Oldbrook
First School & Nursery
Together we make the difference

Maths Calculation Policy

The Early Years Framework and The National Curriculum

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the power of mathematics and a sense of enjoyment and curiosity about the subject.

The principal focus of mathematic teaching in the Early Years is to develop a strong grounding in number. This is essential so that all children develop the necessary building blocks to excel mathematically. Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers. By providing frequent and varied opportunities to build and apply this understanding - such as using manipulatives, including small pebbles and tens frames for organising counting - children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built. In addition, it is important that the curriculum includes rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. It is important that children develop positive attitudes and interests in mathematics, look for patterns and relationships, spot connections, ‘have a go’, talk to adults and peers about what they notice and not be afraid to make mistakes.

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools]. At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money. By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency. Pupils should read and spell mathematical vocabulary, at a level consistent with their
increasing word reading and spelling knowledge at key stage 1.

The aims of this policy

Mastery is for all, and the aim of this policy is to ensure all children leave our school with a secure understanding of the four operations and can confidently use both written and mental calculation strategies in a range of contexts. It aims to ensure consistent strategies, models and images are used across the school to embed and deepen children's learning and understanding of mathematical concepts.

How should this policy be used?

This policy has been designed to support the teaching and planning of mathematics in our school. The policy only details the strategies, and teachers must plan opportunities for pupils to apply these; for example, when solving problems, or where opportunities emerge elsewhere in the curriculum. The examples and illustrations are not exhaustive but provide and overall picture of what the mathematics in our school should
look like. This is not a scheme of work and must be used in conjunction with our school maths policy and curriculum documents.

This policy sets out the progression of strategies and written methods which children will be taught as they develop in their understanding of the four operations. Strategies are set out in a concrete, pictorial, abstract approach to develop children's deep understanding and mastery of mathematical concepts. Children use concrete objects to help them make sense of the concept or problem; this could be anything from real or plastic fruit, to straws, counters or cubes. This is then developed through the use of images, models and children's own pictorial representations before moving on to the abstract mathematics. Children will travel along this continuum again and again, often revisiting
previous stages when a concept is extended. This is referred to as ‘sticky knowledge’. It is also worth noting that if a child has moved on from the concrete to the pictorial, it does not mean that the concrete cannot be used alongside the pictorial. Similarly, if a child is working in the abstract, ‘proving’ something or ‘working out’ could
involve use of the concrete or pictorial. Although the strategies are taught in a progressive sequence, they are designed to equip children with a 'tool box' of skills and strategies that they can apply to solve problems in a range of contexts. As a new strategy is taught it does not necessarily supersede the previous, but builds on prior learning to enable children to have a variety of tools to select from. As children become increasingly independent,
they will be able to and must be encouraged to select those strategies which are most efficient for the task.

The strategies are separated into the 4 operations for ease of reference. However, it is intended that addition and subtraction, and multiplication and division will be taught together to ensure that children are making connections and seeing relationships in their mathematics. Therefore, some strategies will be taught simultaneously, for example, counting on (addition) and counting back (subtraction). Children should be moved through the strategies at a pace appropriate to their age-related expectations as defined in the EYFS and NC. Effective teaching of the strategies relies on increasing levels of number sense, fluency and ability to reason mathematically. Children must be
supported to gain depth of understanding within the strategy through the CPA approach and not learn strategies as a procedure.

Importance of vocabulary

The 2014 National Curriculum places great emphasis on the importance of pupils using the correct mathematical language as a central part of their learning. Children will be unable to articulate their mathematical reasoning if they lack the mathematical vocabulary required to do so. It is
therefore, essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers modelling and only accepting what is correct.
Please see vocabulary progression document for more information.

End of Year Expectations in Calculation

Foundation Stage	Year 1	Year 2
• have a deep understanding of number to 10, including the composition of each number; • subitise (recognise quantities without counting) up to 5; • 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. • verbally count beyond 20, recognising the pattern of the counting system; • compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity; • explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.	• read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs • represent and use number bonds and related subtraction facts within 20 • add and subtract one-digit and two-digit numbers to 20, including zero • solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9. • solve one-step problems involving multiplication and division, by calculating the answer using concrete objects • solve one-step problems involving multiplication and division using pictorial representations and arrays with the support of the teacher	• solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods • recall and use addition and subtraction facts to 20 fluently • derive and use related facts up to 100 • 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 and solve missing number problems • recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs • show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot • solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Progression in Calculation

Addition

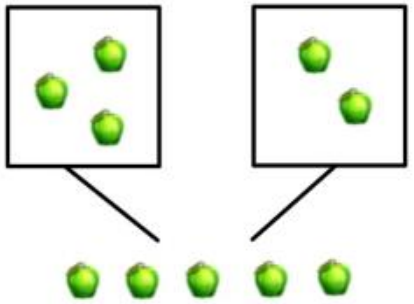
Reception

Finding One More

I have 6 apples and find one more. How many do I have now?

Combining Two Groups

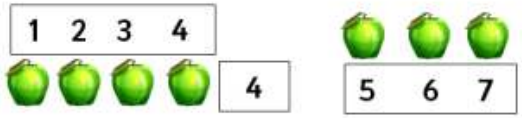
I have 3 apples in 1 basket and 2 in the other. How
many do I have altogether?



Year One

Counting On

Count the first group, start counting from the first group's total when counting second group.



We have some apples (count the apples 1,2,3,4) I add 3 more—how many altogether?

I have 5 apples in my basket and I put in 3 more. How many apples are in the basket now?
Children count on from 5.

Year 2

Previous methods will be revisited to ensure children have a secure understanding of methods.

Children will continue to use concrete objects, count on in their head and use a number line.

By Year 2 children are introduced to methods that will enable their maths solving to be as accurate but efficient as possible.

For children that need a visual, a 100 square will be used.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

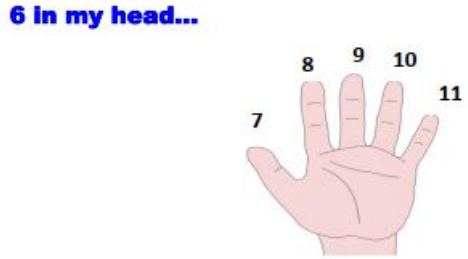
Children will be encouraged to partition numbers to add.

For example.

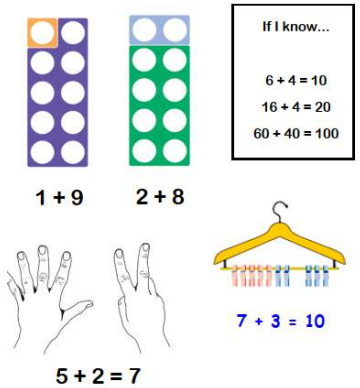
25 + 23 =

Children will start on the number 25 as it is the greater number. Children will then partition 23 which is made up of two tens and three ones.

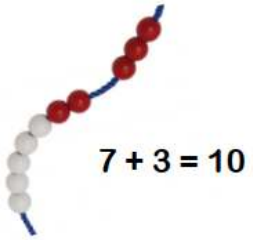
<u>Using Fingers</u>
Hold the highest number in your head. Hold up the correct number of fingers to show the second number and count on to find totals.



<u>Number Bonds</u>
Children begin to learn addition facts to 10 (as well as pairs that make other numbers—5, 6, 7, 8, 9…)



I have 7, how many more do I need until I have a total of 10?



Children will jump down the column twice to add the two tens and jump right three times to add three ones.

<u>Column Method</u>

	1	4
+	2	3
	3	7

Children who show a clear understanding and mental recall of addition number facts may be introduced to the addition of 2 two-digit numbers in Year One. Children will be encouraged to add the units first, followed by the tens. The units added will not bridge ten.

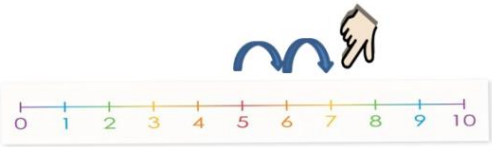
Once secure, children will then add numbers that require the carrying of tens. Children will add the ones first (4 + 7 = 11) The one is written in the ones column and the ten is added underneath the equals sign in the tens column. The tens are then added (40 + 20 + 10 = 70) Children will see this as adding 4 + 2 + 1 = 7 but must still understand these represent tens.

	4	4
+	2	7
	7	1
	1	

Children can use this method to add two, three + digit numbers.

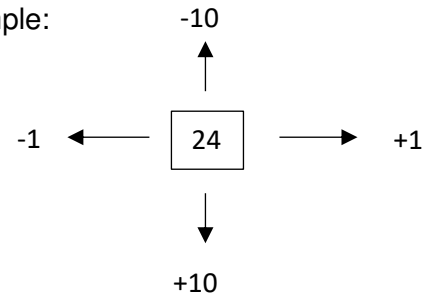
<u>Number Line</u>
Find the first number and then count on the second number (by counting the jumps) to find the total. This can be drawn directly onto the number line if needed.

5 + 2 = 7



<u>100 Square</u>
Children will learn to understand the pattern of number on a 100 square.

For example:



Children will learn to subtract 1/10 and add 1/10 quickly.

Subtraction

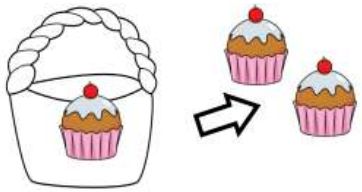
Early Years

Finding one less

I have 6 apples and I eat one of them. How many have I got left? By manipulating objects, children become familiar with the concept of subtraction as removing items from a set.

Subtracting a one-digit number from another one-digit number

As a continuation, children proceed to subtract more than 1 from a group. This is still carried out using a set of concrete objects. I have 3 cakes in my basket and 2 fell out. How many are left?



Year One

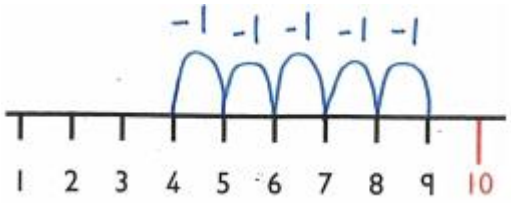
Counting back using our fingers

Children are taught to calculate mentally by holding up the 'first' number on their fingers and 'putting down' the number that is being subtracted.

Number Line

Using a structured number line supports children with each stage of their calculation. Children subtract a small number by 'jumping' along the number line in ones

Example: 9 - 5 =4



Year Two

Previous methods will be revisited to ensure children have a secure understanding of methods.

Children will continue to use concrete objects, count back in their head and use a number line.

By Year 2 children are introduced to methods that will enable their maths solving to be as accurate but efficient as possible.

For children that need a visual, a 100 square will be used.

1	2	3	4	5	6	7	8	9	10
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71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Children will be encouraged to partition numbers to subtract.

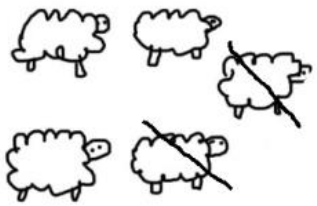
For example.

48 - 21 =

Children will start on the number 48. Children will then partition 21 which is made up of two tens and a one.Children will jump up the column twice to subtract the two tens and jump left once to subtract.

Emergent Recording

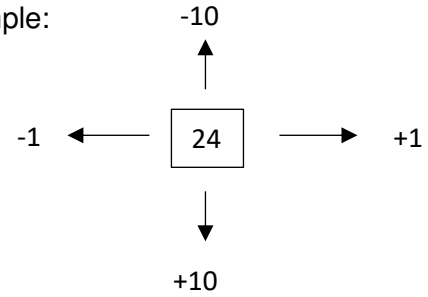
Children begin to ‘tell stories’ using pictures and through use of diagrammatic recording. For example, there were 5 sheep in a field. 2 ran away. How many are left? They count the remaining set.



100 Square

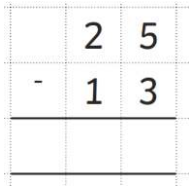
Children will learn to understand the pattern of number on a 100 square and will link this to their addition learning.

For example:



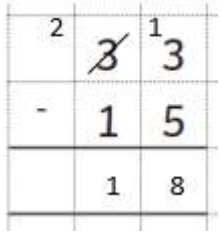
Children will learn to subtract 1/10 and add 1/10 quickly.

Column Method



Children who show a clear understanding and mental recall of subtraction number facts may be introduced to the subtraction of 2 two-digit numbers in Year One. Children will be encouraged to subtract the ones first, followed by the tens. The ones subtracted will not require borrowing ten.

Once secure, children will then subtract numbers that require the borrowing of tens. Children will subtract the ones first (3-5) This requires borrowing a ten from the tens column. The 3 tens are crossed out and changed to 2. The borrowed ten is written above the ones column. The following number sentences are solved 13-5 (recorded in the ones column) and 2-1 (recorded in the tens column)

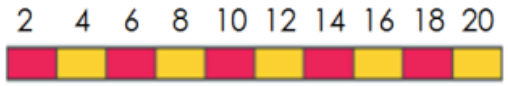


Multiplication

Early Years

Pattern / Skip Counting

With the support of the teacher, children chant in multiples. The teacher may use a counting stick to support this process.



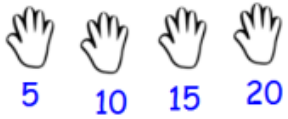
The children learn the 'song' of counting in sets of 2, 5 and 10 (later, 3) and listen to patterns.

Counting in Sets Practically

Children solve everyday problems by using everyday objects which support counting in sets. For example...

Children can recognise the need for counting in sets by 'bundling up' sticks or counting blocks of multilink put together.

How many fingers are there on 4 hands?

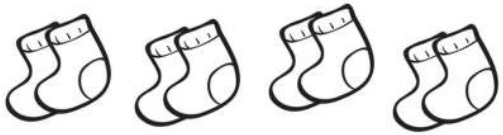


Year One

Pattern / Skip Counting

As in Early Years, children will continue to chant in multiples. It is expected children will be able to count in multiples of 2, 5 and 10 in Year One.

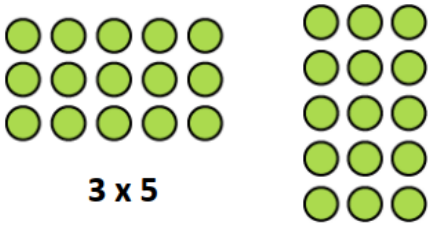
Children progress to representing multiplication as repeated addition on a number line or in simple number sentences.



2 + 2 + 2 + 2 = 8

Multiplication Shown as Arrays

Counting Rows / Columns - each array provides us with two facts due to the commutative nature of multiplication.



3 x 5

5 x 3

15 altogether

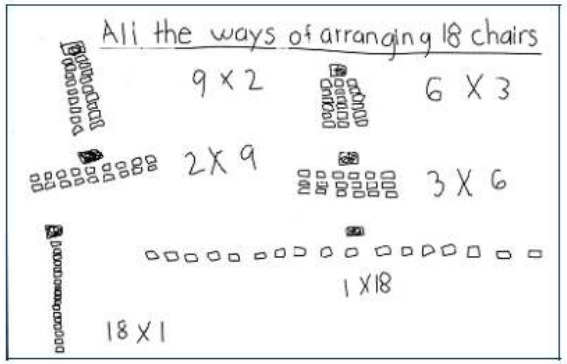
They recognise that the product is the same for each answer. Using this, children can derive new facts by making use of existing 'known' multiplication facts.

Year Two

Pattern / Skip Counting

As in Early Years and Year One, children will continue to chant in multiples. It is expected children will be able to count in multiples of 2, 3, 5 and 10 in Year Two. This is applied to solve multiplication and division problems.

Children will continue to use arrays as a method of solving multiplication number sentences or problems.



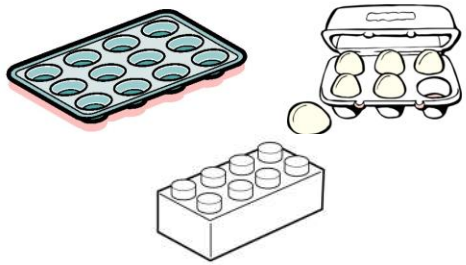
Counting in multiples

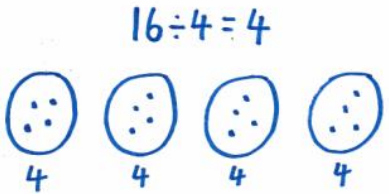
Children will count in multiples to solve multiplication problems as the most efficient method.

For example:

4 x 5 = 20

Children will decide which multiples they can count in. In this example, children should be able to count in 5s. Children will put 4 fingers up and count in 5s four times. 5, 10, 15, 20.

How many wheels on 3 bikes?  	Children can see arrays all around them in everyday life. Use examples of arrays from real life contexts to support counting in sets. 	

Division		
Early Years	Year One	Year Two
Sharing Practically Develop contextual scenarios which involve the 'sharing out' of objects using items which can be manipulated.   How many will they get each? Have you shared them out fairly? This will be done practically to allow children to visually understand the idea of sharing and equal amounts.	Recording Sharing Children are supported to verbalise the process they have followed while they record their sharing. Sharing into groups Children will see that the whole amount (16) needs to be divided by 4. Children will draw 4 circles and place a dot in each circle in turn until they have placed 16 in total. Children are then encouraged to count how many dots there are in each circle and check they have equal amounts. Children will then look at the number of dots in once circle to find their answer.  Halving Numbers Children will develop the understanding that to halve a number it is shared/divided in two. This can be demonstrated using clear visual imagery. 	Pattern / Skip Counting As in Early Years and Year One, children will continue to chant in multiples. It is expected children will be able to count in multiples of 2, 3, 5 and 10 in Year Two. This is applied to solve multiplication and division problems. For example: 20 ÷ 5 = Children would be encouraged to count in multiples of 5 until they reach 20. 5, 10, 15, 20 1 2 3 4 How many times did we count in 5? 4 times. If children are not secure with all multiples they are asked to divide by, they will be encouraged to share into groups, revisiting the method taught in Year One.