

Maths Curriculum 2016-17

Year 5	<p>Number and the number system Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit. Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000. Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero. Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000. Solve number problems and practical problems that involve all of the above. Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.</p> <p>Number – addition and subtraction Add and subtract whole numbers with more than 4 digits, including using formal written methods (column addition and subtraction). Add and subtract numbers mentally with increasingly large numbers, using rounding to check the level of accuracy. Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</p> <p>Number – multiplication and division 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 (nonprime) numbers. Establish whether a number up to 100 is prime and recall prime numbers up to 19. Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers. 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. Including in a problem solving context. Recognise and use square numbers and cube numbers, and the notation for squared(²) and cubed (³). Including in a problem solving context. Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign. Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.</p> <p>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 and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]. Add and subtract fractions with the same denominator and denominators that are multiples of the same number. Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. Read and write decimal numbers as fractions [for example, $0.71 = \frac{71}{100}$]</p>
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	<p>recognising thousandths and relating them to tenths, hundredths and decimal equivalents. Round decimals with two decimal places to the nearest whole number and to one decimal place. Read, write, order and compare numbers with up to three decimal places including in a problem solving context. Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal. Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}, \frac{2}{5}, \frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25.</p> <p>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 (cm²) and square metres (m²) and estimate the area of irregular shapes. Estimate volume [for example, using 1 cm³ blocks to build cuboids (including cubes)] and capacity [for example, using water]. Solve problems involving converting between units of time. Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.</p> <p>Geometry - property of shapes Identify 3-D shapes, including cubes and other cuboids, from 2-D representations. Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles. Draw given angles, and measure them in degrees (°). Identify angles at a point and one whole turn (total 360°); Identify angles at a point on a straight line and $\frac{1}{2}$ a turn (total 180°) and other multiples of 90°. 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.</p> <p>Geometry - position and direction 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>Statistics Solve comparison, sum and difference problems using information presented in a line graph. Complete, read and interpret information in tables, including timetables.</p>
<p>Year 6</p>	<p>Number and the number system Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit. Round any whole number to a required degree of accuracy. Use negative numbers in context, and calculate intervals across zero. Solve number and practical problems that involve all of the above.</p> <p>Number - addition, subtraction, multiplication and division Multiply multi-digit numbers up to 4 digits by two-digit whole number using the</p>

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. Perform mental calculations, including with mixed operations and large numbers. Identify common factors, common multiples and prime numbers. Use their knowledge of the order of operations to carry out calculations involving the four operations. Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. 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.

Number – Fractions (including decimals and percentages)

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. Compare and order fractions, including fractions > 1 . Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions. Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]. Divide proper fractions by whole numbers [for example, $\frac{1}{2} \div 2 = \frac{1}{4}$]. Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$]. Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places. Multiply one-digit numbers with up to two decimal places by whole numbers.

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

Solve problems which require answers to be rounded to specified degrees of accuracy

Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Ratio and Proportion

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison. Solve problems involving similar shapes where the scale factor is known or can be found. Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

Algebra

Use simple formulae including those expressed in words. Express missing number problems algebraically. Find pairs of numbers that satisfy an equation with two unknowns. Enumerate possibilities of combinations of two variables.

Measure

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate to include converting between miles and kilometres. Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from

	<p>a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places. Recognise that shapes with the same areas can have different perimeters and vice versa. Recognise when it is possible to use formulae for area and volume of shapes. Calculate the area of parallelograms and triangles . Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm³) and extending to other units.</p> <p>Geometry - property of shapes Draw 2-D shapes using given dimensions and angles. Recognise, describe and build simple 3-D shapes, including making nets. Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons. Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.</p> <p>Geometry - position and direction 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>Statistics Interpret and construct pie charts and line graphs and use these to solve problems. Calculate and interpret the mean as an average.</p>
<p>Year 7</p>	<p>Number Understand and use place value for decimals, measures and integers of any size: Order positive and negative integers, decimals and fractions (using equivalences); use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥. Use the four operations, including formal written methods, applied to integers, decimals, all both positive and negative. Round numbers and measures to appropriate degree of accuracy (example - to a number of decimal places or significant figures) Understand conventional notation for powers, roots and reciprocals, recognising square numbers up to 225 (15 × 15) and the corresponding roots. Use approximation through rounding to estimate answers and calculate possible resulting errors. Understand what percent means and find equivalent fractions, percentages and decimals. Interpret fractions and percentages as operators. To know that a recurring decimal is a fraction and work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8). Recognize and use multiples, factors (divisors), common factors lowest common multiple (LCM), highest common factor (HCF). Be able to express a number as a product of its prime factors; find HCF and LCM using prime factor decomposition. Use a calculator and other technologies to calculate results accurately and then interpret them appropriately.</p> <p>Algebra Understand and use the vocabulary of algebraic notation, expressions, equations, terms and factors; knowing the difference between an equation, an expression and a formula. Simplify and manipulate algebraic expressions to maintain equivalence (collecting like terms, expanding and factorising expressions) . Substitute numerical values into formulae and expressions, including scientific formula. Model situations or procedures by translating them</p>

into algebraic expressions or formulae (and by using graphs). To construct and solve simple linear equations with one or two steps, collecting like terms and multiplying a single term over a bracket (integer coefficients). Recognise arithmetic (adding a constant) and geometric sequences (multiplying by a constant) and other sequences that arise (squares, triangles, Fibonacci etc.). Generate and find terms of a sequence from either term-to-term or a position-to-term rule including in a variety of practical contexts. Generate a sequence from an n th term and find the n th term from a sequence. To identify and draw, on a graph or using ICT, vertical and horizontal equations and simple linear functions (where y is given explicitly in terms of x .) From linear equations, find co-ordinate pairs and plot them on to a graph including from real-life and other subjects.

Draw and interpret speed distance time travel graphs. To be able to construct and use simple formulae and equations, including other facts within mathematics or from real world situations. To be able to explain what a graph with an equation of $y = mx + c$ will look like.

Ratio, proportion and rates of change

Change freely between related standard units (for example time, length, area, volume/capacity, mass). Use scale factors, scale diagrams and maps. To be able calculate a percentage of an amount and simple percentage increase or decrease.

Express one quantity as a fraction or percentage of another, where the fraction is less than 1 and greater than 1.

Use ratio notation, including reducing to simplest form. Divide a given quantity into two parts in a given part: part or part: whole ratio; express the division of a quantity into two parts as ratio.

Geometry and measures

Choose and use units of measurement to measure, estimate, calculate and solve problems in everyday contexts; Convert one metric unit to another, e.g. grams to kilograms; Read and interpret scales on a range of simple measuring instruments with appropriate accuracy. Know and use the formula for the area of a rectangle; Deduce and use formulae for the area of a triangle, parallelogram and trapezium. Calculate the perimeter and area of shapes made from rectangles and triangles. Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes. Know the sum of angles at a point, on a straight line and in a triangle and recognise vertically opposite angles. Begin to identify and use angle, side and symmetry properties of triangles; explore geometrical problems involving these properties explaining reasoning orally. Identify and use the geometrical properties of quadrilaterals. To be able to measure and draw angles with a protractor. To be able to construct a triangle knowing SAS/ASA/SSS. To be able to draw 2D representations of 3D shapes, and recognise congruent triangles. To be able to recognise the nets of simple 3D shapes; use a ruler and protractor to construct simple nets of 3-D shapes. To be able to reflect in given mirror lines, including diagonal lines. To be able to describe a translation using vectors and recognise congruence. To be able to rotate a shape about a given point and find the rotational symmetry of a 2D shape.

Statistics

Calculate statistics for small sets of data: find the median, mode and range.

Calculate statistics for small sets of data: find the median and the modal class

	<p>for grouped data. To be able to compare two simple distributions using the range and one of the mode, median and mean. To be able to construct and interpret frequency tables, scatter graphs, stem and leaf diagrams and pie charts. To be able to draw a frequency chart and construct a frequency diagram for grouped discrete data. Use vocabulary and ideas of probability, drawing on experience. Populate tables, grids and Venn diagrams. Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts; identify all the possible mutually exclusive outcomes of a single event. Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data. Compare experimental and theoretical probabilities in simple contexts.</p>
<p>Year 8</p>	<p>Number</p> <p>To read and write positive integer powers of 10; multiply and divide by any given power of 10 (and multiples), including 0.1 and 0.01. Apply the four operations including with decimals, fractions and negative numbers in context (including multiplying and dividing an integer by a fraction, or 2 fractions). Order fractions by writing them with a common denominator or by converting them to decimals. Understand the equivalence between recurring decimals and fractions, using division to be able to convert between decimals and fractions accurately. To read and write numbers to a stated degree of accuracy, rounding to an appropriate degree of accuracy (decimal places and significant figures). Estimate calculations (to an appropriate degree of accuracy) and use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation. Recognise and use square and cube numbers and the notation for squared (2) and cubed (3). Recognise powers of 2, 3, 4, 5 and 10. Apply the multiplication, division and power laws of indices. Read, write and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive, negative or 0 and vice versa. Understand and use the priority of operations, including brackets powers and roots and reciprocals; to solve problems involving using integer powers and associated roots in calculations and numbers expressed in standard form, checking for correct order of magnitude and using a calculator as appropriate.</p> <p>Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$</p> <p>Algebra</p> <p>Use simple index notation for small positive integer powers, substituting integers into simple formulae and positive integers into expressions involving small powers (e.g. $3x^2 + 4$ or $2x^3$). Express simple functions in symbols, represent mappings expressed algebraically and finding the inverse of a linear function. Expand and simplify linear expressions; square a linear expression and expand and simplify the product of two linear expressions of the form $(x \pm n)$ and simplify the corresponding quadratic equation. Factorise linear and quadratic expressions including the difference of two square. Find the next term and nth term of linear and quadratic functions for increasing and decreasing sequences. Use systematic trial and improvement methods and ICT tools to find approximate solutions to equations such as $x^3 + x = 20$. Construct</p>

and solve linear equations with integer coefficients (unknown on either or both sides, with and without brackets and involving fractions). Solve inequalities in one variable and represent the solution set on a number line. Use formulae from mathematics and other subjects; substitute numbers into expressions and formulae and derive formulae. Rearrange formulae to change the subject. Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs, explaining what the variables m and c represent. Plot graphs of linear functions (e.g. $y = 2x + 3$) and simple quadratic and cubic functions (e.g. $y = x^2$, $y = 3x^2 + 4$, $y = x^3$). Use algebraic and graphical methods to solve linear equations in two variables (simultaneous equations)

Ratio, proportion and rates of change

To be able to reduce a ratio to its simplest form; to be able to divide a quantity into two or more parts in a given ratio. Understand and use proportionality; solve problems involving direct and inverse proportion and unitary method, inc. graphical and algebraic representations. Use fractions or percentages of quantities to solve problems involving repeated proportional changes or calculating the original quantity after proportional change. Solve problems involving percentage change: percentage increase and decrease, original value problems and simple interest in financial mathematics. Understand and use measures of speed and unit pricing (and other compound measures such as density or pressure) to solve problems

Geometry and measures

To be able to construct triangles to solve problems. Identify alternate and corresponding angles; understand a proof that the sum of the angles of a triangle is 180° and of a quadrilateral is 360° . To be able to use the interior and exterior angles properties of polygons. To be able to solve problems using the geometrical properties of quadrilaterals, cuboids and shapes made from cuboids. Use straight edge and compasses to do standard constructions (angle bisectors, midpoint and perpendicular bisectors of a line, perpendicular bisectors). Calculate lengths, areas and volumes in plane shapes and other prisms (inc. cuboids, cylinders and area of 2D shapes - triangles, parallelograms, trapezia, circles). Convert between area measures (mm^2 to cm^2 , cm^2 to m^2 , and vice versa) and between volume measures (mm^3 to cm^3 , cm^3 to m^3 , and vice versa). Use units of measurement to estimate, calculate and solve problems in everyday contexts involving length, area, volume, capacity, mass, time and angle; know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons). Understand and use congruence and mathematical similarity, knowing that if two 2-d shapes are congruent, corresponding sides and angles are equal. Enlarge 2D, given a centre of enlargement and a whole number or fractional scale factor, on paper and using ICT; recognise the similarity of the resulting shapes

Know that translations, reflections and rotations preserve length and angle, and identify reflection symmetry in 3-D shapes. Understand and apply Pythagoras' theorem when solving problems in 2D. Know how to use map scales and use scales to make scale drawings. To know how to use three-figure bearing and use bearing to use bearings to specify direction. Use 2-D representations (inc. plans and elevations) and oral descriptions to visualise 3-D shapes; deduce some of their properties; draw plans and elevations. Given the coordinates of points A and B, find the mid-point of the line segment AB. Find the locus of a point that

moves according to a given rule, both by reasoning and using ICT, to produce shapes and paths, e.g. triangles. Recognise that measurements given to the nearest whole unit may be accurate by up to one-half of the unit in either direction

Statistics

To be able to find the mean, median and mode from a frequency table. Estimate the mean, median and range of a set of grouped and continuous data and determine the modal class, selecting the statistic most appropriate to the line of enquiry and degree of accuracy. To be able to plan how to collect data, including sample size design and communicate interpretations and results of a statistical survey using selected tables, graphs and diagrams to support. Select, construct and modify, on paper/ICT: pie charts for categorical data; bar charts/ frequency diagrams for discrete/continuous data; simple time graphs for time series; scatter graphs; stem and leaf diagrams and identify which are the most useful in the context of the problem. Estimate and find the median, quartiles, inter-quartile range for large data sets, including using a cumulative frequency diagrams and box and whisker diagrams. Compare 2 or more distributions and make inferences, using the shape of the distributions and measures of average and spread including median and quartiles. Find and record all possible mutually exclusive outcomes for single and two successive events in a systematic way, using diagrams and tables. Estimate probabilities from experimental data; understand that: if an experiment is repeated there may be, and usually will be, different outcomes; increasing the number of times an experiment is repeated generally leads to better estimates of probability; know that if the probability of an event occurring is p , then the probability of it not occurring is $1 - p$. Know that the sum of all mutually exclusive outcomes is 1 and use this when solving problems