Mathematics Progression Map

Years 5 and 6

Topic	Key Knowledge	Skills Progression	Rationale	Vocabulary
Place Value	Year 5 ● Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit. ● Count forwards or backwards in steps of powers of 10 for 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. ● Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000. ● Solve number problems and practical problems that involve all of the above. ● Read Roman numerals to 1000 (M) and recognise years written in Roman numerals. Year 6 ● Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit. ● Round any whole number to a required degree of accuracy.	In Year 5, pupils continue to work with increasingly larger numbers - now up to at least 1 000 000. They encounter negative numbers and practise counting forwards and backwards crossing zero, as well as interpreting negative numbers in different contexts, e.g. temperature. They build on their rounding work from Year 4, applying the same rules to round any number up to 1 000 000 to the nearest 10, 100, 1 000, 10 000 and 100 000. They consolidate their understanding of the Roman numeral system and read and write numerals up to 1000. In Year 6, pupils continue to work with increasingly larger numbers - now up to 10 000 000. They use the whole number system accurately, including fractions, decimals and negative numbers, and solve number and practical problems incorporating all of these areas.	• Place value is the most important concept when teaching mathematics; it underpins the rest of the curriculum and provides an essential foundation of mathematical understanding. • If learners do not have a secure understanding of place value, they will struggle to understand, let alone master, any of the rest of the mathematics curriculum. Each class begins the academic year with a block of teaching on this area to ensure learners are ready to progress.	Year 5 ten thousands hundred thousands powers of integer Year 6 millions ten millions

	● Use negative numbers in context, and calculate intervals across zero. ● Solve number and practical problems that involve all of the above.			
Addition, subtraction, multiplication and division	<u>Year 5</u> ● Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction). ● Add and subtract numbers mentally with increasingly large numbers. ● Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. ● Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. ● Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. ● 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. ● Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.	In Year 5, pupils move onto adding and subtracting whole numbers with more than 4 digits using formal written methods. They continue to choose and use a range of efficient mental methods, making decisions on the most appropriate method to use based on the numbers in the calculation. They apply these strategies to increasingly large numbers. Pupils apply their secure knowledge of rounding rules to estimate and check their answers to calculations. Pupils explore multiples and factors, working systematically to find all factor pairs of a number or all the common factors of two numbers. They are introduced to prime and composite numbers and prime factors, learning how to identify them and prove whether a number is prime or not. By this point, most pupils should have a confident and fluent recall of multiplication tables and their related division facts, and this will underpin all the work they do in Upper KS2. Pupils encounter long multiplication for the first time and use a formal method to multiply numbers with up to 4 digits by a 2-digit number. They learn how to use the formal method of short division to divide a number with up to 4 digits by a 1-digit number, interpreting remainders in context. They use their understanding of the place value of whole and decimal numbers to multiply and divide by 10, 100 and 1000. In Year 6, pupils are introduced to the formal method of long division and use it to divide numbers with up to 4 digits by 2-digit numbers. They continue to interpret remainders in context, but also express them as fractions and decimals. Pupils encounter calculations involving brackets and explore how the order of operations in a calculation affects the answer.	• The related concepts of addition and subtraction have myriad real-life applications for children, e.g. working out how much more pocket money you need to save to buy a toy, figuring out how many squares to move in a board game and calculating how many football stickers you will have left if your parent forces you to give some to your younger sibling! As with addition and subtraction, multiplication and division have various real-life uses which makes this topic an essential and exciting one. • Learning addition and subtraction allows pupils to apply their place value knowledge in context, demonstrating that they have a secure	<u>Year 5</u> multiples factors prime numbers square numbers cube numbers short division divisor dividend multiplicand product quotient <u>Year 6</u> long division

	● Multiply and divide numbers mentally drawing upon known facts. ● 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. ● Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. ● Recognise and use square numbers and cube numbers, and the notation for squared and cubed. ● 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 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. <u>Year 6</u> ● 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	Throughout Year 5 and 6, pupils should encounter a wide range of open-ended problems and puzzles which require them to select appropriate operations and methods, to work systematically to find solutions and to justify their conclusions using mathematical reasoning.	understanding of the composition of numbers. Due to the link between multiplication and repeated addition, this topic naturally follows on from learning about addition and subtraction. Without a solid understanding of these operations, children will be unable to succeed in more advanced mathematical concepts, such as fractions, which they will cover later in the year. Building their understanding of multiplication tables, identifying relationships and describing patterns will underpin work on algebra in Upper KS2.	

	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. ● Perform mental calculations, including with mixed operations and large numbers. ● Identify common factors, common multiples and prime numbers. ● 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.			
Statistics	<u>Year 5</u> ● Solve comparison, sum and difference problems using information presented in a line graph. ● Complete, read and interpret information in tables, including timetables. <u>Year 6</u> ● Interpret and construct pie charts and line graphs and use these to solve problems. ● Calculate and interpret the mean as an average.	In Year 5, pupils are introduced to line graphs, and learn to read them accurately to solve a range of problems. They apply their experience of the four operations to solve a range of problems which involve extracting information from tables. They recall their learning on time (including 12 and 24-hour clock and calculating time intervals) to interpret information from timetables. In Year 6, pupils draw line graphs, making decisions about the appropriate scale to use based on the numbers they are working with. They are introduced to pie charts for the first time, and draw on their knowledge of fractions, percentages and angles to	• The study of statistics offers an opportunity to reinforce pupils' understanding of number, place value and the four operations in the solving of problems. Pupils construct and interpret graphs and charts using real-life examples related to their own experiences, and make the most of	<u>Year 5</u> timetable two-way table <u>Year 6</u> pie chart mean

		interpret and draw them. Pupils learn how to calculate the mean of a set of numbers.	using them in other areas of the curriculum, e.g. science. • This block gives pupils the opportunity to apply their work on the four operations in a variety of contexts in order to interpret different types of charts and graphs and to pose their own questions. Covering this content at this point in the year also ensures that pupils will be able to confidently apply their skills in constructing and interpreting charts and graphs in their science work across the year.	
Fractions, Decimals and Percentages	<u>Year 5</u> ● 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 [for example, ⅖ + ⅘ = 6/5 = 1 ⅕].	In Year 5, pupils encounter percentages for the first time, establishing that fractions, decimals and percentages are all different ways of expressing proportions. They build on the equivalences between fractions and decimals studied in Year 4 to understand how to express percentage and decimal equivalents of simple fractions. They recognise what is meant by 'per cent' and use this to solve problems which require them to convert between fractions, decimals and percentages. Pupils work with fractions greater than 1 and learn to convert between improper practitioner and mixed numbers, using number lines to order both. They build on their previous work on adding and subtracting fractions with the same denominator to add and subtract fractions where the denominators are multiples of the same number; they use their prior learning on	• Proficiency with fractions is an important foundation for learning more advanced mathematics. Fractions are a student's first introduction to abstraction in mathematics and, as such, provide the best introduction to algebra, which they	<u>Year 5</u> fifths thousandths mixed numbers per cent % integer complements

	● Add and subtract fractions with the same denominator and denominators that are multiples of the same number. ● Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. ● Read and write decimal numbers as fractions [for example, 0.71 = 71/100]. ● Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. ● 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. ● Solve problems involving number up to three decimal places. ● 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. ● Solve problems which require knowing percentage and decimal equivalents of ½ , ¼ , ⅕ , ⅖ , ⅘ and those fractions with a denominator of a multiple of 10 or 25. <u>Year 6</u> ● Use common factors to simplify fractions; use common multiples	equivalent fractions to support them. Pupils begin to multiply fractions by whole numbers, supported by concrete resources and pictorial representations. They continue to develop their understanding of decimals, working with numbers with up to three decimal places; they order and compare decimals with different numbers of decimal places, add and subtract decimals and recall complements to 1, which builds on their understanding of complements to 10 and 100. They recall the rules for rounding introduced in Year 4 and apply these to rounding decimals to the nearest whole number and to one decimal place. In Year 6, pupils use their understanding of common factors and multiples, and of equivalent fractions, to express fractions in their simplest form. They should be able to use their prior knowledge to explain how they know that a fraction cannot be simplified further. They use their knowledge of equivalent fractions to compare and order fractions where all the denominators are different, and to add and subtract fractions and mixed numbers with different denominators. They continue to use fractions as operators, learning to multiply pairs of proper fractions and to divide fractions by whole numbers. It is important that they use a variety of images to ensure that they understand these concepts rather than just recalling the steps to take. Pupils consolidate their understanding of equivalent fractions, decimals and percentages and explain how they know they are equivalent. They multiply decimals with up to two decimal places in practical contexts such as measures and money, using mental and written methods as appropriate.	will encounter later in the year. ● The fractions topic naturally follows on from the learning on multiplication and division, as, at this point in KS2, pupils should draw not only on a secure grasp of multiplication tables and their related division facts, but also on efficient methods of multiplication and division which they have been working on.	

	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. ● Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, ¼ x ½ = ⅛]. ● Divide proper fractions by whole numbers [for example, ⅓ ÷ 2 = ⅙]. ● Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, ⅜]. ● 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. ● Multiply one-digit numbers with up to two decimal places by whole numbers. ● 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. ● Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.			

Ratio and Proportion	<u>Year 6</u> ● 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. ● Solve problems involving similar shapes where the scale factor is known or can be found. ● Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.	In Year 6, pupils are introduced to the concepts of ratio and proportion for the first time, and should have opportunities to explore them in practical contexts, such as recipes. They build on prior learning on finding 'fractions of' a number and apply this to calculating percentages.	• Ratios and proportions are foundational to student understanding across multiple topics in mathematics and science, e.g. working with similar figures in algebra and examining relationships in triangles, and examining how changing one variable can affect an experiment in science. Even in real-life situations, ratios and proportions are useful when determining amounts to be used in recipes or calculating how much fuel is needed for a long car journey. • The concepts of ratio and proportion are introduced for the first time in Year 6, though they build directly on prior learning about fractions, e.g. problems such as '⅗ of the class are boys. How many are girls?' Thus, it is essential that this block is taught after the	<u>Year 6</u> relative size missing values integer multiplication percentages scale factor unequal sharing and grouping

			block on fractions, decimals and percentages. Pupils may apply their learning about calculating percentages to pie charts (finding percentages of 360), and so teachers may wish to consider where this block should be taught in relation to work on statistics.	
Algebra	<u>Year 6</u> ● Use simple formulae. ● 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.	In Year 6, algebra is formally introduced for the first time, though pupils should already have come across the basic concept when they have encountered missing number problems further down the school. It is helpful to introduce the use of symbols and letters to represent numbers in contexts which are already familiar to the pupils, e.g. finding a missing number in a calculation, labelling sides and vertices of shapes, angles and coordinates, expressing the rule for finding the length and perimeter of a rectangle.. Once they are confident with the idea of a letter or symbol representing an 'unknown' number, they should be ready to explore expressions, equations and sequences.	• Algebra gives pupils the structures and language to articulate their mathematical ideas, e.g 'I know that two numbers add up to 20, so I can express this as a + b = 20. Now I can record all the possibilities, i.e. all the pairs of numbers which total 20.' It is foundational for more complex mathematical concepts which will be taught at KS3 and beyond, and vital for understanding formulae in science. • Algebra builds directly on pupils' understanding of missing number calculations, which they should have	<u>Year 6</u> formula linear number sequences algebraically equation unknowns combinations variables

			encountered when studying the four operations earlier in the year. They will now have the language to express their working out mathematically, e.g. 'Something + 120 = 500' becomes 'n + 120 = 500.'	
Geometry – Properties of shapes	Year 5 ● Identify 3-D shapes, including cubes and other cuboids, from 2-D representations. ● Know that 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 degrees); angles at a point on a straight line and ½ a turn (total 180 degrees); other multiples of 90 degrees. ● 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. Year 6 ● Draw 2-D shapes using given dimensions and angles. ● Recognise, describe and build simple 3-D shapes, including making nets. ● Compare and classify geometric shapes based on their properties	In Year 5, pupils consolidate their knowledge of 3-D shapes and begin to describe their properties. They continue to develop their understanding of the properties of different polygons, reasoning about whether a given polygon is regular or irregular based on its sides and angles. They recall their work on acute and obtuse angles in Year 4 to estimate the size of angles, before learning to use a protractor to draw and measure them accurately. They learn some simple angle rules, e.g. the total of angles around a point and on a straight line. In Year 6, pupils build on their accurate drawing of angles in Year 5 to draw 2-D shapes given dimensions and angles. They develop an understanding of how 3-D shapes can be constructed from nets, and practise identifying and drawing nets for given 3-D shapes. Pupils recall the angle rules introduced in Year 5 and learn the sum totals for angles in a triangle, quadrilateral and regular polygon, as well as vertically opposite angles; they use these rules to calculate missing angles. They may draw on their algebra learning to express missing angles and lengths. Pupils are introduced to the properties of a circle for the first time and explore the relationship between the diameter and the radius.	● As with measure, understanding geometry gives pupils the language they need to be able to make sense of the world around them and the objects they come across in their everyday lives. Discussing and categorising different shapes helps to develop problem-solving skills and improves children's ability to organise visual information. By convincing a partner that a shape cannot be a triangle because it has four sides, for instance, pupils practise their logical thinking and reasoning skills. ● Pupils will be able to draw on their work on algebra when calculating missing angles, and continue	Year 5 regular polygon irregular polygon reflex angles degrees one whole turn angles on a straight line angles around a point vertically opposite missing angles Year 6 radius diameter circumference dimensions

	and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons. ● 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.		to use their skills in addition, subtraction, multiplication and division to solve problems.	
Measure	<u>Year 5</u> ● Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre). ● 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 rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes. ● Estimate volume [for example, using 1 cm3 blocks to build cuboids (including cubes)] and capacity [for example, using water]. ● Solve problems involving converting between units of time.	In Year 5, pupils are introduced to the differences between the metric and imperial systems of measure and begin to understand and use approximate equivalences. They build on their understanding of how to calculate the perimeter of a rectangle and apply it to composite rectilinear shapes. They consolidate their initial learning about the area of rectangles, learning to calculate the area of rectangles and squares by multiplying the dimensions. Pupils make links between prior learning about capacity and the concept of volume; they explore volume using practical activities such as constructing a model from a sketch using cubes. They build on all of their prior learning about converting units of measure (including time), and decimals, to solve a range of problems using all four operations. In Year 6, pupils learn the equivalence between miles and kilometres and use this to solve problems, as well as continuing to solve a range of more complex problems involving converting units of measure, including time and money. They explore perimeter and area further, investigating the idea that shapes can have the same area but different perimeters and vice versa. They begin to recall and use formulae for areas of shapes - rectangles, squares, parallelograms and triangles. They continue their exploration of volume and learn how the calculate the volume of cubes and cuboids.	• Understanding how measurement works is crucial to being able to quantify the world around us - the skills pupils will begin to develop in this topic will go on to help them in everyday life well beyond primary school. • Children continue to contextualise their understanding of the four operations by applying them to real-life contexts and practical activities, simultaneously developing their problem-solving skills.	<u>Year 5</u> decimal notation scaling metric units imperial units inches compound shape irregular shape square centimetres square metre cubic centimetres pounds pints <u>Year 6</u> conversion miles formulae parallelograms feet cubic metre cubic millimetre cubic kilometre gallons stones ounces

	● Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. <u>Year 6</u> ● 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. ● 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. ● 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].			

Geometry – Position and direction	<u>Year 5</u> ● 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. <u>Year 6</u> ● Describe positions on the full coordinate grid (all four quadrants). ● Draw and translate simple shapes on the coordinate plane, and reflect them in the axes. ● Describe positions on a 2-D grid as coordinates in the first quadrant. ● 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 a given polygon.	In Year 5, pupils recall how to read and plot coordinates in the first quadrant. They learn how to reflect or translate a given shape accurately, and plot the shape in its new position on a coordinate plane. In Year 6, pupils recall how to read and plot coordinates in the first quadrant before being introduced to the other three quadrants. They continue to translate and reflect shapes on the coordinate plane, and draw on their knowledge of polygons to plot specified points and draw sides to complete given polygons.	• The study of positional language supports pupils in being able to respond to and give directions. As they move up the school, a secure grasp of this topic will enable pupils to understand more complex mathematical concepts including angles, coordinates and transformation. They will also apply their understanding to learning to code in computing. • This block builds directly on pupils' learning about properties of shapes, as they will need to have a secure understanding of what different types of triangles, quadrilaterals, etc, look like in order to manipulate them in transformations and plot them on coordinate grids.	<u>Year 5</u> reflection <u>Year 6</u> four quadrants coordinate plane