# Mathematics Programme of Study

| Number and place value | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| Count from 0 in multiples of 4, 8, 50 and 100 | Count in multiples of 6, 7, 9, 25 and 1000 | Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 | |
| Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) | Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) | … determine the value of each digit | *Identify the value of each digit to three decimal places*<br>… determine the value of each digit |
| Compare and order numbers up to 1000 | Order and compare numbers beyond 1000 | Read, write, order and compare numbers to at least 1 000 000… | Read, write, order and compare numbers up to 10 000 000… |
| Read and write numbers up to at least 1000 in numerals and in words | | | |
| Identify, represent and estimate numbers using different representation | Identify, represent and estimate numbers using different representations | | |
| Solve number problems and practical problems involving these ideas | Solve number and practical problems that involve all of the above and with increasingly large positive numbers | Solve number problems and practical problems that involve all of the above | Solve number and practical problems that involve all of the above |
| Find 10 or 100 more or less than a given number | Find 1000 more or less than a given number | | |
| | Count backwards through zero to include negative numbers | Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero | Use negative numbers in context, and calculate intervals across zero |
| | Round any number to the nearest 10, 100 or 1000 | Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 | Round any whole number to a required degree of accuracy |
| *Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks* | Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value | Read Roman numerals to 1000 (M) and recognise years written in Roman numerals | |

| Addition and Subtraction | | | Addition, Subtraction, Multiplication and Division |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| Add numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds | | Add and subtract numbers mentally with increasingly large numbers | Perform mental calculations, including with mixed operations and large numbers |

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| Subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds | | | |
| Add numbers with up to three digits, using the efficient written methods of columnar addition and subtraction | Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate | Add whole numbers with more than 4 digits, including using formal written methods (columnar addition) | |
| Subtract numbers with up to three digits, using the efficient written methods of columnar addition and subtraction | Subtract numbers with up to 4 digits using the formal written methods of subtraction where appropriate | Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction) | |
| Estimate the answer to a calculation and use inverse operations to check answers | Estimate and use inverse operations to check answers to a calculation | Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy | Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy |
| Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction | Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why | Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why | Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why |
| Multiplication and Division | | | |
| Recall and use multiplication facts for the 3, 4 and 8 multiplication tables | Recall multiplication facts for multiplication tables up to 12 × 12 | Recognise and use square numbers and cube numbers, and the notation for squared ($^2$) and cubed ($^3$)<br>Solve problems involving multiplication and division including their knowledge of factors, multiples, squares and cubes | |
| Recall and use division facts for the 3, 4 and 8 multiplication tables | Recall division facts for multiplication tables up to 12 × 12 | | |
| | Recognise and use factor pairs and commutativity in mental calculations | Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers<br>Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br>Establish whether a number up to 100 is prime and recall prime numbers up to 19 | Identify common factors, common multiples and prime numbers |
| 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* | 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 | Multiply and divide numbers mentally drawing upon known facts | Perform mental calculations, including with mixed operations and large numbers |
| See above | Multiply two-digit and three-digit numbers by a one-digit number using formal written layout | 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 multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication |
| Write and calculate mathematical statements for division | | Divide numbers up to 4 digits by a one-digit number using the efficient written method of short division and interpret remainders appropriately for the context | divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division<br>interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context |

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| | | | Divide numbers up to 4 digits by a two-digit whole number using the formal written method of short division |
| solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which *n* objects are connected to *m* objects | solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as which *n* objects are connected to *m* objects | Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign<br>solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates | use their knowledge of the order of operations to carry out calculations involving the four operations<br>solve problems involving addition, subtraction, multiplication and division |

| Fractions | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts | count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten<br>recognise and write decimal equivalents of any number of tenths or hundredths | recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents | |
| recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators | | recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $^{2}/_{5} + {}^{4}/_{5} = {}^{6}/_{5} = {}^{11}/_{5}$) | |
| recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators | | | |

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| recognise and show, using diagrams, equivalent fractions with small denominators | recognise and show, using diagrams, families of common equivalent fractions | identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths | use common factors to simplify fractions; use common multiples to express fractions in the same denomination |
| add and subtract fractions with the same denominator within one whole (e.g. $^5/_7 + {}^1/_7 = {}^6/_7$) | add fractions with the same denominator<br>Subtract fractions with the same denominator | Add and subtract fractions with the same denominator and denominators that are multiples of the same number | Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions |
| compare and order unit fractions with the same denominator | | compare and order fractions whose denominators are all multiples of the same number | compare and order fractions, including fractions >1 |
| | | multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams | multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $^1/_4 \times {}^1/_2 = {}^1/_8$)<br>divide proper fractions by whole numbers (e.g. $^1/_3 \div 2 = {}^1/_6$) |
| Solve problems that involve fractions | 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 | solve problems which require knowing percentage and decimal equivalents of $^1/_2$, $^1/_4$, $^1/_5$, $^2/_5$, $^4/_5$ and those fractions with a denominator of a multiple of 10 or 25 | solve problems which require answers to be rounded to specified degrees of accuracy |
| | recognise and write decimal equivalents to $^1/_4$; $^1/_2$; $^3/_4$ | read and write decimal numbers as fractions (e.g. $0.71 = {}^{71}/_{100}$) | associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$) |
| dividing one-digit numbers or quantities by 10 | 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 units, tenths and hundredths | *multiply whole numbers and those involving decimals by 10, 100 and 1000*<br>*divide whole numbers and those involving decimals by 10, 100 and 1000* | multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places |
| | round decimals with one decimal place to the nearest whole number | round decimals with two decimal places to the nearest whole number and to one decimal place | use written division methods in cases where the answer has up to two decimal places |
| | compare numbers with the same number of decimal places up to two decimal places | read, write, order and compare numbers with up to three decimal places | |
| | | | multiply one-digit numbers with up to two decimal places by whole numbers |
| | solve simple measure and money problems involving fractions and decimals to two decimal places | solve problems involving number up to three decimal places | solve problems which require answers to be rounded to specified degrees of accuracy |
| | | 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 hundred, and as a decimal | recall and use equivalences between simple fractions, decimals and percentages, including in different contexts |

| Measurements | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) | convert between different units of measure (e.g. kilometre to metre; hour to minute) | Convert between different units of measure (e.g. kilometre and metre; metre and centimetre; centimetre and millimetre; gram and kilogram; litre and millilitre) | 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 three decimal places |
| | | understand and use approximate equivalences between metric and common imperial units such as inches, pounds and pints | convert between miles and kilometres |
| measure the perimeter of simple 2-D shapes | measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres | measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres | recognise that shapes with the same areas can have different perimeters and vice versa |
| | find the area of rectilinear shapes by counting squares | calculate and compare the area of squares and rectangles including using standard units, square centimetres ($cm^2$) and square metres ($m^2$) and estimate the area of irregular shapes | calculate the area of parallelograms and triangles recognise when it is possible to use formulae for area and volume of shapes |
| | | estimate volume (e.g. using 1 $cm^3$ blocks to build cubes and cuboids) and capacity (e.g. using water) | calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed ($cm^3$) and cubic metres ($m^3$) and extending to other units, such as $mm^3$ and $km^3$ |

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| Add and subtract amounts of money to give change, using both £ and p in practical contexts | estimate, compare and calculate different measures, including money in pounds and pence | use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling | solve problems involving the calculation and conversion of units of measure, using decimal notation to three decimal places where appropriate |
| tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks | read, write and convert time between analogue and digital 12 and 24-hour clocks | | |
| estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight | | | |
| know the number of seconds in a minute and the number of days in each month, year and leap year | | | |
| compare durations of events, for example to calculate the time taken by particular events or tasks | solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days | solve problems involving converting between units of time | |

| Geometry – properties of shape and position and direction | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| draw 2-D shapes | | | draw 2-D shapes using given dimensions and angles |
| make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them | | identify 3-D shapes, including cubes and other cuboids, from 2-D representations | recognise, describe and build simple 3-D shapes, including making nets |
| recognise that angles are a property of shape or a description of a turn | | draw given angles, and measure them in degrees (°) | |
| 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 | identify acute and obtuse angles and compare and order angles up to two right angles by size | know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles<br>identify: angles at a point and one whole turn (total 360°)<br>angles at a point on a straight line and ½ a turn (total 180°)<br>other multiples of 90° | recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles |
| identify horizontal and vertical lines and pairs of perpendicular and parallel lines | compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes | use the properties of rectangles to deduce related facts and find missing lengths and angles | compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons |
| | identify lines of symmetry in 2-D shapes presented in different orientations | distinguish between regular and irregular polygons based on reasoning about equal sides and angles | |
| | describe positions on a 2-D grid as coordinates in the first quadrant | identify, describe and represent the position of a shape following a translation, using the appropriate language, and know that the shape has not changed | describe positions on the full coordinate grid (all four quadrants)<br>draw and translate simple shapes on the coordinate plane |

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| | describe movements between positions as translations of a given unit to the left/right and up/down | | |
| | complete a simple symmetric figure with respect to a specific line of symmetry | | reflect simple shapes in the axes |
| | plot specified points and draw sides to complete a given polygon | | |
| | | | illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius |

| Statistics | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| interpret and present data using bar charts, pictograms and tables | interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs | solve comparison, sum and difference problems using information presented in line graphs | interpret and construct pie charts and line graphs and use these to solve problems |
| solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables. | solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs | complete, read and interpret information in tables, including timetables | |
| | | | calculate and interpret the mean as an average |

| Ratio and Proportion | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| | | | 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 (e.g. of measures) 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 | | | |
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| **Year 3** | **Year 4** | **Year 5** | **Year 6** |

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| | | | use simple formulae |
| | | | generate and describe linear number sequences |
| | | | express missing number problems algebraically |
| | | | find pairs of numbers that satisfy an equation with two unknowns |
| | | | enumerate possibilities of combinations of two variables |