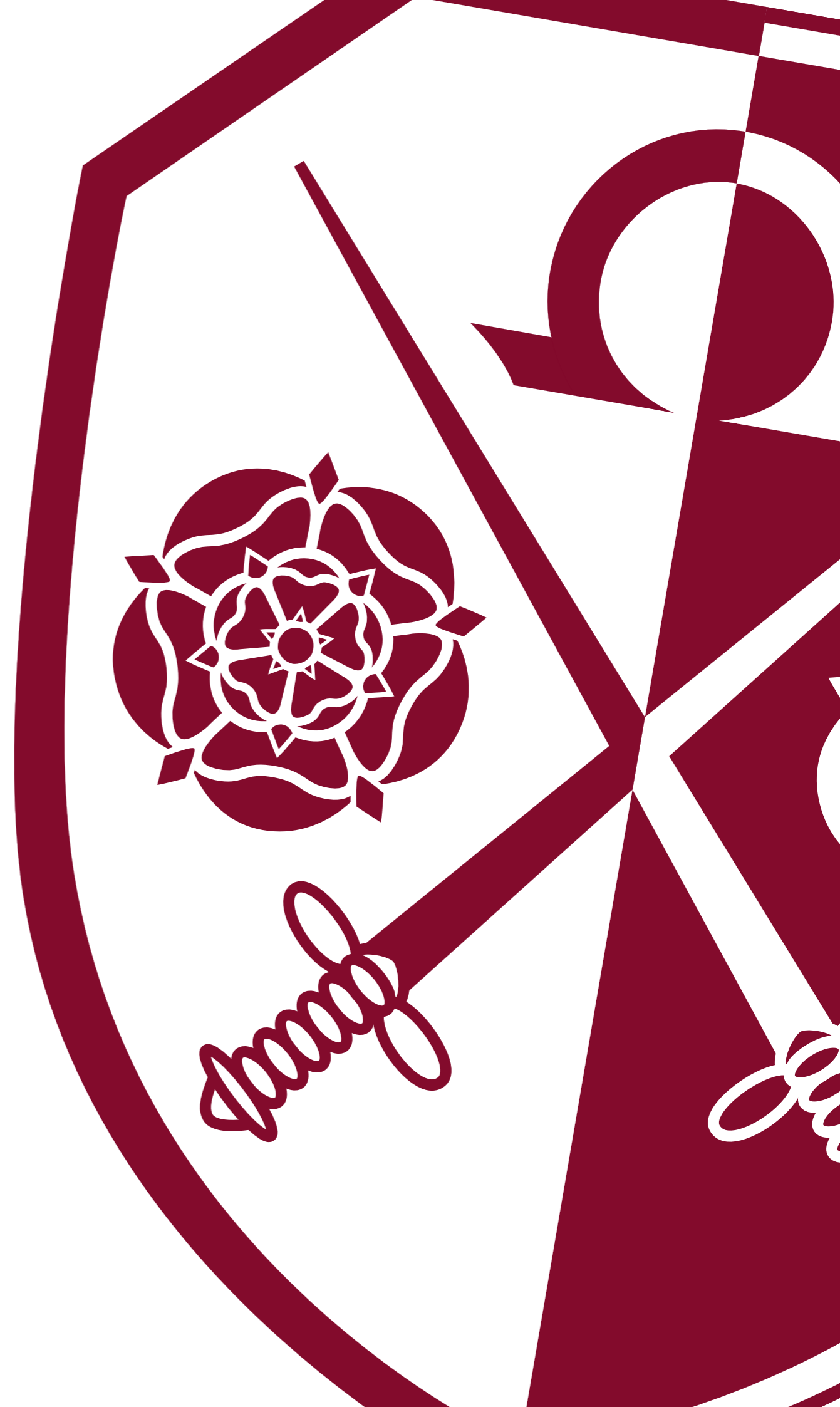
Blue indicates a level below expectations for the year group.

Grey indicates the expected level for the year group.

Red indicates a level beyond that expected for the year group.

number

Types of Number	Fractions	Decimals	Percentages	Place Value and Ordering	Four operations	Accuracy and estimating etc
	Use fractions or percentages to solve problems involving repeated proportional changes		Use fractions or percentages to solve problems involving repeated proportional changes Calculation of the original quantity given the result of a proportional change			
Understand and use rational and irrational numbers Solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude and using a calculator as appropriate.				Solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude and using a calculator as appropriate.		Find the upper and lower bounds of more difficult calculations with quantities given to a various degrees of accuracy
Calculate with standard index form, without a calculator	Understand the equivalence between recurring decimals and fractions	Understand the equivalence between recurring decimals and fractions			Demonstrate sound numerical skills and algebraic fluency; use a calculator effectively	Determine the bounds of intervals
Calculate with standard index form, using a calculator Understand and use index laws including x^0 and negative powers(numeric and algebraic)	Understand and use efficient methods to add, subtract, multiply and divide fractions, interpreting division as a multiplicative inverse		Use a multiplier raised to a power to represent and solve problems involving repeated proportional change, e.g. compound interest		Demonstrate sound numerical skills and use a calculator effectively Use calculators efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation	Estimate complex calculations by rounding to one significant figure and multiplying and dividing mentally Use inequality notation to specify simple error intervals
Change numbers to and from standard form Understand and use index laws - multiply, divide and power only	Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use the equivalence of fractions, decimals and percentages to compare proportions	Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use the equivalence of fractions, decimals and percentages to compare proportions	Calculate percentages and find the outcome of a given percentage increase or decrease Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use the equivalence of fractions, decimals and percentages to compare proportions	Order numbers put to a positive integer power.	Understand the effects of multiplying and dividing by numbers between 0 and 1	Estimate calculations by rounding to one significant figure and multiplying and dividing mentally Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction
Recall integer squares from 2×2 to 15×15 and the corresponding square roots Use the terms square, positive and negative square root, cube and cube root	Add and subtract fractions by writing them with a common denominator,			Order positive integers put to a positive integer power.	Extend mental methods of calculation to include decimals, fractions and percentages	Give answers to an appropriate degree of accuracy Apply inverse operations and approximate to check answers to problems are of the correct magnitude
Recognise and use number patterns and relationships	Calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction Use equivalence between fractions and order fractions and decimals	Use equivalence between fractions and order fractions and decimals		Order negative numbers in context Use equivalence between fractions and order fractions and decimals	Add, subtract, multiply and divide integers Use known facts, place value, knowledge of operations and brackets to calculate including using all four operations with decimals to two places	Round decimals to the nearest decimal place; round a number to one significant figure
Explore and describe number patterns and relationships including multiple, factor and square	Use simple fractions and percentages including calculating fractional or percentage parts of quantities and measurements, using a calculator where necessary Find one number as a fraction of another and reduce a fraction to its simplest form by cancelling common factors	Complete straight forward calculations competently with and without a calculator,including use of function keys on a calculator for powers and roots Begin to use decimal notation in contexts such as money	Use simple fractions and percentages including calculating fractional or percentage parts of quantities and measurements, using a calculator where necessary	Order, add and subtract negative numbers in context, recognise negative numbers in contexts such as temperature Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000 Understand place value in numbers to 1000; and use this to make approximations	Complete straight forward calculations competently with and without a calculator,including use of function keys on a calculator for powers and roots Understand and use an appropriate non-calculator method for solving problems involving multiplying and dividing any three-digit by any two-digit number Use a range of mental methods of computation with all operations; including use of recall of addition and subtraction facts to 20 to solve problems with large numbers Use efficient written methods of addition and subtraction and of short multiplication and division Add and subtract three digit numbers using written method and Add and subtract two-digit numbers mentally Multiply a simple decimal by a single digit Solve problems with or without a calculator ie understanding which operation to choose	Check the accuracy and reasonableness of results by reference to knowledge of the context or to the size of the numbers, by applying inverse operations or by estimating using approximations
Count sets of objects reliably	Begin to use halves and quarters and relate the concept of half of a small quantity to the concept of half of a shape Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent			Begin to understand the place value of each digit; use this to order numbers up to 100	Use efficient written methods of addition and subtraction and of short multiplication and division; including multiplication and division of two digit numbers by 2, 3, 4 or 5 as well as 10 with whole number answers and remainders Begin to understand the role of '=' (the 'equals' sign) Choose the appropriate operation when solving addition and subtraction problems Use mental recall of addition and subtraction facts to 10 Use the knowledge that subtraction is the inverse of addition and understand halving as a way of 'undoing' doubling and vice versa Use mental calculation strategies to solve number problems including those involving money and measures	
	Begin to use the fraction one-half			Count up to 10 objects Measure and order objects using direct comparison Order events Order numbers to 10 Read and write no.s to 10	Add and subtract numbers of objects to 10 Begin to know some addition facts Solve addition/subtraction problems involving up to 10 objects Understand addition as finding the total of two or more sets of objects Understand subtraction as 'taking away' objects from a set and finding how many are left	
				Pupils recognise differences in quantity, for example, in comparing given sets of objects and saying which has more or less, which is the bigger group or smaller group They continue to rote count onwards from a given small number, for example, continuing the rote count onwards in a game using dice and moving counters up to 10; continuing to say, sign or indicate the count aloud when adult begins counting the first two numbers They recognise numerals from one to nine and relate them to sets of objects, for example,: labelling sets of objects with correct numerals They use ordinal numbers (first, second, third) when describing the position of objects, people or events, for example, indicating who is first in a queue or line; who is first, second and third in a race		
				In practical situations they respond to 'add one' to a number of objects, for example, responding to requests such as add one pencil to the pencils in the pot, add one sweet to the dish. Pupils demonstrate an understanding of 'less', for example, indicating which bottle has less water in it. Pupils demonstrate an understanding of one-to-one correspondence in a range of contexts, for example: matching objects such as cups to saucers, straws to drink cartons. Pupils join in rote counting to 10, for example, saying or signing number names to 10 in counting activities Pupils join in rote counting up to five, for example, saying or signing number names to 5 in counting activities They can count at least 5 objects		

ratio, proportion and rates

Ratio	Proportion	Rates of Change
	Understand and use direct and inverse proportion	
Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio		
	Use a multiplier raised to a power to represent and solve problems involving repeated proportional change, e.g. compound interest Use fractions or percentages to solve problems involving repeated proportional changes or the calculation of the original quantity given the result of a proportional change Understand and use simple direct and inverse proportion	
Relate ratios to linear functions	Apply ideas of proportionality to numerical problems & use geometric properties of angles, lines & shapes Calculate the result of any proportional change using multiplicative methods. Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole	Understand & use measures of speed (and other compound measures such as density or pressures) to solve problems
Divide a quantity into two or more parts in a given ratio Solve problems involving ratio and direct proportion - unitary method	Solve problems involving ratio and direct proportion - unitary method	
Understand simple ratio		
Solve simple problems involving ratio and direct proportion Begin to understand simple ratio	Solve simple problems involving ratio and direct proportion	

algebra

Equations	Simplifying	Substitution	Sequences	Graphs	Inequalities	Proof
In more complex cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a>1 (including of the form $x^2 + y^2 = r^2$) Interpret the reverse process as the inverse function solve more complex fractional linear equations with the unknown in the denominator Use completing the square to simplify or solve quadratic equations, a> 1 and to find maximum and minimum values				Draw, sketch and describe the graphs of trigonometric functions for angles of any size, including transformations involving scalings in either or both of the x and y directions In more complex cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a>1 (including of the form x2 + y2 = r2) Transform the graphs of y = f(x), such as linear, quadratic, cubic, sine and cosine functions, using the transformations y = f(x) + a, y = f(x + a), y = f (ax) and y = af(x)		Derive harder algebraic proofs using reasoning and logic
In simple cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a = 1 (including of the form $x^2 + y^2 = r^2$) Solve harder quadratic equations (a≠1)ie a>1 by factorisation or using the quadratic formula Use completing the square to simplify quadratic equations Use completing the square to solve quadratic equations	Derive and use more complex formulae and change the subject of a formula, including cases where the subject occurs twice Interpret the succession of two functions as a 'composite function' (using formal function notation) Manipulate surds in the form a + √b Simplify harder rational expressions			In simple cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a = 1 (including of the form $x^2 + y^2 = r^2$)		
	Demonstrate sound numerical skills and algebraic fluency; use a calculator effectively Manipulate simple surds Recognise and use simple geometric progressions including surds, and other sequences	Demonstrate sound numerical skills and algebraic fluency; use a calculator effectively	Recognise and use simple geometric progressions including surds, and other sequences	Know and understand that the intersection points of the graphs of a linear and quadratic function are the approximate solutions to the corresponding simultaneous equations		
Interpret the reverse process as the inverse function	Derive and use more complex formulae and change the subject of a formula including cases where a power of the subject appears in the question or solution Expand the products of more than 2 binomials Manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions.	Derive and use more complex formulae and change the subject of a formula including cases where a power of the subject appears in the question or solution Evaluate algebraic formulae, substituting fractions, decimals and negative numbers.		Calculate or estimate gradients of graphs and areas under graphs, and interpret results in real-life cases(not including calculus) - speed, acceleration, distance etc Identify and sketch graphs of linear, quadratic, cubic functions and reciprocal functions Solve inequalities in two variables and find the solution set Understand the effect on the graph of addition of (or multiplication by) a constant	Solve inequalities in two variables and find the solution set	
Solve quadratic equations (a=1) by factorisation or using the quadratic formula Solve a pair of simultaneous linear equations by eliminating one variable; link a graphical representation of an equation or pair of equations to the algebraic solution Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically	Factorise quadratic expressions including the difference of two squares Square a linear expression, expand the product of two linear expressions of the form ax ± bn and simplify the corresponding quadratic expression Derive a formula and, in simple cases, change its subject - at least 3 operations	Use formulae from mathematics and other subjects; substitute numbers;- negative and decimals with calculator into expressions Derive a formula and, in simple cases, change its subject - at least 3 operations	Find the next term and the nth term of quadratic sequences and functions and explore their properties Recognise Fibonacci type sequences, quadratics sequences, geometric sequences	Plot graphs of simple quadratic and cubic functions eg y = x^2, y = $3x^2 + 4$ and y = x^3 Solve a pair of simultaneous linear equations by eliminating one variable; link a graphical representation of an equation or pair of equations to the algebraic solution Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically interpret the gradient of a straight line as a rate of change		Construct a mathematical argument & identify inconsistencies in a given argument or exceptions to a generalisation
Construct and solve linear equations with integer coefficients (with and without brackets, negative signs anywhere in the equation, positive or negative solution), using an appropriate method	Square a linear expression, expand the product of two linear expressions of the form x ± n and simplify the corresponding quadratic expression Simplify terms involving multiplication, division and powers Derive a formula and, in simple cases, change its subject - no more than 2 operations	Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject - no more than 2 operations		Plot the graphs of linear functions, where y is given implicitly in terms of x; recognise that the equations can be converted to the form y = mx + c and find intercept and gradient	Solve linear inequalities in one variable, and represent the solution set on a number line	
Form and solve equations involving whole numbers (with or without bracket) using an appropriate method	Simplify terms involving multiplication, division - $12x^3/4x$ etc		Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, and find the nth term of a sequence in algebra where the rule is linear	Construct functions arising from real-life problems and plot their corresponding graphs - conversion graphs, distance time, water into vases etc; interpret graphs arising from real situations Plot the graphs of linear functions, where y is given explicitly in terms of x; recognise that equations of the form y = mx + c correspond to straight-line graphs	Represent inequalities on a number line	Use logical argument to establish the truth of a statement
Solve two step equations.	Multiply a single term over a bracket Simplify or transform linear expressions by collecting like terms	Construct, express in symbolic form, and use simple formulae involving one or two operation	When exploring number sequences, pupils find and describe in words the rule for the next term or nth term of a sequence where the rule is linear Recognise and use number patterns and relationships	Plot the graphs of simple linear functions	Recognise inequality signs.	
		Use simple formulae Begin to use simple formulae expressed in words	Recognise a wider range of sequences			State a generalisation arising from a set of results and identify a counter-example
	Use the knowledge that subtraction is the inverse of addition and understand halving as a way of 'undoing' doubling and vice versa		Predict what comes next in a simple number, shape or spatial pattern or sequence and give reasons for their opinions Recognise sequences of numbers, including odd and even numbers			

Geometry

Perimeter, Area, Volume	Angle Relationships	Shapes	Transformations	Measures	Position
Solve problems involving the volume of the frustum of a truncated cone	Draw, sketch and describe the graphs of trigonometric functions for angles of any size, including transformations involving scalings in either or both of the x and y directions				Solve simple geometrical problems in 2-D using vectors, including use of the commutative and associative properties of vector addition including proof
Use the formula for area of a triangle	Use the sine and cosine rules. Use the formula for area of a triangle	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	Enlarge 2-D shapes, given a centre of enlargement and a negative number scale factor, recognise the similarity of the resulting shapes		
Solve problems involving surface areas and volumes of cylinders, pyramids, cones and spheres	Draw, sketch and describe the graphs of trigonometric functions for angles of any size	Understand and use Pythagoras' theorem to solve 3-D problems			Calculate a scalar multiple of a vector and represent it graphically. Understand how the sign of a vector relates to its direction
Understand the difference between formulae for perimeter, area and volume by considering dimensions	Use trigonometry and geometrical properties to solve problems - circle theorems. Select and combine known facts and problem solving strategies to solve geometrical problems of increasing complexity	Understand and use congruence and mathematical similarity.		Calculate or estimate gradients of graphs and areas under graphs, and interpret results in real-life cases(not including calculus)	Understand that vectors represented by parallel lines are multiples of each other
Understand and use the formulae for the length of a circular arc and area and perimeter of a sector. Solve problems involving surface areas and volumes of right prisms	Understand and use trigonometrical relationships in right-angled triangles, and use these to solve problems, including those involving bearings. Know the exact values of sinx, cosx for 0, 30, 45, 60 and 90 and tanx for 0, 30, 45, and 60. Apply ideas of proportionality to numerical problems & use geometric properties of angles, lines & shapes	Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio. Understand and apply Pythagoras' theorem when solving problems in 2-D	Understand and use vector notation and the associated vocabulary. Enlarge 2-D shapes, given a centre of enlargement and a fractional number scale factor, recognise the similarity of the resulting shapes. Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio	Understand & use measures of speed (and other compound measures such as density or pressures) to solve problems	Represent, add and subtract vectors graphically. Understand and use the commutative properties of vector addition. Understand and use vector notation and the associated vocabulary. Find the locus of a point that moves according to a given rule - complex and real life
Solve problems involving the area and circumference of a circle. Deduce and use formulae for the area of a triangle, parallelogram and trapezium; calculate areas of compound shapes made from rectangles and triangles. Deduce and use formulae for the volume of a cuboid; calculate volumes and surface areas of cuboids	Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text. Understand a proof that the sum of the angles of a triangle is 180° and of a quadrilateral is 360°		Enlarge 2-D shapes, given a centre of enlargement and a whole-number scale factor, recognise the similarity of the resulting shapes. Know that translations, rotations and reflections preserve length and angle and map objects onto congruent images		Find the locus of a point that moves according to a given rule - simple
Use the formulae for area and circumference of a circle and plane rectilinear figures (composite rectangle)	Identify alternate and corresponding angles: Solve problems using angle and symmetry properties of polygons	Classify quadrilaterals by their geometric properties. Visualise and use 2-D representations of 3-D objects including nets	Reason about position and movement and transform shapes	Read and interpret scales on a range of measuring instruments, explaining what each labelled division represents	Use straight edge and compasses to do standard constructions- bisectors and triangles
Understand and use the formula for the area of a rectangle and distinguish area from perimeter	Measure and draw angles to the nearest degree, when constructing models and drawing or using shapes. Use language associated with angle and know and use the angle sum of a triangle and that	Use a wider range of properties of 2-D and 3-D shapes, identify all the symmetries of 2-D shapes	Use geometric properties, including symmetry	Solve problems involving the conversion of units and make sensible estimates of a range of measures in relation to everyday situations	Use coordinates in all four quadrants to locate and specify points
Find perimeters of simple shapes and find areas by counting squares		Begin to recognise nets of familiar 3-D shapes, e.g. cube, cuboid, triangular prism, square-based pyramid. Classify 3-D and 2-D shapes in various ways using mathematical properties such as reflective symmetry for 2-D shapes. Make 3-D models by linking given faces or edges and draw common 2-D shapes in different orientations on grids	Recognise shapes in different orientations and reflect shapes, presented on a grid, in a vertical or horizontal mirror line. Reflect simple shapes in a mirror line, translate shapes horizontally or vertically and begin to rotate a simple shape or object about its centre or a vertex	Interpret, with appropriate accuracy, numbers on a range of measuring instruments. Use standard units of time. Use a wider range of measures including non-standard and standard metric units of length, capacity and mass in a range of contexts	Use and interpret coordinates in the first quadrant. Describe position and movement
	Distinguish between straight and turning movements, recognise right angles in turns and understand angle as a measurement of turn	Pupils search for objects not found in their usual place demonstrating their understanding of object permanence, for example, looking for cups when they are not in their usual cupboard. Describe their properties, including numbers of sides and corners. Sort objects and classify them using more than one criterionUse mathematical names for common 3-D and 2-D shapes		Begin to understand that numbers can be used not only to count discrete objects but also to describe continuous measures. Begin to use a wider range of measures including to use everyday non-standard and standard units to measure length and mass	Describe the position of objects
Measure and order objects using direct comparison		Sort and classify objects			Use everyday language to describe positions of 2-D and 3-D shapes. Use everyday language to describe properties of 2-D and 3-D shapes
		Pupils compare objects directly, focusing on one dimension such as length or height where the difference is marked and can indicate 'the long one' or 'the tall one', for example, comparing two plants, placed side by side and indicate the tall one or comparing two zips and indicating the long one. They describe shapes in simple models, pictures and patterns, for example, stamping shapes in sand and describing them, using a set of flat shapes to make pictures or patterns, naming some of the shapes used, identifying specific shapes from pictures, simple models or patterns. They respond to mathematical vocabulary such as 'straight', 'circle', 'larger' to describe the shape and size of solids and flat shapes, for example, when shopping, pupils find boxes with straight edges to pack into the carrier bag; identify the larger circle when stacking two cans.		They show awareness of time, through some familiarity with names of the days of the week and significant times in their day, such as meal times, bed times, for example, ordering events in their day on a visual daily timetable, understanding and using names of days of the week, 'no school on Saturday or Sunday, swimming on Wednesday'.	
		They manipulate three-dimensional shapes, for example, putting shapes into a shape sorter, using 3D objects to build and manipulate in role-play, rolling a tube in a race with a partner. They pick out described shapes from a collection, for example, picking out all the round shapes in the classroom, finding shapes with straight edges, fitting shapes into matching holes. They show understanding of words signs and symbols that describe positions, for example, responding to a request to put an object in, on, under, inside another object.		They compare the overall size of one object with that of another where the difference is not great, for example, identifying the bigger of two Russian Dolls or nesting cubes. They use familiar words in practical situations when they compare sizes and quantities, for example, using the words 'heavy' and 'light', 'more' and ' less', 'enough' or 'not enough' to compare objects or quantities.	Pupils respond to 'forwards' and 'backwards', for example, moving forwards and backwards on request, recognising when a vehicle is moving forwards or backwards, moving a counter forward or backward on a board game.

statistics

Representing Data	Interpreting Data	Averages and Spread	Data Handling Cycle
Use, interpret and compare histograms, including those with unequal class intervals			Make and test hypotheses and conjectures
	Compare two or more distributions and make inferences, using the shape of the distributions and measures of average and spread including median and quartiles Estimate and find the median, quartiles and interquartile range for large data sets, including using a cumulative frequency diagram	Compare two or more distributions and make inferences, using the shape of the distributions and measures of average and spread including median and quartiles Estimate and find the median, quartiles and interquartile range for large data sets, including using a cumulative frequency diagram	Consider possible approaches to exploring a question or testing a hypothesis; refine methods as enquiry progresses Select and justify a sampling scheme and a method to investigate a population
Identify which type of graphs are most useful in the context of the problem. Select, construct and modify bar charts and frequency diagrams for discrete and continuous data; Select, construct and modify simple time graphs for time series;	Use the line of best fit on a scatter graph to estimate	Estimate the mean, median and range of a set of grouped data and determine the modal class, selecting the most appropriate to the line of enquiry Compare two or more distributions and make inferences, using the shape of the distributions and measures of average and range	Design a survey or experiment to capture the necessary data from one or more sources; determine the sample size and degree of accuracy needed Identify evidence that supports or refutes conjectures and hypotheses Suggest a problem to explore using statistical methods, frame questions and raise conjectures Understand the limitations of evidence and sampling, and the difference between a mathematical argument and conclusions based on experimental evidence
Select, construct and modify scatter graphs. Select, construct and modify stem and leaf diagrams Select, construct and modify pie charts for categorical data;	Communicate interpretations and results of a statistical survey using selected tables, graphs and diagrams in support		Design, trial and if necessary refine data collection sheets; construct tables for large discrete and continuous sets of raw data, choosing suitable class intervals; design and use two-way tables Ask questions, plan how to answer them and collect the data required
Construct and interpret stem-and-leaf diagrams Create and interpret line graphs where the intermediate values have meaning	Create and interpret line graphs where the intermediate values have meaning Interpret graphs and diagrams, including pie charts, and draw conclusions	Find the mean from a discrete table	Test simple hypotheses and conjectures based on evidence; use data to look for patterns and relationships
Construct and interpret frequency diagrams, simple line graphs and pictograms, where the symbol represents a group of unitsGroup data, where appropriate, in equal class intervals Use Venn and Carroll diagrams to record their sorting and classifying of information	Construct and interpret frequency diagrams, simple line graphs and pictograms, where the symbol represents a group of units	Understand and use the mean of discrete data and compare two simple distributions, using the range and one of mode, median or mean Understand and use the mode and range to describe sets of data	Collect and record discrete data
Construct bar charts and pictograms, where the symbol represents a group of units Record results in simple lists, tables, pictograms and block graphs Represent their work	Communicate their findings, using the simple lists, tables, pictograms and block graphs they have recorded		Demonstrate the criterion they have used Understand vocabulary relating to handling data
Communicate their findings, using the simple lists, tables, pictograms and block graphs they have recorded Record results in simple lists, tables, pictograms and block graphs Represent their work	Collect and sort data to test a simple hypothesis Demonstrate the criterion they have used Understand vocabulary relating to handling data		

Probability

Theoretical	Experimental
Calculate and interpret conditional probabilites through Venn diagrams	
Use tree diagrams to find probabilities of successive dependent events	
Recognise when and how to work with probabilities associated with independent and mutually exclusive events Know when to add or multiply two probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is P(A) + P(B), whereas if A and B are independent events, the probability of A and B occurring is P(A) × P(B)	
Use tree diagrams to calculate probabilities of combinations of independent events	Understand relative frequency as an estimate of probability and use this to compare outcomes of an experiment
Find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way	
Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems	
Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems	Estimate probabilities from experimental data; understand that: if an experiment is repeated there may be, and usually will be, different outcomes; Increasing the number of times an experiment is repeated generally leads to better estimates of probability.
In probability, select methods based on equally likely outcomes and experimental evidence, as appropriateUnderstand and use the probability scale from 0 to 1	In probability, select methods based on equally likely outcomes and experimental evidence, as appropriate Understand that different outcomes may result from repeating an experiment

MATHS
Learning Ladder

Year 8

Key

Learning Ladders

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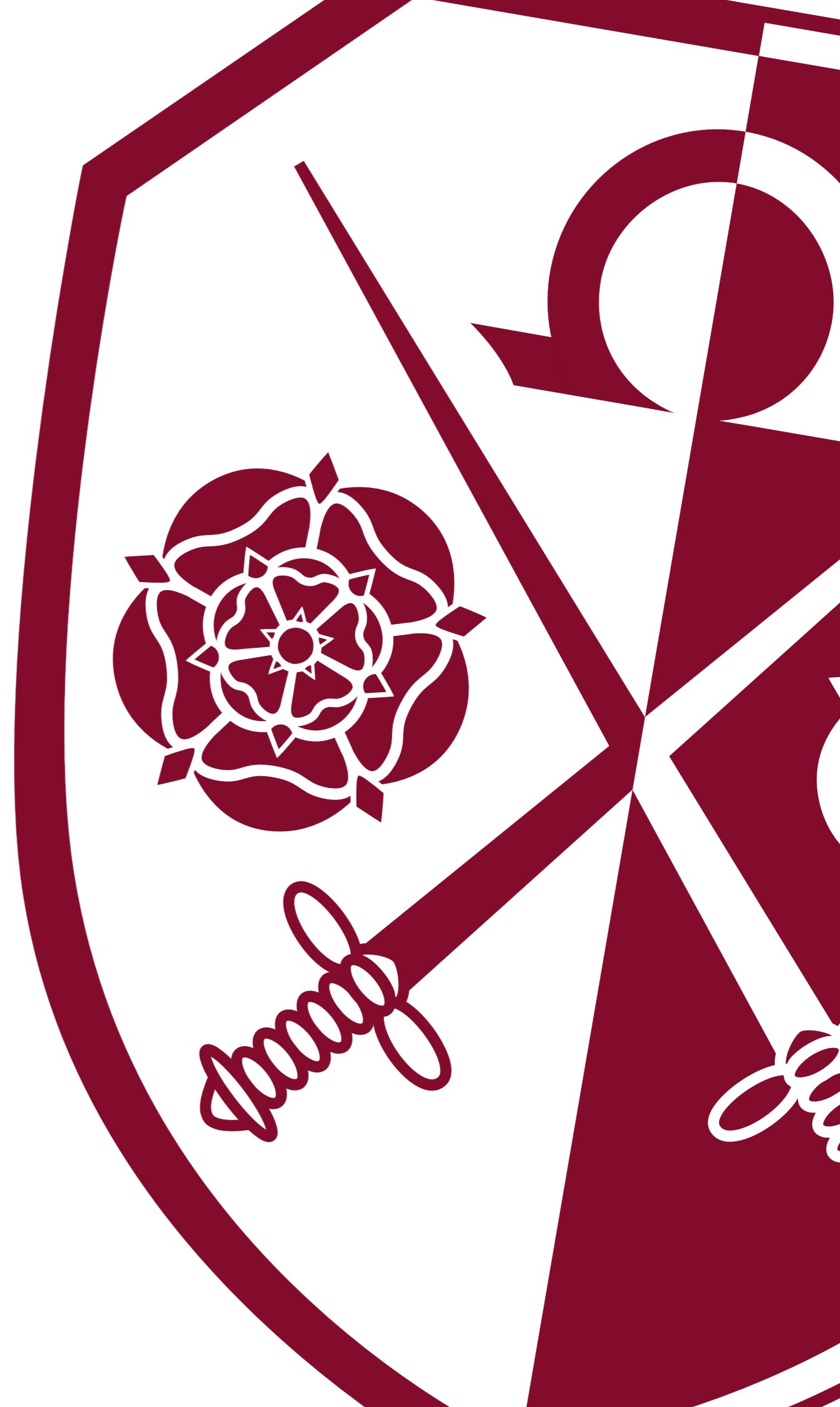
Blue indicates a level below expectations for the year group.

Grey indicates the expected level for the year group.

Red indicates a level beyond that expected for the year group.

number

Types of Number	Fractions	Decimals	Percentages	Place Value and Ordering	Four operations	Accuracy and estimating etc
	Use fractions or percentages to solve problems involving repeated proportional changes		Use fractions or percentages to solve problems involving repeated proportional changes Calculation of the original quantity given the result of a proportional change			
Understand and use rational and irrational numbers Solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude and using a calculator as appropriate.				Solve problems involving calculating with powers, roots and numbers expressed in standard form, checking for correct order of magnitude and using a calculator as appropriate.		Find the upper and lower bounds of more difficult calculations with quantities given to a various degrees of accuracy
Calculate with standard index form, without a calculator	Understand the equivalence between recurring decimals and fractions	Understand the equivalence between recurring decimals and fractions			Demonstrate sound numerical skills and algebraic fluency; use a calculator effectively	Determine the bounds of intervals
Calculate with standard index form, using a calculator Understand and use index laws including x^0 and negative powers(numeric and algebraic)	Understand and use efficient methods to add, subtract, multiply and divide fractions, interpreting division as a multiplicative inverse		Use a multiplier raised to a power to represent and solve problems involving repeated proportional change, e.g. compound interest		Demonstrate sound numerical skills and use a calculator effectively Use calculators efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation	Estimate complex calculations by rounding to one significant figure and multiplying and dividing mentally Use inequality notation to specify simple error intervals
Change numbers to and from standard form Understand and use index laws - multiply, divide and power only	Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use the equivalence of fractions, decimals and percentages to compare proportions	Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use the equivalence of fractions, decimals and percentages to compare proportions	Calculate percentages and find the outcome of a given percentage increase or decrease Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use the equivalence of fractions, decimals and percentages to compare proportions	Order numbers put to a positive integer power.	Understand the effects of multiplying and dividing by numbers between 0 and 1	Estimate calculations by rounding to one significant figure and multiplying and dividing mentally Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction
Recall integer squares from 2×2 to 15×15 and the corresponding square roots Use the terms square, positive and negative square root, cube and cube root	Add and subtract fractions by writing them with a common denominator,			Order positive integers put to a positive integer power.	Extend mental methods of calculation to include decimals, fractions and percentages	Give answers to an appropriate degree of accuracy Apply inverse operations and approximate to check answers to problems are of the correct magnitude
Recognise and use number patterns and relationships	Calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction Use equivalence between fractions and order fractions and decimals	Use equivalence between fractions and order fractions and decimals		Order negative numbers in context Use equivalence between fractions and order fractions and decimals	Add, subtract, multiply and divide integers Use known facts, place value, knowledge of operations and brackets to calculate including using all four operations with decimals to two places	Round decimals to the nearest decimal place; round a number to one significant figure
Explore and describe number patterns and relationships including multiple, factor and square	Use simple fractions and percentages including calculating fractional or percentage parts of quantities and measurements, using a calculator where necessary Find one number as a fraction of another and reduce a fraction to its simplest form by cancelling common factors	Complete straight forward calculations competently with and without a calculator,including use of function keys on a calculator for powers and roots Begin to use decimal notation in contexts such as money	Use simple fractions and percentages including calculating fractional or percentage parts of quantities and measurements, using a calculator where necessary	Order, add and subtract negative numbers in context, recognise negative numbers in contexts such as temperature Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000 Understand place value in numbers to 1000; and use this to make approximations	Complete straight forward calculations competently with and without a calculator,including use of function keys on a calculator for powers and roots Understand and use an appropriate non-calculator method for solving problems involving multiplying and dividing any three-digit by any two-digit number Use a range of mental methods of computation with all operations; including use of recall of addition and subtraction facts to 20 to solve problems with large numbers Use efficient written methods of addition and subtraction and of short multiplication and division Add and subtract three digit numbers using written method and Add and subtract two-digit numbers mentally Multiply a simple decimal by a single digit Solve problems with or without a calculator ie understanding which operation to choose	Check the accuracy and reasonableness of results by reference to knowledge of the context or to the size of the numbers, by applying inverse operations or by estimating using approximations
Count sets of objects reliably	Begin to use halves and quarters and relate the concept of half of a small quantity to the concept of half of a shape Use simple fractions that are several parts of a whole and recognise when two simple fractions are equivalent			Begin to understand the place value of each digit; use this to order numbers up to 100	Use efficient written methods of addition and subtraction and of short multiplication and division; including multiplication and division of two digit numbers by 2, 3, 4 or 5 as well as 10 with whole number answers and remainders Begin to understand the role of '=' (the 'equals' sign) Choose the appropriate operation when solving addition and subtraction problems Use mental recall of addition and subtraction facts to 10 Use the knowledge that subtraction is the inverse of addition and understand halving as a way of 'undoing' doubling and vice versa Use mental calculation strategies to solve number problems including those involving money and measures	
	Begin to use the fraction one-half			Count up to 10 objects Measure and order objects using direct comparison Order events Order numbers to 10 Read and write no.s to 10	Add and subtract numbers of objects to 10 Begin to know some addition facts Solve addition/subtraction problems involving up to 10 objects Understand addition as finding the total of two or more sets of objects Understand subtraction as 'taking away' objects from a set and finding how many are left	
				Pupils recognise differences in quantity, for example, in comparing given sets of objects and saying which has more or less, which is the bigger group or smaller group They continue to rote count onwards from a given small number, for example, continuing the rote count onwards in a game using dice and moving counters up to 10; continuing to say, sign or indicate the count aloud when adult begins counting the first two numbers They recognise numerals from one to nine and relate them to sets of objects, for example,: labelling sets of objects with correct numerals They use ordinal numbers (first, second, third) when describing the position of objects, people or events, for example, indicating who is first in a queue or line; who is first, second and third in a race		
				In practical situations they respond to 'add one' to a number of objects, for example, responding to requests such as add one pencil to the pencils in the pot, add one sweet to the dish. Pupils demonstrate an understanding of 'less', for example, indicating which bottle has less water in it. Pupils demonstrate an understanding of one-to-one correspondence in a range of contexts, for example: matching objects such as cups to saucers, straws to drink cartons. Pupils join in rote counting to 10, for example, saying or signing number names to 10 in counting activities Pupils join in rote counting up to five, for example, saying or signing number names to 5 in counting activities They can count at least 5 objects		

ratio, proportion and rates

Ratio	Proportion	Rates of Change
	Understand and use direct and inverse proportion	
Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio		
	Use a multiplier raised to a power to represent and solve problems involving repeated proportional change, e.g. compound interest Use fractions or percentages to solve problems involving repeated proportional changes or the calculation of the original quantity given the result of a proportional change Understand and use simple direct and inverse proportion	
Relate ratios to linear functions	Apply ideas of proportionality to numerical problems & use geometric properties of angles, lines & shapes Calculate the result of any proportional change using multiplicative methods. Understand and use proportional changes expressed as fractions, decimals, percentages and ratios Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole	Understand & use measures of speed (and other compound measures such as density or pressures) to solve problems
Divide a quantity into two or more parts in a given ratio Solve problems involving ratio and direct proportion - unitary method	Solve problems involving ratio and direct proportion - unitary method	
Understand simple ratio		
Solve simple problems involving ratio and direct proportion Begin to understand simple ratio	Solve simple problems involving ratio and direct proportion	

algebra

Equations	Simplifying	Substitution	Sequences	Graphs	Inequalities	Proof
In more complex cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a>1 (including of the form $x^2 + y^2 = r^2$) Interpret the reverse process as the inverse function solve more complex fractional linear equations with the unknown in the denominator Use completing the square to simplify or solve quadratic equations, a> 1 and to find maximum and minimum values				Draw, sketch and describe the graphs of trigonometric functions for angles of any size, including transformations involving scalings in either or both of the x and y directions In more complex cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a>1 (including of the form x2 + y2 = r2) Transform the graphs of y = f(x), such as linear, quadratic, cubic, sine and cosine functions, using the transformations y = f(x) + a, y = f(x + a), y = f (ax) and y = af(x)		Derive harder algebraic proofs using reasoning and logic
In simple cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a = 1 (including of the form $x^2 + y^2 = r^2$) Solve harder quadratic equations (a≠1)ie a>1 by factorisation or using the quadratic formula Use completing the square to simplify quadratic equations Use completing the square to solve quadratic equations	Derive and use more complex formulae and change the subject of a formula, including cases where the subject occurs twice Interpret the succession of two functions as a 'composite function' (using formal function notation) Manipulate surds in the form a + √b Simplify harder rational expressions			In simple cases, solve a pair of simultaneous equations in two unknowns where one is linear and one is quadratic, a = 1 (including of the form $x^2 + y^2 = r^2$)		
	Demonstrate sound numerical skills and algebraic fluency; use a calculator effectively Manipulate simple surds Recognise and use simple geometric progressions including surds, and other sequences	Demonstrate sound numerical skills and algebraic fluency; use a calculator effectively	Recognise and use simple geometric progressions including surds, and other sequences	Know and understand that the intersection points of the graphs of a linear and quadratic function are the approximate solutions to the corresponding simultaneous equations		
Interpret the reverse process as the inverse function	Derive and use more complex formulae and change the subject of a formula including cases where a power of the subject appears in the question or solution Expand the products of more than 2 binomials Manipulate algebraic formulae, equations and expressions, finding common factors and multiplying two linear expressions.	Derive and use more complex formulae and change the subject of a formula including cases where a power of the subject appears in the question or solution Evaluate algebraic formulae, substituting fractions, decimals and negative numbers.		Calculate or estimate gradients of graphs and areas under graphs, and interpret results in real-life cases(not including calculus) - speed, acceleration, distance etc Identify and sketch graphs of linear, quadratic, cubic functions and reciprocal functions Solve inequalities in two variables and find the solution set Understand the effect on the graph of addition of (or multiplication by) a constant	Solve inequalities in two variables and find the solution set	
Solve quadratic equations (a=1) by factorisation or using the quadratic formula Solve a pair of simultaneous linear equations by eliminating one variable; link a graphical representation of an equation or pair of equations to the algebraic solution Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically	Factorise quadratic expressions including the difference of two squares Square a linear expression, expand the product of two linear expressions of the form ax ± bn and simplify the corresponding quadratic expression Derive a formula and, in simple cases, change its subject - at least 3 operations	Use formulae from mathematics and other subjects; substitute numbers;- negative and decimals with calculator into expressions and formulae; Derive a formula and, in simple cases, change its subject - at least 3 operations	Find the next term and the nth term of quadratic sequences and functions and explore their properties Recognise Fibonacci type sequences, quadratics sequences, geometric sequences	Plot graphs of simple quadratic and cubic functions eg y = x²; y = 3x² + 4 and y = x³ Solve a pair of simultaneous linear equations by eliminating one variable; link a graphical representation of an equation or pair of equations to the algebraic solution Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically nterpret the gradient of a straight line as a rate of change		Construct a mathematical argument & identify inconsistencies in a given argument or exceptions to a generalisation
Construct and solve linear equations with integer coefficients (with and without brackets, negative signs anywhere in the equation, positive or negative solution), using an appropriate method	Square a linear expression, expand the product of two linear expressions of the form x ± n and simplify the corresponding quadratic expression Simplify terms involving multiplication, division and powers Derive a formula and, in simple cases, change its subject - no more than 2 operations	Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae; derive a formula and, in simple cases, change its subject - no more than 2 operations		Plot the graphs of linear functions, where y is given implicitly in terms of x; recognise that the equations can be converted to the form y = mx + c and find intercept and gradient	Solve linear inequalities in one variable, and represent the solution set on a number line	
Form and solve equations involving whole numbers (with or without bracket) using an appropriate method	Simplify terms involving multiplication, division - 12x²/4x etc		Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, and find the nth term of a sequence in algebra where the rule is linear	Construct functions arising from real-life problems and plot their corresponding graphs - conversion graphs, distance time, water into vases etc; interpret graphs arising from real situations Plot the graphs of linear functions, where y is given explicitly in terms of x; recognise that equations of the form y = mx + c correspond to straight-line graphs	Represent inequalities on a number line	Use logical argument to establish the truth of a statement
Solve two step equations.	Multiply a single term over a bracket Simplify or transform linear expressions by collecting like terms	Construct, express in symbolic form, and use simple formulae involving one or two operation	When exploring number sequences, pupils find and describe in words the rule for the next term or nth term of a sequence where the rule is linear Recognise and use number patterns and relationships	Plot the graphs of simple linear functions	Recognise inequality signs.	
		Use simple formulae Begin to use simple formulae expressed in words	Recognise a wider range of sequences			State a generalisation arising from a set of results and identify a counter-example
	Use the knowledge that subtraction is the inverse of addition and understand halving as a way of 'undoing' doubling and vice versa		Predict what comes next in a simple number, shape or spatial pattern or sequence and give reasons for their opinions Recognise sequences of numbers, including odd and even numbers			

Geometry

Perimeter, Area, Volume	Angle Relationships	Shapes	Transformations	Measures	Position
Solve problems involving the volume of the frustum of a truncated cone	Draw, sketch and describe the graphs of trigonometric functions for angles of any size, including transformations involving scalings in either or both of the x and y directions				Solve simple geometrical problems in 2-D using vectors, including use of the commutative and associative properties of vector addition including proof
Use the formula for area of a triangle	Use the sine and cosine rules. Use the formula for area of a triangle	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	Enlarge 2-D shapes, given a centre of enlargement and a negative number scale factor, recognise the similarity of the resulting shapes		
Solve problems involving surface areas and volumes of cylinders, pyramids, cones and spheres	Draw, sketch and describe the graphs of trigonometric functions for angles of any size	Understand and use Pythagoras' theorem to solve 3-D problems			Calculate a scalar multiple of a vector and represent it graphically Understand how the sign of a vector relates to its direction
Understand the difference between formulae for perimeter, area and volume by considering dimensions	Use trigonometry and geometrical properties to solve problems - circle theorems Select and combine known facts and problem solving strategies to solve geometrical problems of increasing complexity	Understand and use congruence and mathematical similarity.		Calculate or estimate gradients of graphs and areas under graphs, and interpret results in real-life cases(not including calculus)	Understand that vectors represented by parallel lines are multiples of each other
Understand and use the formulae for the length of a circular arc and area and perimeter of a sector Solve problems involving surface areas and volumes of right prisms	Understand and use trigonometrical relationships in right-angled triangles, and use these to solve problems, including those involving bearings Know the exact values of sinx, cosx for 0, 30, 45, 60 and 90 and tanx for 0, 30, 45, and 60 Apply ideas of proportionality to numerical problems & use geometric properties of angles, lines & shapes	Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio Understand and apply Pythagoras' theorem when solving problems in 2-D	Understand and use vector notation and the associated vocabulary Enlarge 2-D shapes, given a centre of enlargement and a fractional number scale factor, recognise the similarity of the resulting shapes Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio	Understand & use measures of speed (and other compound measures such as density or pressures) to solve problems	Represent, add and subtract vectors graphically Understand and use the commutative properties of vector addition Understand and use vector notation and the associated vocabulary Find the locus of a point that moves according to a given rule - complex and real life
Solve problems involving the area and circumference of a circle Deduce and use formulae for the area of a triangle, parallelogram and trapezium; calculate areas of compound shapes made from rectangles and triangles Deduce and use formulae for the volume of a cuboid; calculate volumes and surface areas of cuboids	Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text. Understand a proof that the sum of the angles of a triangle is 180° and of a quadrilateral is 360°		Enlarge 2-D shapes, given a centre of enlargement and a whole-number scale factor, recognise the similarity of the resulting shapes Know that translations, rotations and reflections preserve length and angle and map objects onto congruent images		Find the locus of a point that moves according to a given rule - simple
Use the formulae for area and circumference of a circle and plane rectilinear figures (composite rectangle)	Identify alternate and corresponding angles: Solve problems using angle and symmetry properties of polygons	Classify quadrilaterals by their geometric properties Visualise and use 2-D representations of 3-D objects including nets	Reason about position and movement and transform shapes	Read and interpret scales on a range of measuring instruments, explaining what each labelled division represents	Use straight edge and compasses to do standard constructions- bisectors and triangles
Understand and use the formula for the area of a rectangle and distinguish area from perimeter	Measure and draw angles to the nearest degree, when constructing models and drawing or using shapes Use language associated with angle and know and use the angle sum of a triangle and that	Use a wider range of properties of 2-D and 3-D shapes, identify all the symmetries of 2-D shapes	Use geometric properties, including symmetry	Solve problems involving the conversion of units and make sensible estimates of a range of measures in relation to everyday situations	Use coordinates in all four quadrants to locate and specify points
Find perimeters of simple shapes and find areas by counting squares		Begin to recognise nets of familiar 3-D shapes, e.g. cube, cuboid, triangular prism, square-based pyramid Classify 3-D and 2-D shapes in various ways using mathematical properties such as reflective symmetry for 2-D shapes Make 3-D models by linking given faces or edges and draw common 2-D shapes in different orientations on grids	Recognise shapes in different orientations and reflect shapes, presented on a grid, in a vertical or horizontal mirror line Reflect simple shapes in a mirror line, translate shapes horizontally or vertically and begin to rotate a simple shape or object about its centre or a vertex	Interpret, with appropriate accuracy, numbers on a range of measuring instruments Use standard units of time Use a wider range of measures including non-standard and standard metric units of length, capacity and mass in a range of contexts	Use and interpret coordinates in the first quadrant Describe position and movement
	Distinguish between straight and turning movements, recognise right angles in turns and understand angle as a measurement of turn	Pupils search for objects not found in their usual place demonstrating their understanding of object permanence, for example, looking for cups when they are not in their usual cupboard Describe their properties, including numbers of sides and corners Sort objects and classify them using more than one criterionUse mathematical names for common 3-D and 2-D shapes		Begin to understand that numbers can be used not only to count discrete objects but also to describe continuous measures Begin to use a wider range of measures including to use everyday non-standard and standard units to measure length and mass	Describe the position of objects
Measure and order objects using direct comparison		Sort and classify objects			Use everyday language to describe positions of 2-D and 3-D shapes Use everyday language to describe properties of 2-D and 3-D shapes
		Pupils compare objects directly, focusing on one dimension such as length or height where the difference is marked and can indicate 'the long one' or 'the tall one', for example, comparing two plants, placed side by side and indicate the tall one or comparing two zips and indicating the long one. They describe shapes in simple models, pictures and patterns, for example, stamping shapes in sand and describing them, using a set of flat shapes to make pictures or patterns, naming some of the shapes used, identifying specific shapes from pictures, simple models or patterns. They respond to mathematical vocabulary such as 'straight', 'circle', 'larger' to describe the shape and size of solids and flat shapes, for example, when shopping, pupils find boxes with straight edges to pack into the carrier bag; identify the larger circle when stacking two cans.		They show awareness of time, through some familiarity with names of the days of the week and significant times in their day, such as meal times, bed times, for example, ordering events in their day on a visual daily timetable, understanding and using names of days of the week, 'no school on Saturday or Sunday, swimming on Wednesday'.	
		They manipulate three-dimensional shapes, for example, putting shapes into a shape sorter, using 3D objects to build and manipulate in role-play, rolling a tube in a race with a partner. They pick out described shapes from a collection, for example, picking out all the round shapes in the classroom, finding shapes with straight edges, fitting shapes into matching holes. They show understanding of words signs and symbols that describe positions, for example, responding to a request to put an object in, on, under, inside another object.		They compare the overall size of one object with that of another where the difference is not great, for example, identifying the bigger of two Russian Dolls or nesting cubes. They use familiar words in practical situations when they compare sizes and quantities, for example, using the words 'heavy' and 'light', 'more' and ' less', 'enough' or 'not enough' to compare objects or quantities.	Pupils respond to 'forwards' and 'backwards', for example, moving forwards and backwards on request, recognising when a vehicle is moving forwards or backwards, moving a counter forward or backward on a board game.

statistics

Representing Data	Interpreting Data	Averages and Spread	Data Handling Cycle
Use, interpret and compare histograms, including those with unequal class intervals			Make and test hypotheses and conjectures
	Compare two or more distributions and make inferences, using the shape of the distributions and measures of average and spread including median and quartiles Estimate and find the median, quartiles and interquartile range for large data sets, including using a cumulative frequency diagram	Compare two or more distributions and make inferences, using the shape of the distributions and measures of average and spread including median and quartiles Estimate and find the median, quartiles and interquartile range for large data sets, including using a cumulative frequency diagram	Consider possible approaches to exploring a question or testing a hypothesis; refine methods as enquiry progresses Select and justify a sampling scheme and a method to investigate a population
Identify which type of graphs are most useful in the context of the problem. Select, construct and modify bar charts and frequency diagrams for discrete and continuous data; Select, construct and modify simple time graphs for time series;	Use the line of best fit on a scatter graph to estimate	Estimate the mean, median and range of a set of grouped data and determine the modal class, selecting the most appropriate to the line of enquiry Compare two or more distributions and make inferences, using the shape of the distributions and measures of average and range	Design a survey or experiment to capture the necessary data from one or more sources; determine the sample size and degree of accuracy needed Identify evidence that supports or refutes conjectures and hypotheses Suggest a problem to explore using statistical methods, frame questions and raise conjectures Understand the limitations of evidence and sampling, and the difference between a mathematical argument and conclusions based on experimental evidence
Select, construct and modify scatter graphs. Select, construct and modify stem and leaf diagrams Select, construct and modify pie charts for categorical data;	Communicate interpretations and results of a statistical survey using selected tables, graphs and diagrams in support		Design, trial and if necessary refine data collection sheets; construct tables for large discrete and continuous sets of raw data, choosing suitable class intervals; design and use two-way tables Ask questions, plan how to answer them and collect the data required
Construct and interpret stem-and-leaf diagrams Create and interpret line graphs where the intermediate values have meaning	Create and interpret line graphs where the intermediate values have meaning Interpret graphs and diagrams, including pie charts, and draw conclusions	Find the mean from a discrete table	Test simple hypotheses and conjectures based on evidence; use data to look for patterns and relationships
Construct and interpret frequency diagrams, simple line graphs and pictograms, where the symbol represents a group of unitsGroup data, where appropriate, in equal class intervals Use Venn and Carroll diagrams to record their sorting and classifying of information	Construct and interpret frequency diagrams, simple line graphs and pictograms, where the symbol represents a group of units	Understand and use the mean of discrete data and compare two simple distributions, using the range and one of mode, median or mean Understand and use the mode and range to describe sets of data	Collect and record discrete data
Construct bar charts and pictograms, where the symbol represents a group of units Record results in simple lists, tables, pictograms and block graphs Represent their work	Communicate their findings, using the simple lists, tables, pictograms and block graphs they have recorded		Demonstrate the criterion they have used Understand vocabulary relating to handling data
Communicate their findings, using the simple lists, tables, pictograms and block graphs they have recorded Record results in simple lists, tables, pictograms and block graphs Represent their work	Collect and sort data to test a simple hypothesis Demonstrate the criterion they have used Understand vocabulary relating to handling data		

Probability

Theoretical	Experimental
Calculate and interpret conditional probabilites through Venn diagrams	
Use tree diagrams to find probabilities of successive dependent events	
Recognise when and how to work with probabilities associated with independent and mutually exclusive events Know when to add or multiply two probabilities: if A and B are mutually exclusive, then the probability of A or B occurring is P(A) + P(B), whereas if A and B are independent events, the probability of A and B occurring is P(A) × P(B)	
Use tree diagrams to calculate probabilities of combinations of independent events	Understand relative frequency as an estimate of probability and use this to compare outcomes of an experiment
Find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way	
Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems	
Know that the sum of probabilities of all mutually exclusive outcomes is 1 and use this when solving problems	Estimate probabilities from experimental data; understand that: if an experiment is repeated there may be, and usually will be, different outcomes; Increasing the number of times an experiment is repeated generally leads to better estimates of probability.
In probability, select methods based on equally likely outcomes and experimental evidence, as appropriateUnderstand and use the probability scale from 0 to 1	In probability, select methods based on equally likely outcomes and experimental evidence, as appropriate Understand that different outcomes may result from repeating an experiment