

#### Aim:

Our aim is for all students to develop a mathematical mind and be able to tackle real life problems. Maths is organised into distinct strands; however, connections should continually be made across the mathematical curriculum to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. We teach a spiral curriculum maths where every strand is taught each term, the basics are revisited and when children are secure new concepts are introduced.

In year 5 and 6 it is important that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. Pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. Pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them. By the end of year 6, pupils should be fluent in written methods for all 4 operations, including long multiplication and division, and in working with fractions, decimals and percentages. Pupils should read, spell and pronounce mathematical vocabulary correctly.

The scope and sequence comprises objectives from the National Curriculum, ISEB 11+ and 13+ curriculum.

A minimum of 5 hours of mathematics should be taught each week.

The mathematical strands for year 6 are:

- Number & Place value
- Addition, Subtraction, Multiplication and Division
- Fractions, Decimals and Percentages
- Ratio and proportion
- Algebra
- Measures
- Geometry: Properties of Shape, Position & Direction
- Statistics



Number & Place value			
All children	Most children	Some children	Numicon Ref
Read and write numbers to at least 10 000 000.  Order and compare and compare numbers to at least 1 000 000.	Read, write, order and compare numbers to at least 10 000 000 and determine the value of each digit.	Count with fluency forwards or backwards in steps of powers of 10 for any given number up to 10 000 000	Numbers & the Number System 1.3  Calculating 1.4 • 3.1–3.6 • 4.1 • 4.2 • 8.4 • 9.1 • 9.2 • 13.3  Preparing for formal testing 3.1 • 3.2
Use the whole number system, including saying,	Understand and use place value for decimals,	Order positive and negative integers, decimals and	Investigating GMS 2.2
reading and writing numbers accurately.	measures and integers of any size.	fractions; use the number line as a model for ordering of the real numbers; use the symbols $=$ , $\neq$ , $<$ , $>$ , $\leq$ , $\geq$	
Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero.	Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=$ , $\neq$ , $<$ , $>$ , $\leq$ , $\geq$	Use mathematical rules to perform calculations involving negative numbers (e.g. $-2 \times 4 = -8$ ; $-3 \times -5 = 15$ ; $4 - (-3) = 7$ ).	Calculating 1.3  Calculating 1.1–1.3  Preparing for formal testing 3.6
Round any number up to 10 000 000 to the nearest 10, 100, 1000, 10 000, 100 000 and 1 000 000.  Round any whole number to a required degree of accuracy, for example, to	Use approximation through rounding to estimate answers and calculate possible resulting errors.  Round decimals with three places to the nearest whole number and to one or two	Round to a given sum of different significant figures.	
the nearest 10, 20, 50, etc. Use a calculator to solve problems and interpret the display correctly in the context of measurement.	decimal places.  Use a calculator to solve problems, including problems involving rounding up and down, and money (to 2dps).	Use a calculator and other technologies to calculate results accurately and then interpret them appropriately	



	Addition, Subtraction, Multiplication & Division			
All children	Most children	Some children	Numicon Ref	
Apply formal written methods of addition and subtraction when solving problems involving numbers up to 5 digits. Written addition inc. money. Subtraction inc. finding change.	Practise addition and subtraction for larger numbers, using the formal written methods of columnar addition and subtraction.	Use addition and subtraction methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative  Calculations with negative numbers will be restricted to integers; mixed numbers will be familiar e.g. 7½ or 2¾	Pattern & Algebra  1.3 • 3.1 • 4.6  Calculating  1.1 - 1.5 • 3.6 • 4.1 - 4.5 • 6.1 • 6.3 - 6.5 • 7.5 • 8.5 • 13.1-13.2  Preparing for formal testing 3.1 • 3.3 • 3.5 • 4.1  Investigating GMS 2.1  Measurement 1.2	
Practise mental calculations with increasingly large numbers to aid fluency (for example, 12,462 – 2,300 = 10,162).	Undertake mental calculations with increasingly large numbers and more complex calculations.	Perform mental calculations, including with mixed operations and large numbers		
Identify common factors and common multiples and prime numbers.	Identify lower common denominators, highest common factors and prime factors.  Common factors can be related to finding equivalent fractions.	Use the concepts and vocabulary of factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple.	Pattern & Algebra 1.1–1.5 • 4.5  Numbers & the Number System 2.2 • 2.3  Calculating 2.1–2.3 • 2.5 • 5.1 • 5.2 • 7.2 • 8.5 • 10.5 • 10.7 • 11.4 • 11.5  Preparing for formal testing 4.2  Investigating NPC 2  Measurement 4.2 • 4.5	
Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. Establish whether a number up to 100 is prime and recall prime numbers up to 19.	Use divisibility rules to determine whether a number is prime (e.g. 2889 is not prime as it is divisible by 3 -> 2 + 8 + 8 + 9 = 27 which is in the 3 times table).	Use the concepts and vocabulary of prime numbers, prime factorisation, including using product notation and the unique factorisation properly	Pattern & Algebra 1.1–1.4 • 4.5  Numbers & the Number System 2.3	
Use and understand the terms factor, multiple and prime, square and cube numbers and the notation for squared and cubed.	Recognise all powers/indices/roots, write the correct notation and evaluate e.g. $2^{3} = 2 \times 2 \times 2$ .	Multiply and divide indices (e.g. $2^3 \times 2^4 = 2^7$ ).		



	Addition, Subtraction, Multiplication & Division			
All children	Most children	Some children	Numicon Ref	
Multiply multi-digit numbers up to 4 digits by a two- digit whole number using the formal written method of long multiplication.	To solve multi-step word problems requiring the use of long multiplication.	Use multiplication methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative  Calculations with negative numbers will be restricted to integers; mixed numbers will be familiar e.g. 7½ or 2¾	Pattern & algebra  1.3 • 2.5  Calculating  2.1 • 2.2 • 2.4 • 3.4–3.6 • 5.1 • 5.4 • 6.1 • 6.3–6.5 • 9.1–9.5 • 10.7 •  13.1–13.4  Preparing for formal testing  3.2 • 3.4 - 3.5  Measurement  1.4 • 2.5 • 4.2 • 4.3 4.5	
Divide numbers up to 4 digits by a one or two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context	Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, $98 \div 4 = \frac{98}{4} = 24 \text{ r } 2 = 24 \frac{1}{2} = 24.5 \approx 25$ ).  Interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.	Use division methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative Calculations with negative numbers will be restricted to integers; mixed numbers will be familiar e.g. 7½ or 2¾  Divide decimals by decimals and understanding the effect.	Pattern & algebra 1.3  Calculating 2.3 • 2.5 • 3.6 • 5.1 • 5.3 • 7.3 • 7.4 • 10.1–10.7 • 13.1–13.4  Preparing for formal testing 3.1 • 3.5  Investigating NPC 2  Measurement 4.2	
Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context	Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, $98 \div 4 = \frac{98}{4} = 24 \text{ r } 2 = 24 \frac{1}{2} = 24.5 \approx 25$ ). Interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.	Use division methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative.  Calculations with negative numbers will be restricted to integers; mixed numbers will be familiar e.g. 7½ or 2¾		



Addition, Subtraction, Multiplication & Division			
All children	Most children	Some children	Numicon Ref
Use knowledge of multiplication facts (up to 12 x 12) and corresponding inverses to multiply and divide numbers.	Continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.	Can use multiplication facts to simplify more complex problems e.g. 24 x 6 = 12 x 12	Pattern & Algebra 1.1–1.3 • 2.5 • 3.1 • 4.5 • 4.6  Calculating 2.1–2.5 • 3.1 • 3.4 • 5.1–5.4 • 6.1 • 9.1 • 9.2 • 9.5 • 10.1–10.7 • 13.1 • 13.3 • 13.4  Preparing for formal testing 3.1 - 3.2  Investigating NPC 1 • NPC 2 • NPC 5  Measurement 3.1 • 4.1–4.5
Explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.	Use their knowledge of the order of operations to carry out calculations involving the four operations (BIDMAS).	Use knowledge of BIDMAS to solve simple linear, algebraic equations (e.g. y = 4x + 3).	
Problem solving:  Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes Solve problems involving addition, subtraction, multiplication and division Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.  Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.  Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy			



	Fractions, Decimals & Percentages			
All children	Most children	Some children	Numicon Ref	
Calculate decimals and percentages of fractions (e.g. 1/5 = 0.2; 1/25 = 0.04 or 4%).	Associate a fraction with division and calculate decimal fraction equivalents and percentages [for example, 0.375 or 37.5%] for a simple fraction [for example, 3/8).	Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$ )	Calculating 5.1 • 5.3–5.5 • 6.2 • 7.5  Measurement 2.5	
Identify how many tenths there are in a number (e.g. in 3.5 there are 35 tenths) and how many hundredths (e.g. in 0.45 there are 45 hundredths).	Identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places	Use knowledge of multiplying and dividing by 10, 100, 1000 to multiply and divide by any multiple of 10.		
To add and subtract numbers up to 3 decimal places, doubling and halving decimals.  Mentally add and subtract tenths, and one-digit whole numbers and tenths.	Multiply and divide numbers with up to two decimal places by whole numbers.  Division of decimal numbers by one-digit whole numbers, initially, in practical contexts involving measures and money. They recognise division calculations as the inverse of multiplication.	Solve problems involving number up to 3 decimal places.  Multiply and divide decimals by decimals.  -	Calculating 2.5 • 5.2 • 8.5 • 11.1–11.5  Preparing for formal testing 4.2	
Compare and order fractions with different denominators including fractions greater than 1.	Compare and order mixed fractions, decimals and percentages including those greater than 1.	Compare and order mixed fractions, decimals and percentages including recurring decimals.		
Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.  To convert mixed numbers and improper fractions to decimals and percentages.	Identify and justify when a fraction is in its simplest form.	Being able to manipulate fractions and use the most appropriate form of the fraction appropriate for the context e.g. pie charts.	Pattern & Algebra 1.3  Numbers & the Number System 2.3  Calculating 2.5  Preparing for formal testing 4.2  Measurement 1.1	
Add and subtract fractions with different denominators.	Add and subtract fractions with different denominators including mixed numbers and improper.	Add and subtract all types of fractions, decimals and percentages.		



Fractions, Decimals & Percentages			
All children	Most children	Some children	Numicon Ref
Multiply simple pairs of proper fractions, writing the answer in its simplest form.	Multiply improper fractions and mixed numbers.	Cross cancel fractions to simplifying before multiplying.	
Divide simple pairs of proper fractions, writing the answer in its simplest form.	Divide improper fractions and mixed numbers.	Cross cancel fractions to simplifying before dividing.	
Find fractions using division (e.g. 1/100 of 5kg) and percentages of numbers (e.g. 10%, 5%, 15% of £80) multiples of 5.	Use mathematical knowledge to calculate percentages of numbers including decimal percentages and percentages greater than 100%	Being to understand percentages in real life examples.	
Solve problems which require answers to be rounded to specified degrees of accuracy. Solve problems which require knowing percentage and decimal equivalents of fractions with a denominator with a multiple of 5 (eg. 5%, 10%, 15%, etc).  Solve problems which require knowing percentages and decimal equivalents of fractions with 1dp, eg. 17.5% of 60, or 0.1% of 15 000).  Approximating or rounding numbers within problems to the context e.g. How many egg boxes would you need for 8 eggs?			



Ratio & Proportion			
All children	Most children	Some children	Numicon Ref
Understand the language and concept of ratio and proportion and how they link to fractions.  e.g. Express 1 quantity as a fraction of another, where	Use ratio notation, including reduction to simplest form. Divide a given quantity into 2 parts in a given part:part ratio	Divide a given quantity into a part:whole ratio.	Numbers & the Number System 2.3  Calculating 5.1 • 5.2 • 5.5 • 7.1–7.5  Geometry 2.1
the fraction is less than 1 or greater than 1.			Measurement 1.4 • 1.5 • 4.4
Use simple 1:1 scales e.g. 1cm = 1km	Consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation a:b to record their work.	Use scale factors, scale diagrams and maps.  Scale factors may be either in the form '1:50000' or '1 cm represents 500m'.	
Solve problems involving unequal quantities, for example, 'for every egg you need 3 spoonful's of flour', 'of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion.  Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics  Solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts including similar shapes with scale factors.  Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples			

Algebra			
All children	Most children	Some children	Numicon Ref
Solve equations with one unknown.	Solve equations with same unknowns on both sides by simplifying and collecting like terms.	Find pairs of numbers that satisfy an equation with 2 unknowns	Pattern & Algebra 3.2 – 3.5 • 4.1 • 4.3  Geometry 2.1 • 3.5
Substitute positive integers into simple formulae	Express missing number problems algebraically	Substitute positive and negative integers into simple formulae	
Generate and describe linear number sequences	To create a general rule for a number sequence and find the nth term	Generate and describe quadratic number sequences	Pattern & Algebra 2.1 – 2.3 • 2.5 • 4.1–4.4
To write equivalent expressions (for example, a + b = b + a) and simplify expressions e.g. 2a + 3a = 5a	Simplifying expression with multiplication e.g. 2a x b = 2ab	Simplifying with brackets and fractions.	



Measures			
All children	Most children	Some children	Numicon Ref
Tell the time using analogue and digital clocks, answering in 12-hour and 24-hour times.	Solve time duration problems.	Solve problems involving converting between units of time e.g. calendars, 24-hour clock.	
Draw and measure lines to the nearest millimetre.	Measure lines to the nearest millimetre, that do not start at 0 (e.g. length from 3.4cm to 5.1cm = 17mm).  Use a given scale to draw lines (e.g. 1mm = 5cm).	Draw and measure line segments and angles in geometric figures, including interpreting scale drawings and finding the area.	
Measure and calculate the perimeter of regular and irregular polygons in millimetres, centimetres and metres. Recognise that shapes with the same areas can have different perimeters and vice versa.	Use the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example 4 + 2b = 20 for a rectangle of sides 2 cm and b cm and perimeter of 20cm.	Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving rightangled triangles.	
-	Measure and calculate the circumference and area of a circle.	Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes	
Recognise when it is possible to use formulae for area and volume of shapes including parallelograms and triangles.	To use formulae to find the area and volume of compound shapes.	Derive and apply formulae to calculate and solve problems involving perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes).	Calculating 3.5 • 6.1 • 6.2  Investigating GMS 1.1 • 1.2 NPC 1.1  Measurement 3.3 • 4.1–4.5
Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.	Solving problems involving different metric units so that they convert units whilst solving e.g. knowing that 1 sq. m. is equal to 10,000 sq. cm.	Solving problems involving compound units for speed, such as miles per hour.	Calculating 1.1 • 1.5 • 3.4 • 4.1 • 8.4 • 9.2  Investigating GMS 1.2 • 2.2 • 2.3  Geometry 1.1–1.3 • 2.1  Measurement 1.1 • 1.3 – 1.5 • 4.3
Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints.	Convert between metric units and other imperial units of measure e.g. converting between miles and kilometres.	Use metric and imperial units of measure to create conversion graphs and use these to answer conversion questions.	Calculating 13.3.  Measurement 1.4 • 4.3



Measures			
All children	Most children	Some children	Numicon Ref
Calculate, estimate and compare volume of cubes and cuboids using standard units, including cm <sup>3</sup> and m <sup>3</sup> and extending to others unit for example, mm <sup>3</sup> and km <sup>3</sup> .	Know and use the formula for calculating the volume of cubes and cuboids, answering in mm <sup>3</sup> , cm <sup>3</sup> , m <sup>3</sup> and km <sup>3</sup> .	Recognise when it is possible to use formulae for volume of shapes.	

Geometry Properties of Shape			
All children	Most children	Some children	Numicon Ref
Describe the properties of both 2D and 3D shapes, symmetry, parallel, perpendicular and explain how unknown angles and lengths can be derived from known measurements.	These relationships might be expressed algebraically for example, d = 2 × r; a = 180 – (b + c).	Drawing 2D representations of 3D shapes from different perspectives.	Geometry 1.3 • 2.1 • 3.5  Measurement 3.1 – 3.2 • 4.1 • 4.4
To draw lines with a ruler to the nearest millimetre, and angles measuring with a protractor.  Know angles are measured in degrees; estimate and compare acute, obtuse and reflex angles.  Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons.	Use a ruler and protractor to draw a range of regular and irregular 2D shapes. Use conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons which are reflectively and rotationally symmetric.	Illustrate and draw parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.	Geometry 1.1 • 1.2  Measurement 1.5
Identify and draw nets of 3D shapes.	Identify different nets of the same 3D shape.	Make/draw different nets of a range of 3D shapes.	
Calculate missing angles: at a point and one whole turn (total 360°) on a straight line and a half turn (total 180°) other multiples of 90° (e.g. right angle).  Calculate missing angles in triangles and quadrilaterals.	Use the term diagonal and make conjectures about the angles formed between sides, and between diagonals and parallel sides, and other properties of quadrilaterals, for example using dynamic geometry ICT tools.	Calculate angles in any regular polygon.	Geometry 1.1 • 1.2 • 1.4 • 1.5



Geometry Position & Direction			
All children	Most children	Some children	Numicon Ref
Identify, describe and represent the position of a	Reflect shapes using a diagonal line of reflection.	Reflect shapes using a given equation of a line, e.g.	Calculating 7.1
shape following a reflection, using the appropriate language, and know that		Reflect shape using the line $x = 4$ , or $y = 3$ .	Investigating GMS 1.1 • 1.2
the shape has not changed.			Geometry 1.1–1.5 • 3.1–3.4
			Measurement 2.1 • 3.1–3.3 • 4.1 • 4.4 • 4.5
Translate a shape using given vectors. Know that the shape has	Translate a shape using all 4 quadrants, using given vector.	Be able to write a translation as a vector.	
not changed.			
Identify shapes following a rotation in a certain	Rotate shapes in a specified direction and a given	Rotate shapes around a centre of rotation, using a	
direction and by a specified	magnitude of rotation	specified magnitude of	
angle (multiple of 90°).	(multiple of 90°).	rotation and in a specified direction.	
Enlarge shapes using a given	Enlarge shapes using a scale	Solve problems involving	
scale factor (could also be	factor and a centre of	similar shapes where the	
<1 to decrease the size).	enlargement.	scale factor is known or can	
		be found, move on to negative scale factors.	
Describe positions on the	Draw and label rectangles	Use algebra for example,	
full coordinate grid (all four	(including squares),	translating vertex (a, b) to	
quadrants).	parallelograms and	(a – 2, b + 3); (a, b) and (a +	
	rhombuses, specified by	d, b + d) being opposite	
	coordinates in the four	vertices of a square of side	
	quadrants, predicting	d.	
	missing coordinates using		
	the properties of shapes.		



Statistics			
All children	Most children	Some children	Numicon Ref
Solve problems using data presented in a range of graphs and charts (eg. Bar charts, line graphs, pictograms, etc).	Interpret (and construct) pie charts and line graphs and use these to solve problems. Connect their work on angles, fractions and percentages to the interpretation of pie charts.	Describe simple mathematical relationships between 2 variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs	Pattern & Algebra 1.4, 2.1 • 2.5  Calculating 3.3  Investigating NPC 5 • GMS 3.5  Measurement 1.1 • 1.3–1.5 • 4.4
Use information presented in tables (including frequency tables) to construct graphs and charts.	Interpret a reading that lies between two unnumbered divisions on a scale (up to 3 dp).	Connect their work on coordinates and scales to their interpretation of time graphs.	
To calculate the mode, median, range and mean from small sets of data.	Use information presented in tables to calculate the mode, median, range and mean.	To be able to interpret the averages and make comparisons between data.	Calculating 4.1 • 6.1  Investigating NPC 5  Measurement 1.1 • 1.2
Determine the probability of an event. Describe the occurrence of familiar events using the language of chance or likelihood.	Represent the probability of an event occurring mathematically (using fractions, decimals and percentages).	Calculate the probability of an event occurring, including those with two factors (eg. rolling a 7 with two dice).	
Problem solving: Answer a set of related questions by collecting, selecting and organising relevant data; draw conclusions, using computing to present features, and identify further questions to ask.  Begin to decide which representations of data are most appropriate and why. Encounter and draw graphs relating 2 variables, arising from their own enquiry and in other subjects			Calculating 3.3 • 7.4  Investigating GMS 2.1 • 2.2  Measurement 1.2 • 1.4 • 1.5