Mathematics overview

At Wormley CE Primary School, we recognise and promote maths as a **creative** and **interconnected subject**. We believe that **everybody** is capable of being a successful mathematician. The subject is **essential** to everyday life and provides a **foundation** for understanding the world. Our aim is to provide our learners with **rich opportunities** in maths to learn **independently** and **actively** in order that they:

- Become **fluent** in the fundamentals of mathematics;
- Are able to **reason** and justify mathematically;
- Can **solve problems** within a range of contexts.

We believe mixed ability group and paired work is vital with a strong emphasis on 'talk' to allow children to 'think aloud' and build the skills necessary to be confident mathematicians.

Children of every age and ability will have access to **resources** (for example dienes blocks, numberlines, numicon, Cuisenaire rods, place value counters) to aid their understanding.

Through **varied, engaging** and **open ended** scenarios, which are **relevant** to the learner, we aim to **nurture a love and curiosity** of the subject.

Children are taught **at the pace appropriate to them**. Those who grasp concepts rapidly will be **challenged through rich and sophisticated problems** before being presented with new material; those who are not sufficiently fluent with earlier material will be **allowed to consolidate** their understanding before moving on.

The curriculum content for each year group is detailed below:

The Year 1 Learner

Working mathematically

By the end of year 1, children begin to solve simple problems involving addition and subtraction in familiar contexts such as going shopping, using a range of hands-on equipment, symbols, images and pictures. They begin to use what they know to tackle problems that are more complex and provide simple reasons for their opinions.

Counting and understanding numbers

Children will be learning to:

- identify and represent numbers using objects, pictures and models, such as the number line, numicon and dienes blocks
- use 'equal to, more than, less than (fewer), most and least.'
- accurately count numbers to, and across, 100 forwards and backwards from any given number with increasing understanding.
- count, read, write and order numbers in numerals up to 100 and from 1 to 20 in words.
- identify, when given a number, one more and one less.
- count in multiples of twos, fives and tens.

Calculating

Children will be learning to:

- understand known addition and subtraction facts within 20, including zero;
- demonstrate an understanding of multiplication and division through grouping and sharing using hands-on resources, pictorial representations and arrays (2, 5 and 10);
- understand doubling and halving small quantities.

Fractions

Children will be learning to:

- find and name, through play and hands-on resources, half and one quarter of objects, shapes and quantities.

Measurement

Children will be learning to

- begin to measure using non-standard units (finger widths, blocks etc.) moving to standard units of measure (e.g. cm) using tools such as a ruler, weighing scales and containers.
- begin to record and compare measurements such as lengths and heights, mass and weight, capacity and volume using language such as long / short; heavy / light; full / half-full / empty. They wil

- tell the time to the hour, half past the hour and be able to sequence events in chronological order using precise language (for example, before and after, next, first, today etc.).
- recognise and know the value of different denominations of coins and notes.

Geometry

Children will be learning to:

- recognise and name common 2-D shapes, e.g. rectangles (including squares), circles and triangles, and 3-D shapes, e.g. cuboids (including cubes, pyramids and spheres) in different orientations and sizes.
- describe position, direction and movement, including whole, half and three quarter turns.

Statistics

In preparation for year 2, children will be learning to:

- begin to compare, sort and classify information, including through cross curricular links e.g. science – sorting materials into groups according to their properties.
- begin to construct simple pictograms and tables.

The Year 2 Learner

Working mathematically

By the end of year 2, children will solve problems with one or a small number of simple steps. Children will discuss their understanding and begin to explain their thinking using appropriate mathematical vocabulary, hands-on resources and different ways of recording. They will ask simple questions relevant to the problem and begin to suggest ways of solving them.

Counting and understanding numbers

Children will be learning to:

- develop their understanding of place value of numbers to at least 100 and apply this when ordering, comparing, estimating and rounding.
- begin to understand zero as a place holder as this is the foundation for manipulating larger numbers in subsequent years.
- count fluently forwards and backwards up to and beyond 100 in multiples of 2, 3, 5 and 10 from any number.
- use hands-on resources to help them understand and apply their knowledge of place value in two digit numbers, representing the numbers in a variety of different ways.

Calculating

Children will be learning:

- that addition and multiplication number sentences can be re-ordered and the answer remains the same (commutativity) such as 9+5+1= 5+1+9. They learn that this is not the case with subtraction and division.
- to solve a variety of problems using mental and written calculations for +, -, x, ÷ in practical contexts. These methods will include partitioning which is where the number is broken up into more manageable parts (e.g. 64 = 60 + 4 or 50 + 14), re-ordering (e.g. moving the larger number to the beginning of the number sentence when adding several small numbers) and using a number line.
- the 2, 5 and 10 times tables, as well as the matching division facts (4 x 5 = 20, 20 ÷ 5 = 4) and recall them quickly and accurately.
- to apply their knowledge of addition and subtraction facts to 20 and use these to work out facts up to 100.

Fractions including decimals

Throughout year 2, children will be learning to:

- develop their understanding of fractions and the link to division, exploring this concept using pictures, images and hands-on resources.
- solve problems involving fractions (e.g. find 1/3 of the hexagon or $\frac{1}{4}$ of the marbles) and record what they have done.
- count regularly and fluently in fractions such as $\frac{1}{2}$ and $\frac{1}{4}$ forwards and backwards and, through positioning them on a number line, understand that some have the same value (equivalent) e.g. $\frac{1}{2} = \frac{1}{4}$.

Measurement

Children will be learning to:

- estimate, choose, use and compare a variety of measurements for length, mass, temperature, capacity, time and money.
- use measuring apparatus such as rulers accurately.
- use their knowledge of measurement to solve problems (e.g. how many ways to make 50p).
- extend their understanding of time to tell and write it on an analogue clock to 5 minute intervals, including quarter past / to the hour.
- know key time related facts (minutes in an hour, hours in a day) and relate this to their everyday life.

Geometry

Children will be learning to:

- identify, describe, compare and sort common 2-D and 3-D shapes according to their properties (sides, vertices, edges, faces) and apply this knowledge to solve simple problems.
- develop their understanding by finding examples of 3-D shapes in the real world and exploring the 2-D shapes that can be found on them (e.g. a circle is one of the faces on a cylinder).
- begin to describe position, direction and movement in a range of different situations, including understanding rotation (turning through right

angles clockwise and anti-clockwise).
- use their knowledge of shape in patterns and sequences.

Statistics
Children will be learning to:
- sort and compare information,
- communicate findings by asking and answering questions
- draw simple pictograms, tally charts and tables.

The Year 3 Learner

Working mathematically
By the end of year 3, children will talk about their mathematics using the numbers they are familiar with, applying their understanding of number, measures and shape to a greater range of problems. They will make decisions about calculations and information that is needed to solve problems, for example when a recipe for two people needs to be doubled to make a recipe for four. Children will be expected to prove their thinking through pictures, jottings and conversations. They will be encouraged to pose their own questions, working in an organised way to solve them which will help pupils to identify common patterns or any errors more easily.

Counting and understanding numbers
Children will be learning to:
- be familiar with numbers that have 3 digits and will have experienced many opportunities to order, compare and show them in different ways using apparatus such as a tape measure, a 100 grid or money.
- use their understanding of place value (how the value of each digit changes depending on its position in the number),
- partition (break and make) numbers in different ways e.g. 234 = 200 and 30 and 4; 100 and 100 and 20 and 10 and 4; *or* 200 and 20 and 14.
- develop a secure understanding of numbers up to 1000 and will count beyond it in 1s, 10s and 100s.
- use this counting to help find 10 or 100 more than any given number.
- become familiar with numbers with one decimal place and will count up and down in tenths; share groups of objects or shapes into tenths and represent these in pictures and using hands-on resources.
- count forwards and backwards from 0 in steps of 4, 8, 50 and 100 and link this to multiplication and division.
- count in 3s to help maintain their fluency from Year 2.

- **Calculating**

Children will be learning to

- develop their mental calculation skills to add and subtract combinations of three-digit numbers e.g. 248 +/- 8; 319 +/- 40; 428 +/- 200.
- develop their range of strategies using jottings (sketches and notes to help them remember the steps) and number lines to help them understand how each calculation works.
- share their methods with others to help them see which work best, are quickest and most accurate.
- understand the importance of estimation when calculating to see if their answer is reasonable or not.
- recall their multiplication and division facts for 3, 4 and 8x tables and be supported to see the links between the 2, 4 and 8x tables.
- explore patterns and rules for the times tables they learn and will use pictures and objects to support their understanding. They will also learn that multiplication can be done in any order e.g. 3 x 4 x 2 = 2 x 3 x 4.
- begin to use, when they are ready, more formal methods of recording addition and subtraction, including column methods, using hands-on resources to secure their understanding of these methods. This will be applied to numbers up to three digits. Children who become very adept at these calculations will be stretched through problems such as those involving missing numbers so that they know when, if and why they need to use these methods.
- develop their understanding of multiplication and division and apply their times table knowledge to multiply 2-digit by 1-digit numbers using the skills of partitioning (breaking and making numbers). For example, 43 x 5 can also be thought of as 40 x 5 and 3 x 5 *or* (4 x 5 x 10) + (3 x 5). When they are ready, they will move from informal methods of calculating multiplication and division to formal written methods i.e. short column multiplication and be supported by using hands-on resources.

Fractions

Children will be learning to:

- develop their understanding of fractions and decimals and will be introduced to tenths.
- count and understand tenths as ten equal parts as well as through dividing sets of objects into ten equal parts / groups.
- find and write fractions of objects using their multiplication tables knowledge, e.g. 1/5 of a group of 20 buttons can be solved by 20 ÷ 5 = 4,
- continue to explore equivalent fractions using diagrams to explain their understanding e.g. 2/4 is equivalent to or of equal value to 4/8.
- begin to add and subtract fractions where the denominator is the same e.g. 4/6 + 1/6 = 5/6.

Measurement

Children will be learning to:

- continue to measure, compare, add and subtract measurements and progress to mixed units e.g. expressing amounts as litres and millilitres – 2 litres 400ml.
- measure the perimeter of 2-D shapes
- continue to add and subtract amounts of money including giving change.

- estimate and read time to the nearest minute on analogue and digital clock faces. They will be introduced to the Roman numerals I to XII to help with this.
- solve problems and calculate with time involving comparing the duration of events such as the length of favourite television programme or journeys to school.
- use language with increasing accuracy, such as seconds, minutes and hours; o'clock, a.m. / p.m., morning, afternoon, noon and midnight.
- recall the number of seconds in a minute and the number of days in each month, year and leap year.

Geometry

Children will be learning to:

- accurately draw 2-D shapes with rulers measuring sides accurately.
- make 3-D shapes to help them understand how they are composed
- recognise 3-D shapes in a range of places and contexts (e.g. buildings, packages) and use correct mathematical vocabulary to describe them.
- recognise what a right angle is and know 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 horizontal and vertical lines and pairs of perpendicular (⊥) and parallel lines (=).

Statistics

Children will be learning to:

- collect, organise, answer and pose questions about information using bar charts, pictograms and tables

answer questions such as 'how many more children prefer football to cricket?'

The Year 4 Learner

Working mathematically

By the end of year 4, children will apply their understanding of maths to solve a wide variety of problems with more than one step and be expected to prove their thinking through pictures, jottings and conversations. They will continue to make connections between different areas of maths and ask their own questions, working in an organised way to find solutions which help them identify common patterns or any errors more easily.

Counting and understanding numbers

Children will be learning to:

- be familiar with numbers that have up to 4 digits and be able to order and compare by showing them in different ways such as on a tape measure or using hands-on resources.
- be able to partition (break and make) numbers in different ways e.g. 2345 = 2000 and 300 and 40 and 5 but could also represent this as 1000 and

1000 and 200 and 100 and 40 and 5 or 2000 and 200 and 145, using their understanding of place value (how the value of each digit changes depending on its position in the number),

- work with numbers securely up to 10,000 and may begin to count beyond in 1s, 10s, 100s and 1000s. They will use this to help them find 10, 100 or 1000 more or less than any given number.
- multiply and divide whole numbers by 10 and 100 and understand that this changes the value of each digit rather than 'just adding a 0'.
- develop their understanding to decimal hundredths, comparing and ordering these using contexts such as money.
- learn about the pattern to find any Roman numeral to 100.
- develop their expertise when counting forwards and backwards from 0 to include multiples of 6, 7, 9 and 25; decimals with up to 2 places and fractions.
- count fluently in tenths, hundredths and simple fractions.
- develop their understanding of negative numbers through counting backwards through 0.
- recognise and describe number patterns and relationships including multiples (e.g. 3, 6, 9, 12 are multiples of 3) and factor pairs (e.g. 1 and 12, 2 and 6, 3 and 4 are all factor pairs for 12) for known times tables.

Calculating

Children will be learning to:

- develop various strategies for solving +, -, x, ÷ calculations mentally, using jottings when appropriate and for checking that their answers are sensible. Children will be encouraged to
- share their methods with others to help them see which work best, are quickest and most accurate.
- become fluent in all multiplication and division facts up to 12 x 12 and apply these facts to other problems e.g. 232 x 7 = (200 x 7) + (30 x 7) + (2 x 7).
- use the = sign to demonstrate equal value e.g. 3 x 8 = 48 ÷ 2 and solve missing number problems e.g. 3 x ? = 48÷2.
- explore patterns and rules for the times tables they learn and use pictures and objects to support their understanding.
- solve problems accurately using the column addition and subtraction methods for numbers with up to 4-digits and explain how the methods work. They will use apparatus to secure their understanding of these. This will include addition and subtraction calculations with different numbers of digits (such as 1286 + 357); and numbers containing 0s (such as 8009 – 3231).
- use formal written methods of short multiplication and short division for two and three digit numbers by a single digit. Children who become very adept at these types of calculations will be stretched through problems such as those containing missing numbers so that they know when, if and why they need to use the methods.

Fractions including decimals

Children will be learning to:

- develop their understanding of fractions by comparing to, or finding a part of, the whole.
- add and subtract, through hands-on resources, pictures or jottings, such as a number line, two fractions with the same denominator (e.g. 2/3 + 2/3).
- solve problems involving fractions such as 'find ¾ of 20 litres' using their knowledge of multiplication and division and through practical equipment.
- secure their understanding that fractions and decimals are different ways of expressing numbers and proportions.

Measurement

Children will be learning to:

- secure their understanding of place value and decimals to record measurements accurately.
- use their understanding of multiplying and dividing by 10, 100 and 1000 to convert between different units of measure of length (km, m, cm, mm), weight (kg, g) and money (£ and p).
- link their understanding of area to multiplication and describe how to find the perimeter of a rectangle quickly.
- read and write the time accurately using analogue and digital clocks, including clocks with Roman numerals. They will convert between units of time (hours, minutes and seconds).
- estimate, compare, calculate and solve a variety of problems involving all units of measurement.

Geometry

Children will be learning to:

- extend their knowledge of shape to include more unusual quadrilaterals (four-sided shapes) and triangles.
- use increasingly more specific vocabulary such as parallelogram, rhombus and trapezium; scalene and isosceles.
- refine their understanding of symmetry and solve problems where the shape is not displayed in its usual way (e.g. it might be on its side).
- find and name different angles and use this information to decide if a shape is regular or irregular.
- describe position and movement on a grid as co-ordinates and will plot points to draw 2-D shapes.

Statistics

Children will be learning to:

- complete, read and interpret information on bar charts
- solve problems that involve finding information in charts, tables and graphs (including time graphs).

The Year 5 Learner

Working mathematically

By the end of year 5, children will apply their mathematical experiences to explore ideas and raise relevant questions, constructing complex

explanations and reasoned arguments. They will be able to solve a wide variety of complex problems which require sustained concentration and demand efficient written and mental methods of calculations. These will include problems relating to fractions, scaling (times as many), converting between units of measure and employ all four operations (+, -, x, ÷).

Counting and understanding numbers

Children will be learning to:

- extend and apply their knowledge of place value for numbers up to one million, rounding, estimating and comparing them (including decimals and negative numbers) in a variety of situations.
- understand powers of ten
- count forwards or backwards from any number (for example, -50, -5… 5, 50, 500, 5000...).
- discover, through investigations, special numbers including factors, primes, square and cube numbers.

Calculating

Children will be learning to:

- become fluent in a wide range of mental calculation strategies for all operations and will select the most appropriate method dependent on the calculation.
- apply their knowledge of place value fluently to multiply and divide numbers (including decimals) by 10, 100 and 1000.
- use formal written methods (when mental methods are not appropriate) of addition and subtraction accurately.
- continue to develop their understanding of the formal methods through hands-on resources and use their known facts within long multiplication (up to 4 digit numbers by 2 digit numbers e.g. 2345 x 68) and short division (up to 4 digit numbers by 1 digit number e.g. 2345 ÷ 7) which may result in remainders.
- solve multi-step problems in meaningful contexts and decide which operations to use.

Fractions including decimals and percentages

Children will be learning to:

- secure their strong understanding that fractions express a proportion of amounts and quantities (such as measurements), shapes and other visual representations.
- extend their knowledge and understanding of the connections between fractions and decimals to also include percentages.
- derive simple equivalences (e.g. 67% = 67/100 = 0.67) and recall percentage and decimal equivalents for ½, ¼, 1/5, 2/5, 4/5 and fractions with a denominator of a multiple of 10 or 25 (e.g. 25% = 25/100).
- order, add and subtract fractions, including mixed numbers and those whose denominators are multiples of the same number, for example $\frac{3}{10} + \frac{1}{5} =$

$\frac{3}{10} + \frac{2}{10} = \frac{5}{10} = \frac{1}{2}$.

- multiply proper fractions and mixed numbers by whole numbers, using apparatus, images and models
- continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities in real life situations.

Measurement

Children will be learning to:

- extend their understanding of measurement through a wide variety of practical experiences and hands-on resources
- convert larger to smaller related units of measure and vice-versa including length, capacity, weight, time and money.
- convert between imperial (such as inches, pints, miles) and metric units (such as centimetres, litres, kilometres).
- measure, calculate and solve problems involving perimeter of straight-sided, right-angled shapes (rectilinear) and learn to express this algebraically such as, 4 + 2b = 20.
- find and measure the area of these shapes with increasing accuracy.
- estimate volume.

Geometry

Children will be learning to:

- measure, identify and draw angles in degrees, developing a strong understanding of acute, obtuse, reflex and right angles.
- use this knowledge to find missing angles and lengths in a variety of situations, including at a point, on a straight line and within a shape.
- move (translate) and reflect shapes and describe their new positions.
- use language with increasing sophistication to compare and classify shapes based on their properties and size.
- visualise 3-D shapes from 2-D diagrams.
- use their understanding or shapes to solve problems.

Statistics

Children will be learning to:

- complete, read and solve comparison, sum and difference problems using information presented in graphs, charts and tables, including timetables.
- decide which representations of data are the most appropriate
- be able to justify their reasons.

The Year 6 Learner

Working mathematically

By the end of year 6, children will structure their own investigations and solve a wide variety of increasingly complex problems. They will independently develop their own lines of enquiry and be expected to prove their solutions in a variety of ways including algebra, negative proof (use a counter example to prove the rule) and be able to communicate their results using accurate mathematical language. Children will demonstrate secure knowledge and confidence to talk in depth about mathematical concepts and explain their solutions, decisions and reasoning.

Counting and understanding numbers

Children will be learning to:

- extend and apply their knowledge of place value for numbers up to and beyond one million (including decimals and negative numbers) in a variety of situations.
- extend knowledge of special numbers to include common factors, common multiples and a deeper understanding of prime numbers.
- round numbers and identify what degree of accuracy is appropriate.

Calculating

Children will be learning to:

- be fluent in a wide range of mental and formal written calculation strategies for all operations, extending to long division (four digit numbers by two digit numbers) by the end of the year. They wi
- apply estimation in a range of ways.
- Explore, through investigations, the effect of the order of operations including the use of brackets.

Fractions including decimals and percentages

Children will be learning to:

- recall and using equivalences between simple fractions, decimals and percentages.
- express fractions in their simplest form and calculate the decimal equivalent, for example $\frac{3}{8} = 3 \div 8 = 0.375$.
- apply this understanding of equivalent fractions to order, add and subtract fractions (including mixed numbers and those with different denominators) by the end of the year e.g. $\frac{1}{3} + \frac{1}{4} + \square = 1$.
- use hands-on resources and images to multiply and divide proper fractions and mixed numbers by whole numbers e.g. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ and $\frac{1}{3} \div 2 = \frac{1}{6}$.
- solve problems involving the calculation of percentages linked to real life situations.

Ratio and proportion

Children will be learning to:

- explore ratio and proportion through real life experiences such as changing the quantities in recipes (scaling), scale drawings and maps.

Algebra

Throughout their primary experience children will have encountered algebra in a number of different situations which is drawn together and formalised in year 6. By the end of the year, they will

- confidently use symbols and letters to represent variables and unknowns in mathematical situations that they already understand, for example, simple formula and equivalent expressions a+b = b+a.
- describe number sequences and missing number calculations.

Measurement

Children will be learning to:

- convert, through investigation and problem solving, between a range of measurement units (including both imperial and metric).
- calculate the perimeter and area of parallelograms and triangles
- explore the relationship between area and perimeter
- calculate, estimate and compare volume of cubes and cuboids identifying when it is appropriate to use formula.

Geometry

Children will be learning to:

- draw 2-D and build 3-D shapes with accuracy using given dimensions and angles.
- create nets of common 3-D shapes
- consolidate their knowledge of angles within shapes and extend it to find missing angles in triangles, quadrilaterals and regular polygons.
- name parts of circles, including radius, diameter and circumference, and explore the relationships between these elements.
- use four quadrant co-ordinate grids to describe positions, draw and translate simple shapes.
- predict missing co-ordinates and express these algebraically.

Statistics

Children will increase their knowledge of different data representations to include:

- interpreting and constructing pie charts (using their knowledge of angles, fractions and percentages) and line graphs (e.g. miles to km conversion).
- knowing when it is appropriate to use the mean as an average and how to calculate it.