

## Years 5 and 6

### Long term aims and objectives



### Whole School Aims

- To ensure that all pupils become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- To ensure that all pupils reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language.
- To ensure that all pupils 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.

### Upper Key Stage 2

- The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.
- At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems.
- Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.
- By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.
- Pupils should read, spell and pronounce mathematical vocabulary correctly.

**Terms 1 and 2**

Year 5 statutory requirements	Year 6 statutory requirements	Calculation methods – used for mental and written calculations.
<p><b>Maths investigation work – (nrich website, KLZ maths site, Apex books for resources)</b>          Children should be able to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and develop an argument, justification or proof using mathematical language.  <u>Term 1 focus</u> - Finding rules and describing patterns  <u>Term 2 focus</u> - Logic and reasoning puzzles</p>		<p><b>Addition</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Expanded vertical</b></p> <math display="block">\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 0.06 \\ 1.20 \\ 11.00 \\ 60.00 \\ \hline 72.26 \end{array}</math> </div> <div style="text-align: center;"> <p><b>Compact vertical</b></p> <math display="block">\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 72.26 \\ \hline 11 \end{array}</math> </div> </div>
<p><b>Number and place value</b>          Read, write, order, compare numbers to at least 1,000,000 and determine the value of each digit.          Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000.          Interpret negative numbers in context, count forwards and backwards with positive, negative and whole numbers, including through zero.  <b>Number addition and subtraction</b>          Add and subtract whole numbers with more than 4 digits, including using formal written method (columnar addition and subtraction).          Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.  <b>Number – multiplication and division</b>          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          Multiply and divide numbers mentally drawing upon known facts          Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context          ☑ multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</p>	<p><b>Number and place value</b>          Read, write, order, compare numbers to at least 1,000,000 and determine the value of each digit.          Use negative numbers in context, and calculate intervals across zero  <b>Number – addition, subtraction, multiplication and division</b>          Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication          Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context          Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context          Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why  <b>Number – fractions (including decimals and percentages)</b>          Use common factors to simplify fractions; use common multiples to express fractions in the same</p>	<p>Target at end of Year 6 - children will add up whole numbers and decimals to 3 decimal places using the compact method and will continue to use expanded methods for mental calculations.</p> <p><b>Subtraction</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Counting on</b></p> <math display="block">72.5 - 45.7 = 26.8</math> </div> <div style="text-align: center;"> <p><b>Decomposition</b></p> <math display="block">72.5 - 45.7 = 26.8</math> <math display="block">\begin{array}{r} 72.5 \\ - 45.7 \\ \hline 26.8 \end{array}</math> </div> </div> <p>Target at end of Year 6 – children will subtract whole numbers and decimal numbers to 3 decimal places using ‘decomposition’ and will continue to use counting on for mental calculations.</p>

Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign  
**Number – fractions (including decimals and percentages)**

Compare and order fractions whose denominators are all multiples of the same number

Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths

Recognise mixed numbers and improper fractions

Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents

**Measurement**

Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)

Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints

Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm<sup>2</sup>) and square metres (m<sup>2</sup>) and estimate the area of irregular shapes

Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

**Geometry – properties of shapes**

Use the properties of rectangles to deduce related facts and find missing lengths and angles

Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

**Statistics**

Solve comparison, sum and difference problems using

denomination

Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 10 and 1000 giving answers up to three decimal places.

Multiply one digit numbers with up to two decimal places by whole numbers

Use written division methods in cases where the answer has up to two decimal places

**Ratio and proportion**

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

**Algebra**

Generate and describe linear number sequences

**Measurement**

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places

Convert between miles and kilometres

Recognise that shapes with the same areas can have different perimeters and vice versa

Recognise when it is possible to use formulae for area and volume of shapes

Calculate the area of parallelograms and triangles

**Geometry – properties of shapes**

Draw 2-D shapes using given dimensions and angles

Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons

**Multiplication**

47 x 36 = 1692  
 (estimate 50 x 40 = 2000)

x	40	7	
30	1200	210	1410
6	240	42	282
			1692

124 x 26 = 3224																									
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Target - At the end of Year 6, children will use the short method for multiplying with whole numbers and decimals and will continue to partition for mental calculations.

**Division**

432 ÷ 5 = 86 r2  
 (estimate: 400 ÷ 5 = 80)

	8	6	r2
5	4	3	2

Target – At the end of Year 6, children will use the short division method to divide whole numbers and decimals by single and two digit numbers. They will be able to express remainders as whole numbers, fractions and decimals. They will continue to use 'repeated subtraction' as a mental method for division.

information presented in a line graph	Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius <b>Statistics</b> Interpret and construct line graphs and use these to solve problems	
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**Terms 3 and 4**

Year 5 statutory requirements	Year 6 statutory requirements	Calculation methods – used for mental and written calculations.
<p><b>Maths investigation work – (nrich website, KLZ maths site, Apex books for resources)</b> Children should be able to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and develop an argument, justification or proof using mathematical language. Term 3 focus – Diagram and visual problems Term 4 focus – Finding all possibilities</p>		<p><b>Addition</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Expanded vertical</b></p> <math display="block">\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 0.06 \\ 1.20 \\ 11.00 \\ 60.00 \\ \hline 72.26 \end{array}</math> </div> <div style="text-align: center;"> <p><b>Compact vertical</b></p> <math display="block">\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 72.26 \\ \hline 11 \end{array}</math> </div> </div> <p>Target at end of Year 6 - children will add up whole numbers and decimals to 3 decimal places using the compact method and will continue to use expanded methods for mental calculations.</p>
<p><b>Number and place value</b> Round any number up to 1,000,000 to the nearest 10, 100, 10,000 and 100,000 <b>Number addition and subtraction</b> <b>Number – multiplication and division</b> Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers Establish whether a number up to 100 is prime and recall prime numbers up to 19. Recognise and use square numbers and cube numbers, and the notation for squared (<sup>2</sup>) and cubed (<sup>3</sup>) Solve problems involving multiplication and division including using their knowledge of factors and multiples, square and cubes. Solve problems involving multiplications and division, including scaling by simple fractions and problems involving simple rates. <b>Number – fractions (including decimals and percentages)</b></p>	<p><b>Number and place value</b> Round any whole number to a required degree of accuracy. <b>Number – addition, subtraction, multiplication and division</b> Identify common factors, common multiples and prime numbers. Use their knowledge of the order of operations to carry out calculations involving the four operations. <b>Number – fractions (including decimals and percentages)</b> Recall and use equivalences between simple fractions, decimal and percentages, including in different contexts. <b>Ratio and proportion</b> Sole problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. Solve problems involving the calculations of percentages (for example, of measures, and such as 15% of 360) and the use of percentages for comparison.</p>	<p><b>Subtraction</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Counting on</b></p> <math display="block">72.5 - 45.7 = 26.8</math> </div> <div style="text-align: center;"> <p><b>Decomposition</b></p> <math display="block">\begin{array}{r} 72.5 \\ - 45.7 \\ \hline 26.8 \end{array}</math> </div> </div> <p>Target at end of Year 6 – children will subtract whole numbers and decimal numbers to 3 decimal places using ‘decomposition’ and will continue to use</p>

<p>Add and subtract fractions with the same denominator and denominators that are multiples of the same number.</p> <p>Read and write decimal numbers as fractions. For example <math>0.71 = 71/100</math></p> <p>Round decimals with two decimal places to the nearest whole number and to one decimal place.</p> <p>Read, write, order and compare numbers with up to three decimal places.</p> <p>Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred' and write percentages as fractions with denominator 100, and as a decimal.</p> <p>Solve problems which require knowing percentage and decimal equivalents of <math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{1}{5}</math>, <math>\frac{2}{5}</math>, <math>\frac{4}{5}</math> and those fractions with a denominator of a multiple of 10 or 25.</p> <p><u>Measurement</u> Revision of measurement covered in Terms 1 and 2 with a focus on mass.</p> <p><u>Geometry- properties of shapes</u> Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angle Draw given angles, and measure them in degrees (o) Identify: angles at a point and one whole turn (total 360o), angles at a point on a straight line and <math>\frac{1}{2}</math> a turn (total 180o), other multiples of 90o</p> <p><u>Geometry position and direction</u> Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.</p>	<p><u>Algebra</u> To be able to use simple formulae</p> <p><u>Measurement</u> Revision of measurement covered in Terms 1 and 2 with a focus on mass.</p> <p><u>Geometry shape</u> Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.</p> <p><u>Geometry position and direction</u> Describe positions on the full coordinate grid (all four quadrants) Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.</p> <p><u>Statistics</u> To interpret and construct pie charts and use these</p>	<p>counting on for mental calculations.</p>
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to solve problems

### Multiplication

$$47 \times 36 = 1692$$

(estimate  $50 \times 40 = 2000$ )

x	40	7	
30	1200	210	1410
6	240	42	282
			1692

				1	2
				1	2
				4	4
				x	2
				6	
				7	4
				4	
				2	4
				8	0
				3	2
				2	4
				1	2

**Target -** At the end of Year 6, children will use the short method for multiplying with whole numbers and decimals and will continue to partition for mental calculations.

### Division

$$432 \div 5 = 86 \text{ r}2$$

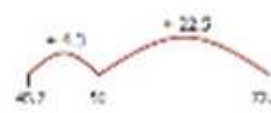
(estimate:  $400 \div 5 = 80$ )

				8	6
				r	2
				3	
				5	4
				3	2

**Target –** At the end of Year 6, children will use the short division method to divide whole numbers and decimals by single and two digit numbers. They will be able to express remainders as whole numbers, fractions and decimals. They will continue to use 'repeated subtraction' as a mental method for division.



## Terms 5 and 6

Year 5 statutory requirements	Year 6 statutory requirements	Calculation methods – used for mental and written calculations.
<p><b>Maths investigation work – (nrich website, KLZ maths site, Apex books for resources)</b>            Children should be able to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and develop an argument, justification or proof using mathematical language.  <u>Term 5 focus</u> – examples and counter examples to prove, disprove statements  <u>Term 6 focus</u> – mixed combination of all 5 types</p>		<p><u>Addition</u></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Expanded vertical</b></p> <math display="block">\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 0.06 \\ 1.20 \\ 11.00 \\ 60.00 \\ \hline 72.26 \end{array}</math> </div> <div style="text-align: center;"> <p><b>Compact vertical</b></p> <math display="block">\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 72.26 \\ 11 \end{array}</math> </div> </div> <p>Target at end of Year 6 - children will add up whole numbers and decimals to 3 decimal places using the compact method and will continue to use expanded methods for mental calculations.</p> <p><u>Subtraction</u></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>Counting on</b></p> <math display="block">72.5 - 45.7 = 26.8</math>  </div> <div style="text-align: center;"> <p><b>Decomposition</b></p> <math display="block">\begin{array}{r} 72.5 \\ - 45.7 \\ \hline 26.8 \end{array}</math> </div> </div> <p>Target at end of Year 6 – children will subtract whole numbers and decimal numbers to 3 decimal places using ‘decomposition’ and will continue to use counting on for mental calculations.</p>
<p><b>Number and place value</b>            Solve number problems and practical problems that involve all of the above (all number and place value objectives)            Read roman numerals to 1000 (M) and recognise years written in Roman numerals.  <b>Number addition and subtraction</b>            Add and subtract numbers mentally with increasingly large numbers.            Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.  <b>Number – multiplication and division</b>  <b>Number – fractions (including decimals and percentages)</b>            Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements &gt;1 as a mixed number (for example <math>2/5 + 4/5 = 6/5 = 1 \frac{1}{5}</math>)            Solve problems involving number up to three decimal places.</p>	<p><b>Number and place value</b>  <b>Number – addition, subtraction, multiplication and division</b>            Perform mental calculations, including with mixed operations and large numbers.            Solve problems involving addition, subtraction, multiplication and division.            Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.  <b>Number – fractions (including decimals and percentages)</b>            Compare and order fractions, including fractions &gt; 1            Multiply simple pairs of proper fractions, writing the answer in its simplest form (for example <math>1/4 \times 1/2 = 1/8</math>)            Divide proper fractions by whole numbers (for example <math>1/3 \div 2 = 1/6</math>)            Associate a fraction with division and calculate decimal fraction equivalents (for example, 0.375) for a simple fraction (for example, <math>3/8</math>)            Solve problems which require answer to be rounded to specified degrees of accuracy. .  <b>Ratio and proportion</b>            Solve problems involving similar shapes where the scale factor is known or can be found.  <b>Algebra</b>            Express missing number problems algebraically.            Find pairs of numbers that satisfy an equation with</p>	

Measurement

Estimate volume [for example, using 1 cm<sup>3</sup> blocks to build cuboids (including cubes)] and capacity [for example, using water]  
Solve problems involving converting between units of time  
Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

Geometry

Identify 3-D shapes, including cubes and other cuboids, from 2-D representations

Statistics

Complete, read and interpret information in tables, including timetables.

two unknowns.  
Enumerate possibilities of combinations of two variables.

Measurement

Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm<sup>3</sup>) and cubic metres (m<sup>3</sup>), and extending to other units [for example, mm<sup>3</sup> and km<sup>3</sup>].

Geometry shape

Recognise, describe and build simple 3-D shapes, including making nets

**Multiplication**

47 x 36 = 1692  
(estimate 50 x 40 = 2000)

x	40	?	
30	1200	210	1410
6	240	42	282
			1692

124 x 26 = 3224	
	1 2 4
x	2 6
	7 4 4
	2 4 8 0
	3 2 2 4
	3 2 2 4

**Target - At the end of Year 6, children will use the short method for multiplying with whole numbers and decimals and will continue to partition for mental calculations.**

**Division**

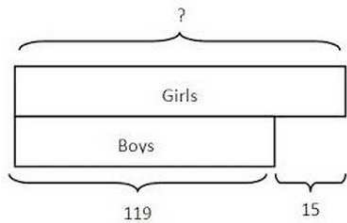
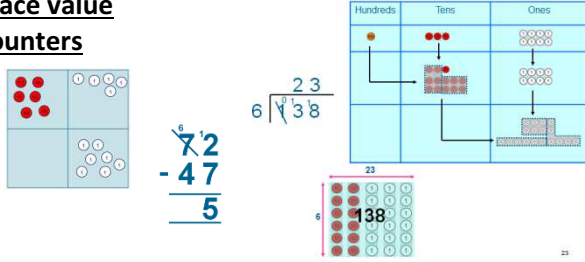
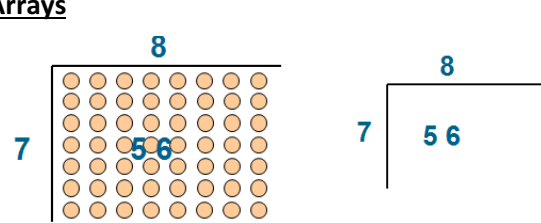
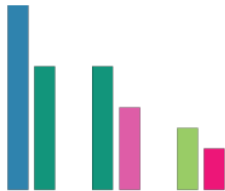
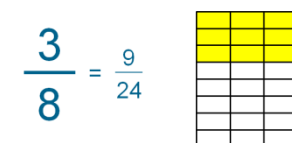



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**Target – At the end of Year 6, children will use the short division method to divide whole numbers and decimals by single and two digit numbers. They will be able to express remainders as whole numbers, fractions and decimals. They will continue to use ‘repeated subtraction’ as a mental method for division.**



Models and resources to be used to aid conceptual understanding

<p><b>Bar model</b></p>  <ul style="list-style-type: none"> <li>• For problem solving using all 4 operations.</li> <li>• For visualising fractions and working out equivalence</li> <li>• For working out fractions of a whole and the whole when given a fraction/ percentage.</li> </ul>	<p><b>Place value counters</b></p>  <ul style="list-style-type: none"> <li>• To support conceptual understanding of decomposition and short division</li> </ul>	<p><b>Arrays</b></p>  <ul style="list-style-type: none"> <li>• Image used to support inverse operations and missing number questions e.g. <math>\square \div 27 = 675</math></li> </ul>
<p><b>Cuisenaire rods</b></p>  <ul style="list-style-type: none"> <li>• To model ratio</li> <li>• To model fraction equivalence</li> </ul>	<p><b>Fraction grids</b></p>  <ul style="list-style-type: none"> <li>• Used to model equivalence of fractions</li> <li>• Used to model addition and subtraction of fractions</li> </ul>	<p><b>Bead strings</b></p>  <ul style="list-style-type: none"> <li>• For place value – division of one whole into tenths, hundredths and thousandths</li> </ul>
<p><b>Double-sided counters</b></p>  <ul style="list-style-type: none"> <li>• Used to model partitioning in different ways – how can these counters be used to make 34 or 1.6?</li> </ul>	<p><b>Place value using computer programs</b></p>  <ul style="list-style-type: none"> <li>• Place value and equivalent values of decimal numbers</li> </ul>	