

## The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **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.

## Foundation Stage

Pupils should be taught to:

- count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number.
- use quantities and objects, add and subtract two single-digit numbers and count on or back to find the answer.
- solve problems, including doubling, halving and sharing.
- use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems.
- recognise, create and describe patterns.
- explore characteristics of everyday objects and shapes and use mathematical language to describe them.

## Key Stage 1

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils:

- develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools].
- develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money.
- know, by the end of year 2, the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.
- read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

## Lower Key Stage 2

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils:

- become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.
- develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.
- should, by the end of year 4, have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.
- should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

## Upper Key Stage 2

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils:

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

Progression and Assessment Criteria	Nursery Mathematician	Reception Mathematician	Year 1 Mathematician	Year 2 Mathematician
	<p><b>Number: (30-50 months)</b></p> <p><b>Children:</b></p> <ul style="list-style-type: none"> <li>use some number names and number language spontaneously</li> <li>use some number names accurately in play</li> <li>recite numbers in order to 10</li> <li>know that numbers identify how many objects are in a set</li> <li>begin to represent numbers using fingers, marks on paper or pictures</li> <li>sometimes match numeral and quantity correctly</li> <li>show curiosity about numbers by offering comments or asking questions</li> <li>compare two groups of objects, saying when they have the same number</li> <li>show an interest in number problems</li> <li>separate a group of three or four objects in different ways, beginning to recognise that the total is still the same</li> <li>show an interest in numerals in the environment</li> <li>show an interest in representing numbers</li> <li>realise not only objects, but anything can be counted, including steps, claps or jumps</li> </ul> <p><b>Adults:</b></p> <ul style="list-style-type: none"> <li>use number language, e.g. 'one', 'two', 'three', 'lots', 'fewer', 'hundreds', 'how many?' and 'count' in a variety of situations</li> <li>support children's developing understanding of abstraction by counting things that are not objects, such as hops, jumps, clicks or claps</li> <li>model counting of objects in a random layout, showing the result is always the same as long as each object is only counted once</li> <li>model and encourage use of mathematical language e.g. asking questions such as 'How many saucepans will fit on the shelf?'</li> <li>help children to understand that one thing can be shared by number of pieces, e.g. a pizza</li> <li>while reading number stories or rhymes, ask e.g. 'When one more frog jumps in, how many will there be in the pool altogether?'</li> <li>use pictures and objects to illustrate counting songs, rhymes and number stories</li> <li>encourage children to use mark-making to support their thinking about numbers and simple problems</li> <li>talk with children about the strategies they are using, e.g. to work out a solution to a simple problem by using fingers or counting aloud</li> </ul>	<p><b>Number: (40-60 months)</b></p> <p><b>Children:</b></p> <ul style="list-style-type: none"> <li>recognise some numerals of personal significance</li> <li>recognise numerals 1 to 5</li> <li>count up to three or four objects by saying one number name for each item</li> <li>count actions or objects which cannot be moved</li> <li>count objects to 10, and begin to count beyond 10</li> <li>count out up to six objects from a larger group</li> <li>select the correct numeral to represent 1 to 5, then 1 to 10 objects</li> <li>count an irregular arrangement of up to ten objects</li> <li>estimate how many objects they can see and check by counting them</li> <li>use the language of 'more' and 'fewer' to compare two sets of objects</li> <li>find the total number of items in two groups by counting all of them</li> <li>say the number that is one more than a given number</li> <li>find one more or one less from a group of up to five objects, then ten objects</li> <li>in practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting</li> <li>records, using marks that they can interpret and explain</li> <li>begin to identify own mathematical problems based on own interests and fascinations</li> </ul> <p><b>Early Learning Goals:</b></p> <ul style="list-style-type: none"> <li>count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number</li> <li>using quantities and objects, add and subtract two single-digit numbers and count on or back to find the answer</li> <li>solve problems, including doubling, halving and sharing</li> </ul> <p><b>Adults:</b></p> <ul style="list-style-type: none"> <li>encourage estimation, e.g. estimate how many sandwiches to make for the picnic</li> <li>encourage use of mathematical language, e.g. number names to ten: 'Have you got enough to give me three?'</li> <li>ensure that children are involved in making displays, e.g. making their own pictograms of lunch choices – develop this as a 3D representation using bricks and discuss the most popular choices</li> <li>add numerals to all areas of learning and development, e.g. to a display of a favourite story, such as 'The Three Billy Goats Gruff'</li> <li>make books about numbers that have meaning for the child such as favourite numbers, birth dates or telephone numbers</li> <li>use rhymes, songs and stories involving counting on and counting back in ones, twos, fives and tens</li> </ul>	<p><b>Number and place value</b></p> <ul style="list-style-type: none"> <li>count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number</li> <li>count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens</li> <li>given a number, identify one more and one less</li> <li>identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least</li> <li>read and write numbers from 1 to 20 in numerals and words.</li> </ul> <p><b>Number – addition and subtraction</b></p> <ul style="list-style-type: none"> <li>read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs</li> <li>represent and use number bonds and related subtraction facts within 20</li> <li>add and subtract one-digit and two-digit numbers to 20, including zero</li> <li>solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems</li> </ul> <p><b>Number – multiplication and division</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>	<p><b>Number and place value</b></p> <ul style="list-style-type: none"> <li>count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward</li> <li>recognise the place value of each digit in a two-digit number (tens, ones)</li> <li>identify, represent and estimate numbers using different representations, including the number line</li> <li>compare and order numbers from 0 up to 100; use &lt;, &gt; and = signs</li> <li>read and write numbers to at least 100 in numerals and in words</li> <li>use place value and number facts to solve problems</li> </ul> <p><b>Number – addition and subtraction</b></p> <ul style="list-style-type: none"> <li>solve problems with addition and subtraction: <ul style="list-style-type: none"> <li>using concrete objects and pictorial representations, including those involving numbers, quantities and measures</li> <li>applying their increasing knowledge of mental and written methods</li> </ul> </li> <li>recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100</li> <li>add and subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> <li>a two-digit number and ones</li> <li>a two-digit number and tens</li> <li>two two-digit numbers</li> <li>adding three one-digit numbers</li> </ul> </li> <li>show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot</li> <li>recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.</li> </ul> <p><b>Number – multiplication and division</b></p> <ul style="list-style-type: none"> <li>recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers</li> <li>calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs</li> <li>show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</li> <li>solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.</li> </ul>

<p><b>Environments:</b></p> <ul style="list-style-type: none"> <li>• give children a reason to count, e.g. by asking them to select enough wrist bands for three friends to play with the puppets</li> <li>• enable children to note the 'missing set', e.g. 'There are none left' when sharing things out</li> <li>• provide number labels for children to use, e.g. by putting a number label on each bike and a corresponding number on each parking space</li> <li>• include counting money and change in role-play games</li> <li>• create opportunities for children to separate objects into unequal groups as well as equal groups</li> <li>• provide story props that children can use in their play, e.g. varieties of fruit and several baskets</li> </ul>	<ul style="list-style-type: none"> <li>• emphasise the empty set and introduce the concept of nothing or zero</li> <li>• show interest in how children solve problems and value their different solutions</li> <li>• make sure children are secure about the order of numbers before asking what comes after or before each number</li> <li>• discuss with children how problems relate to others they have met, and their different solutions</li> <li>• talk about the methods children use to answer a problem they have posed, e.g. 'Get one more, and then we will both have two.'</li> <li>• encourage children to make up their own story problems for other children to solve</li> <li>• encourage children to extend problems, e.g. "Suppose there were three people to share the bricks between instead of two".</li> <li>• use mathematical vocabulary and demonstrate methods of recording, using standard notation where appropriate</li> <li>• give children learning English as additional language opportunities to work in their home language to ensure accurate understanding of concepts</li> </ul> <p><b>Environments:</b></p> <ul style="list-style-type: none"> <li>• provide collections of interesting things for children to sort, order, count and label in their play</li> <li>• display numerals in purposeful contexts, e.g. a sign showing how many children can play on a number track</li> <li>• use tactile numeral cards made from sandpaper, velvet or string</li> <li>• create opportunities for children to experiment with a number of objects, the written numeral and the written number word. Develop this through matching activities with a range of numbers, numerals and a selection of objects</li> <li>• use a 100 square to show number patterns</li> <li>• encourage children to count the things they see and talk about and use numbers beyond ten</li> <li>• make number games readily available and teach children how to use them</li> <li>• display interesting books about number</li> <li>• play games such as hide and seek that involve counting</li> <li>• encourage children to record what they have done, e.g. by drawing or tallying</li> <li>• use number staircases to show a starting point and how you arrive at another point when something is added or taken away</li> <li>• provide a wide range of number resources and encourage children to be creative in identifying and devising problems and solutions in all areas of learning</li> <li>• make number lines available for reference and encourage children to use them in their own play.</li> <li>• help children to understand that five fingers on each hand make a total of ten fingers altogether, or that two rows of three eggs in the box make six eggs altogether</li> </ul>	<p><b>Fractions</b></p> <ul style="list-style-type: none"> <li>• recognise, find and name a half as one of two equal parts of an object, shape or quantity</li> <li>• recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.</li> <li>• describe what I can see and give an opinion about the work of an artist. (S, EW)</li> <li>• ask questions about a piece of art or work of an artist. (S, EW)</li> </ul>	<p><b>Fractions</b></p> <ul style="list-style-type: none"> <li>• recognise, find, name and write fractions <math>\frac{1}{3}</math>, <math>\frac{1}{4}</math>, <math>\frac{2}{4}</math> and <math>\frac{3}{4}</math> of a length, shape, set of objects or quantity</li> <li>• write simple fractions for example, <math>\frac{1}{2}</math> of 6 = 3 and recognise the equivalence of <math>\frac{2}{4}</math> and <math>\frac{1}{2}</math></li> </ul>
---	--	---	--

Progression and Assessment Criteria	Nursery Mathematician	Reception Mathematician	Year 1 Mathematician	Year 2 Mathematician
	<p><b>Shape, Space and Measure</b></p> <p><b>Children:</b></p> <ul style="list-style-type: none"> <li>show an interest in shape and space by playing with shapes or making arrangements with objects</li> <li>show awareness of similarities of shapes in the environment</li> <li>use positional language</li> <li>show interest in shape by sustained construction activity or by talking about shapes or arrangements</li> <li>show interest in shapes in the environment</li> <li>use shapes appropriately for tasks</li> <li>begin to talk about the shapes of everyday objects, e.g. 'round' and 'tall'</li> </ul> <p><b>Adults:</b></p> <ul style="list-style-type: none"> <li>demonstrate the language for shape, position and measures in discussions, e.g. 'sphere', 'shape', 'box', 'in', 'on', 'inside', 'under', long, longer', 'longest', 'short', 'shorter', 'shortest', 'heavy', 'light', 'full' and 'empty'</li> <li>find out and use equivalent terms for these in home languages</li> <li>encourage children to talk about the shapes they see and use and how they are arranged and used in constructions</li> <li>value children's constructions, e.g. helping to display them or taking photographs of them</li> </ul> <p><b>Environments:</b></p> <ul style="list-style-type: none"> <li>organise the environment to foster shape matching, e.g. pictures of different bricks on containers to show where they are kept</li> <li>have large and small blocks and boxes available for construction both indoors and outdoors</li> <li>play games involving children positioning themselves inside, behind, on top and so on</li> <li>provide rich and varied opportunities for comparing length, weight, capacity and time</li> <li>use stories such as Rosie's Walk by Pat Hutchins to talk about distance and stimulate discussion about non-standard units and the need for standard units</li> <li>show pictures that have symmetry or pattern and talk to children about them</li> </ul>	<p><b>Shape, Space and Measure</b></p> <p><b>Children:</b></p> <ul style="list-style-type: none"> <li>begin to use mathematical names for 'solid' 3D shapes and 'flat' 2D shapes, and mathematical terms to describe shapes</li> <li>select a particular named shape</li> <li>can describe their relative position such as 'behind' or 'next to'</li> <li>order two or three items by length or height</li> <li>order two items by weight or capacity</li> <li>use familiar objects and common shapes to create and recreate patterns and build models</li> <li>use everyday language related to time</li> <li>begin to use everyday language related to money</li> <li>order and sequence familiar events</li> <li>measure short periods of time in simple ways</li> </ul> <p><b>Early Learning Goals:</b></p> <ul style="list-style-type: none"> <li>use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems</li> <li>recognise, create and describe patterns</li> <li>explore characteristics of everyday objects and shapes and use mathematical language to describe them</li> </ul> <p><b>Adults:</b></p> <ul style="list-style-type: none"> <li>ask 'silly' questions, e.g. show a tiny box and ask if there is a bicycle in it</li> <li>play peek-a-boo, revealing shapes a little at a time and at different angles, asking children to say what they think the shape is, what else it could be or what it could not be</li> <li>be a robot and ask children to give you instructions to get to somewhere. Children also take turns to be the robot</li> <li>introduce children to the use of mathematical names for 'solid' 3D shapes and 'flat' 2D shapes, and the mathematical terms to describe shapes</li> <li>encourage children to use everyday words to describe position, e.g. when following pathways or playing with outdoor apparatus</li> </ul> <p><b>Environments:</b></p> <ul style="list-style-type: none"> <li>make books about shape, time and measure: shapes found in the environment; long and short things; things of a specific length; and ones about patterns, or comparing things that are heavier/lighter</li> <li>have areas where children can explore the properties of objects and where they can weigh and measure, such as a cookery station or a building area</li> <li>plan opportunities for children to describe and compare shapes, measures and distance</li> <li>provide materials and resources for children to observe and describe patterns in the indoor and outdoor environment and in daily routines</li> <li>provide a range of natural materials for children to arrange, compare and order</li> </ul>	<p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>compare, describe and solve practical problems for: <ul style="list-style-type: none"> <li>lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]</li> <li>mass/weight [for example, heavy/light, heavier than, lighter than]</li> <li>capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]</li> <li>time [for example, quicker, slower, earlier, later]</li> </ul> </li> <li>measure and begin to record the following: <ul style="list-style-type: none"> <li>lengths and heights</li> <li>mass/weight</li> <li>capacity and volume</li> <li>time (hours, minutes, seconds)</li> </ul> </li> <li>recognise and know the value of different denominations of coins and notes</li> <li>sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]</li> <li>recognise and use language relating to dates, including days of the week, weeks, months and years</li> <li>tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.</li> </ul> <p><b>Geometry – properties of shapes</b></p> <ul style="list-style-type: none"> <li>recognise and name common 2-D and 3-D shapes, including: <ul style="list-style-type: none"> <li>2-D shapes [for example, rectangles (including squares), circles and triangles]</li> <li>3-D shapes [for example, cuboids (including cubes), pyramids and spheres]</li> </ul> </li> </ul> <p><b>Geometry – position and direction</b></p> <p>describe position, direction and movement, including whole, half, quarter and three-quarter turns</p>	<p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>choose and use appropriate standard units to estimate and measure 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</li> <li>compare and order lengths, mass, volume/capacity and record the results using &gt;, &lt; and =</li> <li>recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value</li> <li>find different combinations of coins that equal the same amounts of money</li> <li>solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change</li> <li>compare and sequence intervals of time</li> <li>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</li> <li>know the number of minutes in an hour and the number of hours in a day.</li> </ul> <p><b>Geometry – properties of shapes</b></p> <ul style="list-style-type: none"> <li>identify and describe the properties of 2D shapes, including the number of sides and line symmetry in a vertical line</li> <li>identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces</li> <li>identify 2-D shapes on the surface of 3-D shapes [for example, a circle on a cylinder and a triangle on a pyramid]</li> <li>compare and sort common 2-D and 3-D shapes and everyday objects</li> </ul> <p><b>Geometry – position and direction</b></p> <ul style="list-style-type: none"> <li>order and arrange combinations of mathematical objects in patterns and sequences</li> <li>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).</li> </ul> <p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>interpret and construct simple pictograms, tally charts, block diagrams and simple tables</li> <li>ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity</li> <li>ask and answer questions about totalling and comparing categorical data</li> </ul>

	Year 3 Mathematician	Year 4 Mathematician	Year 5 Mathematician	Year 6 Mathematician
Progression and Assessment Criteria	<p><b>Number and place value</b></p> <ul style="list-style-type: none"> <li>count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number</li> <li>recognise the place value of each digit in a three-digit number (hundreds, tens, ones)</li> <li>compare and order numbers up to 1000</li> <li>identify, represent and estimate numbers using different representations</li> <li>read and write numbers up to 1000 in numerals and in words</li> <li>solve number problems and practical problems involving these ideas.</li> </ul>	<p><b>Number and place value</b></p> <ul style="list-style-type: none"> <li>count in multiples of 6, 7, 9, 25 and 1000</li> <li>find 1000 more or less than a given number</li> <li>count backwards through zero to include negative numbers</li> <li>recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)</li> <li>order and compare numbers beyond 1000</li> <li>identify, represent and estimate numbers using different representations</li> <li>round any number to the nearest 10, 100 or 1000</li> <li>solve number and practical problems that involve all of the above and with increasingly large positive numbers</li> <li>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.</li> </ul>	<p><b>Number and place value</b></p> <ul style="list-style-type: none"> <li>read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit</li> <li>count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000</li> <li>interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero</li> <li>round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100000</li> <li>solve number problems and practical problems that involve all of the above</li> <li>read Roman numerals to 1000 (M) and recognise years written in Roman numerals.</li> </ul>	<p><b>Number and place value</b></p> <ul style="list-style-type: none"> <li>read, write, order and compare numbers up to 10 000 000 and determine the value of each digit</li> <li>round any whole number to a required degree of accuracy</li> <li>use negative numbers in context, and calculate intervals across zero</li> <li>solve number and practical problems that involve all of the above.</li> </ul>



	Year 3 Mathematician	Year 4 Mathematician	Year 5 Mathematician	Year 6 Mathematician
Progression and Assessment Criteria	<p><b>Number – addition and subtraction</b></p> <ul style="list-style-type: none"> <li>add and subtract numbers mentally, including: <ul style="list-style-type: none"> <li>a three-digit number and ones</li> <li>a three-digit number and tens</li> <li>a three-digit number and hundreds</li> </ul> </li> <li>add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction</li> <li>estimate the answer to a calculation and use inverse operations to check answers</li> <li>solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.</li> </ul> <p><b>Number – multiplication and division</b></p> <ul style="list-style-type: none"> <li>recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables</li> <li>write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods</li> <li>solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which <math>n</math> objects are connected to <math>m</math> objects.</li> </ul>	<p><b>Number – addition and subtraction</b></p> <ul style="list-style-type: none"> <li>add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate</li> <li>estimate and use inverse operations to check answers to a calculation</li> <li>solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.</li> </ul> <p><b>Number – multiplication and division</b></p> <ul style="list-style-type: none"> <li>recall multiplication and division facts for multiplication tables up to <math>12 \times 12</math></li> <li>use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers</li> <li>recognise and use factor pairs and commutativity in mental calculations</li> <li>multiply two-digit and three-digit numbers by a one-digit number using formal written layout</li> <li>solve problems 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 <math>n</math> objects are connected to <math>m</math> objects.</li> </ul>	<p><b>Number – addition and subtraction</b></p> <ul style="list-style-type: none"> <li>add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)</li> <li>add and subtract numbers mentally with increasingly large numbers</li> <li>use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy</li> <li>solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</li> </ul> <p><b>Number – multiplication and division</b></p> <ul style="list-style-type: none"> <li>identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers</li> <li>know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers</li> <li>establish whether a number up to 100 is prime and recall prime numbers up to 19</li> <li>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</li> <li>multiply and divide numbers mentally drawing upon known facts</li> <li>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</li> <li>multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</li> <li>recognise and use square numbers and cube numbers, and the notation for squared (<math>^2</math>) and cubed (<math>^3</math>)</li> <li>solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes</li> <li>solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign</li> <li>solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.</li> </ul>	<p><b>Number – addition, subtraction, multiplication and division</b></p> <ul style="list-style-type: none"> <li>multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication</li> <li>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</li> <li>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</li> <li>perform mental calculations, including with mixed operations and large numbers</li> <li>identify common factors, common multiples and prime numbers</li> <li>use their knowledge of the order of operations to carry out calculations involving the four operations</li> <li>solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</li> <li>solve problems involving addition, subtraction, multiplication and division</li> <li>use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</li> </ul> <p><b>Algebra</b></p> <ul style="list-style-type: none"> <li>use simple formulae</li> <li>generate and describe linear number sequences</li> <li>express missing number problems algebraically</li> <li>find pairs of numbers that satisfy an equation with two unknowns</li> <li>enumerate possibilities of combinations of two variables.</li> </ul>

	Year 3 Mathematician	Year 4 Mathematician	Year 5 Mathematician	Year 6 Mathematician
Progression and Assessment Criteria	<p><b>Fractions</b></p> <ul style="list-style-type: none"> <li>count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10</li> <li>recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators</li> <li>recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators</li> <li>recognise and show, using diagrams, equivalent fractions with small denominators</li> <li>add and subtract fractions with the same denominator within one whole [for example, <math>75 + 71 = 76</math>]</li> <li>compare and order unit fractions, and fractions with the same denominators</li> <li>solve problems that involve all of the above.</li> </ul>	<p><b>Fractions, including decimals</b></p> <ul style="list-style-type: none"> <li>recognise and show, using diagrams, families of common equivalent fractions</li> <li>count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.</li> <li>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</li> <li>add and subtract fractions with the same denominator</li> <li>recognise and write decimal equivalents of any number of tenths or hundredths</li> <li>recognise and write decimal equivalents to <math>\frac{1}{4}</math>, <math>\frac{1}{2}</math>, <math>\frac{3}{4}</math></li> <li>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</li> <li>round decimals with one decimal place to the nearest whole number</li> <li>compare numbers with the same number of decimal places up to two decimal places</li> <li>solve simple measure and money problems involving fractions and decimals to two decimal places.</li> </ul>	<p><b>Fractions, including decimals and percentages</b></p> <ul style="list-style-type: none"> <li>compare and order fractions whose denominators are all multiples of the same number</li> <li>identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths</li> <li>recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements <math>&gt; 1</math> as a mixed number</li> <li>add and subtract fractions with the same denominator and denominators that are multiples of the same number</li> <li>multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams</li> <li>read and write decimal numbers as fractions [for example, <math>0.71 = \frac{71}{100}</math>]</li> <li>recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents</li> <li>round decimals with two decimal places to the nearest whole number and to one decimal place</li> <li>read, write, order and compare numbers with up to three decimal places</li> <li>solve problems involving number up to three decimal places</li> <li>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</li> <li>solve problems which require knowing percentage and decimal equivalents of <math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{1}{5}</math>, <math>\frac{2}{5}</math>, <math>\frac{4}{5}</math> and those fractions with a denominator of a multiple of 10 or 25.</li> </ul>	<p><b>Fractions, including decimals and percentages</b></p> <ul style="list-style-type: none"> <li>use common factors to simplify fractions; use common multiples to express fractions in the same denomination</li> <li>compare and order fractions, including fractions <math>&gt; 1</math></li> <li>add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions</li> <li>multiply simple pairs of proper fractions, writing the answer in its simplest form</li> <li>divide proper fractions by whole numbers</li> <li>associate a fraction with division and calculate decimal fraction equivalents for a simple fraction</li> <li>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</li> <li>multiply one-digit numbers with up to two decimal places by whole numbers</li> <li>use written division methods in cases where the answer has up to two decimal places</li> <li>solve problems which require answers to be rounded to specified degrees of accuracy</li> <li>recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.</li> </ul> <p><b>Ratio and proportion</b></p> <ul style="list-style-type: none"> <li>solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts</li> <li>solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison</li> <li>solve problems involving similar shapes where the scale factor is known or can be found</li> <li>solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.</li> </ul>

Progression and Assessment Criteria	Year 3 Mathematician	Year 4 Mathematician	Year 5 Mathematician	Year 6 Mathematician
	<p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)</li> <li>measure the perimeter of simple 2-D shapes</li> <li>add and subtract amounts of money to give change, using both £ and p in practical contexts</li> <li>tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks</li> <li>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</li> <li>know the number of seconds in a minute and the number of days in each month, year and leap year</li> <li>compare durations of events [for example to calculate the time taken by particular events or tasks].</li> </ul> <p><b>Geometry – properties of shapes</b></p> <ul style="list-style-type: none"> <li>draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them</li> <li>recognise angles as a property of shape or a description of a turn</li> <li>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 than or less than a right angle</li> <li>identify horizontal and vertical lines and pairs of perpendicular and parallel lines.</li> </ul>	<p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>Convert between different units of measure [for example, kilometre to metre; hour to minute]</li> <li>measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres</li> <li>find the area of rectilinear shapes by counting squares</li> <li>estimate, compare and calculate different measures, including money in pounds and pence</li> <li>read, write and convert time between analogue and digital 12- and 24-hour clocks</li> <li>solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.</li> </ul> <p><b>Geometry – properties of shapes</b></p> <ul style="list-style-type: none"> <li>compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes</li> <li>identify acute and obtuse angles and compare and order angles up to two right angles by size</li> <li>identify lines of symmetry in 2-D shapes presented in different orientations</li> <li>complete a simple symmetric figure with respect to a specific line of symmetry.</li> </ul> <p><b>Geometry – position and direction</b></p> <ul style="list-style-type: none"> <li>describe positions on a 2-D grid as coordinates in the first quadrant</li> <li>describe movements between positions as translations of a given unit to the left/right and up/down</li> <li>plot specified points and draw sides to complete a given polygon.</li> </ul>	<p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)</li> <li>understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints</li> <li>measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres</li> <li>calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm<sup>2</sup>) and square metres (m<sup>2</sup>) and estimate the area of irregular shapes</li> <li>estimate volume [for example, using 1 cm<sup>3</sup> blocks to build cuboids (including cubes)] and capacity [for example, using water]</li> <li>solve problems converting between units of time</li> <li>use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.</li> </ul> <p><b>Geometry – properties of shapes</b></p> <ul style="list-style-type: none"> <li>identify 3-D shapes, including cubes and other cuboids, from 2-D representations</li> <li>know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles</li> <li>draw given angles, and measure them in degrees (°)</li> <li>identify: <ul style="list-style-type: none"> <li>angles at a point and one whole turn (total 360°)</li> <li>angles at a point on a straight line and ½ turn (total 180°)</li> <li>other multiples of 90°</li> </ul> </li> <li>use the properties of rectangles to deduce related facts and find missing lengths and angles</li> <li>distinguish between regular and irregular polygons based on reasoning about equal sides and angles.</li> </ul> <p><b>Geometry – position and direction</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>	<p><b>Measurement</b></p> <ul style="list-style-type: none"> <li>solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate</li> <li>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</li> <li>convert between miles and kilometres</li> <li>recognise that shapes with the same areas can have different perimeters and vice versa</li> <li>recognise when it is possible to use formulae for area and volume of shapes</li> <li>calculate the area of parallelograms and triangles</li> <li>calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm<sup>3</sup>) and cubic metres (m<sup>3</sup>), and extending to other units [for example, mm<sup>3</sup> and km<sup>3</sup>].</li> </ul> <p><b>Geometry – properties of shapes</b></p> <ul style="list-style-type: none"> <li>draw 2-D shapes using given dimensions and angles</li> <li>recognise, describe and build simple 3-D shapes, including making nets</li> <li>compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons</li> <li>illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius</li> <li>recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.</li> </ul> <p><b>Geometry – position and direction</b></p> <ul style="list-style-type: none"> <li>describe positions on the full coordinate grid (all four quadrants)</li> <li>draw and translate simple shapes on the coordinate plane, and reflect them in the axes.</li> </ul>



## Hardwick – Mathematics

	Year 3 Mathematician	Year 4 Mathematician	Year 5 Mathematician	Year 6 Mathematician
Progression Criteria	<p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>interpret and present data using bar charts, pictograms and tables</li> <li>solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables.</li> </ul>	<p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.</li> <li>solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.</li> </ul>	<p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>solve comparison, sum and difference problems using information presented in a line graph</li> <li>complete, read and interpret information in tables, including timetables</li> </ul>	<p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>interpret and construct pie charts and line graphs and use these to solve problems</li> <li>calculate and interpret the mean as an average.</li> </ul>