The Glebe Primary School

'We can and we will'

EYFS Calculation Policy

Mental and Written Calculations

Mission Statement:

At Glebe Primary School we believe in an ethos that values the whole child. We strive to enable all children to achieve their full potential academically, socially and emotionally.

Introduction:

At Glebe Primary School, children are introduced to the process of calculation through practical, oral, and mental activities. As children begin to understand the underlying ideas, they develop ways of recording to support their thinking. Over time, children learn how to use models and images (such as empty number lines) to support the mental and informal written calculations. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally.

At whatever stage in their learning, and whatever method is being used, it must still be underpinned by a secure and appropriate knowledge of number facts, along with the mental skills that are needed to carry out the process and judge if their answer was successful.

INTENT

The overall aim is that when children leave primary school they:

- Have a secure knowledge of number facts and a good understanding of the four operations;
- Are able to use this knowledge and understanding to carry out calculations mentally and apply general strategies to special cases involving bigger numbers;
- Make use of diagrams and informal notes to help record steps and multi-step answers; when using mental methods, that generate more information than can be kept in their heads.
- Have an efficient, reliable, compact written method, for each operation, that children can apply with confidence when undertaking calculations that they cannot carry out mentally.

The range of methods taught are designed to enable children to:

- Become confident, independent and efficient in their calculations;
- Choose the appropriate operation and methods (from a variety of mental and written methods) rather than rely on formal written methods for all calculations;
- To solve a particular calculation;
- Develop strategies for checking accuracy i.e using the inverse to check their answers.

IMPLEMENTATION

At Glebe Primary School, we do not follow a specific mathematics scheme or framework. Instead, we use resources from well-known mathematical leaders, such as White Rose Maths, to support our teaching. Our teachers use their judgement and skills to source resources that have been matched carefully to the abilities of the children, as well as resources designed to stretch and challenge all abilities.

CPA Approach (Concrete, Pictorial, Abstract)

At Glebe Primary School, we recognise that the Concrete Pictorial Abstract (CPA) approach is highly effective in the teaching of maths to develop conceptual understanding. This approach will vary between year groups and the individual abilities of children within each class. Manipulatives (objects), pictorial representations, words, numbers and symbols are everywhere. The mastery approach incorporates all of these to help children explore and demonstrate mathematical ideas, enrich their learning experience and deepen understanding. Together, these elements help cement knowledge so pupils truly understand what they have learnt. All pupils, when introduced to a key new concept, should have the opportunity to build competency in this topic by taking this approach. Pupils are encouraged to physically represent mathematical concepts. Objects (manipulatives) and pictures are used to demonstrate and visualise abstract ideas, alongside numbers and symbols.

- **Concrete:** Concrete is the "doing" stage, using concrete objects to model problems.
- **Pictorial:** Pictorial is the "seeing" stage, using representations of the objects to model problems.
- **Abstract:** Abstract is the "symbolic" stage, where children are able to use abstract symbols to model problems.

Early Learning Goal for Numbers:

- 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.

Children must be exposed to different representations of mathematical concepts in order to embed conceptual understanding. One of the aims, under the Characteristics of Effective Learning, is 'creating and thinking critically.' Children are encouraged to make links, find

new ways to do things, solve problems, change strategies as needed, make predictions and develop ideas of grouping, sequencing, cause and effect.

Reviewed: March 2022

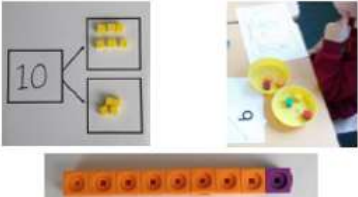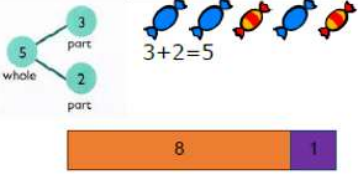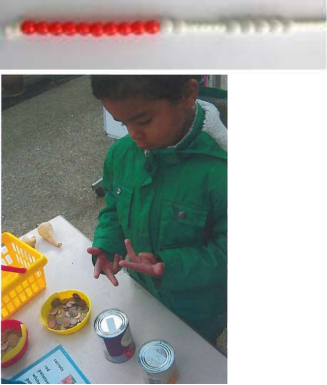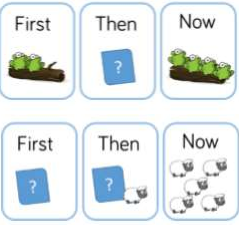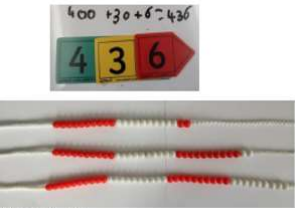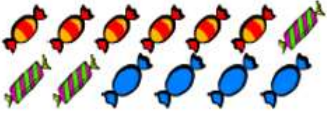**To be reviewed: March 2024**

Appendix 1: Addition
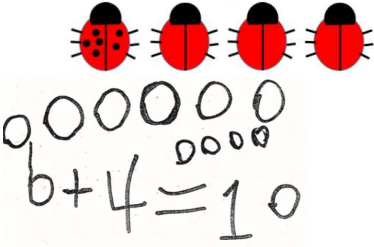
Nursery

Before addition can be introduced, children need to have a secure knowledge of numbers to 5. In Nursery, children are introduced to the concept of counting, number order and number recognition through practical activities and games. This is taught through child initiated games such as hide and seek and I spy. Children also learn how to count 1:1 (pointing to each object as they count) and that anything can be counted, for example, claps, steps and jumps. This is reinforced by opportunities provided in the outdoor area for the children to count e.g. counting building blocks, twigs etc.

Reception

Before addition can be introduced, children in Reception build on concepts taught in Nursery by working through the number objectives in the 40 – 60 month band of Development Matters. Children need to have a secure knowledge of number in order to begin addition. Children are then introduced to the concept of addition through practical games and activities. Children act out addition sums to physically add two groups of objects together and use arm gestures to represent the signs + and =. This is reinforced by opportunities provided in the outdoor area for the children to use addition e.g. adding together groups of building blocks, twigs etc. Children build on their previous knowledge of 'more' by learning that adding two groups of objects together gives them a larger number (more objects). Adults model addition vocabulary supported by age appropriate definition. An example of this is "addition means we add two groups together / we put 2 lots of objects together. Equals means we find out how many we have got altogether. 3 add 2 equals 5! We have got 5 altogether". Adults support children in recording their addition sums in the written form on whiteboards and in their maths books.

Addition

STRATEGY	CONCRETE	PICTORIAL	ABSTRACT
Combining two groups to make a whole	**Number shapes** Use the number shapes to investigate which smaller numbers combine to make exactly 2, 3, 4, or 5 Check by sitting them on top of the whole number. Is there more than one combination? Which number has the most combinations? **Construction** Provide cubes in 2 different colours. Ask the children to build a tower of 5. Compare the towers. What is the same? What is different? What if you make towers of 4 cubes? 3 cubes? Can you find different ways to make towers of 2 cubes?	3 part / 5 whole / 2 part $3+2=5$ How many legs does the ladybird have? How many spots? Use counters to add 6 spots to the other ladybirds. Can you find more than one way to do it? $6+4=10$	I have 4 apples and I pick 3 more. How many do I have altogether?
Counting on		First Then Now	$5 + 12 =$ Reinforce starting from the largest number.
Adding 3 single digits	400 +30 +6 = 436 4 3 6 22+17=39	$6 + 3 + 4 = 13$	$4 + 7 + 6 =$ Initially focusing on identifying the two numbers that add together to make 10.

Addition

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

GUIDANCE/MODELS AND IMAGES

Children begin to combine groups of objects or pictures using concrete apparatus.

Solve simple problems using fingers.

Construct number sentences verbally or using cards to go with practical activities.

Children are encouraged to read number sentences aloud in different ways e.g. "Three add two equals 5" "5 is equal to three and two."

Count on to find the answer.

Have an understanding of what "more" means and be able to say what is one more than a given number.

Number tracks can be introduced to count up on and to find one more.

Children make a record in pictures, words or symbols of addition activities.

When appropriate, numicon shapes are introduced to identify 1 more/less, combine pieces to add and find number bonds.

Number lines can be used alongside number tracks and practical apparatus to solve addition calculations and word problems.

$2 + 5 = 7$

$4 + 2 = 6$

$3 + 1 = 4$

0 1 2 3 4 5 6 7 8 9 10
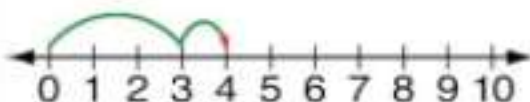
Vocabulary:

Games and songs can be useful way to begin using vocabulary involved in addition.
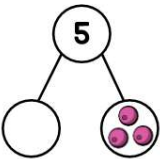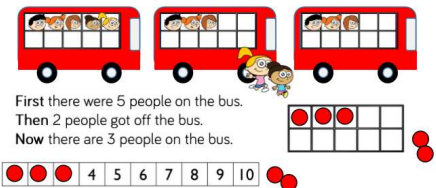
Add, more, sum, and make, total, altogether.
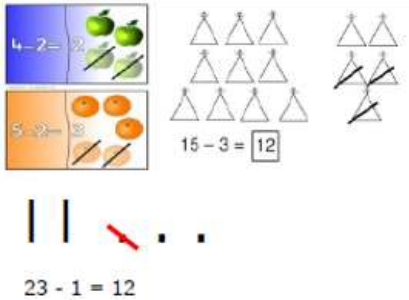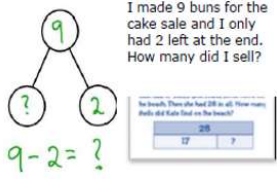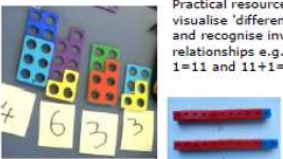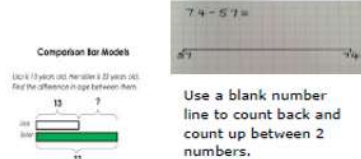
Appendix 2: Subtraction

<u>SUBTRACTION</u>

Nursery Before subtraction can be introduced, children need to have a secure knowledge of number. In Nursery, children are introduced to the concept of counting backwards. This is taught through child initiated games indoors and outdoors such as acting out counting songs and running races (children shouting "5,4,3,2,1,0 - GO!").

Reception Before subtraction can be introduced, children in Reception build on concepts taught in Nursery by working through the number objectives in the 40 – 60 month band of Development Matters. Children need to have a secure knowledge of number in order to begin subtraction. Children are then introduced to the concept of subtraction through practical games and activities. Children act out subtractions to physically subtract a number of objects from a group. Children use arm gestures to represent the signs - and =. This is reinforced by opportunities provided in the outdoor area for the children to count e.g. counting building blocks, twigs etc. Children build on their previous knowledge of 'less' by learning that subtracting means taking away a certain number of objects from a group (leaving them with less objects). Adults model subtraction vocabulary supported by age appropriate definition. An example of this is "subtraction means we take away objects from a group / we have 11 got less objects now. Equals means we find out how many we have got left. Wow! We have only got 3 left!" Adults support children in recording their subtractions in the written form on whiteboards and in their maths books.

STRATEGY	CONCRETE	PICTORIAL	ABSTRACT
Taking away ones	 **Sand area** A game for 2 children. Ask the children to line up 10 pebbles or shells. The children take turns to choose whether they take 1, 2 or 3 pebbles. The winner is the player who avoids taking the last pebble. Knocking over skittles and counting how many are left.	 15 − 3 = 12 23 − 1 = 12 	18 − 3 = 7 − 3 = The shop had 12 cakes and 7 of them sold. How many were left?
Counting back	Use counters or objects and move away from the group as they are counted.	Use first, then now to tell simple maths stories to practise taking away in familiar contexts. First there were 5 people on the bus. Then 2 people got off the bus. Now there are 3 people on the bus. 4 5 6 7 8 9 10	Put 14 in your head and count back 5. What number did you land on?
Part, part whole model	If 10 is the whole and 6 is one of the parts. What is the other part?	9 Children should be taught the skills to approach problems in a systematic way.	I made 9 buns for the cake sale and I only had 2 left at the end. How many did I sell? 9 − 2 = ?
Finding the difference	Practical resources to visualise 'difference' and recognise inverse relationships e.g. 12-1=11 and 11+1=12	Comparison Bar Models Use a blank number line to count back and count up between 2 numbers.	Look at the graph. What is the difference between the children who have blue eyes and those who have green eyes?

Subtraction

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

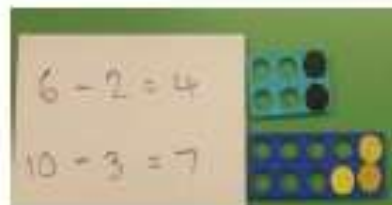| GUIDANCE/MODELS AND IMAGES	
Concrete apparatus is used to relate subtraction to taking away and counting how many objects are left.	$5 - 1 = 4$
Solve simple problems using fingers.	$5 - 3 = 2$
Construct number sentences verbally or using cards to go with practical activities.	
Children are encouraged to read sentences aloud in different ways "five subtract one leaves four" "four is equal to five subtract one."	
Count back to find the answer.	
Have an understanding of what "less" means and be able to say what is one less than a given number. What is 1 less than 9? 1 less than 20?	
Number tracks can be introduced to count back and to find one less.	
Children make a record in pictures, words or symbols of subtraction activities.	
Number lines can then be used alongside number tracks and practical apparatus to solve subtraction calculations and word problems.	$5 - 4 = 1$

Vocabulary:

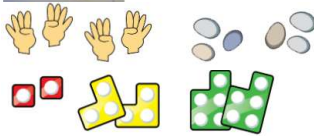Games and songs can be a useful way to begin using the vocabulary involved in subtraction.
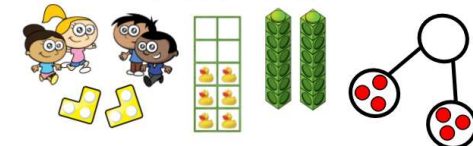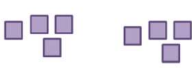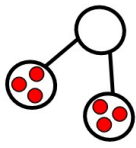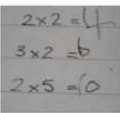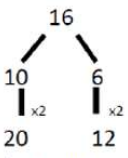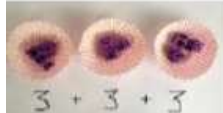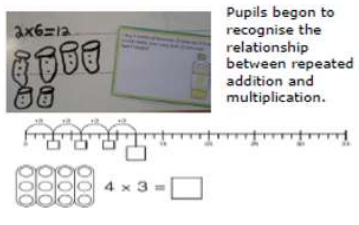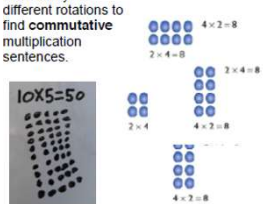
Take (away), leave, left/left over, less, fewer, difference.

Appendix 3: Multiplication and Division

<u>MULTIPLICATION</u>

By the end of Reception, children are expected to understand the concept of doubling and to be able to double a number up to 10. Before doubling can be introduced, children need to have a secure knowledge of counting, number facts and addition in order to double. Children are then introduced to the concept of doubling through practical games and activities, including the use of the outdoor areas. Children act out 'doubling' by physically add two equal groups together to find out the 'doubles' answer.

Additionally, children are expected to understand the concept of sharing (usually into two equal groups) and making sure that each group has an equal amount. Understanding of equality and fairness is crucial to this first step of exploring division.

STRATEGY	CONCRETE	PICTORIAL	ABSTRACT
Doubling	Allow the children to explore different ways to build doubles using real objects and practical equipment. Provide sets of dominoes and ask the children to find the doubles. Show the children how to play dominoes and look at the doubles they make as they play. **Play Doubles** The children take turns to roll 2 dice and score a point each time they roll a double. The first to reach 3 points wins the game.	Double 4 is 8	$2 \times 2 =$ $3 \times 2 =$ $2 \times 5 =$ 16 10 6 x2 x2 20 12 If I can see 10 wheels, how many bikes are there?
Counting in multiples		Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers and work out missing numbers in sequences both forward and backward. If I count in 2's will I get to the number 58?
Repeated addition	$5+5+5=15$ $3+3+3=9$	$2 \times 6 = 12$ Pupils begon to recognise the relationship between repeated addition and multiplication. $4 \times 3 = \square$	$2+2+2+2+2=10$ $2 \times 5 = 10$
Arrays	$3 \times 5 = 15$ $5 \times 3 = 15$ $15 - 3 = 5$ $15 \div 5 =$	Draw arrays in different rotations to find **commutative** multiplication sentences. $10 \times 5 = 50$ $4 \times 2 = 8$ $2 \times 4 = 8$ $2 \times 4 = 8$ 2×4 $4 \times 2 = 8$ $4 \times 2 = 8$	3 children go to the park to hunt for pine cones. They find 5 each, how many do they find altogether? 5 children eat the same number of cakes at a party. 15 cakes are eaten in total, how many did they each eat? $5+5+5=15$ $3 \times 5 = 15$ $3+3+3+3+3=15$ $5 \times 3 = 15$

Multiplication

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

The link between addition and multiplication can be introduced through doubling and reinforced through repeated addition of the same number.

Numicon is used to visualise the repeated adding of the same number.

5 + 5 + 5

Children begin with mostly pictorial representations e.g. How many groups of 2 are there? 2 + 2 + 2 + 2 + 2, so 5 groups of 2.

Real life contexts and use of practical equipment is used to count in repeated groups of the same size e.g. How many wheels are there altogether?

Children are encouraged to read number sentences aloud in different ways "five times two makes ten" "ten is equal to five multiplied by two" "ten is the same as five lots of two."

2, 4, 6, 8, 10, 12

Count in twos, fives and tens both aloud and with objects.

Children are given multiplication problems set in a real life context. Children are encouraged to visualise the problem e.g. How many fingers on two hands? How many sides on three triangles? How many legs on four ducks?

Vocabulary:
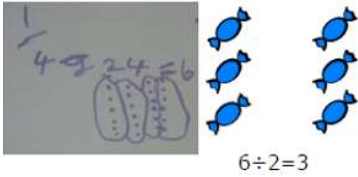
Lots of, groups of, times, repeated addition, double, combine.

DIVISION

STRATEGY	CONCRETE	PICTORIAL	ABSTRACT
Sharing		6÷2=3	Share 9 buns between three people. 9 ÷ 3 = 3 Can you make up your own 'sharing' story and record a matching equation?

Division and Fractions

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

GUIDANCE/MODELS AND IMAGES

Division can be introduced through halving or sharing an equal amount into 2 groups.

Children begin with mostly pictorial representations linked to real life contexts.

Children need to see and hear representations of division as both grouping and sharing.

Grouping model:

Mum has 6 socks. She grouped them into pairs. How many pairs did she make?

Sharing model:
I have 10 sweets. I want to share them with my friend. How many will we have each?

The sharing model is a useful way to introduce young children to fractions e.g. Can you cut the pizza in half?

Children make a record in pictures, words or symbols of division activities.

Children are encouraged to have a go at recording the calculation that has been carried out e.g. by arranging concrete objects into groups.
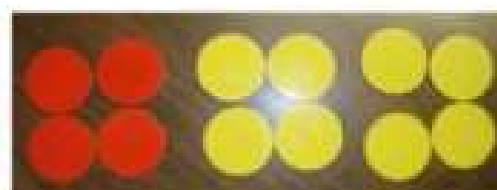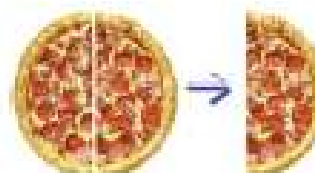
Vocabulary:

Half, halve, share, equal, groups of, left/left over.