Mathematics

We provide a high quality Maths education at Roman Road School as a tool for everyday life. It is a wide range of concepts and relationships which provide a way of viewing and making sense of the world. It is used to analyse and communicate information and ideas and to tackle a range of practical tasks and real-life problems. A high quality Mathematics education, therefore, provides a foundation for understanding the world, the ability to reason mathematically and a sense of enjoyment and curiosity about the subject.

The National Curriculum for Mathematics aims to ensure that all pupils:

- become **fluent** in the fundamental of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

Roman Road's curriculum framework comprises:

Roman Road Primary School have adopted and adapted Gateshead's Core Curriculum for Maths to best suit the learning needs of its pupils. Using this spiral curriculum enables our children to reinforce, consolidate and move the learning forward.

- **A Curriculum Overview** identifying the way it is organised into blocks with a description of the key aspects of mathematics to be developed in units associated with each of these blocks. Ways to make links within and beyond mathematics are identified in the block descriptions to ensure mathematics is experienced as an interconnected subject with relevance to many other subjects. Objectives for problem solving and reasoning are embedded into each block to promote the skills of thinking mathematically.

- **Yearly teaching programmes** for Years 1 to 6 which clearly identify, for each block, whether elements are:
    - Drawn from the NC programmes of study (**bold type**)
    - Drawn from the non-statutory guidance (plain type)
    - Suggested enhancements to take account of issues of progression or provision for problem solving and reasoning (*italics*)

- **Yearly progression grids or medium term plans** for each year group to suggest how the mathematics in each block might be taught in units across the three terms. Teachers should judge whether the allocation of objectives across the terms is the best fit for their pupils based on assessment of prior learning and adapt the plans accordingly. Timing associated with these plans are subject to change to best match the learning needs of pupils. Progression grids across different year groups inform teachers of previous learning and how learning will be taken forward in the year groups that follow.

- **A calculation guidance document** which shows how calculation strategies and methods of recording are developed. This takes account of the programmes of study and non-statutory guidance but is further enhanced by the inclusion of support for the development of mental calculation strategies and the appropriate use of informal or expanded written procedures which can be used to support understanding of formal written methods.

Curriculum Structure / Strands of Maths

The core curriculum is organised into blocks of work with the following key focuses:

- Understanding and investigating with number
- Developing and applying calculation – addition and subtraction
- Developing and applying calculation – multiplication and division
- Measurement
- Geometry
- Statistics

Understanding and investigating with Number

Pupils develop their understanding of numbers and the number system, encompassing positive and negative integers, decimals and fractions and the notation systems associated with them. How numbers can be represented in different ways using a range of practical materials or manipulatives is explored. Pupils learn how to compare and order numbers and to place them on number lines with reference to other numbers. They gain a growing understanding of relationships between numbers, the properties that can be associated with numbers and how

these attributes can support efficient methods of calculation. Relationships between numbers and quantities are developed to give an appreciation of different ways to express a proportion, including percentages, and to develop an understanding of ratio.

Pupils apply their number knowledge to calculate, to read and interpret scales in statistical and measurement contexts, to solve routine and non-routine problems, often in cross curricular contexts. They also investigate within the number system itself, reasoning about number, conjecturing relationships and generalisations and learning to develop arguments, justifications and proofs using mathematical language and other forms of communication such as diagrams.

Developing and applying Calculation

Pupils develop their understanding of how the number operations are related to practical situations. They learn about the laws of arithmetic that govern number operations and appreciate how the different operations are related to each other. Increasingly sophisticated and efficient methods of calculation are developed based on understanding of number, including place value; recall and rapid derivation of key number facts; an appreciation of efficient mental calculation strategies and, by the end of Key Stage 2, fluent use and understanding of a formal written procedure for each of the operations. Children develop their calculation skills with whole numbers and with fractions and decimals as appropriate for their stage of development.

Calculation skills are applied to the solution of a wide range of routine and non-routine problems. Pupils calculate to solve number-based puzzles and contextualised problems including those involving measures or shapes. They often have to perform calculations using information presented as tables, charts and graphs. When solving problems pupils choose appropriate calculation strategies, explain their problem-solving approach and the reasoning behind it to others and have opportunities to compare their different approaches. Algebraic thinking is developed in these units through the formation, interpretation and solving of equations with one or more unknown numbers, represented by symbols. Gaining a good understanding of inverse operations is important to this development and is a strong feature of these units.

Measurement

Pupils develop an understanding of the nature and use of a range of measurements including those for money, time, length, mass, volume, capacity, perimeter and area. They appreciate the need for standard units of measurement and become increasingly familiar with these units and the relationships between them, using this understanding to order, compare and convert between different measures. Pupils learn to measure using a range of equipment with increasing accuracy and appreciate the need for appropriate levels of accuracy.

Children apply their measuring skills to solve problems, including practical problems such as the construction of shapes and artefacts. They apply their understanding of the number system and their calculation skills in measures contexts and make strong connections between number, measurement and geometry. Children may learn to express some of the relationships they explore in measurement using algebraic expressions. They encounter statistical data about measurements to interpret and apply, which may be information from other subject areas or from an enquiry of interest to the children and suggested by them.

Geometry

Pupils develop an increasing understanding of the properties and 2-D and 3-D shapes and use this to describe, identify and classify shapes using appropriate mathematical vocabulary. Pupils draw and construct shapes with increasing accuracy often for a practical purpose and sometimes as part of a cross curricular project.

Children also learn to describe and record position, direction and movement, including turns or rotations, reflection and translations using appropriate vocabulary. They develop an understanding of the coordinate plane and can use coordinates to describe position and movement between positions.

Pupils use their growing knowledge and understanding of geometry to solve puzzles and contextualised problems which require them to reason and make conjectures. They explain their thinking and communicate their ideas to others in words, writing and through the use of diagrams.

Through solving problems pupils develop their geometry skills in conjunction with those of calculation and measurement. They understand the connections between geometry and other aspects of maths and appreciate its significance for subjects outside of mathematics.

Statistics

Pupils learn to collect information and to construct and interpret a range of tables, charts and graphs. They use the information to solve problems involving comparisons, sums and differences in a range of contexts. These skills will be applied regularly in other units and in cross curricular contexts. Statistical information will often be collected, presented and interpreted in response to questions of interest to the children that they have posed. Children might use Venn and Carroll diagrams or branching tree diagrams to support reasoning about numbers, shapes or measures.

educationGateshead Core Curriculum for Primary Mathematics Progression Grid Years 1-3

Year 1	Year 2	Year 3
Understanding and investigating with numbers	**Understanding and investigating with numbers**	**Understanding and investigating with numbers**
Place value, ordering and rounding	**Place value, ordering and rounding**	**Place value, ordering and rounding**
• **Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number.** • Practise counting as reciting numbers and enumerating objects and to identify order (1st, 2nd, 3rd...). • **Read and write numbers from 1 to 20 in numerals and words.** • **Count, read and write numbers to 100 in numerals.** • **Identify and represent numbers using objects and pictorial representations including the number line.** • **Given a number, identify one more and one less.** • **Use the language of: equal to, more than, less than (fewer), most, least** *to compare and order numbers and quantities.* • Begin to recognise place value in numbers *up to and* beyond 20 by reading, writing, counting and comparing numbers up to 100, supported by objects and pictorial representations e.g. *Knowing that adding a one digit number to ten makes a teen number and subtracting units from a teen number leaves ten.* • *Solve problems involving counting objects.*	• *Continue to count forwards and backwards in ones and tens from any number to 100 and beyond to establish fluency, especially across boundaries of 10s and 100s.* • **Read and write numbers to at least 100 in numerals and words.** • **Compare and order numbers from 0 up to 100; use >, < and = signs.** • **Identify, represent and estimate numbers using different representations, including the number line** and spatial representations. • **Recognise the place value of each digit in a two-digit number (tens, ones).** • Begin to understand zero as a place holder. • Partition numbers in different ways e.g. 23 = 20 + 3 and 23 = 10 + 13 to support subtraction. • *Understand e.g. 23 as20 + 3 and as 2 tens and 3 ones.* • **Use place value and number facts to solve problems.** • *Apply understanding of the number system to solve problems and puzzles involving numbers, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbol.*	• Continue to count in ones, tens and hundreds *from any number,* using a variety of representations, including those related to measures, to become fluent in the order and place value of numbers to 1000. • **Read and write numbers up to 1000 in numerals and words.** • **Compare and order number s up to 1000.** • *Use the vocabulary of comparing and ordering numbers including use of >, < symbols and = sign.* • **Identify, represent and estimate numbers using different representations.** • **Recognise the place value of each digit in a three-digit number (hundreds, tens and ones).** • Apply partitioning related to place value using varied and increasingly complex problems e.g. 146 = 100 + 40 + 6 and 146 = 130 + 16. • *Understand e.g. 146 as 100 + 40 + 6 and as 1 hundred, 4 tens and 6 ones.* • *Round any number to nearest 10 or 100.* • *Apply understanding of the number system to* **solve number and practical problems** *and puzzles involving numbers, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbol.*

Year 1	Year 2	Year 3
Properties of numbers and number sequences	**Properties of numbers and number sequences**	**Properties of numbers and number sequences**
• **Count in multiples of twos, fives and tens** from different multiples to develop recognition of patterns e.g. odd and even numbers. • Recognise and create repeating patterns with objects and with shapes. • *Describe simple patterns and relationships involving numbers; decide if examples satisfy a given condition.*	• **Count in steps of 2, 3 and 5 from 0 and in tens from any number, forward and back.** Counting in steps of three will support later understanding of a third. • **Find 10 more or 10 less than any given number.** • Recognize patterns in numbers to and beyond 100. • *Recognise and extend number sequences formed by counting from any number in steps of constant size.* • *Apply understanding of number properties to solve routine and non-routine problems and puzzles involving numbers, money or measure.* • *Explore and discuss patterns, properties and relationships that arise in the number system using appropriate mathematical vocabulary.* • *Develop lines of enquiry through conjecturing relationships and generalisations and testing ideas. Identify examples for which a statement is true or false.*	• Continue to use multiples of 2, 3, 5 and 10. • **Count from 0 in multiples of 4, 8, 50 and 100** • **Find 10 or 100 more or less than a given number.** • *Recognise patterns in sequences of multiples and connections between them e.g. explore patterns on a 12 x 12 multiplication grid.* • *Recognise and extend number sequences formed by counting from any number in steps of constant size.* • *Apply understanding of number properties to solve routine and non-routine problems and puzzles involving numbers, money or measure.* • *Explore and discuss patterns, properties and relationships that arise in the number system using appropriate mathematical vocabulary.* • *Develop lines of enquiry through conjecturing relationships and generalisations and testing ideas. Identify examples for which a statement is true or false.*

Year 1	Year 2	Year 3
Fractions	**Fractions**	**Fractions and decimals**
• *Experience* half and quarter as 'fractions of' discrete (e.*g. countables*) and continuous (*e.g. liquid*) quantities by solving problems using shapes, objects and quantities. For example, recognise and find half a length, quantity, set of objects or shape. • Connect halves and quarters to the equal sharing and grouping of sets of objects and to measures, as well as recognising and combining halves and quarters as parts of a whole. • **Recognize, find and name a half as one of two equal parts of an object, shape or quantity** • **Recognize, find and name a quarter as one of four equal parts of an object, shape or quantity**	• Use fractions as 'fractions of' discrete (e.*g. countables*) and continuous (*e.g. liquid*) quantities by solving problems using shapes, objects and quantities. • Connect unit fractions to equal sharing and grouping, to numbers when they can be calculated and to measures, finding fractions of lengths, quantities, sets of objects and shapes. • **Recognise, find, name and write fractions 1/3 , ¼, 2/4, and ¾ of a length, shape and set of objects or quantity.** • **Write simple fractions e.g. ½ of 6 = 3 and recognise the equivalence of 2/4 and ½** • Count in fractions up to 10 starting at any number and using the ½ and 2/4 equivalence on the number line e.g. 1 ¼, 1 2/4, (or 1 ½) 1 ¾ , 2. Reinforce the concept of fractions as numbers and that they can add up to more than one. • *Apply understanding of fractions to solve routine and non-routine problems and puzzles involving numbers, shapes, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.*	• Continue to recognise fractions in the context of parts of a whole, numbers, measurements, a shape, and unit fractions as a division of a quantity. • **Recognize, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators.** • Understand the relation between unit fractions as operators (fractions of), and division by integers. • **Recognize and use fractions as numbers: unit fractions and non-unit fractions with small denominators.** Use them on a number line and deduce relations between them such as size and equivalence. Go beyond the 0 – 1 interval, including relating this to measure. • **Compare and order unit fractions, and fractions with the same denominators.** • **Recognise and show, using diagrams, equivalent fractions with small denominators.** • **Add and subtract fractions with the same denominator within one whole e.g. 5/7 + 1/7 = 6/7.** • **Count up and down in** *fractions including* **tenths.** • **Recognise that tenths arise from dividing an object into ten equal parts and in dividing one-digit numbers or quantities by 10,** connecting them to place value, decimal measures and division by 10. • *Apply understanding of fractions to* **solve** *routine and non-routine* **problems** *and puzzles involving numbers, shapes, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.*

Year 1	Year 2	Year 3
Developing and applying calculation	**Developing and applying calculation**	**Developing and applying calculation**
Addition and Subtraction	**Addition and Subtraction**	**Addition and Subtraction**

• **Represent and use number bonds and related subtraction facts within 20** *using concrete objects and pictorial representations to support understanding.*
• Memorise and reason with number bonds to 10 and 20 in several forms (for example, 9 + 7 = 16; 16 – 7 = 9; 7 = 16 – 9). This establishes addition and subtraction as related operations.
• *Make connections e.g. between 7 + 2= 9 and 17 + 2 = 19.*
• **Add and subtract one-digit and two-digit numbers to 20, including zero.**
• Realise the effect of adding or subtracting zero.
• **Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs.**
• Combine and increase numbers, counting forwards and backwards.
• **solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ - 9.**
• Discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.
	• **Recall and use addition and subtraction facts to 20 fluently and derive and use related facts to 100** e.g. use 3 + 7 = 10; 10 -7 = 3 and 7 = 10 – 3 to calculate 30 + 70 = 100; 100 – 70 = 30 and 70 = 100 – 30.
	• **Add and subtract numbers using concrete objects, pictorial representations and mentally, including:**
	  ○ **a two-digit number and ones**
	  ○ **a two-digit number and tens**
	  ○ **two two-digit numbers**
	  ○ **adding three one-digit numbers**
	• **Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.**
	• Check calculations e.g. by adding to check subtraction and adding numbers in a different order to check addition e.g. 5 + 2 +1 = 1 + 5 + 2 = 1 + 2 + 5. This establishes commutativity and associativity of addition.
	• **Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.**
	• Continue to extend understanding of language of addition and subtraction to include sum and difference.
	• **Solve problems with addition and subtraction**
	  ○ **Using concrete objects and pictorial representations, including those involving numbers, quantities and measures.**
	  ○ **Applying increasing knowledge of mental and written methods.**
	• *Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 4+ 6 = 5 + 5; 17 = 19 - ∆).*
	• *Use and explain a range of mental strategies appropriate to the numbers involved, sometimes supporting explanations with jottings or informal recording.*
	• *Solve calculation problems using information from a range of pictograms, tally charts, block diagrams and simple tables.*
	• *Apply understanding of number operations to solve number puzzles and non-routine problems and explain reasoning.*
	•
		• *Continue to practice recall of addition and subtraction facts to 20; use these known facts and understanding of place value to quickly derive sums and differences using two-digit numbers.*
		• **Add and subtract numbers mentally including**
		  ○ **a three-digit number and ones**
		  ○ **a three-digit number and tens**
		  ○ **a three-digit number and hundreds**
		  ○ addition and subtraction of two digit numbers including additions with answers exceeding 100.
		• *Use and explain a range of mental strategies appropriate to the numbers involved, sometimes supporting explanations with jottings or informal recording.*
		• **Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.**
		• **Estimate the answer to a calculation and use inverse operations to check answers.**
		• *Understand and use the principles of the arithmetic laws; commutative and associative.*
		• **Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.**
		• Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 6 + 8 = 7 + 7; 33 = 38 - ∆).
		• *Solve calculation problems using information from a range of tables and charts.*
		• *Apply understanding of number operations to solve number puzzles and non-routine problems and explain reasoning.*

Multiplication and Division	Multiplication and Division	Multiplication and Division
• **Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.** • Through grouping and sharing small quantities, pupils begin to understand: multiplication and division; doubling numbers and quantities; and *make connections with* finding simple fractions of objects, numbers and quantities. • **Count in multiples of twos, fives and tens** • Make connections between arrays, number patterns, and counting in twos, fives and tens. • *Recall doubles of numbers to 10 and corresponding halves.*	• **Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognizing odd and even numbers.** • Connect the 2, 5 and 10 multiplication tables to each other. Connect the 10 multiplication table to place value and the 5 multiplication table to the divisions on a clock face. • *Continue to recognise doubles and corresponding halves.* • Connect unit fractions to equal sharing and grouping, to numbers when they can be calculated and to measures, finding fractions of lengths, quantities, sets of objects and shapes. • **Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs.** • **Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.** • **Solve problems involving multiplication and division using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.** • Work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. Relate these to fractions and measures. • Use a variety of language to describe multiplication and division.	• **Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.** Continue to practice 2, 5 and 10 tables and connect the 2, 4 and 8 multiplication tables through doubling. • Develop efficient mental methods for example using commutativity and associativity e.g. 4 x 12 x 5 = 20 x 12 = 240 and multiplication and division facts e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3 = 2 to derive related facts such as 30 x 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3. • **Write and calculate mathematical statements for multiplication and division using the multiplication tables that are known, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.** • *Use informal recording methods such as the grid method, linked to understanding of partitioning arrays to support the development of formal methods as appropriate.* • **Solve problems, including missing number problems, involving multiplications and division,** including measuring contexts and **positive integer scaling problems** (e.g. four times as high, 8 times as long) **and correspondence problems in which n objects are connected to m objects** (e.g. 3 hats and 4 coats, how many different outfits, 4 cakes shared equally between 8 children). • *Use rounding, estimation and inverse operations to check answers to calculations and determine, in the context of a problem, levels of accuracy.* • *Solve calculation problems using information from a range of tables and charts.* • *Apply understanding of number operations to solve number puzzles, routine and non –routine problems and explain reasoning.* • *Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 2* x *12 = 4* x *6; 30 = 5* x ◊*)*

Year 1	Year 2	Year 3
Measurement	**Measurement**	**Measurement**

• **Compare, describe and solve practical problems for:**
  • **lengths and heights [e.g. long/short, longer/shorter, tall/short, double/half]**
  • **mass/weight [e.g. heavy/light, heavier than, lighter than]**
  • **capacity and volume [e.g. full/empty, more than, less than, half, half full, quarter]**
  • **time [e.g. quicker, slower, earlier, later].**
• Move from using and comparing different types of quantities and measures using non-standard units, including discrete (for example, counting) and continuous (for example, liquid) measurement, to using manageable common standard units.
• Begin to use measuring tools such as a ruler, weighing scales and containers.
• **measure and begin to record the following:**
  • **lengths and heights**
  • **mass/weight**
  • **capacity and volume**
  • **time (hours, minutes, seconds).**
• **Recognize and know the value of different denominations of coins and notes.**
• **Sequence events in chronological order using language [e.g. before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening].**
• **Recognize and use language relating to dates, including days of the week, weeks, months and years.**
• **Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.**
• Use the language of time, including telling the time throughout the day, first using o'clock and then half past.
• Connect experiences of turning clockwise with movement of hands on a clock face.
	• **Choose and use appropriate standard units to estimate and measure,** with increasing accuracy, **length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels.**
	• Use appropriate language for measuring and record using standard abbreviations.
	• **Compare and order lengths, mass, volume/capacity and record the results using >, < and =.**
	• Compare using simple multiples such as 'half as high', 'twice as wide'.
	• Become fluent in counting and recognizing coins *and notes*. Read and say amounts of money confidently.
	• **Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value.**
	• **Find different combinations of coins that equal the same amounts of money.**
	• **Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change.**
	• **Compare and sequence intervals of time.**
	• **Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.**
	• **Know the number of minutes in an hour and the number of hours in a day.**
	• *Use all four operations to solve problems including scaling problems involving measure (e.g. length, mass, volume, money)***.** *Information required to solve a problem is often drawn from tables, and charts.*
	• *Apply measuring skills to an appropriate degree of accuracy, alongside the skills of thinking mathematically to solve problems. These should include practical problems and might involve construction of shapes or artefacts, often in a cross curricular context.*
	• *Make and explain connections between number, measures and shape.*
		• Continue to measure using appropriate tools and units.
		• **Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g): volume/ capacity (l/ml),** including
		  ○ comparing and using mixed units e.g. 1kg and 200g
		  ○ simple equivalents of mixed units e.g. 5m = 500cm.
		  ○ comparisons involving simple scaling by integers e.g. a given quantity is twice as long or 5 times as high. This should be connected to multiplication.
		• **Measure the perimeter of simple 2-D shapes.**
		• Continue to become fluent in recognising the value of coins**; add and subtract amounts of money to give change, using both £ and p in practical contexts.** Record £ and p separately.
		• **Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and the 12-hour and 24-hour clocks.** Use the digital 12 hour clock.
		• **Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./ p.m., morning, afternoon, noon and midnight.**
		• **Know the number of seconds in a minute and the number of days in each month, a year and leap year.**
		• **Compare duration of events e.g. the time taken by a particular event or task.**
		• *Use all four operations to solve problems including scaling problems involving measure (e.g. length, mass, volume, money)***.** *Information required to solve a problem is often drawn from tables, including timetables, graphs and charts.*
		• *Apply measuring skills to an appropriate degree of accuracy, alongside the skills of thinking mathematically to solve problems. These should include practical problems and might involve construction of shapes or artefacts, often in a cross curricular context.*
		• *Make and explain connections between number, measures and shape.*

Year 1	Year 2	Year 3
Geometry	**Geometry**	**Geometry**
Properties of Shapes	**Properties of Shapes**	**Properties of Shapes**
Recognize and name common 2-D and 3-D shapes, including: • **2-D shapes [e.g. rectangles (including squares), circles and triangles]** • **3-D shapes [e.g. cuboids (including cubes), pyramids and spheres].** • Pupils handle common 2-D and 3-D shapes, naming these and related everyday objects fluently. They recognize these shapes in different orientations and sizes, and know that rectangles, triangles, cuboids and pyramids are not always similar to each other. • *Compare and sort common 2D and 3D shapes and everyday objects.* • *Recognize and create repeating patterns with objects and with shapes.*	• **Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line.** • **Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces.** • **Identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid].** • **Compare and sort common 2-D and 3-D shapes and everyday objects** on the basis of their properties and use vocabulary precisely. • Read and write names of shapes appropriate to their word reading and spelling. • Draw lines and shapes using a straight edge • *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, drawings or practical materials.*	• *Continue to develop use of correct mathematical vocabulary (including parallel and perpendicular) to* describe, *identify, compare and sort* 2-D and 3-D shape. Descriptions include length of lines and acute and obtuse angles. • Extend knowledge of the properties of shapes to symmetrical and non-symmetrical polygons and polyhedra. • **Draw 2-D shapes and make 3-D shapes using modelling materials (**connect decimals and rounding to drawing and measuring straight lines in centimetres in a variety of contexts)**; recognise 3-D shapes in different orientations and describe them.** • **Recognise angles as a property of shape or a description of turn.** • **Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater or less than a right angle** and use the language of acute and obtuse. • **Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.** • *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*

Year 1	Year 2	Year 3
Position and Direction	**Position and Direction**	**Position and Direction**
• **Describe position, direction and movement, including half, quarter and three-quarter turns.** • Make whole, half, quarter and three-quarter turns in both directions and connect turning clockwise with movement on a clock face. • Use the language of position, direction and motion, including: left and right, top, middle and bottom, on top of, in front of, above, between, around, near, close and far, up and down, forwards and backwards, inside and outside. • Recognize and create repeating patterns with objects and with shapes.	• **Order and arrange combinations of mathematical objects in patterns and sequences** including the use of shapes in different orientations. • **Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise).** • Use the language of angles in practical contexts e.g. pupils moving in turns, instructing others to do so and programming robots using instructions given in right angles	• *Continue to use mathematical language to describe position, direction and movement including movement in a straight line and quarter, half, three quarter and full turns both clockwise and anti-clockwise.* • *Recognise and use the four compass directions N, E, S, W.*
Statistics	**Statistics**	**Statistics**
Interpreting, Constructing and Presenting Data	**Interpreting, Constructing and Presenting Data**	**Interpreting, Constructing and Presenting Data**
NB this is not included in the National Curriculum for Year 1 but schools may wish to introduce pupils to these skills or use data contexts to support problem solving • *Begin to interpret and construct simple pictograms, tally charts, block diagrams and simple tables often in cross curricular contexts.* • *Begin to ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity.*	• **Interpret and construct simple pictograms, tally charts, block diagrams and simple tables.** • Use many-to-one correspondence in pictograms with simple ratios 2, 5, 10. • **Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity.** • **Ask and answer questions about totalling and comparing categorical data.** • *Pose their own questions that can be answered using information presented in different pictograms, tally charts, block diagrams and simple tables.* • *Understand and use Venn and Carroll diagrams to support reasoning about numbers or shapes* • *Apply the skills of collecting, representing and interpreting statistical data across the curriculum within and beyond mathematic, sometimes in response to an enquiry of interest to and suggested by pupils.*	• **Interpret and present data using bar charts, pictograms and tables** in different contexts. • Understand and use simple scales e.g. 2, 5, 10 units per cm in pictograms and bar charts with increasing accuracy. • **Solve one and two-step questions e.g. 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables.** • *Pose their own questions that can be answered using information presented in different bar charts pictograms and tables.* • *Understand and use Venn and Carroll diagrams to support reasoning about numbers or shapes* • *Apply the skills of collecting, representing and interpreting statistical data across the curriculum within and beyond mathematics, sometimes in response to an enquiry of interest to and suggested by pupils.*

educationGateshead Core Curriculum for Primary Mathematics Progression Grid Years 4 – 6

Year 4	Year 5	Year 6
Understanding and investigating with numbers	**Understanding and investigating with numbers**	**Understanding and investigating with numbers**
Place value, ordering and rounding	**Place value, ordering and rounding**	**Place value, ordering and rounding**
• **Count** *forwards and back in steps of* 10, 100 *from any given number.* • *Interpret negative numbers in context and* **count backwards through zero to include negative numbers.** • *Read, write,* **order and compare numbers beyond 1000.** • **Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens and ones).** • **Find 1000 more or less than a given number.** • *Use the vocabulary of comparing and ordering numbers and use >, < symbols and = sign.* • **Identify, represent and estimate numbers using different representations** including measures. • **Read Roman numerals to 100 (I to C) and know that, over time, the numeral system changed to include the concept of zero and place value.** *Appreciate the difference between the Roman numeral system and our own number system from a place value viewpoint.* • **Round any number to the nearest 10, 100 or 1000.** • Connect estimation and rounding of numbers to the use of measuring instruments. • *Apply understanding of the number system to* **solve number and practical problems** *and puzzles involving* **increasingly large positive numbers***, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.*	• **Count forwards or backwards in steps of powers of 10 from any given number up to 1 000 000.** • **Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero.** *Order a given set of negative and positive integers.* • **Read, write, order and compare numbers to at least 1 000 000 and determine the** place **value of each digit.** Continue to use numbers in contexts including measurement. • Extend and apply understanding of the number system to decimal numbers and fractions • *Use the vocabulary of comparing and ordering numbers including use of >, < symbols and = sign.* • **Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.** *Appreciate the difference between the Roman numeral system and our own number system from a place value viewpoint.* • **Round any number up to 1 000 000 to the nearest 10, 100, 1 000, 10 000 and 100 000.** • *Apply understanding of the number system to solve* **number problems and practical problems** *and puzzles involving numbers, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.*	• *Continue to count forwards or backwards in steps of powers of 10 from any given number up to 10 000 000.* • **Use,** *interpret and order,* **negative numbers in context, and calculate intervals across zero.** • Using a number line add and subtract positive and negative integers for measures such as temperature**.** • **Read, write,** say**, order and compare numbers up to 10 000 000 and determine the value of each digit.** *Continue to use numbers in contexts including measurement.* • *Continue to extend and apply understanding of the number system to decimal numbers and fractions* • *Use the vocabulary of comparing and ordering numbers including use of >, < symbols and = sign.* • *Continue to read Roman numerals to 1000 (M) and recognise years written in Roman numerals. Appreciate the difference between the Roman numeral system and our own number system from a place value viewpoint.* • **Round any whole number to a required degree of accuracy** • *Apply understanding of the number system to solve* **number problems and practical problems** *and puzzles involving numbers, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.*

Year 4	Year 5	Year 6
Properties of numbers and number sequences	**Properties of numbers and number sequences**	**Properties of numbers and number sequences**
• *Continue to* **count in** *and recognise known multiples, extend to* **multiples of 6, 7, 9, 25 and 1000.** • *Recognise patterns in sequences of multiples and connections between them e.g. explore patterns on a 12 x 12 multiplication grid.* • *Use the vocabulary of factors and multiples and look for common factors and multiples to support work with fractions.* • *Recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back.* • *Apply understanding of number properties to solve routine and non-routine problems and puzzles involving numbers, money or measure.* • *Explore and discuss patterns, properties and relationships that arise in the number system using appropriate mathematical vocabulary.* • *Develop lines of enquiry through conjecturing relationships and generalizations and testing ideas. Identify examples for which a statement is true or false.*	• *Continue to practice to recognise multiples of numbers up to 12 x 12, to recognise patterns in sequences of multiples and connections between them. Know and apply tests of divisibility.* • **Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.** *Identify common multiples.* • **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.** • **Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}).** • Use understanding of the terms factor, multiple and prime, square and cube numbers to construct equivalence statements (e.g. 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10). • Recognise and describe linear number sequences, including those involving fractions and decimals and find the term to term rule. • *Apply understanding of number properties to solve routine and non-routine problems and puzzles involving numbers, money or measure.* • *Explore and discuss patterns, properties and relationships that arise in the number system using appropriate mathematical vocabulary.* • *Develop lines of enquiry through conjecturing relationships and generalisations and testing ideas. Identify examples for which a statement is true or false.*	• Continue to use all the multiplication tables to calculate mathematical statements in order to maintain fluency. • **Identify common factors, common multiples, prime numbers, *squared and cubed numbers.*** • Relate common factors to the finding of equivalent fractions. • *Continue to recognise and describe linear number sequences, including those involving fractions and decimals and find the term to term rule.* • *Apply understanding of number properties to solve routine and non-routine problems and puzzles involving numbers, money or measure.* • *Explore and discuss patterns, properties and relationships that arise in the number system using appropriate mathematical vocabulary.* • *Develop lines of enquiry through conjecturing relationships and generalisations and testing ideas. Identify examples for which a statement is true or false.*

Year 4	Year 5	Year 6
Fractions decimals and percentages	**Fractions decimals and percentages**	**Fractions decimals and percentages, ratio and proportion**
• Make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities. • **Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non unit fractions where the answer is a whole number.** • Understand the relation between non-unit fractions and multiplication and division, with particular emphasis on tenths and hundredths. • *Compare and order fractions.* • **Recognise and show, using diagrams, families of common equivalent fractions.** • Use factors and multiples to recognise equivalent fractions and simplify where appropriate e.g. 6/9 = 2/3 or ¼ = 2/8. • **Add and subtract fractions with the same denominator** practising through increasingly complex problems beyond one whole. • Extend understanding of the number system and decimal place value to tenths and hundredths and relate this to decimal measure. • Understand decimals and fractions are different ways of expressing numbers and proportions. • Extend use of the number line to connect fractions, numbers and measures. • Count forwards and back using simple fractions and decimals. • **Count up and down in** tenths and **hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.** • **Recognise and write decimal equivalents to ¼, ½, ¾ .** • **Recognise and write decimal equivalents of any number of tenths or hundredths.**	• Continue to develop understanding of fractions as numbers, measures and operators by finding, *naming and writing,* fractions of numbers and quantities. • Extend and apply understanding of the number system to decimal numbers and fractions • **Compare and order fractions whose denominators are all multiples of the same number.** • **Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.** • **Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $^{2}/_{5} + {}^{4}/_{5} = {}^{6}/_{5} = 1{}^{1}/_{5}$).** • Connect equivalent fractions > 1 that simplify to integers with division and other fractions > 1 to division with remainders, using the number line and other models, and hence move from these to improper and mixed fractions • **Add and subtract fractions with the same denominator and with denominators that are multiples of the same number** extending to calculations that exceed 1 as a mixed number. • **Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.** • Connect multiplication by a fraction to using fractions as operators (fractions of) and to division. This relates to scaling by simple fractions, including fractions > 1. • Continue to practice counting forwards and backwards using fractions and decimals,	• **Use common factors to simplify fractions; use common multiples to express fractions in the same denomination** • **Compare and order fractions, including fractions > 1** • **Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.** Practise, use and understand addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example ½ + 1/8 = 5/8) and progress to varied and increasingly complex problems. • **Multiply simple pairs of proper fractions, writing the answer in its simplest form (for example ¼ x ½ = 1/8).** Use a variety of images to support their understanding of multiplication with fractions. Make links with earlier work about fractions as operators (fractions of), as numbers, and as equal parts of objects, for example parts of a rectangle. • Use understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example if ¼ of a length is 36cm, then the whole length is 36 x 4 = 144cm). • **Divide proper fractions by whole numbers (for example 1/3 ÷ 2 = 1/6)** • **Associate a fraction with division and calculate decimal fraction equivalents (for example, 0.375) for a simple fraction (for example, 3/8)** • Practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators

• **Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones , tenths and hundredths.** • **Round decimals with one decimal place to the nearest whole number.** • **Compare** and order **numbers and** quantities **with the same number of decimal places up to two decimal places** and represent them in several ways, such as on number lines. • **Solve simple measure and money problems involving fractions and decimals to two decimal places.** • *Apply understanding of fractions and decimals to solve routine and non-routine problems and puzzles involving numbers, shapes, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.*	including bridging through zero, for example on a number line. • **Read and write decimal numbers as fractions (e.g. 0.71 = $^{71}/_{100}$).** • **Recognize and use thousandths and relate them to tenths, hundredths, decimal equivalents** and measures. • **Round decimals with two decimal places to the nearest whole number and to one decimal place.** • **Read, write, order and compare numbers with up to three decimal places.** • Mentally add and subtract tenths, and one-digit whole numbers and tenths. • Add and subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (e.g.0.83+ 0.17 =1) *using formal written methods when appropriate.* • **Recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator 100 and as a decimal fraction.** • **Solve problems which require knowing percentage and decimal equivalents of $^{1}/_{2}$, $^{1}/_{4}$, $^{1}/_{5}$, $^{2}/_{5}$, $^{4}/_{5}$ and those with a denominator of a multiple of 10 or 25.** • Make connections between percentages, fractions and decimals e.g. 100% represents a whole quantity, 1% is 1/100… and relate this to finding 'fractions of'. • Understand that percentages, decimals and fractions are different ways of expressing proportions • Recognise and describe linear number sequences, including those involving fractions and decimals and find the term to term rule. • Apply understanding of fractions, decimals up to three places and percentages to solve routine and non-routine problems and puzzles involving numbers, shapes, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.	• Explore and make conjectures about converting a simple fraction to a decimal fraction (for example, 3 ÷ 8 = 0.375). For simple fractions with recurring decimal equivalents pupils learn about rounding the decimal to three decimal places or other appropriate approximations depending on the context. • **Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places** • Start to multiply and divide decimals starting with simpler cases e.g. 0.4 x 2 = 0.8 or division of decimal numbers by one-digit whole numbers, in practical contexts involving measures or money. Recognise division calculations as the inverse of multiplication. • **Multiply one-digit numbers with up to two decimal places by whole numbers** up to two digits**.** • Divide numbers with up to two decimal places by whole numbers up to two digits. • **Use written division methods in cases where the answer has up to two decimal places.** • **Solve problems which require answers to be rounded to specified degrees of accuracy** and check reasonableness of answers. • Develop skills of rounding and estimating as a means of predicting and checking the order of magnitude of answers to decimal calculations. • **Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.** • Apply understanding of fractions, decimals up to three places and percentages to solve routine and non-routine problems and puzzles involving numbers, shapes, money or measures. Explain methods and reasoning orally and in writing, including using diagrams and symbols.

Year 4	Year 5	Year 6
		Ratio and proportion
		• **Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts** • **Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison.** Link percentages of 360° to calculating angles of pie charts. • **Solve problems involving similar shapes where the scale factor is known or can be found.** • Recognise proportionality in contexts where the relations between quantities are in the same ratio (for example, similar shapes and recipes) • Consolidate understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. Use the notation a:b to record work *if appropriate.* • Solve problems involving unequal quantities, for example 'for every egg you need three spoonfuls of flour', '3/5 of the class are boys'. • **Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.**
		Algebra

		• Start to use symbols and letters to represent variables and unknowns in *familiar* mathematical situations e.g
		  o Missing numbers, lengths, coordinates and angles
		  o Equivalent expressions e.g. a + b = b + a
		  o Generalisations of number patterns
		  o Number puzzles e.g. what two numbers can add up to.
		• **Use simple formulae** in maths and science
		• **Generate and describe linear number sequences**
		• **Express missing number problems algebraically**
		• **Find pairs of numbers that satisfy an equation with two unknowns**
		• **Enumerate possibilities of combinations of two variables.**

Year 4	Year 5	Year 6
Developing and applying calculation	**Developing and applying calculation**	**Developing and applying calculation**
Addition and Subtraction	**Addition and Subtraction**	**Addition and Subtraction**
• *Continue to practice using known facts and understanding of place value to quickly derive sums and differences using whole numbers and decimals* • Continue to practice mental methods with increasingly large numbers e.g. *Use place value and known facts to add or subtract one near multiple of 100 from another e.g. 602 –* 498 or 535 + 399. • *Use and explain a range of mental strategies appropriate to the numbers involved, sometimes supporting explanations with jottings or informal recording.* • **Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.** • **Add and subtract fractions with the same denominator** practising through increasingly complex problems beyond one whole. • **Estimate and use inverse operations to check answers to a calculation.** • *Understand and use the relationships between the four operations and the principles of the arithmetic laws; commutative, associative and distributive.* • **Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.** • *Solve calculation problems including using information from a range of tables and charts* • *Apply understanding of number operations to solve number puzzles and non-routine problems and explain reasoning.* • Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 13 + 24 = 12+ 25; 33 = 55 - ∆).	• *Continue to practice using known facts and understanding of place value to quickly derive sums and differences using whole numbers and decimals.* • **Add and subtract numbers mentally with increasingly large numbers** e.g. *Use place value and known facts to subtract one near multiple of 1000 from another e.g. 6070 – 4097* or 12 462 – 2300 = 10 162**.** • Mentally add and subtract tenths, and one-digit whole numbers and tenths. • *Use and explain a range of mental strategies appropriate to the numbers involved, sometimes supporting explanations with jottings or informal recording.* • **Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction).** • Add and subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (e.g.0.83+ 0.17 =1) *using formal written methods when appropriate.* • **Add and subtract fractions with the same denominator and with denominators that are multiples of the same number.** • **Use rounding,** *estimation and inverse operations* **to check answers to calculations and determine, in the context of a problem, levels of accuracy.** • *Understand and use the relationships between the four operations and the principles of the arithmetic laws; commutative, associative and distributive. (*Distributivity can be expressed as a(b+c) = ab + ac). • **Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.** • *Solve calculation problems using information from a range of table and charts.* • *Apply understanding of number operations to solve number puzzles and non-routine problems and explain reasoning.* • *Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 13 + 24 = 12+ 25; 33 = 55 - ∆).* • *Use a calculator to solve problems when the numbers involved are appropriate, including decimals and fractions, and interpret the display correctly for the context.*	• **Perform mental calculations, including with mixed operations,** *appropriate* **large numbers** *and decimals* and more complex calculations. • *Use and explain a range of mental strategies appropriate to the numbers involved, sometimes supporting explanations with jottings or informal recording.* • Practise addition and subtraction for larger numbers using the formal written methods of columnar addition and subtraction. • 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** • **Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why** • **Solve problems involving addition, subtraction, multiplication and division.** • **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.** • *Solve calculation problems using information from a range of table and charts.* • *Apply understanding of number operations to solve number puzzles and non-routine problems and explain reasoning.* • *Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 13 + 24 = 12+ 25; 33 = 55 - ∆).* • *Use a calculator to solve problems when the numbers involved are appropriate, including decimals, fractions and percentages, and interpret the display correctly for the context.*

Year 4	Year 5	Year 6
Multiplication and Division	**Multiplication and Division**	**Multiplication and Division**
• **Recall multiplication and division facts for multiplication tables up to 12 x 12.** • *Relate multiplication and division to arrays and explore partitioning arrays in different ways to show relationships between number facts.* • **Use place value, known and derived facts to multiply and divide mentally** (e.g. 600 ÷ 3 = 200 can be derived from 2 x 3 = 6) **, including multiplying by 0 and 1; dividing by 1; multiplying together three numbers.** • **Recognise and use factor pairs and commutativity in mental calculations.** • **Multiply two-digit and three-digit numbers by a one-digit number using formal written layout** of short multiplication. • Use the formal written method of short division *for calculations involving two and three-digit numbers divided by a single digit* with exact answers. • *Understand and use the relationships between the four operations and the principles of the arithmetic laws; commutative, associative and distributive.* • Write statements about the equality of expressions e.g. using the distributive law 39 x 7 = 30 x 7 + 9 x 7 and the associative law (2 x 3) x 4 = 2 x (3 x 4). Combine knowledge of number facts and rules of arithmetic to solve mental and written calculations e.g. 2 x 6 x 5 = 10 x 6 = 60. • **Solve** one and two step **problems** in contexts **involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects** e.g. the number of choices on a menu or three cakes shared equally between 10 children. • *Use rounding, estimation and inverse operations to check answers to calculations*	• **Multiply and divide numbers mentally drawing upon known facts** *place value and properties of numbers to support mental calculation with larger numbers.* • **Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.** • *Use knowledge of place value and multiplication facts to derive related multiplication and division facts involving decimals e.g. 0.8 x 7, 4.8 ÷ 6.* • **Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including** short multiplication and **long multiplication for two-digit numbers.** • **Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context** as fractions, as decimals or by rounding. • **multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.** • Connect multiplication by a fraction to using fractions as operators (fractions of) and to division. This relates to scaling by simple fractions, including fractions > 1. • *Understand and use the relationships between the four operations and the principles of the arithmetic laws; commutative, associative and distributive.* **(**Distributivity can be expressed as a(b+c) = ab + ac). • *Use rounding, estimation and inverse operations to check answers to calculations and determine, in the context of a problem, levels of accuracy.* • **Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes.**	• Continue to use all multiplication tables to calculate mathematical statements to maintain fluency. *Use these to* undertake **mental calculations** with increasingly **large** *(appropriate)* **numbers, mixed operations** and more complex calculations. • *Continue to use knowledge of place value and multiplication facts to derive related multiplication and division facts involving decimals e.g. 0.8 x 7, 4.8 ÷ 6.* • 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** • **Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication** • **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** • **Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context** • *Solve calculation problems using information from a range of table and charts.* • *Apply understanding of number operations to solve number puzzles and non-routine problems and explain reasoning.* • *Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 13 + 24 = 12+ 25; 33 = 55 - ∆).* • *Understand and use the relationships between the four operations and the principles of the arithmetic laws; commutative,*

and determine, in the context of a problem, levels of accuracy. • *Solve calculation problems using information from a range of tables and charts.* • *Apply understanding of number operations to solve number puzzles, routine and non – routine problems and explain reasoning.* • *Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 2* x *24 = 12* x *4; 33 = 5* x ◊*).*	• **Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.** • **Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.** • Use multiplication and division as inverses e.g. by multiplying and dividing by powers of ten in scale drawings or by powers of 1000 in converting between units such as kilometres and meters. • *Solve calculation problems including using information from a range of tables and charts.* • *Apply understanding of number operations to solve number puzzles, routine and non – routine problems and explain reasoning.* • Use and explain the equals sign to indicate equivalence, including in missing number problems (e.g. 2 x 24 = 12 x 4; 33 = 5 x ◊). • *Use a calculator to solve problems when the numbers involved are appropriate, including decimals and fractions, and interpret the display correctly for the context.*	*associative and distributive***. (**Distributivity can be expressed as a(b+c) = ab + ac). • *Use rounding, estimation and inverse operations to check answers to calculations and determine, in the context of a problem, levels of accuracy.* • *Use a calculator to solve problems when the numbers involved are appropriate, including decimals and fractions, and interpret the display correctly for the context.*

Year 4	Year 5	Year 6
Measurement	**Measurement**	**Measurement**
• *Continue to use read and write standard metric units and their abbreviations, developing fluency in their relationships.* • *Suggest suitable units and equipment for measuring and read scales to an appropriate degree of accuracy.* • **Estimate, compare,** *order* **and calculate different measures, including money in pounds and pence** building on understanding of place value, decimal notation *and knowledge of fractions.* • **Convert between units of measure e.g. kilometre to metre; hour to minute** using multiplication. • **Measure and calculate the perimeter of a rectilinear figure, including squares, in centimetres and metres.** • Express perimeter algebraically as 2 (a + b) where a and b are dimensions in the same unit. • **Find the area of rectilinear shapes by counting squares.** • Relate area to arrays and multiplication. • *Continue to develop accuracy with telling the time and using the vocabulary of time. Compare durations of events including when expressed in different units e.g. 3.5 hours and 140 minutes.* • **Read, write and convert time between analogue and digital 12- and 24-hour clocks.** • **Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.** • *Use all four operations to solve problems including scaling problems involving measure (e.g. length, mass, volume, money) and using decimal notation where appropriate***.** *Information required to solve a problem is often drawn from tables, including timetables, graphs and charts.* • *Apply measuring skills to an appropriate degree of accuracy, alongside the skills of thinking mathematically to solve problems. These should include practical problems and might involve construction of shapes or artefacts, often in a cross curricular context.* • *Make and explain connections between number, measures and shape.*	• *Continue to use read and write standard metric units and their abbreviations, developing fluency in their relationships.* • *Suggest suitable units and equipment for measuring and read scales to an appropriate degree of accuracy.* • **convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)** using knowledge of place value and multiplication / division. • **Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints.** • **Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres.** • **Calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes.** *For rectangles use the formula, length* x *breadth = area, expressed in words or symbols.* • Use the relations of perimeter or area to find unknown lengths, missing measures questions such as these can be expressed algebraically e.g. 4 + 2b = 20 for a rectangle of sides 2cm and bcm and perimeter 20cm. • Calculate area from scale drawings using given measurements**.** • **Estimate volume (e.g. using 1 cm^3 blocks to build cubes and cuboids) and capacity (e.g. using water).** • *Continue to read the time, interpret timetables and use units of time, including to* **solve problems involving converting between units of time.** • **Use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling.** *Information required to solve a problem is often drawn from tables, including timetables, graphs and charts.* • *Apply measuring skills to an appropriate degree of accuracy, alongside the skills of thinking mathematically to solve problems. These should include practical problems and might involve construction of shapes or artefacts, often in a cross curricular context.* • *Make and explain connections between number, measures and shape.*	• **Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate** • **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** • **Convert between miles and kilometres** • Know approximate conversions and use to tell if an answer is sensible. • Connect conversion e.g. from kilometres to miles to a graphical representation as preparation for understanding linear /proportional graphs. • Begin to learn about compound units for speed, such as miles per hour, if appropriate and apply their knowledge in science and other subjects. • **Recognise that shapes with the same areas can have different perimeters and vice versa** • **Recognise when it is possible to use formulae for area and volume of shapes** • **Calculate the area of parallelograms and triangles.** Relate area of rectangles to parallelograms and triangles e.g. by dissection, calculate their areas, understanding and using the formulae (in words or symbols) to do this. • **Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units [for example, mm3 and km3].** • Use a number line to add and subtract positive and negative integers for measures such as temperature • *Continue to read the time, interpret timetables and use units of time, including to* **solve problems involving converting between units of time.** • **Use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling.** *Information required to solve a problem is often drawn from tables, including timetables, graphs and charts.* • *Apply measuring skills to an appropriate degree of accuracy, alongside the skills of thinking mathematically to solve problems. These should include practical problems and might involve construction of shapes or artefacts, often in a cross curricular context.* • *Make and explain connections between number, measures and shape.*

Year 4	Year 5	Year 6
Geometry	**Geometry**	**Geometry**
Properties of Shapes	**Properties of Shapes**	**Properties of Shapes**

• *Continue to develop use of correct mathematical vocabulary(including parallel and perpendicular) to identify and describe 2-D and 3-D shapes.*
• *Continue to draw and make 2-D and 3-D shapes using a range of materials.*
• **Compare and classify geometric shapes, including quadrilaterals** e.g. parallelogram, rhombus, trapezium **and triangles** e.g. isosceles**,** equilateral, scalene**, based on their properties and sizes**
• Compare lengths and angles to decide if a polygon is regular or irregular.
• **Identify acute and obtuse angles and compare and order angles up to two right angles by size** in preparation for using a protractor.
• **Identify lines of symmetry in 2-D shapes presented in different orientations.**
• **Complete a simple symmetric figure with respect to a specific line of symmetry.**
• Draw symmetric patterns using a variety of media to become familiar with different orientations of lines symmetry; and recognise line symmetry in a variety of diagrams including where the line of symmetry does not dissect the original shape.
• *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*
	• *Continue to compare and classify geometric shapes based on developing knowledge and understanding of their properties.*
	• **Use the properties of rectangles to deduce related facts and find missing lengths and angles.**
	• **Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.**
	• Use the term diagonal and make conjectures about the angles formed between sides, and between diagonals and parallel sides, and other properties of quadrilaterals, e.g. through using dynamic geometry ICT tools.
	• **Identify 3D shapes, including cubes and other cuboids, from 2D representations.**
	• **Know angles are measured in degrees; estimate and compare acute, obtuse and reflex angles.**
	• **Draw given angles and measure them in degrees (°).**
	• **Identify:**
	  ○ **angles at a point and one whole turn (total 360°)**
	  ○ **angles at a point on a straight line and ½ a turn (total 180°)**
	  ○ **other multiples of 90°.**
	• Become accurate in drawing lines with a ruler to the nearest millimetre, and measuring with a protractor. Use conventional markings for parallel lines and right angles.
	• Use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems.
	• *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*
		• **Draw 2-D shapes** and nets accurately **using given dimensions and angles.** Use measuring tools and conventional markings and labels for lines and angles.
		• **Recognise, describe and build simple 3-D shapes, including making nets**
		• **Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons.**
		• Explain how unknown lengths and angles can be derived from known measurements.
		• **Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius**
		• **Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.**
		• Express some relationships algebraically *e.g*. d = 2 x r, a = 180 – (b + c).
		• *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*

Year 4	Year 5	Year 6
Position and Direction	**Position and Direction**	**Position and Direction**
• Draw a pair of axes in one quadrant, with equal scales and integer labels. • Read, write and use pairs of coordinates to **describe positions on a 2-D grid as coordinates in the first quadrant.** • Use co-ordinate plotting ICT tools. • **Describe movements between positions as translations of a given unit to the left/right and up/down.** • **Plot specified points and draw sides to complete given polygon** • *Recognise and use the eight compass directions* • *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*	• **Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.** • Recognize and use reflection and translation in a variety of diagrams, including continuing to use a 2D grid and coordinates in the first quadrant. Reflection should be in lines that are parallel to the axes. • *Recognize and use the eight compass directions* • *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*	• **Describe positions on the full coordinate grid (all four quadrants)** • Draw and label a pair of axes in all four quadrants with equal scaling, extending knowledge of one quadrant to all four quadrants, including the use of negative numbers. • Draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates, using the properties of the shapes. These might be expressed algebraically for example, translating vertex (a,b) to (a-2, b+3);(a,b) and (a+d, b+d) being opposite vertices of a square of side d. • **Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.** • *Recognize and use the eight compass directions* • *Solve problems, involving reasoning about shapes and their properties. Explain solutions orally or using writing, diagrams, practical materials or dynamic geometry ICT tools.*
Year 4	**Year 5**	**Year 6**
Statistics	**Statistics**	**Statistics**
Interpreting, Constructing and Presenting Data	**Interpreting, Constructing and Presenting Data**	**Interpreting, Constructing and Presenting Data**
• **Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.** • Begin to relate the graphical representation of data to recording change over time. • Understand and use a greater range of scales in representations. • **Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.** • *Pose questions that can be answered using information presented in different graphs charts and tables.* • *Understand and use Venn and Carroll diagrams to support reasoning about numbers or shapes.* • *Apply the skills of collecting, representing and interpreting statistical data across the curriculum within and beyond mathematic, sometimes in response to an enquiry of interest to and suggested by pupils.*	• **Complete, read and interpret information in** (a wide range of charts and***)* tables, including timetables.** • **Solve comparison, sum and difference problems using information presented in a line graph.** • Connect work on coordinates and scales to their interpretation of time graphs. • Begin to decide which representations of data are most appropriate and why. • *Pose questions that can be answered using information presented in different graphs charts and tables.* • *Understand and use Venn and Carroll diagrams to support reasoning about numbers or shapes.* • *Apply the skills of collecting, representing and interpreting statistical data across the curriculum within and beyond mathematic, sometimes in response to an enquiry of interest to and suggested by pupils.*	• **Interpret and construct pie charts and line graphs and use these to solve problems.** • Connect work on angles, fractions and percentages to the interpretation of pie charts. • Encounter and draw graphs relating to two variables, arising from their own enquiry and in other subjects • Connect conversion from kilometres to miles in measurement to its graphical representation. • **Calculate and interpret the mean as an average.** Know when it is appropriate to find the mean of a data set. • *Pose questions that can be answered using information presented in different graphs charts and tables.* • *Understand and use Venn and Carroll diagrams to support reasoning about numbers or shapes.* • *Apply the skills of collecting, representing and interpreting statistical data across the curriculum within and beyond mathematic, sometimes in response to an enquiry of interest to and suggested by pupils.*