Year 6 Mathematics Curriculum

Numeracy and mathematics:
Teachers should use every relevant subject to develop pupils' mathematical fluency. Confidence in numeracy and other mathematical skills is a precondition of success across the national curriculum.
Teachers should develop pupils' numeracy and mathematical reasoning in all subjects so that they understand and appreciate the importance of mathematics. Pupils should be taught to apply arithmetic fluently to problems, understand and use measures, make estimates and sense check their work. Pupils should apply their geometric and algebraic understanding, and relate their understanding of probability to the notions of risk and uncertainty. They should also understand the cycle of collecting, presenting and analysing data. They should be taught to apply their mathematics to both routine and non-routine problems, including breaking down more complex problems into a series of simpler steps.

Number and Place Value	**Number addition, subtraction, multiplication and division**	**Number Fractions (including decimals and percentages)**	**Ratio and Proportion**	**Algebra**	**Measurement**	**Geometry**	**Statistics**
read, write, order and compare numbers up to 10 000 000 and determine the value of each digit	multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication	use common factors to simplify fractions; use common multiples to express fractions in the same denomination	solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	use simple formulae	solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	draw 2-D shapes using given dimensions and angles	interpret and construct pie charts and line graphs and use these to solve problems
round any whole number to a required degree of accuracy	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	compare and order fractions, including fractions > 1	solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	generate and describe linear number sequences	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	recognise, describe and build simple 3-D shapes, including making nets	calculate and interpret the mean as an average

use negative numbers in context, and calculate intervals across zero	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	add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions	solve problems involving similar shapes where the scale factor is known or can be found	express missing number problems algebraically	convert between miles and kilometres	compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons	
solve number and practical problems that involve all of the above.	perform mental calculations, including with mixed operations and large numbers	multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]	solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.	find pairs of numbers that satisfy an equation with two unknowns	recognise that shapes with the same areas can have different perimeters and vice versa	illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius	
	identify common factors, common multiples and prime numbers	divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$]		enumerate possibilities of combinations of two variables.	recognise when it is possible to use formulae for area and volume of shapes	recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.	
	use their knowledge of the order of operations to carry out calculations involving the four operations	associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$]			calculate the area of parallelograms and triangles	describe positions on the full coordinate grid (all four quadrants)	
	solve addition and subtraction multi-step problems in	identify the value of each digit in numbers given to three decimal			calculate, estimate and compare volume of cubes and	draw and translate simple shapes on the coordinate plane,	

	contexts, deciding which operations and methods to use and why	places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places			cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3].	and reflect them in the axes.	
	solve problems involving addition, subtraction, multiplication and division	multiply one-digit numbers with up to two decimal places by whole numbers					
	use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.	use written division methods in cases where the answer has up to two decimal places					
		solve problems which require answers to be rounded to specified degrees of accuracy					
		recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.					

Guidance

Number and Place Value:

Pupils use the whole number system, including saying, reading and writing numbers accurately.

Number addition, subtraction, multiplication and division:

Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1).

They undertake mental calculations with increasingly large numbers and more complex calculations.

Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.

Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures.

Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

Common factors can be related to finding equivalent fractions.

Fractions (including decimals and percentages):

Pupils should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example, $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$) and progress to varied and increasingly complex problems.

Pupils should use a variety of images to support their understanding of multiplication with fractions. This follows earlier work about fractions as operators (fractions of), as numbers, and as equal parts of objects, for example as parts of a rectangle.

Pupils use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if $\frac{1}{4}$ of a length is 36cm, then the whole length is 36 × 4 = 144cm).

They practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators.

Pupils can explore and make conjectures about converting a simple fraction to a decimal fraction (for example, 3 ÷ 8 = 0.375). For simple fractions with recurring decimal equivalents, pupils learn about rounding the decimal to three decimal places, or other appropriate approximations depending on the context. Pupils multiply and divide numbers with up to two decimal places by one-digit and two-digit whole numbers. Pupils multiply decimals by whole numbers, starting with the simplest cases, such as 0.4 × 2 = 0.8, and in practical contexts, such as measures and money.

Pupils are introduced to the division of decimal numbers by one-digit whole number, initially, in practical contexts involving measures and money. They recognise division calculations as the inverse of multiplication.

Pupils also develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations. This includes rounding answers to a specified degree of accuracy and checking the reasonableness of their answers.

Ratio and Proportion:

Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio (for example, similar shapes and recipes).

Pupils link percentages or 360° to calculating angles of pie charts.

Pupils should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation *a*:*b* to record their work.

Pupils solve problems involving unequal quantities, for example, 'for every egg you need three spoonfuls of flour', '$\frac{3}{5}$ of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion.

Algebra:

Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as:

missing numbers, lengths, coordinates and angles

formulae in mathematics and science

equivalent expressions (for example, $a + b = b + a$)

generalisations of number patterns

number puzzles (for example, what two numbers can add up to).

Measurements:

Pupils connect conversion (for example, from kilometres to miles) to a graphical representation as preparation for understanding linear/proportional graphs.

They know approximate conversions and are able to tell if an answer is sensible.

Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature.

They relate the area of rectangles to parallelograms and triangles, for example, by dissection, and calculate their areas, understanding and using the formulae (in words or symbols) to do this.

Pupils could be introduced to compound units for speed, such as miles per hour, and apply their knowledge in science or other subjects as appropriate.

Geometry:

Pupils draw shapes and nets accurately, using measuring tools and conventional markings and labels for lines and angles.

Pupils describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements.

These relationships might be expressed algebraically for example, $d = 2 \times r$;

$a = 180 - (b + c)$.

Pupils draw and label a pair of axes in all four quadrants with equal scaling. This extends their knowledge of one quadrant to all four quadrants, including the use of negative numbers.

Pupils draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes. These might be expressed algebraically for example, translating vertex (a, b) to $(a - 2, b + 3)$; (a, b) and $(a + d, b + d)$ being opposite vertices of a square of side d.

Statistics:

Pupils connect their work on angles, fractions and percentages to the interpretation of pie charts.

Pupils both encounter and draw graphs relating two variables, arising from their own enquiry and in other subjects.

They should connect conversion from kilometres to miles in measurement to its graphical representation.

Pupils know when it is appropriate to find the mean of a data set.