

Little Gaddesden C of E Primary School



National Curriculum 2014 – Mathematics in Key Stage 2

Approach

The new primary strategy provides detailed schemes of work for each year group and ensures progression throughout the school. Mathematical skills are promoted through multiplication tables, mental arithmetic, practical activities, specific investigations and project work.

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.

Number

• **Counting and understanding numbers:**

Children will be very 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. Using their understanding of place value (how the value of each digit changes depending on its position in the number), children will be able to 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 . They will develop a secure understanding of numbers up to 1000 and will count beyond it in 1 s, 10 s and 100 s. They will use this counting to help find 10 or 100 more than any given number.

Children will be introduced to 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.

Children will count forwards and backwards from 0 in steps of 4 , 8 , 50 and 100 and link this to multiplication and division. They will also count in 3 s to help maintain their fluency from Year 2.

• **Calculating:**

Children will continue to develop their mental calculation skills to add and subtract combinations of three-digit numbers e.g. 248 ± 8 ; 319 ± 40 ; 428 ± 200 . They will 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. Children will share their methods with others to help them see which work best, are quickest and most accurate. Children will understand the importance of estimation when calculating to see if their answer is reasonable or not. They will recall their multiplication and division facts for 3 , 4 and 8 x tables and be supported to see the links between the 2 , 4 and 8 x tables. They 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. $3 \times 4 \times 2 = 2 \times 3 \times 4$.

Children will be introduced to more formal methods of recording addition and subtraction, including column methods. They will use 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.

Children will 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, 43×5 can also be thought of as 40×5 and 3×5 or $(4 \times 5 \times 10) + (3 \times 5)$. 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 develop their understanding of fractions and decimals and will be introduced to tenths. They will count and understand tenths as ten equal parts as well as through dividing sets of objects into ten equal parts / groups. They will 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 $20 \div 5 = 4$, and will continue to explore equivalent fractions using diagrams to explain their understanding e.g. $2/4$ is equivalent to or of equal value to $4/8$. They will also begin to add and subtract fractions where the denominator is the same e.g. $4/6 + 1/6 = 5/6$.

Measurement

Children will continue to measure, compare, add and subtract measurements and progress to mixed units e.g. expressing amounts as litres and millilitres – 2 litres 400ml. They will measure the perimeter of 2-D shapes and will continue to add and subtract amounts of money including giving change. Children will 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. Problem solving and calculating with time will involve comparing the duration of events such as the length of favourite television programme or journeys to school. They will use language with increasing accuracy, such as seconds, minutes and hours; o'clock, a.m. / p.m., morning, afternoon, noon and midnight. They will need to recall the number of seconds in a minute and the number of days in each month, year and leap year.

Geometry

Children will accurately draw 2-D shapes with rulers measuring sides accurately. They will make 3-D shapes to help them understand how they are composed and will recognise 3-D shapes in a range of places and contexts (e.g. buildings, packages) and use correct mathematical vocabulary to describe them. They will learn 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 as well as identify whether angles are greater than or less than a right angle. They will also be able to identify horizontal and vertical lines and pairs of perpendicular (⊥) and parallel lines (=).

Statistics

Children will collect, organise, answer and pose questions about information using bar charts, pictograms and tables to answer questions such as 'how many more children prefer football to cricket?'.

parallelograms and triangles. Additionally, they will explore the relationship between area and perimeter. They will know how to calculate, estimate and compare volume of cubes and cuboids identifying when it is appropriate to use formula.

Geometry

Children will draw 2-D and build 3-D shapes with accuracy using given dimensions and angles. They will create nets of common 3-D shapes. They will consolidate their knowledge of angles within shapes and extend it to find missing angles in triangles, quadrilaterals and regular polygons. Children name parts of circles, including radius, diameter and circumference, and explore the relationships between these elements. Children will use four quadrant co-ordinate grids to describe positions, draw and translate simple shapes. Using their knowledge of the properties of shape, they will be able to 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). They will know when it is appropriate to use the mean as an average and how to calculate it.

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.

Number

- **Counting and understanding numbers**

Children 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. Special numbers are extended to include common factors, common multiples and a deeper understanding of prime numbers. Children will be able to round numbers and identify what degree of accuracy is appropriate.

- **Calculating**

Children will 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 will apply estimation in a range of ways. Through investigations, they explore the effect of the order of operations including the use of brackets.

- **Fractions including decimals and percentages**

Children recall and using equivalences between simple fractions, decimals and percentages. Additionally, they are able to express fractions in their simplest form and calculate the decimal equivalent, for example $\frac{3}{8} = 3 \div 8 = 0.375$.

Applying this understanding of equivalent fractions, children will order, add and subtract fractions (including mixed numbers and those with different denominators) by the end of the year e.g. $\frac{1}{3} + \frac{1}{4} + \square = 1$. Using hands-on resources and images, they will multiply and divide proper fractions and mixed numbers by whole numbers e.g. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ and $\frac{1}{3} \div 2 = \frac{1}{6}$. Children will solve problems involving the calculation of percentages linked to real life situations.

Ratio and proportion

Pupils 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 $a+b = b+a$. Children will describe number sequences and missing number calculations.

Measurement

Through investigation and problem solving, children convert between a range of measurement units (including both imperial and metric). Calculation of perimeter and area is extended to include

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.

Number

- **Counting and understanding numbers**

Children will be very familiar with numbers that have up to 4 digits and will be able to order and compare by showing them in different ways such as on a tape measure or using hands-on resources. Using their understanding of place value (how the value of each digit changes depending on its position in the number), children will 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 . They will 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. They will 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'. They will develop their understanding to decimal hundredths, comparing and ordering these using contexts such as money. Children will also learn about the pattern to find any Roman numeral to 100 .

Children will 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. They will be able to fluently count in tenths, hundredths and simple fractions. They will develop their understanding of negative numbers through counting backwards through 0 . Children will be able to 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 develop various strategies for solving $+$, $-$, \times , \div 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. Over the course of the year, children will become fluent in all multiplication and division facts up to 12×12 and apply these facts to other problems e.g. $232 \times 7 = (200 \times 7) + (30 \times 7) + (2 \times 7)$. Children will use the $=$ sign to demonstrate equal value e.g. $3 \times 8 = 48 \div 2$ and solve missing number problems e.g. $3 \times ? = 48 \div 2$. They will explore patterns and rules for the times tables they learn and use pictures and objects to support their understanding.

Children will be required to 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 $8009 - 3231$). They will 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 develop their understanding of fractions by comparing to, or finding a part of, the whole. Through hands-on resources, pictures or jottings, such as a number line, children will add and subtract two fractions with the same denominator (e.g. $\frac{2}{3} + \frac{2}{3}$). Children will solve problems involving fractions such as 'find $\frac{3}{4}$ of 20 litres' using their knowledge of multiplication and division and through practical equipment. Children secure their understanding that fractions and decimals are different ways of expressing numbers and proportions.

Measurement

Children secure their understanding of place value and decimals to record measurements accurately. They 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). Children will link their understanding of area to multiplication and describe how to find the perimeter of a rectangle quickly. Children will 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). Children estimate, compare, calculate and solve a variety of problems involving all units of measurement.

Geometry

Children will extend their knowledge of shape to include more unusual quadrilaterals (four-sided shapes) and triangles. They will use increasingly more specific vocabulary such as parallelogram, rhombus and trapezium; scalene and isosceles. They 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). Children find and name different angles and use this information to decide if a shape is regular or irregular. Children describe position and movement on a grid as co-ordinates and will plot points to draw 2-D shapes.

Statistics

Children will complete, read and interpret information on bar charts; they will 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, ÷).

Number

- **Counting and understanding numbers**

Children 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. They are introduced to powers of ten and are able to count forwards or backwards from any number (for example, -50, -5... 5, 50, 500, 5000...). Through investigations, they will discover special numbers including factors, primes, square and cube numbers.

- **Calculating**

Children will be fluent in a wide range of mental calculation strategies for all operations and will select the most appropriate method dependent on the calculation. They apply their knowledge of place value fluently to multiply and divide numbers (including decimals) by 10, 100 and 1000. When mental methods are not appropriate, they use formal written methods of addition and subtraction accurately. They 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. 2345×68) and short division (up to 4 digit numbers by 1 digit number e.g. $2345 \div 7$) which may result in remainders. They solve multi-step problems in meaningful contexts and decide which operations to use.

- **Fractions including decimals and percentages**

Children secure their strong understanding that fractions express a proportion of amounts and quantities (such as measurements), shapes and other visual representations. Children extend their knowledge and understanding of the connections between fractions and decimals to also include percentages. They will be able to derive simple equivalences (e.g. $67\% = \frac{67}{100} = 0.67$) and recall percentage and decimal equivalents for $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and fractions with a denominator of a multiple of 10 or 25 (e.g. $25\% = \frac{25}{100}$).

They order, add and subtract fractions, including mixed numbers and those whose denominators are multiples of the same number, for example $\frac{3}{10} + \frac{1}{5} = \frac{3}{10} + \frac{2}{10} = \frac{5}{10} = \frac{1}{2}$. Using apparatus, images and models, they multiply proper fractions and mixed numbers by whole numbers. Children continue to develop their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities in real life situations.

Measurement

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

Geometry

Children will measure, identify and draw angles in degrees, developing a strong understanding of acute, obtuse, reflex and right angles. They 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. Children will move (translate), reflect shapes and describe their new positions. Language will be used with increasing sophistication to compare and classify shapes based on their properties and size. They will be able to visualise 3-D shapes from 2-D diagrams. They will use their understanding of shapes to solve problems.

Statistics

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