



# MATHEMATICS CURRICULUM

*'Mathematics is not about numbers, equations, computations, or algorithms: it is about understanding'*

*William Paul Thurston*

# Mathematics: Intent

## Purpose

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. Therefore, a high-quality mathematics education provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

## Aims

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

- become fluent in the fundamentals of mathematics, including through varied and frequent practise 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.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas.

The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage.

Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

# Curriculum Implementation

At Nascot Wood Junior School, children study mathematics daily, covering a broad and balanced mathematical curriculum including elements of number, calculation, geometry, measures and statistics. Alongside daily mathematics lessons, we aim to teach mathematics in a cross-curricular manner as well as discretely to teach the practical application of mathematical skills. This is due to the interconnected nature of mathematics. We focus not only on the mathematical methods but also on mathematical vocabulary and to use Maths Mastery to broaden and deepen mathematical understanding.

We aim for each child to be confident in their yearly objectives and develop their ability to use this knowledge to develop a greater depth understanding to solve varied fluency problems as well as problem solving and reasoning questions. Although we have the Herts for Learning Essential Planning as the backbone of our mathematics teaching, we use a range of textbooks and online resources throughout the school to ensure a curriculum that is specific to each child's learning needs. Parents are encouraged to subscribe to the on line programme, Maths Whizz, which aims to build pupil engagement and consolidate mathematical knowledge.

From the 2019/20 academic year onwards, schools in England will be required to administer an online multiplication tables check (MTC) to year 4 pupils. The purpose of the MTC is to determine whether pupils can recall their times tables fluently, which is essential for future success in mathematics. It will help schools to identify pupils who have not yet mastered their times tables, so that additional support can be provided. To support the children with their multiplication practice we use 'Times Table Rockstars' as an online and fun learning platform which also offer resources to be used in the classroom. We also use concrete modelling and monitor progress using times table grids. Please note that the school was used to pilot the online multiplication tables check.

Y3 learning sequence 1													
Week	1	2	3	4	5	6	7	8	9	10	11	12	
Number and place value	<ul style="list-style-type: none"><li>count from 0 in multiples of 4, 8, 50 and 100 and 2, 3, 5 and 10 from Y2</li><li>read and write numbers up to 1000 in numerals and in words</li><li>compare and order numbers up to 1000</li><li>find 10 or 100 more or less than a given number using concrete resources and pictorial representations</li><li>recognise the place value of each digit in a three-digit number (hundreds, tens, ones)</li><li>round numbers to the nearest 10 and 100</li><li>identify, represent and estimate numbers using different representations and concrete resources</li><li>solve problems involving all of the above</li></ul>												
Addition and subtraction		<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>any pair of two digit numbers including bridging through multiples of ten and through 100</li><li>a near double e.g. 19 + 16, 60 + 70</li><li>recall sums and differences of pairs of multiples of 10, 100 or 1000</li><li>recall doubles and halves of multiples of 10 to 100 e.g. 90 + 90</li></ul></li><li>understand that addition is commutative and that subtraction is not e.g. 7-5 is not the same as 5-7</li><li>estimate the answer to a calculation and use inverse operations to check answers and rounding to nearest 10 or 100</li></ul>											

Week	1	2	3	4	5	6	7	8	9	10	11	12
Geometry				<ul style="list-style-type: none"> <li>continue to identify and name a greater repertoire of regular and irregular shapes</li> <li>identify horizontal and vertical lines and pairs of perpendicular and parallel lines</li> <li>draw 2-D shapes               <ul style="list-style-type: none"> <li>measuring sides with increasing accuracy</li> <li>to include symmetrical and non-symmetrical polyhedra</li> </ul> </li> <li>make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them</li> <li>recognise that angles are 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 and classify acute and obtuse angles</li> </ul>								
Measurement				<ul style="list-style-type: none"> <li>measure, compare, add and subtract: lengths (m/cm/mm) (no conversion between units and expressed as mixed units e.g. 1m 30cm)</li> <li>measure the perimeter of simple 2-D shapes</li> </ul>			<ul style="list-style-type: none"> <li>measure, compare, add and subtract:               <ul style="list-style-type: none"> <li>lengths (m/cm/mm);</li> <li>mass (kg/g);</li> <li>volume/capacity (l/ml)</li> </ul>               (no conversion between units and expressed as mixed units e.g. 1m 30cm)             </li> <li><i>use known multiplication facts for scaling of measures by integers (e.g. a given quantity or measure is twice as long or five times as high)</i></li> </ul>					

Week	1	2	3	4	5	6	7	8	9	10	11	12
Multiplication and division							<ul style="list-style-type: none"> <li>derive and begin to recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables               <ul style="list-style-type: none"> <li>recognise and derive factor pairs of multiples in known tables</li> <li><i>connect 2, 4 and 8 multiplication tables with doubling</i></li> <li>derive rules for divisibility for 2, 5, 3, 4, 8 and 10 x tables</li> <li>understand that multiplication is commutative and division is not</li> <li><i>derive new facts from given facts (e.g. <math>3 \times 2 = 6</math>, <math>6 \div 3 = 2</math> and <math>2 = 6 \div 3</math>)</i></li> </ul> </li> <li>solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects (using familiar multiplication and division facts)</li> </ul>					
Fractions (including decimals)									Link to knowledge of multiplication and division facts <ul style="list-style-type: none"> <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>compare and order unit fractions, and fractions with the same denominators</li> </ul>			

Y3 learning sequence 2												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Fractions (including decimals)	<ul style="list-style-type: none"><li>count up and down in tenths <i>including bridging through 1s</i>:<ul style="list-style-type: none"><li>relate counting in tenths to counting in known multiples e.g. relate counting in multiples of 4 to counting in multiples of 0.4</li></ul></li><li>recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10<ul style="list-style-type: none"><li>represent numbers with decimal tenths using concrete resources and pictorial representations</li><li>partition numbers with one decimal place</li><li>order and compare numbers with one decimal place</li><li>round numbers with one decimal place to the nearest whole number</li><li>relate decimal tenths to fractional tenths e.g. <math>1/10 = 0.1</math></li><li>relate decimal tenths to multiples of ten pence when working with money</li></ul></li><li>add and subtract fractions with the same denominator within one whole (for example, <math>\frac{5}{7} + \frac{1}{7} = \frac{6}{7}</math>)<ul style="list-style-type: none"><li>add and subtract decimal tenths</li></ul></li><li>solve problems that involve applying knowledge of fractions work so far</li></ul>											
Addition and subtraction				<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 including partitioning the ones number when bridging through multiples of 10 and 100</li><li>a three-digit number and tens and relate to counting on and back in tens from any number bridging through multiples of 100</li><li>a three-digit number and hundreds</li><li>calculate what must be added to any 3 digit number to make the next multiple of 100 e.g. <math>521 + \square\square = 600</math> using knowledge of complements to 100 from Y2</li></ul></li><li>add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction using concrete resources and understanding of place value<ol style="list-style-type: none"><li>no exchange</li><li>extra (+) or fewer (-) digits in the answer</li><li>exchanging units to tens</li><li>exchanging tens to hundreds</li><li>exchanging units to tens and tens to hundreds</li></ol></li><li>estimate the answer to a calculation and use rounding to 10 and 100 and 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>								



Week	1	2	3	4	5	6	7	8	9	10	11	12
Measurement				<ul style="list-style-type: none"> <li>add and subtract amounts of money to give change, using both £ and p in practical contexts (<i>they record £ and p separately and not as decimals which is introduced formally in Y4</i>)</li> <li>develop fluency when recognising the value of coins and notes</li> </ul>					<ul style="list-style-type: none"> <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</li> <li>record and compare time in terms of seconds, minutes and hours</li> <li>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 [e.g. to calculate the time taken by particular events or tasks]</li> </ul>			

<p>Multiplication and division</p>		<ul style="list-style-type: none"> <li>recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables and relate counting in multiples of e.g. 4 to counting in multiples of 40, 400 and 0.4</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 methods <i>supported by concrete resources and pictorial representations</i> <ul style="list-style-type: none"> <li>use commutativity and associativity (for example, <math>2 \times 3 \times 5 = 2 \times 5 \times 3 = 10 \times 3 = 30</math>) and multiplication and division facts (for example, using <math>3 \times 2 = 6</math>, <math>6 \div 3 = 2</math> and <math>2 = 6 \div 3</math>) to derive related facts (<math>30 \times 2 = 60</math>, <math>60 \div 3 = 20</math> and <math>20 = 60 \div 3</math>)</li> <li>use partitioning to multiply a two-digit number by a one digit number e.g. <math>23 \times 4 = 20 \times 4 + 3 \times 4 = 92</math></li> </ul> </li> <li>solve problems, including missing number problems, involving multiplication and division <i>with known facts</i>, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects e.g. 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children</li> </ul>	
<p>Statistics</p>	<p>Link to comparing chronology and through cross curricular activities and a variety of contexts</p> <ul style="list-style-type: none"> <li>interpret and present data using bar charts, pictograms and tables <i>using simple scales (for example, 2, 5, 10 units per cm)</i></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>		

Y3 learning sequence 3												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Fractions (including decimals)	<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 and concrete resources, equivalent fractions with small denominators</li> <li>compare and order unit fractions, and fractions with the same denominators <i>on a number line including beyond 0-1 and relate this to measure</i></li> <li>add and subtract fractions with the same denominator within one whole (for example, <math>\frac{5}{7} + \frac{1}{7} = \frac{6}{7}</math>)</li> <li>solve problems that involve all of the above</li> </ul>											
Measurement			<ul style="list-style-type: none"> <li>measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)               <ul style="list-style-type: none"> <li>reading scales that increase in simple rates such as 2s, 5s, 10s, 50s and 100s</li> <li><i>derive and begin to recall simple equivalence of units that relate to work on fractions <math>1m = 100cm</math>, <math>\frac{1}{2}m = 50cm</math>, <math>\frac{1}{10}m = 10cm</math></i></li> <li><i>compare and order measures using mixed units e.g. 1kg and 200g</i></li> </ul> </li> <li>measure the perimeter of simple 2-D shapes               <ul style="list-style-type: none"> <li>with increasing accuracy and draw rectilinear shapes with given perimeters in centimetres</li> </ul> </li> </ul>					<ul style="list-style-type: none"> <li>add and subtract amounts of money to give change, using both £ and p in practical contexts <i>(they record £ and p separately and not as decimals which is introduced formally in Y4)</i></li> <li>develop fluency when recognising the value of coins and notes</li> </ul>				

Geometry		<ul style="list-style-type: none"> <li>• continue to identify and name a greater repertoire of regular and irregular shapes</li> <li>• draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them <ul style="list-style-type: none"> <li>- <i>draw sides of 2D shapes and construct 3D shapes using measuring tools with increasing accuracy in centimetres in a variety of contexts</i></li> </ul> </li> <li>identify horizontal and vertical lines and pairs of perpendicular and parallel lines <ul style="list-style-type: none"> <li>- <i>describe shapes using accurate language</i></li> </ul> </li> <li>• recognise that angles are 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 and classify acute and obtuse angles</li> <li>• read and record the vocabulary of position, direction and movement using the four points of a compass to describe movement around a grid</li> </ul>	
----------	--	---	--

Addition and subtraction		<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<ol style="list-style-type: none"><li>1. no exchange</li><li>2. extra (+) or fewer (-) digits in the answer</li><li>3. exchanging units to tens</li><li>4. exchanging tens to hundreds</li><li>5. exchanging units to tens and tens to hundreds</li></ol></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>			
	Multiplication and division		<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<ul style="list-style-type: none"><li>- using concrete resources to introduce each stage and relating to mental methods taught<ol style="list-style-type: none"><li>1. TO x O no exchange</li><li>2. TO x O extra digit in the answer</li><li>3. TO x O with exchange of ones into tens</li><li>4. TO ÷ O no exchange no remainder</li><li>5. TO ÷ O with exchange no remainder</li></ol></li></ul></li><li>• solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects</li></ul>		

# The Year 3 Learner

## Working mathematically

By the end of year 3, children will talk about their mathematics using the numbers they are familiar with, applying their understanding of number, measures and shape to a greater range of problems. They will make decisions about calculations and information that is needed to solve problems, for example when a recipe for two people needs to be doubled to make a recipe for four. Children will be expected to prove their thinking through pictures, jottings and conversations. They will be encouraged to pose their own questions, working in an organised way to solve them which will help pupils to identify common patterns or any errors more easily.

## Number

### Counting and understanding numbers

Children will be very familiar with numbers that have 3 digits and will have experienced many opportunities to order, compare and show them in different ways using apparatus such as a tape measure, a 100 grid or money. Using their understanding of place value (how the value of each digit changes depending on its position in the number), children will be able to partition (break and make) numbers in different ways e.g.  $234 = 200$  and  $30$  and  $4$ ;  $100$  and  $100$  and  $20$  and  $10$  and  $4$ ; *or*  $200$  and  $20$  and  $14$ . They will develop a secure understanding of numbers up to  $1000$  and will count beyond it in  $1$ s,  $10$ s and  $100$ s. They will use this counting to help find  $10$  or  $100$  more than any given number.

Children will be introduced to numbers with one decimal place and will count up and down in tenths; share groups of objects or shapes into tenths and represent these in pictures and using hands-on resources.

Children will count forwards and backwards from  $0$  in steps of  $4$ ,  $8$ ,  $50$  and  $100$  and link this to multiplication and division. They will also count in  $3$ s to help maintain their fluency from Year 2.

### Calculating

Children will continue to develop their mental calculation skills to add and subtract combinations of three-digit numbers e.g.  $248 \pm 8$ ;  $319 \pm 40$ ;  $428 \pm 200$ . They will develop their range of strategies using jottings (sketches and notes to help them remember the steps) and number lines to help them understand how each calculation works. Children will share their methods with others to help them see which work best, are quickest and most accurate. Children will understand the importance of estimation when calculating to see if their answer is reasonable or not. They will recall their multiplication and division facts for  $3$ ,  $4$  and  $8$ x tables and be supported to see the links between the  $2$ ,  $4$  and  $8$ x tables. They explore patterns and rules for the times tables they learn and will use pictures and objects to support their understanding. They will also learn that multiplication can be done in any order e.g.  $3 \times 4 \times 2 = 2 \times 3 \times 4$ .

Children will be introduced to more formal methods of recording addition and subtraction, including column methods. They will use hands-on resources to secure their understanding of these methods. This will be applied to numbers up to three digits. Children who become very adept at these calculations will be stretched through problems such as those involving missing numbers so that they know when, if and why they need to use these methods.

Children will develop their understanding of multiplication and division and apply their times table knowledge to multiply 2-digit by 1-digit numbers using the skills of partitioning (breaking and making numbers). For example,  $43 \times 5$  can also be thought of as  $40 \times 5$  and  $3 \times 5$  *or*  $(4 \times 5 \times 10) + (3 \times 5)$ . They will move from informal methods of calculating multiplication and division to formal written methods i.e. short column multiplication and be supported by using hands-on resources.

#### ▪ Fractions

Children will develop their understanding of fractions and decimals and will be introduced to tenths. They will count and understand tenths as ten equal parts as well as through dividing sets of objects into ten equal parts / groups. They will find and write fractions of objects using their multiplication tables knowledge, e.g.  $\frac{1}{5}$  of a group of 20 buttons can be solved by  $20 \div 5 = 4$ , and will continue to explore equivalent fractions using diagrams to explain their understanding e.g.  $\frac{2}{4}$  is equivalent to or of equal value to  $\frac{4}{8}$ . They will also begin to add and subtract fractions where the denominator is the same e.g.  $\frac{4}{6} + \frac{1}{6} = \frac{5}{6}$ .

#### Measurement

Children will continue to measure, compare, add and subtract measurements and progress to mixed units e.g. expressing amounts as litres and millilitres – 2 litres 400ml. They will measure the perimeter of 2-D shapes and will continue to add and subtract amounts of money including giving change. Children will estimate and read time to the nearest minute on analogue and digital clock faces. They will be introduced to the Roman numerals I to XII to help with this. Problem solving and calculating with time will involve comparing the duration of events such as the length of favourite television programme or journeys to school. They will use language with increasing accuracy, such as seconds, minutes and hours; o'clock, a.m. / p.m., morning, afternoon, noon and midnight. They will need to recall the number of seconds in a minute and the number of days in each month, year and leap year.

## **Geometry**

Children will accurately draw 2-D shapes with rulers measuring sides accurately.

They will make 3-D shapes to help them understand how they are composed and will recognise 3-D shapes in a range of places and contexts (e.g. buildings, packages) and use correct mathematical vocabulary to describe them. They will learn what a right angle is and know that two right angles make a half-turn, three make three quarters of a turn and four a complete turn as well as identify whether angles are greater than or less than a right angle . They will also be able to identify horizontal and vertical lines and pairs of perpendicular ( $\perp$ ) and parallel lines ( $\parallel$ ).

## **Statistics**

Children will collect, organise, answer and pose questions about information using bar charts, pictograms and tables to answer questions such as 'how many more children prefer football to cricket?'.



Y4 learning sequence 1												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Number and place value	<ul style="list-style-type: none"><li>count in multiples of 6, 7, 9, 25 and <u>10, 100</u> and 1000</li><li>order and compare numbers beyond 1000</li><li>find <u>10, 100</u> and 1000 more or less than a given number</li><li>recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)</li><li>read Roman numerals to 100 (I to C)</li><li>know that over time, the numeral system changed to include the concept of zero and place value</li><li>compare number systems from history with ours</li><li>identify, represent and estimate numbers using different representations and concrete resources including measures and when comparing number systems</li><li>round any number to the nearest 10, 100 or 1000 <i>and connect to estimation when calculating or when using measuring instruments</i></li><li>solve number and practical problems that involve all of the above and with increasingly large positive numbers</li></ul>			<ul style="list-style-type: none"><li>count backwards through zero to include negative numbers and relate to their use in real life</li><li>order and compare numbers including negative numbers</li></ul>			<ul style="list-style-type: none"><li>count in multiples of 6, 7, 9, 25 and <u>10, 100</u> and 1000<ul style="list-style-type: none"><li>- relate counting in 6s to counting in 60s ready for converting units of time</li></ul></li></ul>					
	<ul style="list-style-type: none"><li>derive, use and be increasingly fluent when recalling multiplication and division facts for multiplication tables up to 12 × 12 (exploring the 6 and 9x tables and relating to the 3 x table)</li><li>represent the multiplication tables using concrete resources and pictorial representations</li></ul>											

Addition and subtraction	<ul style="list-style-type: none"> <li>identify patterns and relationships within times tables (including rules for divisibility)</li> <li>use known facts to derive new facts and inverse facts</li> </ul>		
		<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 using concrete resources to represent and understanding of place value</li> <li>estimate and use inverse operations to check answers to a calculation</li> <li>add and subtract mentally using concrete resources and pictorial representations to support understanding and to include: <ul style="list-style-type: none"> <li>know when and how to use jottings to support conservation of number</li> <li>calculate what must be added to any three digit number to make the next multiple of 100</li> <li>add and subtract a pair of 2 digit numbers e.g. <math>38 + 86</math></li> <li>add and subtract 3 digit multiples of 10 e.g. <math>620 - 380</math></li> </ul> </li> <li>solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why (within known number competency)</li> </ul>	
Geometry		<ul style="list-style-type: none"> <li>draw 2-d shapes with increasing accuracy</li> <li>compare, identify and classify geometric shapes, including quadrilaterals (<i>rhombus, parallelogram, trapezium and rectangle</i>) and triangles (<i>isosceles, scalene and equilateral</i>), based on their properties and sizes</li> <li>identify lines of symmetry in 2-D shapes presented in different orientations (and in a variety of contexts)</li> <li>complete a simple symmetric figure with respect to a specific line of symmetry (<i>including where the line of symmetry does not dissect the original shape</i>)</li> <li>identify acute and obtuse angles and compare and order angles up to two right angles by size (<i>not required to use a protractor</i>)</li> <li><i>use understanding of angle and lengths of side to decide whether 2d shapes are regular or irregular</i></li> <li><i>draw and construct symmetric patterns and shapes in different orientations and using different media</i></li> </ul>	

Measurement			
		<ul style="list-style-type: none"> <li>measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres</li> </ul>	
Statistics			<ul style="list-style-type: none"> <li>interpret and present discrete data using appropriate graphical methods, including bar charts</li> <li>solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs</li> </ul>

Y4 learning sequence 2												
Week	1	2	3	4	5	6	7	8	9	10	11	12
<b>Fractions (including decimals)</b>	<ul style="list-style-type: none"> <li>count up and down in hundredths and tenths including bridging through tenths and ones               <ul style="list-style-type: none"> <li>continue to relate counting in tenths to counting in known multiples e.g. relate counting in multiples of 6 to counting in multiples of 0.6</li> </ul> </li> <li>recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten and relate to pounds and pence and other decimal units of measurement               <ul style="list-style-type: none"> <li>link to place value</li> <li>relate decimal notation to division of a whole number by ten and later 100</li> </ul> </li> <li>compare and order unit fractions and fractions with the same denominators</li> <li>recognise the place value of each digit to two decimal places</li> <li>add and subtract fractions with the same denominator i.e. where the denominator is 10 or 100</li> <li>recognise and write decimal equivalents to <math>\frac{1}{4}</math>; <math>\frac{1}{2}</math>; <math>\frac{3}{4}</math> and relate to money and decimal measures</li> <li>recognise and write decimal equivalents of any number of tenths or hundredths</li> <li>compare numbers with the same number of decimal places up to two decimal places               <ul style="list-style-type: none"> <li>order decimals with up to 2 decimal places</li> <li>represent numbers with up to two decimal places in several ways including on a number line</li> </ul> </li> <li>round decimals with one decimal place to the nearest whole number and relate to rounding whole numbers, money and decimal measures</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>solve simple measure and money problems involving fractions and decimals to two decimal places</li> </ul>											
<b>Multiplication and division</b>	<ul style="list-style-type: none"> <li>derive, use and be increasingly fluent when recalling multiplication and division facts for multiplication tables (6 x, 11x and 12x)               <ul style="list-style-type: none"> <li>relate 12x, 6x, 3x and 4x tables identifying common multiples and making links to doubling</li> <li>relate 12x and 6x tables to chronology e.g. count in multiples of 60</li> </ul> </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               <ul style="list-style-type: none"> <li><i>understand that multiplication can be done in any order when multiplying three numbers e.g. <math>2 \times 3 \times 4 = 3 \times 4 \times 2 = 4 \times 3 \times 2 = 24</math></i></li> </ul> </li> <li>recognise and use factor pairs and commutativity in mental calculations               <ul style="list-style-type: none"> <li>understand that multiplication is commutative but that division is not</li> </ul> </li> <li>solve problems involving multiplying and adding, including using integer scaling problems and harder correspondence problems such as n objects are connected to m objects</li> </ul>											

<b>Addition and subtraction</b>		<ul style="list-style-type: none"> <li>• add and subtract numbers with up to 4 digits (including decimal tenths and hundredths) using the formal written methods of columnar addition and subtraction where appropriate <ul style="list-style-type: none"> <li>- relate this to money and measures using decimal notation</li> <li>- using concrete resources and pictorial representations to support understanding and communication</li> </ul> </li> <li>• estimate and use inverse operations to check answers to a calculation</li> <li>• add and subtract numbers mentally using concrete resources and pictorial representations to support understanding and to include; <ul style="list-style-type: none"> <li>- know when and how to use jottings to support conservation of number</li> <li>- calculate what must be added to any three digit number to make the next multiple of 100 and then any 4 digit number to make the next multiple of 1000 e.g. <math>4087 + \square\square\square = 5000</math></li> <li>- add and subtract a pair of 2 digit numbers e.g. <math>38 + 86</math></li> <li>- add and subtract 3 digit multiples of 10 e.g. <math>620 - 380</math></li> <li>- calculate what must be added to a decimal with units and tenths and then a unit with tenths and hundredths to make the next whole number e.g. <math>7.2 + \square\square = 8</math> and relate to money, decimal measures and knowledge of place value</li> </ul> </li> <li>• solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why</li> </ul>	<ul style="list-style-type: none"> <li>• add and subtract numbers mentally using concrete resources and pictorial representations to support understanding and to include; <ul style="list-style-type: none"> <li>- partitioning, counting on and back in minutes, and bridging through 60 when calculating time</li> </ul> </li> </ul>	
<b>Measurement</b>		<ul style="list-style-type: none"> <li>• convert between different units of measure [e.g. kilometre to metre; hour to minute] <ul style="list-style-type: none"> <li>- relate to understanding of place value</li> <li>- use decimal notation when recording money and understand how money looks on a calculator display</li> <li>- record metric measures using decimal notation</li> <li>- recognise decimal equivalents to <math>\frac{1}{4}</math>; <math>\frac{1}{2}</math>; <math>\frac{3}{4}</math> and relate to measure</li> </ul> </li> <li>• estimate, compare and calculate different measures, including money in pounds and pence</li> </ul>	<ul style="list-style-type: none"> <li>• read, write and convert time between analogue and digital 12 and 24-hour clocks and recall with increasing fluency</li> <li>• solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days</li> </ul>	

Statistics		<ul style="list-style-type: none"> <li>- explore and use these strategies in a range of contexts including those that involve practical uses of measure</li> <li>- measure with increasing accuracy and record using decimal notation</li> </ul>		
			<ul style="list-style-type: none"> <li>• interpret and present discrete and continuous data using appropriate graphical methods - time graphs</li> <li>• solve comparison, sum and difference problems using information presented in tables and other graphs (<i>e.g. graphs and tables relating to timed events</i> )</li> </ul>	

Y4 learning sequence 3												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Geometry	<ul style="list-style-type: none"><li>draw 2-D shapes with increasing accuracy</li><li>begin to identify simple nets 3-D shapes e.g. unfold packets which are cubes or cuboids</li><li>compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes</li><li>describe movements between positions as translations of a given unit to the left/right and up/down</li><li>describe positions on a 2-D grid as coordinates in the first quadrant</li><li>plot specified points and draw sides to complete a given polygon</li><li>identify lines of symmetry in 2-D shapes presented in different orientations (and in a variety of contexts)</li><li>complete a simple symmetric figure with respect to a specific line of symmetry (including where the line of symmetry does not dissect the original shape)</li></ul>											

## Multiplication and division

- recall multiplication and division facts for multiplication tables up to  $12 \times 12$ 
  - reason and generalise through investigation rules for divisibility for multiplication tables
- 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
  - derive new facts from known facts with increasing fluency e.g. if  $6 \times 3 = 18$  then  $60 \times 3 = 180$  etc.
  - understand when it is and isn't possible to use the inverse operation to solve missing number questions e.g.  $240 \div \square = 3$
  - use known strategies e.g. partitioning before multiplying (distributive law) e.g.  $36 \times 4 = (30 \times 4) + (6 \times 4) = 120 + 24 = 144$  ensuring the correct use of brackets
- recognise and use factor pairs and commutativity in mental calculations
  - *use understanding that multiplication can be done in any order e.g.  $20 \times 3 \times 4 = 3 \times 4 \times 20 = 4 \times 3 \times 20 = 240$  (associative law)*
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout using concrete resources and pictorial representation to support understanding and communication
  1. TO x O no exchange
  2. TO x O extra digit in the answer
  3. TO x O with exchange of ones into tens
  4. HTO x O with no exchange
  5. HTO x O with exchange of ones to tens
  6. HTO x O with exchange of tens into hundreds
  7. HTO x O with exchange of ones into tens and tens into hundreds
- *divide two-digit and three-digit numbers by a one-digit number where the answer is exact i.e. no remainders*
  1. TO  $\div$  O no exchange no remainder
  2. TO  $\div$  O with exchange no remainder
  3. HTO  $\div$  O no exchange and no remainder
  4. HTO  $\div$  O with exchange of hundreds into tens
  5. HTO  $\div$  O with exchange of tens into ones
  6. HTO  $\div$  O with exchange of hundreds into tens and tens into ones
  7. Where there are zeros in the quotient e.g.  $816 \div 4 = 204$
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems e.g. making measurements 4 times longer or if one pack of sweets is £1.20 how much will sweets for 12 people cost? and harder correspondence problems such as n objects are connected to m objects e.g. *numbers of choices of a meal on a menu or three cakes shared equally between 10 children*



Fractions (including decimals)	<ul style="list-style-type: none"><li>• order and compare fractions of quantities and shape in practical contexts</li><li>• recognise and show, using diagrams, families of common equivalent fractions<ul style="list-style-type: none"><li>- use concrete resources and pictorial representation to explore relationships between fraction families</li><li>- use factors and multiples to recognise equivalent fractions and simplify where appropriate (e.g. <math>\frac{6}{9} = \frac{2}{3}</math> or <math>\frac{1}{4} = \frac{2}{8}</math>)</li></ul></li><li>• add and subtract fractions with the same denominator including;<ul style="list-style-type: none"><li>- recall pairs of fractions with the same denominator that total 1</li><li>- add and subtract pairs of fractions with the same denominator bridging through 1</li><li>- in a variety of contexts</li></ul></li><li>• round decimals with one decimal place to the nearest whole number and relate to rounding whole numbers, money and decimal measures</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>• 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<ul style="list-style-type: none"><li>- link to arrays in multiplication, known factor pairs and multiplication and division facts</li><li>- <i>make connections between fractions of a length, of a shape and as a representation of one whole or set of quantities</i></li></ul></li><li>• solve simple measure and money problems involving fractions and decimals to two decimal places</li></ul>		
Measurement	<table><tr><td><ul style="list-style-type: none"><li>• find the area of rectilinear shapes by counting squares <i>and link to arrays in multiplication</i></li><li>• convert between different units of measure [e.g. kilometre to metre; hour to minute]</li><li>• solve simple problems involving converting between different units of measure [e.g. kilometre to metre]</li><li>• calculate different measures including money in pounds and pence</li></ul></td><td><ul style="list-style-type: none"><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></td></tr></table>	<ul style="list-style-type: none"><li>• find the area of rectilinear shapes by counting squares <i>and link to arrays in multiplication</i></li><li>• convert between different units of measure [e.g. kilometre to metre; hour to minute]</li><li>• solve simple problems involving converting between different units of measure [e.g. kilometre to metre]</li><li>• calculate different measures including money in pounds and pence</li></ul>	<ul style="list-style-type: none"><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>
<ul style="list-style-type: none"><li>• find the area of rectilinear shapes by counting squares <i>and link to arrays in multiplication</i></li><li>• convert between different units of measure [e.g. kilometre to metre; hour to minute]</li><li>• solve simple problems involving converting between different units of measure [e.g. kilometre to metre]</li><li>• calculate different measures including money in pounds and pence</li></ul>	<ul style="list-style-type: none"><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>		

# The Year 4 Learner

## Working mathematically

By the end of year 4, children will apply their understanding of maths to solve a wide variety of problems with more than one step and be expected to prove their thinking through pictures, jottings and conversations. They will continue to make connections between different areas of maths and ask their own questions, working in an organised way to find solutions which help them identify common patterns or any errors more easily.

## Number

### ▪ Counting and understanding numbers

Children will be very familiar with numbers that have up to 4 digits and will be able to order and compare by showing them in different ways such as on a tape measure or using hands-on resources. Using their understanding of place value (how the value of each digit changes depending on its position in the number), children will be able to partition (break and make) numbers in different ways e.g.  $2345 = 2000$  and  $300$  and  $40$  and  $5$  but could also represent this as  $1000$  and  $1000$  and  $200$  and  $100$  and  $40$  and  $5$  or  $2000$  and  $200$  and  $145$ . They will work with numbers securely up to  $10,000$  and may begin to count beyond in  $1$ s,  $10$ s,  $100$ s and  $1000$ s. They will use this to help them find  $10$ ,  $100$  or  $1000$  more or less than any given number. They will multiply and divide whole numbers by  $10$  and  $100$  and understand that this changes the value of each digit rather than 'just adding a  $0$ '. They will develop their understanding to decimal hundredths, comparing and ordering these using contexts such as money. Children will also learn about the pattern to find any Roman numeral to  $100$ .

Children will develop their expertise when counting forwards and backwards from  $0$  to include multiples of  $6$ ,  $7$ ,  $9$  and  $25$ ; decimals with up to  $2$  places and fractions. They will be able to fluently count in tenths, hundredths and simple fractions. They will develop their understanding of negative numbers through counting backwards through  $0$ . Children will be able to recognise and describe number patterns and relationships including multiples (e.g.  $3$ ,  $6$ ,  $9$ ,  $12$  are multiples of  $3$ ) and factor pairs (e.g.  $1$  and  $12$ ,  $2$  and  $6$ ,  $3$  and  $4$  are all factor pairs for  $12$ ) for known times tables.

### ▪ Calculating

Children will develop various strategies for solving  $+$ ,  $-$ ,  $\times$ ,  $\div$  calculations mentally, using jottings when appropriate and for checking that their answers are sensible. Children will be encouraged to share their methods with others to help them see which work best, are quickest and most accurate. Over the course of the year, children will become fluent in all multiplication and division facts up to  $12 \times 12$  and apply these facts to other problems e.g.  $232 \times 7 = (200 \times 7) + (30 \times 7) + (2 \times 7)$ . Children will use the  $=$  sign to demonstrate equal value e.g.  $3 \times 8 = 48 \div 2$  and solve missing number problems e.g.  $3 \times ? = 48 \div 2$ . They will explore patterns and rules for the times tables they learn and use pictures and objects to support their understanding.

Children will be required to solve problems accurately using the column addition and subtraction methods for numbers with up to  $4$ -digits and explain how the methods work. They will use apparatus to secure their understanding of these. This will include addition and subtraction calculations with different numbers of digits (such as  $1286 + 357$ ); and numbers containing  $0$ s (such as  $8009 - 3231$ ). They will use formal written methods of short multiplication and short division for two and three digit numbers by a single digit. Children who become very adept at these types of calculations will be stretched through problems such as those containing missing numbers so that they know when, if and why they need to use the methods.

- **Fractions including decimals**

Children will develop their understanding of fractions by comparing to, or finding a part of, the whole. Through hands-on resources, pictures or jottings, such as a number line, children will add and subtract two fractions with the same denominator (e.g.  $\frac{2}{3} + \frac{2}{3}$ ). Children will solve problems involving fractions such as 'find  $\frac{3}{4}$  of 20 litres' using their knowledge of multiplication and division and through practical equipment. Children secure their understanding that fractions and decimals are different ways of expressing numbers and proportions.

## **Measurement**

Children secure their understanding of place value and decimals to record measurements accurately. They use their understanding of multiplying and dividing by 10, 100 and 1000 to convert between different units of measure of length (km, m, cm, mm), weight (kg, g) and money (£ and p). Children will link their understanding of area to multiplication and describe how to find the perimeter of a rectangle quickly. Children will read and write the time accurately using analogue and digital clocks, including clocks with Roman numerals. They will convert between units of time (hours, minutes and seconds). Children estimate, compare, calculate and solve a variety of problems involving all units of measurement.

## **Geometry**

Children will extend their knowledge of shape to include more unusual quadrilaterals (four-sided shapes) and triangles. They will use increasingly more specific vocabulary such as parallelogram, rhombus and trapezium; scalene and isosceles. They refine their understanding of symmetry and solve problems where the shape is not displayed in its usual way (e.g. it might be on its side). Children find and name different angles and use this information to decide if a shape is regular or irregular. Children describe position and movement on a grid as co-ordinates and will plot points to draw 2-D shapes.

## **Statistics**

Children will complete, read and interpret information on bar charts; they will solve problems that involve finding information in charts, tables and graphs; including time graphs.

Y5 learning sequence 1												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Number and place value	<ul style="list-style-type: none"> <li>count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000</li> <li>read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit, relating to prior learning</li> <li>read Roman numerals to 1000 (M) and recognise years written in Roman numerals</li> <li>round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 <i>and connect to estimation when calculating or when using measuring instruments</i></li> <li><i>apply understanding of the number system to decimal numbers and fractions they have met so far</i></li> <li>interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero</li> <li><i>recognise and describe linear number sequences including those involving fractions and describe the term to term rule</i></li> <li>solve number problems and practical problems that involve all of the above</li> </ul>											
Fractions (including decimals)	<ul style="list-style-type: none"> <li>read and write decimal numbers as fractions [ e.g. <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> </ul>											
Multiplication and division	<ul style="list-style-type: none"> <li>multiply and divide numbers mentally drawing upon known facts</li> <li>multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 e.g. <i>multiply and divide by powers of 10 in scale drawings and multiply and divide by powers of a 1000 in converting between units such as kilometres and metres</i></li> </ul>											

Addition and subtraction		<ul style="list-style-type: none"><li>• add and subtract numbers mentally with increasingly large numbers<ul style="list-style-type: none"><li>– know when and how to use jottings to support conservation of number</li><li>– calculate what must be added to any 4 digit number to make the next multiple of 1000 e.g. <math>4087 + \square\square\square = 5000</math></li></ul></li><li>– practise mental calculations with increasingly large numbers to aid fluency (e.g. <math>12\ 462 - 2\ 300 = 10\ 162</math>)</li><li>• add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) <i>including extending through</i><ul style="list-style-type: none"><li>- varying the place value e.g. <math>23456 + 637 + 7503</math> or <math>642.7 + 75.69 + 6200.09</math></li><li>- varying number of times 0 is used as a placeholder e.g. <math>70056 - 2399</math></li><li>- solving missing number calculations (knowing when they can and cannot use the inverse operation e.g. <math>3490 + \square\square\square = 4286</math> or <math>52901 - \square\square\square\square = 49244</math>)</li></ul></li><li>- applying to a variety of contexts including measurement</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>	
	Measurement	<ul style="list-style-type: none"><li>• convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)</li></ul>	<ul style="list-style-type: none"><li>• calculate and compare the area of rectangles (including squares) 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 [e.g. using 1 cm<sup>3</sup> blocks to build cuboids(including cubes)] and capacity[e.g. using water ]</li></ul>
		<ul style="list-style-type: none"><li>• multiply and divide numbers mentally drawing upon known facts</li><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>• recognise and use square numbers and cube numbers, and the notation for squared (<sup>2</sup>) and cubed (<sup>3</sup>)</li><li>• <i>use understanding of factors, multiples, primes and square and cube numbers to construct equivalence statements (e.g. <math>4 \times 35 = 2 \times 2 \times 35</math>; <math>3 \times 270 = 3 \times 3 \times 9 \times 10 = 9^2 \times 10</math>)</i></li></ul>	

## Multiplication and division

- *use and explain the equals sign to indicate equivalence, including in missing number problems (e.g.  $13 + 24 = 12 + 25$ ;  $33 = 5 \times \square$ )*
- multiply numbers up to 4 digits by a one digit number using a formal written method, using concrete resources
  1. HTO x O with no exchange
  2. HTO x O with exchange of ones to tens
  3. HTO x O with exchange of tens into hundreds
  4. HTO x O with exchange of ones into tens and tens into hundreds
  5. As above with a greater number of digits multiplied by a single digit
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division (whole number remainders only) using concrete resources
  1. HTO  $\div$  O no exchange and no remainder
  2. HTO  $\div$  O no exchange with whole number remainder
  3. HTO  $\div$  O with exchange of hundreds into tens
  4. HTO  $\div$  O with exchange of tens into ones
  5. HTO  $\div$  O with exchange with whole number remainder
  6. Where there are zeros in the quotient e.g.  $816 \div 4 = 204$
  7. With a greater number of digits to be divided by a single digit
- 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

Y5 learning sequence 2												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Addition and subtraction	<ul style="list-style-type: none"> <li>add and subtract numbers mentally with increasingly large numbers               <ul style="list-style-type: none"> <li>know when and how to use jottings to support conservation of number</li> <li>practise mental calculations with increasingly large numbers to aid fluency (e.g. <math>12\ 462 - 2\ 300 = 10\ 162</math>)</li> </ul> </li> <li>add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) including extending through               <ul style="list-style-type: none"> <li>varying the place value e.g. <math>23456 + 637 + 7503</math> or <math>642.7 + 75.69 + 6200.09</math></li> <li>varying number of times 0 is used as a placeholder e.g. <math>70056 - 2399</math></li> <li>solving missing number calculations (knowing when they can and cannot use the inverse operation e.g. <math>3490 + \square\square\square = 4286</math> or <math>52901 - \square\square\square\square = 49244</math>)</li> <li>applying to a variety of contexts including measurement</li> </ul> </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>											
	<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>multiply and divide numbers mentally drawing upon known facts</li> <li>multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 e.g. <i>multiply and divide by powers of 10 in scale drawings and multiply and divide by powers of a 1000 in converting between units such as kilometres and metres</i></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>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               <ul style="list-style-type: none"> <li>where remainder is a whole number</li> <li>where remainder is expressed as a fraction of the divisor</li> <li>where remainder is expressed as a simplified fraction</li> </ul> </li> <li>solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates</li> </ul>											

Fractions (including decimals and percentages)	<ul style="list-style-type: none"><li>count forwards and backwards with whole numbers, decimals and fractions including bridging zero, for example on a number line</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 [ e.g. <math>2/5 + 4/5 = 6/5 = 11/5</math>]</li><li>identify, name and write equivalent fractions of a given fraction, represented visually, including tenths, hundredths <i>and thousandths</i></li><li>compare and order fractions whose denominators are all multiples of the same number using the number line and other models</li><li><i>connect multiplication by a fraction to using fractions as operators (fractions of), and to division</i></li><li><i>develop understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities</i></li><li>add and subtract fractions with the same denominator and multiples of the same number</li><li><i>add and subtract tenths, and one-digit whole numbers and tenths, decimals with different numbers of decimal places, and derive complements of 1(e.g. <math>0.83 + 0.17 = 1</math>)</i></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 [ e.g. <math>0.71 = 71/100</math> ]</li><li>round decimals with two decimal places to the nearest whole number and to one decimal place</li></ul>			
Measurement		<ul style="list-style-type: none"><li>solve problems involving converting between units of time</li><li>convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)</li><li>use all four operations to solve problems involving measure [e.g. a. money, b. length, c. mass, d. volume,] using decimal notation including scaling</li></ul>		
Statistics		<ul style="list-style-type: none"><li>complete, read and interpret information in tables, including timetables</li><li>solve comparison, sum and difference problems using information presented in a line graph</li><li><i>begin to decide which representations of data are most appropriate and reason why</i></li></ul>		
Properties of shape			<ul style="list-style-type: none"><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><li>identify 3-D shapes, including cubes and other cuboids, from 2-D representations</li></ul>	



## Geometry

### Position and direction

- *use conventional markings for parallel lines and right 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*
- know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
- identify:
  - angles at a point and one whole turn (total  $360^\circ$ )
  - angles at a point on a straight line and  $\frac{1}{2}$  a turn (total  $180^\circ$ )
  - other multiples of  $90^\circ$
- draw given angles, and measure them in degrees ( $^\circ$ )
- *increase accuracy when drawing lines with a ruler and set square to the nearest millimetre, and measuring angles with a protractor*
- *use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems*
- 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 (using conventions of coordinates *in the first quadrant and for reflections in lines that are parallel to the axes*)

Y5 learning sequence 3												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Number and place value	<ul style="list-style-type: none"> <li>count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000</li> <li>read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit</li> <li>read Roman numerals to 1000 (M) and recognise years written in Roman numerals</li> <li>round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000</li> <li>interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero</li> <li><i>recognise and describe linear number sequences including those involving fractions and describe the term to term rule</i></li> <li>solve number problems and practical problems that involve all of the above</li> </ul>											
Fractions (including decimals and percentages)	<ul style="list-style-type: none"> <li>multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams</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 with a denominator of a multiple of 10 or 25</li> </ul>											

<p><b>Addition, subtraction, multiplication and division</b></p>		<ul style="list-style-type: none"> <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> <li>• multiply and divide numbers mentally drawing upon known facts</li> <li>• multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</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>• 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               <ol style="list-style-type: none"> <li>1. where remainder is a whole number</li> <li>2. where remainder is expressed as a fraction of the divisor</li> <li>3. where remainder is expressed as a simplified fraction</li> <li>4. where the remainder is expressed as a decimal number</li> </ol> </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> <li>• begin to investigate the impact of brackets on calculation e.g. <math>4 + 3 \times 2</math> could equal <math>4 + (3 \times 2)</math> or <math>(4 + 3) \times 2</math></li> </ul>
<p><b>Measurement</b></p>		<ul style="list-style-type: none"> <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) 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>• use all four operations to solve problems involving measure [e.g. length, mass, volume, money] using decimal notation including scaling</li> </ul>
		<ul style="list-style-type: none"> <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> <li>• <i>use conventional markings for parallel lines and right angles</i></li> <li>• <i>use the term diagonal and make conjectures about the angles formed between sides, and between</i></li> </ul>

## Geometry

*diagonals and parallel sides, and other properties of quadrilaterals*

- know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
- identify:
  - angles at a point and one whole turn (total  $360^\circ$ )
  - angles at a point on a straight line and  $\frac{1}{2}$  a turn (total  $180^\circ$ )
  - other multiples of  $90^\circ$
- draw given angles, and measure them in degrees ( $^\circ$ )
- *increase accuracy when drawing lines with a ruler to the nearest millimetre, and measuring with a protractor*

# The Year 5 Learner

## Working mathematically

By the end of year 5, children will apply their mathematical experiences to explore ideas and raise relevant questions, constructing complex explanations and reasoned arguments. They will be able to solve a wide variety of complex problems which require sustained concentration and demand efficient written and mental methods of calculations. These will include problems relating to fractions, scaling (times as many), converting between units of measure and employ all four operations (+, -, x, ÷).

## Number

### Counting and understanding numbers

Children extend and apply their knowledge of place value for numbers up to one million, rounding, estimating and comparing them (including decimals and negative numbers) in a variety of situations. They are introduced to powers of ten and are able to count forwards or backwards from any number (for example, -50, -5... 5, 50, 500, 5000...). Through investigations, they will discover special numbers including factors, primes, square and cube numbers.

### Calculating

Children will be fluent in a wide range of mental calculation strategies for all operations and will select the most appropriate method dependent on the calculation. They apply their knowledge of place value fluently to multiply and divide numbers (including decimals) by 10, 100 and 1000. When mental methods are not appropriate, they use formal written methods of addition and subtraction accurately. They continue to develop their understanding of the formal methods through hands-on resources and use their known facts within long multiplication (up to 4 digit numbers by 2 digit numbers e.g.  $2345 \times 68$ ) and short division (up to 4 digit numbers by 1 digit number e.g.  $2345 \div 7$ ) which may result in remainders. They solve multi-step problems in meaningful contexts and decide which operations to use.

### Fractions including decimals and percentages

Children secure their strong understanding that fractions express a proportion of amounts and quantities (such as measurements), shapes and other visual representations. Children extend their knowledge and understanding of the connections between fractions and decimals to also include percentages. They will be able to derive simple equivalences (e.g.  $67\% = 67/100 = 0.67$ ) and recall percentage and decimal equivalents for  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{2}{5}$ ,  $\frac{4}{5}$  and fractions with a denominator of a multiple of 10 or 25 (e.g.  $25\% = 25/100$ ).

They order, add and subtract fractions, including mixed numbers and those whose denominators are multiples of the same number, for example  $\frac{3}{10} + \frac{1}{5} = \frac{3}{10} + \frac{2}{10}$ ,  $= \frac{5}{10} = \frac{1}{2}$ . Using apparatus, images and models, they multiply proper fractions and mixed numbers by whole numbers. Children continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities in real life situations.

## **Measurement**

Through a wide variety of practical experiences and hands-on resources, children extend their understanding of measurement. They convert larger to smaller related units of measure and vice-versa including length, capacity, weight, time and money. Children will convert between imperial (such as inches, pints, miles) and metric units (such as centimetres, litres, kilometres). Children will measure, calculate and solve problems involving perimeter of straight-sided, right-angled shapes (rectilinear) and learn to express this algebraically such as,  $4 + 2b = 20$ . They find and measure the area of these shapes with increasing accuracy. They begin to estimate volume.

## **Geometry**

Children will measure, identify and draw angles in degrees, developing a strong understanding of acute, obtuse, reflex and right angles. They use this knowledge to find missing angles and lengths in a variety of situations, including at a point, on a straight line and within a shape. Children will move (translate), reflect shapes and describe their new positions. Language will be used with increasing sophistication to compare and classify shapes based on their properties and size. They will be able to visualise 3-D shapes from 2-D diagrams. They will use their understanding of shapes to solve problems.

## **Statistics**

Children will complete, read and solve comparison, sum and difference problems using information presented in graphs, charts and tables, including timetables. They begin to decide which representations of data are the most appropriate and are able to justify their reasons.

Y6 learning sequence 1												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Number and place value	<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>• determine the value of each digit in numbers up to 10 000 000</li><li>• round any whole number to a required degree of accuracy to the nearest power of 10</li><li>• solve number and practical problems that involve all of the above</li><li>• apply understanding of the number system to decimal numbers and fractions they have met so far</li><li>• recognise and describe linear number sequences including those involving fractions and describe the term to term rule</li><li>• develop skills of rounding, estimating, predicting and checking the reasonableness of answers</li></ul>											
	<ul style="list-style-type: none"><li>• identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places</li><li>• solve problems which require answers to be rounded to specified degrees of accuracy<ul style="list-style-type: none"><li>– learn about why we round recurring decimals</li><li>– <i>rounding to 3 decimal places</i></li><li>– <i>checking the reasonableness of their answers</i> using knowledge of decimal place value</li></ul></li><li>• recall and use equivalences between simple fractions, decimals and percentages, including in different contexts<ul style="list-style-type: none"><li>– <i>explore and make conjectures about converting a simple fraction to a decimal fraction (for example, <math>3 \div 8 = 0.375</math>)</i></li></ul></li><li>• calculate with increasing accuracy<ul style="list-style-type: none"><li>– multiply a one digit decimal number by a single digit number (e.g. <math>0.6 \times 8</math>)</li><li>– add and subtract decimal numbers that have the same number of decimal places</li></ul></li></ul>				<ul style="list-style-type: none"><li>• recognise and use equivalent fractions</li><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 [ for example, <math>1/4 \times 1/2 = 1/8</math>] using concrete resources and pictorial representation to aid understanding</li><li>• divide proper fractions by whole numbers [for example, <math>1/3 \div 2 = 1/6</math> ] using concrete resources and pictorial representation to aid understanding</li><li>• associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, <math>3/8</math> ]</li><li>• solve problems that require finding simple fractions and percentages of whole numbers and quantities</li></ul>					<ul style="list-style-type: none"><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></ul>		
Measurement	<ul style="list-style-type: none"><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<ul style="list-style-type: none"><li>– <i>could be introduced to compound units for speed such as miles per hour and apply their knowledge in science or other appropriate subjects</i></li></ul></li><li>• solve problems involving the calculation and conversion of units of measure, using decimal</li></ul>											

Algebra	notation up to three decimal places where appropriate			
		<ul style="list-style-type: none"> <li>begin to use <i>symbols and letters to represent variables and unknowns in mathematical situations they already understand</i></li> <li>express missing number problems algebraically and relate to missing number problems and the use of the inverse in previous years</li> <li>begin to generalise and describe linear number sequences</li> <li>rehearse finding pairs of numbers that satisfy an equation with two unknowns <i>e.g. Ben thinks of two numbers: the sum of the two numbers is 10: multiplied together they make 24: what are Ben's numbers?</i></li> <li>enumerate possibilities of combinations of two variables <i>e.g. number puzzles - which two numbers could add up to ...?</i></li> </ul>		
	Addition, subtraction, multiplication and division	<ul style="list-style-type: none"> <li>continue to develop fluency in multiplication and division facts to 12 x 12 and derive related facts</li> <li>multiply and divide numbers mentally drawing on known facts and strategies with increasing efficiency</li> <li>perform mental calculations, including with mixed operations and large numbers</li> <li><i>recognise and use multiples, factors, prime numbers less than 20 and square numbers up to 144</i></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 relate to understanding of commutativity, associative and distributive law</li> </ul>		
	Ratio and proportion	<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 unequal sharing and grouping using knowledge of fractions and multiples <i>e.g. 'for every egg you need 3 spoonfuls of flour'</i> <ul style="list-style-type: none"> <li><i>begin to use a:b notation to record their work</i></li> </ul> </li> </ul>		



Y6 learning sequence 2												
Week	1	2	3	4	5	6	7	8	9	10	11	12
Geometry	<ul style="list-style-type: none"> <li>compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons               <ul style="list-style-type: none"> <li><i>relationships might be expressed algebraically for example <math>a=180 - (b+c)</math></i></li> </ul> </li> <li>draw 2-D shapes using given dimensions and angles               <ul style="list-style-type: none"> <li><i>using measuring tools and conventional markings for lines and angles</i></li> <li>sides that are accurate to +/- 2mm</li> <li>angles that are multiples of <math>5^\circ</math> and accurate to +/- <math>2^\circ</math></li> </ul> </li> <li>recognise, describe and build simple 3-D shapes, including making nets</li> <li>recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles</li> <li>illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius               <ul style="list-style-type: none"> <li><i>relationships might be expressed algebraically for example <math>d = 2 \times r</math></i></li> </ul> </li> </ul>						<ul style="list-style-type: none"> <li>identify, describe and draw translations of simple shapes on the coordinate plane, and reflect them in the axes</li> <li>identify, describe and represent the position of a shape on the full coordinate grid (all four quadrants)               <ul style="list-style-type: none"> <li><i>where the quadrants have equal scaling</i></li> <li><i>including the use of negative numbers</i></li> <li>with increasing confidence in all four quadrants</li> </ul> </li> <li><i>draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes</i></li> </ul>					
Ratio and proportion	<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 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               <ul style="list-style-type: none"> <li><i>consolidate understanding by solving a variety of problems comparing quantities, sizes and scale drawings</i></li> <li><i>estimate distance on a map using a simple scale</i></li> <li><i>use a:b notation to record their work</i></li> </ul> </li> </ul>											
Algebra	<ul style="list-style-type: none"> <li>express missing number problems algebraically</li> <li>use simple formulae</li> <li>generate and describe linear number sequences</li> <li>find pairs of numbers that satisfy an equation with two unknowns</li> <li>enumerate possibilities of combinations of two variables</li> </ul>											
Measurement	<ul style="list-style-type: none"> <li>recognise that shapes with the same areas can have different perimeters and vice versa</li> <li>calculate the area of parallelograms and triangles</li> <li>recognise when it is possible to use formulae for area and volume of shapes</li> </ul>											

Addition, subtraction, multiplication and division		<ul style="list-style-type: none"> <li>calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (<math>\text{cm}^3</math>) and cubic metres (<math>\text{m}^3</math>), and extending to other units [for example <math>\text{mm}^3</math> and <math>\text{km}^3</math>]</li> </ul>	
	<ul style="list-style-type: none"> <li>identify common factors, common multiples and prime numbers</li> <li>perform mental calculations, including with mixed operations and large numbers</li> <li>use jottings where necessary to speed up a the process of calculating mentally</li> <li>use their knowledge of the order of operations to carry out calculations involving the four operations and relate to understanding of commutativity and associative and distributive law</li> </ul>	<ul style="list-style-type: none"> <li>solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</li> <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>solve problems involving addition, subtraction, multiplication and division</li> </ul>	
Statistics		<ul style="list-style-type: none"> <li>interpret and construct pie charts and line graphs and use these to solve problems</li> </ul>	
Fractions (including decimals and percentages)		<ul style="list-style-type: none"> <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 [ for example, <math>\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}</math>]</li> <li>divide proper fractions by whole numbers [for example, <math>\frac{1}{3} \div 2 = \frac{1}{6}</math>]</li> <li>associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, <math>\frac{3}{8}</math>]</li> <li>identify the value of each digit 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>	

Y6 learning sequence 3												
Week	1	2	3	4	5	6	7	8	9	10	11	12
<b>Addition, subtraction, multiplication and division</b>	<ul style="list-style-type: none"> <li>• use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy</li> <li>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</li> <li>• identify common factors, common multiples and prime numbers</li> <li>• perform mental calculations, including with mixed operations and large numbers</li> <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>• solve problems involving addition, subtraction, multiplication and division</li> <li>• use their knowledge of the order of operations to carry out calculations involving the four operations</li> </ul>											
	<b>Statistics</b> <ul style="list-style-type: none"> <li>• calculate and interpret the mean as an average               <ul style="list-style-type: none"> <li>– <i>know when it is appropriate to find the mean of a data set</i></li> <li>– for simple sets of discrete data (e.g. find the mean mass of three food packets weighing 2kg, 7kg and 10kg)</li> </ul> </li> <li>• interpret and construct pie charts, line graphs and tables and use these to solve problems               <ul style="list-style-type: none"> <li>– <i>connect conversion from kilometres to miles in measurement to its graphical representation</i></li> <li>– continue to read and interpret information using various graphs</li> <li>– construct tables, charts and graphs that help to answer their questions</li> <li>– solve comparison, sum and difference problems using information presented in charts and graphs</li> </ul> </li> </ul>											
	<b>Number and place value</b> <ul style="list-style-type: none"> <li>• use negative numbers in context, and calculate intervals across zero</li> <li>• solve number and practical problems that involve understanding of negative numbers such as temperature and plotting coordinates on four quadrants</li> </ul>											
	<b>Measurement</b> <ul style="list-style-type: none"> <li>• <i>use, add and subtract positive and negative integers for measures such as temperature</i></li> <li>• <i>connect conversion (for example, from kilometres to miles) to a graphical representation</i></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 of up to three decimal places</li> <li>• continue to rehearse using approximate equivalences between metric measures and common imperial units such as inches, pounds and pints</li> <li>• convert between miles and kilometres</li> </ul>											

Geometry		<ul style="list-style-type: none"> <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>draw and translate simple shapes on the coordinate plane, and reflect them in the axes</li> <li>describe positions on the full coordinate grid (all four quadrants)</li> </ul>	
	Algebra	<ul style="list-style-type: none"> <li>express missing number problems algebraically</li> <li>use simple formulae</li> <li>generate and describe linear number sequences</li> <li>find pairs of numbers that satisfy an equation with two unknowns</li> <li>enumerate possibilities of combinations of two variables</li> </ul>	
	Ratio and proportion	<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 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>	

# The Year 6 Learner

## Working mathematically

By the end of year 6, children will structure their own investigations and solve a wide variety of increasingly complex problems. They will independently develop their own lines of enquiry and be expected to prove their solutions in a variety of ways including algebra, negative proof (use a counter example to prove the rule) and be able to communicate their results using accurate mathematical language. Children will demonstrate secure knowledge and confidence to talk in depth about mathematical concepts and explain their solutions, decisions and reasoning.

## Number

- **Counting and understanding numbers**

Children extend and apply their knowledge of place value for numbers up to and beyond one million (including decimals and negative numbers) in a variety of situations. Special numbers are extended to include common factors, common multiples and a deeper understanding of prime numbers. Children will be able to round numbers and identify what degree of accuracy is appropriate.

- **Calculating**

Children will be fluent in a wide range of mental and formal written calculation strategies for all operations, extending to long division (four digit numbers by two digit numbers) by the end of the year. They will apply estimation in a range of ways. Through investigations, they explore the effect of the order of operations including the use of brackets.

- **Fractions including decimals and percentages**

Children recall and using equivalences between simple fractions, decimals and percentages. Additionally, they are able to express fractions in their simplest form and calculate the decimal equivalent, for example  $\frac{3}{8} = 3 \div 8 = 0.375$ .

Applying this understanding of equivalent fractions, children will order, add and subtract fractions (including mixed numbers and those with different denominators) by the end of the year e.g.  $\frac{1}{3} + \frac{1}{4} + \square = 1$ . Using hands-on resources and images, they will multiply and divide proper fractions and mixed numbers by whole numbers e.g.  $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$  and  $\frac{1}{3} \div 2 = \frac{1}{6}$ . Children will solve problems involving the calculation of percentages linked to real life situations.

## **Ratio and proportion**

Pupils explore ratio and proportion through real life experiences such as changing the quantities in recipes (scaling), scale drawings and maps.

## **Algebra**

Throughout their primary experience children will have encountered algebra in a number of different situations which is drawn together and formalised in year 6. By the end of the year, they will confidently use symbols and letters to represent variables and unknowns in mathematical situations that they already understand, for example, simple formula and equivalent expressions  $a+b = b+a$ . Children will describe number sequences and missing number calculations.

## **Measurement**

Through investigation and problem solving, children convert between a range of measurement units (including both imperial and metric). Calculation of perimeter and area is extended to include parallelograms and triangles. Additionally, they will explore the relationship between area and perimeter. They will know how to calculate, estimate and compare volume of cubes and cuboids identifying when it is appropriate to use formula.

## **Geometry**

Children will draw 2-D and build 3-D shapes with accuracy using given dimensions and angles. They will create nets of common 3-D shapes. They will consolidate their knowledge of angles within shapes and extend it to find missing angles in triangles, quadrilaterals and regular polygons. Children name parts of circles, including radius, diameter and circumference, and explore the relationships between these elements. Children will use four quadrant co-ordinate grids to describe positions, draw and translate simple shapes. Using their knowledge of the properties of shape, they will be able to predict missing co-ordinates and express these algebraically.

## **Statistics**

Children will increase their knowledge of different data representations to include interpreting and constructing pie charts (using their knowledge of angles, fractions and percentages) and line graphs (e.g. miles to km conversion). They will know when it is appropriate to use the mean as an average and how to calculate it.

# Curriculum Impact

- Deep and sustainable learning
- Ability to build on something already mastered
- Ability to reason about a concept and make connections to other concepts
- Procedural fluency with conceptual understanding - the understanding of how and why it all works
- Development of a growth mind-set – we are all mathematicians
- Resilience and perseverance
- Ability to thrive in a mathematically driven world



## Wider Impact

- KS2 results are consistently above national and Hertfordshire measures
- The school is consistently graded as outstanding by our Hertfordshire Improvement Partner
- Anecdotal evidence suggests that our past pupils do well at GCSE and A level, and are highly valued by secondary colleagues
- There is a large percentage of children each year who gain places at high performing secondary schools, both in the state and private sector

## We evaluate the impact of what we teach by...

- Carefully monitoring and reporting on the progress and attainment of individual children and groups of children, and ensuring that staff have access to this information to inform their planning
- Identifying gaps between disadvantaged children and other children, and ways to address gaps if they occur
- Regularly consulting with children
- Working in partnership with parents

*This process of evaluation results in a continuous and relentless striving for marginal gains improvement.*