

Mathematics

Intent

Our high quality mathematics curriculum provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics and a sense of enjoyment and curiosity about the subject. All children become mentally fluent with numbers, keen pattern spotters and resilient problem solvers.

The curriculum is carefully planned to ensure that our pupils build upon skills learnt each year and have a clear progression in line with age related expectations. Children learn each area in depth and apply their learning to the mastery approach to enable deeper learning at every stage.

Implementation

We teach with White Rose small steps Maths in Reception and Key Stage 1 to ensure our children understand a concept and we then delve deeper using the mastery approach using the CPA (concrete, pictorial, abstract) process. Children develop a love of maths through games, songs, rhymes, and play using concrete manipulatives in enhanced provision in each classroom. We use NRich mathematical activities in Early Years classes to develop mathematical reasoning, and problem-solving skills and to offer challenging, inspiring and engaging activities. There is a focus on the following counting principles; one to one correspondence, stable order and cardinal principle.

Number

Place Value

Children begin in the early years by identifying small amounts, subitising and beginning to name the numbers. The children join in with number songs and are read stories about numbers and amounts. They are exposed to the single digit numbers in their environment and are encouraged, through play, to explore these, as well as solve problems such as; *How many plates do these 3 bears need?* The language of 'lots, more, less, same' is used within the classroom daily.

By the end of Early Years Foundation Stage (EYFS) children will have a deep understanding of numbers to 10, including the composition of each number. Some children will count beyond 20 and recognise patterns of the counting system. Children will be able to recall number bonds to 5, 10 as well as explore and represent patterns within numbers, including even and odd numbers, doubling facts and sharing.

In KS1, the children begin to work with numbers to 100 and beyond, continuing to develop their understanding of the value of each digit in a 1, 2 and 3 digit number. Children are taught to recognise numbers using objects and pictorial representations through the use of numicon, base 10 and place value cards. These are also used to compare and order numbers using number lines, number squares and mathematical symbols. We continue to use songs and stories to further the children's understanding and maths games to help consolidate concepts such as counting in 2,3, 5, and 10's.

Addition and Subtraction

Combine objects like stacking blocks and cups in the environment, such as putting objects inside others and taking them out again. They take part in finger rhymes with numbers where the number increases and decreases.

Children are taught to find different ways to make numbers within 10 while in the early years, for example $2 + 2$, $3 + 1$ make 4. They explore this concept in a variety of practical ways and when ready will record their number equations. Pupils in the Early Years also compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other

quantity. Pupils react to changes of amount in a group of up to three items and compare amounts using vocabulary such as 'lots', 'more' or 'same'. Children begin to understand the 'one more than/one less than' relationship between consecutive numbers. Using quantities and objects, children add and subtract two single-digit numbers and count on or back to find the answer. Children are also introduced to a number line to help with counting skills.

Once in KS1 children begin to read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs. Children represent and use number bonds and related subtraction facts within 20, add and subtract one-digit and two-digit numbers to 20, including zero. Pupils are taught to solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = \square - 9$ as they move into Year 2 pupils solve 2 step problems and write their own addition and subtraction problems, firstly using objects, pictorial then abstractly, applying their increasing knowledge of mental and written methods. Problems include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.

Pupils add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones a two-digit number and tens two two-digit numbers adding three one-digit numbers show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot recognise and use the inverse relationship between addition and subtraction and use this to check calculations. Year 2 children learn how to record addition and subtraction in columns which supports place value and prepares for formal written methods with larger numbers. The children work on this skill collaboratively and with concrete maths equipment to start, then explore the expanded column method before moving into the more formal way of recording. This ensures the children have a good understanding of this method.

Multiplication and Division

Children in our school first learn the skills of multiplication and division in play. They are encouraged to solve sharing problems in a real context such as 'How many pieces of fruit does each teddy bear get?'. Children also practise the skill of doubling, using mirrors, folding paint pictures and using concrete objects in the classroom. Halving is also introduced to the children in the Early Years, firstly using fruit, shapes and objects then using drawings as they develop this.

In Key Stage 1 Pupils are taught to solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Through grouping and sharing small quantities, pupils begin to understand: multiplication and division; doubling numbers and quantities. They make connections between arrays, number patterns, and counting in twos, fives and tens. Children learn counting songs and watch short clips to help reinforce the learning as well as play maths games within the Maths lessons and as part of the Rainbow Challenge.

Children calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals (=) signs. They learn that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot. Pupils are taught a variety of vocabulary to describe multiplication and division and these are reviewed in daily lessons. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example, $40 \div 2 = 20$, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, $4 \times 5 = 20$ and $20 \div 5 = 4$).

Fractions

Children begin to use the vocabulary of half regularly, when, for example, discussing food, shapes and children in their class (E.g. Do you want half a piece of toast?)

KS1 Pupils are taught half and quarter as 'fractions of' discrete and continuous quantities by solving problems using shapes, objects and quantities. For example, they could recognise and find half a length, quantity, set of objects or shape. Pupils connect halves and quarters to the equal sharing and grouping of sets of objects and to measures, as well as recognising and combining halves and quarters as parts of a whole. By the end of KS1 children are able to write simple fractions for example, $\frac{1}{2}$ of 6 = 3 and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$. They connect unit fractions to equal sharing and grouping, they meet $\frac{3}{4}$ as the first example of a non-unit fraction. Pupils count in fractions up to 10, starting from any number. This reinforces the concept of fractions as numbers and that they can add up to more than one.

Measurement

Through play, children at Kings Infant school compare weight and the length of concrete objects in the classroom and using their bodies, then compare sizes and weight using language such as 'bigger/little/smaller', 'high/low', 'tall', 'heavy'. Children enjoy water play when investigating the capacity of an object or seeing how many items they can fit into a container.

In Key Stage 1, Children compare, describe and solve practical problems for: lengths and heights, mass/weight, capacity and volume, time measure and begin to record them.

They continue to develop their vocabulary in each context and use it in their play and mathematical lessons. Children sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening] they begin to recognise and use language relating to dates, including days of the week, weeks, months and years. Pupils move from using and comparing different types of quantities and measures using non-standard units measurement, to using manageable common standard units. In order to become familiar with standard measures, pupils begin to use measuring tools such as a ruler, weighing scales and containers. Pupils use the language of time, including telling the time throughout the day, first using o'clock, half past and then become fluent in telling the time on analogue and digital clocks to 5 minutes as well as recording the time.

Children select and use rulers, scales, thermometers and measuring vessels and use their skills to compare and order lengths, mass, volume/capacity and record the results using $>$, $<$ and $=$.

Children use money in their play and in Year 1 begin to use symbols for pounds (£) and pence (p); throughout the key stage children learn to 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 such as giving change.

Geometry

Throughout our classes in the school children experience building with a range of resources and complete puzzles to help build their knowledge of shape, they explore 2D and 3D shapes in play and guided sessions including going on Shape Hunts around the school and surrounding areas. Children learn mathematical vocabulary linked to shape including the names and properties through songs, stories and discussion. Children are given time to investigate the shapes, combine shapes and use them within all areas of learning, including art sessions. They use shapes to create patterns and to spot pattern errors and begin to manipulate shapes to develop spatial reasoning skills.

As children move into Key stage 1 they handle common 2-D and 3-D shapes, naming these and related everyday objects fluently. They recognise these shapes in different orientations and sizes, and know that rectangles, triangles, cuboids and pyramids are not always similar to each other.

Children are given the opportunity to build 3D shapes using a variety of resources such as plasticine, sticks and lego, and describe their properties using the correct vocabulary. Children are also asked to sort shapes according to their chosen criteria and spot shapes within others.

Pupils in Year 2 use folding and pair games to learn about symmetry and use mirrors to spot lines of symmetry in shapes, letters and numbers. Children also use symmetry to create, continue and spot mistakes in patterns.

Position and Direction

Children in our school understand position through words. They describe where things are in the classroom using prepositions and describe their route around the school and when during their daily routines. In Key Stage 1, Pupils use the language of position, direction and motion, in and make whole, half, quarter and three-quarter turns in both directions in class games and PE lessons, they learn to connect turning clockwise with movement on a clock face. They use the concept and language of angles to describe 'turn' by applying rotations, including in practical contexts for example, pupils themselves moving in turns, giving instructions to other pupils to do so, and programming robots using instructions given in right angles.

Statistics

Children are introduced to the concept of statistics in the Early Years through class surveys where they put a picture on their preference to create a class pictogram and create tallies during counting activities. In KS1, they develop this further by using pictograms, block graphs and simple tables to represent data they have collected, initially using cubes and sticky notes then moving into a pictorial representation whether it be how many of each colour cube can they hold in their hand, how children get to school or the classes favourite food. They use these graphs to ask and answer simple questions and compare the data. Pupils in Year 2 learn to represent the data with each mark meaning 1, 2, 5 or 10.

Impact

Children become competent with numbers, whether using manipulatives, representation or digits themselves within the application of real life context and heuristic learning, using mathematical language when explaining and reasoning. Children have depth to their learning and develop their conceptual understanding.

Learners have a deeper understanding of mathematics and are able to relate it to real world concepts. Children develop skills in being articulate and are able to reason well verbally, pictorially and in written form. With the use of Mastery teaching, children enjoy maths and engage fully in the subject. They demonstrate quick recall of facts and mathematical procedures as well as having more confidence when attempting to tackle problems. Learners continue to develop fluidity and flexibility to use different representations to help them to problem-solve.