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Place Value

Reading and writing numbers –

- Experiment with their own symbols and marks as well as numerals
- Link the number symbol (numeral) with its cardinal number value.
- Read and write numbers in numerals to 100 and in words to 20; to at least 100; to at least 1 000 000, up to 10 000 000.

Counting –

- Recite numbers past 5
- Say one number for each item in order
- Know that the last number reached when counting a small set of objects tells you how many there are in total (cardinal principle)
- Verbally count beyond 20 recognising the pattern of the counting system.
- Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number; given a number,
- Find 1 more or less; 10 or 100 more or less; 1000 more or less than a given number
- Count in multiples of twos, fives and tens; in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward; from 0 in multiples of 4, 8, 50 and 100; 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

Identify and represent numbers –

- Develop fast recognition of up to 3 objects, without having to count them individually.
- Show 'finger numbers' up to 5
- Link numerals and amounts: for example, showing the right number of objects to match the numeral up to 5
- Have a deep understanding of number to 10, including the composition of each number.
- Subitise (recognise quantities without counting) up to 5.
- Identify and represent numbers using objects and pictorial representations including the number line (and estimate year 2, year 3, year 4)
- Use the language of: equal to, more than, less than (fewer), most, least

Recognise the place value of digits -

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- Recognise the place value of each digit in a two-digit number, three-digit number (hundreds, tens, ones); four-digit number (thousands, hundreds, tens, and ones); to at least 1 000 000; up to 10 000 000

Compare and Order –

- Compare quantities using language 'more than and fewer than'
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity.
- Compare and order numbers from 0 up to 100; use <, > and = signs; up to 1000; beyond 1000; up to 10 000 000

Rounding –

- Round any number to the nearest 10, 100 or 1000; up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000; any whole number to a required degree of accuracy

Roman Numerals –

- 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; to 1000 (M) and recognise years written in Roman numerals.

Negative Numbers –

- Count backwards through zero to include negative numbers with positive and negative whole numbers, including through zero
- Interpret negative numbers in context
- Use negative numbers in context
- Calculate intervals across zero

Solving Problems –

- Solve real world problems with numbers up to 5
- Use place value and number facts to solve problems (year 2); and practical problems, with increasingly large positive numbers (year 4, year 5, year 6)

Number – Addition and Subtraction

Recognise symbols -

- Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs

Number facts –

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- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.
- Represent and use number bonds and related subtraction facts within 20
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- Show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot

Mental Calculations -

- (+) and (–) numbers mentally, including: a 2-digit number and ones; a 2-digit number and tens; two 2+-digit numbers; adding three 1-digit numbers; including: a 3-digit number and ones; a 3-digit number and tens; a 3-digit number and hundreds; with increasingly large numbers; with mixed operations and large numbers

Written Calculations -

- (+) and (–) 1-digit and 2-digit numbers to 20, including 0, using concrete objects, pictorial representations including: a 2-digit number and ones; a 2-digit number and tens; two 2-digit numbers; adding three 1-digit numbers;
- Using formal written methods (where appropriate) of columnar addition and subtraction with up to 3 digits, with up to 4 digits; with more than 4 digits

Inverse Operation -

- Recognise and use the inverse relationship between (+) and (–) and use this to check calculations and solve missing number problems (year 2, year 3, year 4)

Estimation -

- Estimate the answer to a calculation; to check answers and determine, in the context of a problem, an appropriate degree of accuracy.
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

Solve Problems -

- Solve problems that involve (+) and (–), one-step problems using concrete objects and pictorial representations, and missing number problems such as 7 = – 9, including those involving numbers, quantities and measures (year 3); two-step problems in contexts, deciding which

operations and methods to use and why; multi-step problems in contexts, deciding which operations and methods to use and why (Year 6)

- Use their knowledge of the order of operations to carry out calculations involving the 4 operations

Patterns

- Talk about and identifies the patterns around them. (e.g. stripes of clothes, designs on rugs) and uses informal language like 'pointy', 'spotty' and 'blobs'.
- Extend and create ABAB patterns – stick, leaf, stick, leaf
- Notice and correct an error in repeating patterns
- Begin to describe a sequence of events, real or fictional using words such as 'first', 'then'

Number – Multiplication and Division

Number facts

- Explore and represent patterns within numbers up to 10, including even and odds, double facts and how quantities can be distributed equally.
- Recall and use (x) and (÷) facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers; for the 3, 4 and 8 multiplication tables; for multiplication tables up to 12 × 12
- Calculate mathematical statements for (x) and (÷) within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- Show that (x) of two numbers can be done in any order (commutative) and (÷) of one number by another cannot

Written Calculations

- Write and calculate mathematical statements for (x) and (÷) using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods
- Using formal written layout, (x) 2-digit and 3-digit numbers by a 1-digit number; numbers up to 4 digits by a 1- or 2-digit number including long multiplication for 2-digit numbers; multi-digit numbers up to 4 digits by a 2-digit whole number using long multiplication
- Using the formal written method of short division, (÷) numbers up to 4 digits by a 1-digit (÷) numbers up to 4 digits by a 2-digit number, interpreting remainders according to the context (year 5 and year 6)
- (÷) numbers up to 4 digits by a 2-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.

Mental Methods

- Use place value, known and derived facts to (x) and (÷) mentally, including: x by 0 and 1; ÷ by 1; x together 3 numbers
- (x) and (÷) numbers mentally drawing upon known facts
- (x) and (÷) whole numbers and those involving decimals by 10, 100 and 1000

Factors, Multiples, Prime, Cube and Square Numbers

- 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
- 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 (2) and cubed (3)
- Identify common factors, common multiples and prime numbers

Solving Problems

- Solve 1-step problems involving (x) and (÷), by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher, using materials, arrays, repeated addition, mental methods, and (x) and (÷) facts, including problems in contexts.
- Solve problems, including missing number problems, involving (x) and (÷), including positive integer scaling problems and correspondence problems in which n objects are connected to m objects, including using the distributive law to multiply 2 digit numbers by 1 digit,
- Solve problems involving (+), (–), (x) and (÷) and a combination of these, including understanding the meaning of the (=) sign (and year 6)
- Solve problems involving (x) and (÷), including scaling by simple fractions and problems involving simple rates.
- Solve problems involving (x) and (÷) including using their knowledge of factors and multiples, squares and cubes
- Use their knowledge of the order of operations to carry out calculations involving the four operations

Estimation

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- Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Number – Fractions

Recognise, find, name and write

- Recognise, find and name a half as one of two equal parts and a quarter as one of four equal parts (of an object, shape or quantity), and write $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$ of a length, shape, set of objects or quantity, fractions of a discrete set of objects and use fractions as numbers (unit fractions and non-unit fractions with small denominators), decimal equivalents of any number of tenths or hundredths, $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{4}$, and use thousandths and relate them to tenths, hundredths and decimal equivalents,
- Identify the value of each digit in numbers given to three decimal places

Count

- Count up and down in tenths (recognise that tenths arise from (÷) an object into 10 equal parts and in (÷) 1-digit numbers or quantities by 10), in hundredths (recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten)

Compare and Order

- Compare and order unit fractions, and fractions with the same denominators, whose denominators are all multiples of the same number, including fractions > 1
- Compare and order with the same number of decimal places up to 2 decimal places, and read and write, numbers with up to 3 decimal places

Equivalents

- Recognise the equivalence of $\frac{1}{2}$ and $\frac{2}{4}$.
- Recognise and show, using diagrams, equivalent fractions with small denominators; and 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

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- associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375 = $\frac{3}{8}$]

(+) and (–) fractions

- (+) and (–) fractions with the same denominator within one whole [for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$], with the same denominator, and denominators that are multiples of the same number, with different denominators and mixed numbers, using the concept of equivalent fractions

Solve Problems

- Solve problems that involve all of the above, involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
- 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 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.

(÷) by multiples of 10 to create a decimal

- Find the effect of (÷) a 1- or 2-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths, and 1000 giving answers up to three decimal places

Rounding Decimals

- Round decimals with 1 decimal place to the nearest whole number, with 2 decimal places to the nearest whole number and to 1 decimal place
- Solve problems which require answers to be rounded to specified degrees of accuracy

Mixed Numbers

- 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, $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]

(x) and (÷) of fractions

- Write simple fractions for example, $\frac{1}{2}$ of 6 = 3
- 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 for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$
- Divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$

Fractions, Decimals and Percentages

- 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
- Read and write decimal numbers as fractions [for example, 0.71 = $\frac{71}{100}$
- Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Multiply Decimals

- Multiply 1-digit numbers with up to 2- 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 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
- 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.

Measurement

Measure

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- Make comparisons between objects relating to size, length, capacity and weight
- Compare length, weight and capacity.
- Measure and begin to record the following: lengths and heights, mass/weight, capacity and volume
- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- Compare and order lengths, mass, volume/capacity and record the results using >, < and =
- measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)

Converting units of measure

- Convert between different units of measure [for example, kilometre to metre; hour to minute]
- 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
- 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

Time

- Measure and begin to record the following: time (hours, minutes, seconds)
- Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times.
- compare and sequence intervals of time
- tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times
- know the number of minutes in an hour and the number of hours in a day.
- tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks

- estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and 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]
- read, write and convert time between analogue and digital 12- and 24-hour clocks
- 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

Money

- Recognise and know the value of different denominations of coins and note.
- Recognise and use language relating to dates, including days of the week, weeks, months and years
- recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- find different combinations of coins that equal the same amounts of money
- solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change
- 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

Solve Problems

- Compare, describe and solve practical problems for: lengths and heights [for example, long/short, longer/shorter, tall/short, double/half], mass/weight [for example, heavy/light, heavier than, lighter than], capacity and volume [for example, full/empty, more than, less than, half, half full, quarter], time [for example, quicker, slower, earlier, later]
- use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

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- solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate

Sequence events

- Sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]

Perimeter, Area and Volume

- measure the perimeter of simple 2-D shapes
- measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
- find the area of rectilinear shapes by counting squares
- 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

Geometry - Properties of shape

2D Shapes

- Talk about and explore 2D shapes using informal and mathematical language: sides, corners, straight, flat and round
- Select, rotate and manipulate shapes to develop spatial reasoning skills.
- Compose and decompose shapes so that children recognise a shape can have other shapes within it, just as numbers can.
- Recognise and name common 2-D including: 2-D shapes [for example, rectangles (including squares), circles and triangles].
- Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line
- Compare and sort common 2-D
- Draw 2-D shapes
- 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
- Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

3D Shapes

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- Talk about and explore 3D shapes using informal and mathematical language: sides, corners, straight, flat and round
- Select shapes appropriately: flat surfaces for building, a triangular prism for a roof.
- Select, rotate and manipulate shapes to develop spatial reasoning skills.
- Compose and decompose shapes so that children recognise a shape can have other shapes within it, just as numbers can.
- Recognising and name 3-D shapes [[for example, cuboids (including cubes), pyramids and spheres].
- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces
- Identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid]
- Compare and sort common 3-D shapes and everyday objects.
- 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

Angles

- Recognise angles as a property of shape or a description of a turn
- 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
- 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 2
- 1 a turn (total 180o)
- other multiples of 90o
- Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons

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- Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.
-

Lines

- Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.

Lines of Symmetry

- Identify lines of symmetry in 2-D shapes presented in different orientations
- complete a simple symmetric figure with respect to a specific line of symmetry.
- draw 2-D shapes using given dimensions and angles
- illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius

Geometry – Position and direction

- Understand position through words alone e.g. 'the bag is under the table' – with no pointing
- Describe a familiar route
- Discuss routes and locations using words like 'in front of' and 'behind'
- describe position, direction and movement, including whole, half, quarter and three-quarter turns.
- order and arrange combinations of mathematical objects in patterns and sequences
- describe positions on a 2-D grid as coordinates in the first quadrant
- describe movements between positions as translations of a given unit to the left/right and up/down
- plot specified points and draw sides to complete a given polygon.
- 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.
- 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.

Statistics

- Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs. Interpret and

present data using bar charts, pictograms and tables Interpret and construct pie charts and line graphs and use these to solve problems.

- 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.; solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs; in a line graph
- Complete, read and interpret information in tables, including timetables
- Calculate and interpret the mean as an average.