Brookland Infant and Nursery School

WRITTEN CALCULATIONS POLICY

This policy has been largely adapted from the White Rose Maths Hub Calculation Policy with further material added.

Aims

- To outline for teaching staff and parents the written strategies for calculation taught at Brookland Infant School for addition, subtraction, multiplication and division, in line with the new curriculum for Mathematics.
- To show how using key pieces of practical maths apparatus helps to accelerate the children's learning.
- To ensure consistency of approach from one year group to the next.
- To enable children to develop confidence and fluency in calculations that they will be able to apply to a variety of problem-solving activities.

At Brookland Infants, we aim, through creative and inclusive lessons, to create a sense of excitement and curiosity around Mathematics. Children are encouraged to make links between what they are learning and the world around them. A high quality maths education provides a foundation for understanding of the world. Maths is essential to everyday life and necessary in almost all forms of employment. As children at Brookland Infants learn mathematics, they are acquiring fluency in mental methods (maths they do in their heads) as well as written methods.

Although the way we teach calculation is organised in a sequence, teaching staff work with the ethos that individual children's needs denote the part of the curriculum that should be accessed. Progression in mathematics for all children is essential and so, no matter what their starting point, through accurate assessment, high expectations and quality teaching, pupils are able to realise their mathematical potential. All teachers ensure children with special educational needs are as carefully planned for and inclusivity is at the heart of what we do. The Early Years Curriculum ensures mathematics is interactive, real life and encompasses adult led and child led activities. Cross-curricular links are made where possible, particularly in science, through the use of technology and during whole school topics. Children at Brookland Infants understand that mathematics can be found everywhere and in everything, and exploring and being creative with maths is essential to developing an enthusiasm and fascination for the subject.

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The National Curriculum for Mathematics aims to ensure all pupils:

- **Become fluent in fundamentals of mathematics so that they are efficient in using and selecting the appropriate written algorithms and mental methods, underpinned by mathematical concepts**
- **Can solve problems by applying their mathematics to a variety of problems with increasing sophistication, including in unfamiliar contexts and to model real-life scenarios**
- **Can reason mathematically by following a line of enquiry and develop and present a justification, including in unfamiliar mathematical language.**

At Brookland Infant School, children are first given the opportunity to explore mathematical concepts using the following practical resources;

Numicon – aids children in recognising how much a number is worth, ordering and comparing numbers. Numicon is also used to help children explain their mathematical thinking when problem solving.

Counters – counters are used to aid children with counting. We also use the different colours to represent different amounts, introducing algebraic thinking.

Bead strings – bead strings are used for all four operations (addition, subtraction, division and multiplication). They are also used to count up in different amounts.

Dienes/base 10 – used to demonstrate a visual representation when understanding the value of numbers. They are also used for all four operations. Dienes/base 10 are related to each other in terms of size helping children to compare numbers.

Place value table - aids children in understanding how much a number is worth. This is also used when multiplying and dividing by 10, 100 and 1000... showing how the digits move to the left or the right.

Hundred number square - used to aid early counting. Excellent for adding and subtracting 10. Children can use this to find patterns in multiplication tables.

Place value arrow cards – used to demonstrate how much a number is worth. Also used to partition numbers (break up into, for example, hundreds, tens and units) and add or subtract.
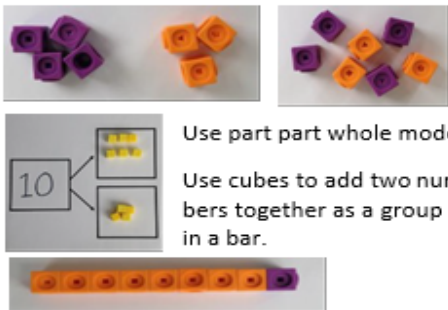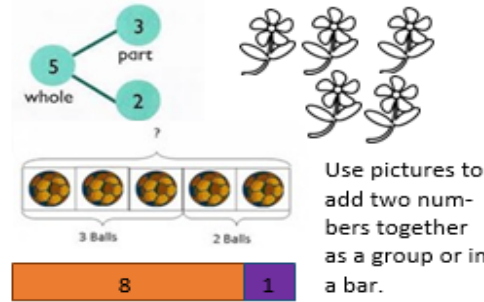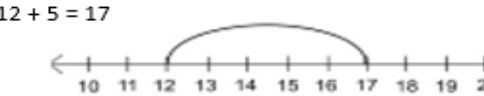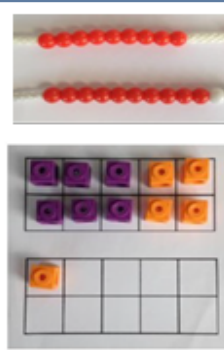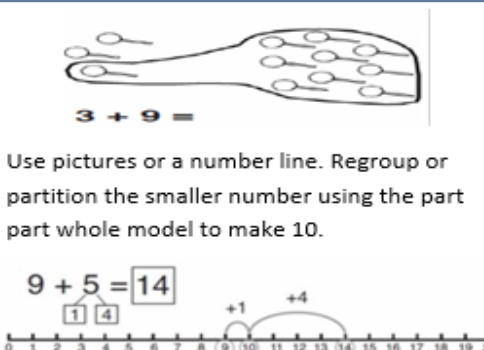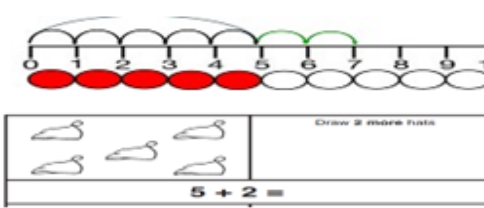
Money – used when problem solving with money and to help understanding of decimals.
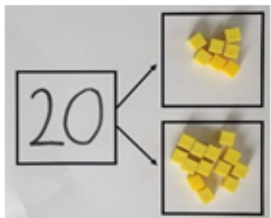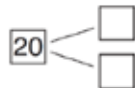
Year 1 Addition
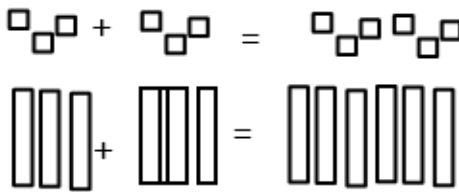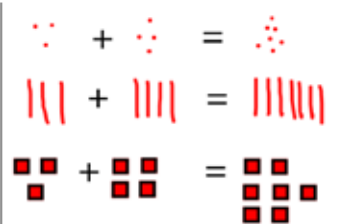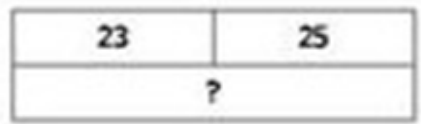
Objective & Strategy	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	Use part part whole model. Use cubes to add two numbers together as a group or in a bar.	Use pictures to add two numbers together as a group or in a bar.	$4 + 3 = 7$ $10 = 6 + 4$ Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	$12 + 5 = 17$ Start at the larger number on the number line and count on in ones or in one jump to find the answer.	$5 + 12 = 17$ Place the larger number in your head and count on the smaller number to find your answer.
Regrouping to make 10. *This is an essential skill for column addition later.*	$6 + 5 = 11$ Start with the bigger number and use the smaller number to make 10. Use ten frames.	$3 + 9 =$ Use pictures or a number line. Regroup or partition the smaller number using the part part whole model to make 10. $9 + 5 = \boxed{14}$	$7 + 4 = 11$ If I am at seven, how many more do I need to make 10. How many more do I add on now?
Represent & use number bonds and related subtraction facts within 20	2 more than 5.	$5 + 2 =$	Emphasis should be on the language '1 more than 5 is equal to 6.' '2 more than 5 is 7.' '8 is 3 more than 5.'

Year 2 Addition
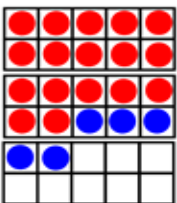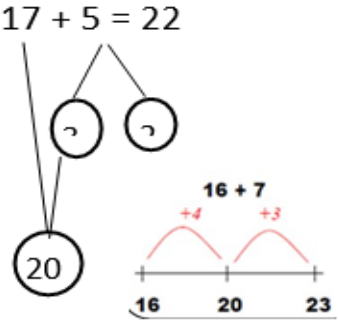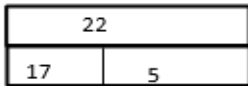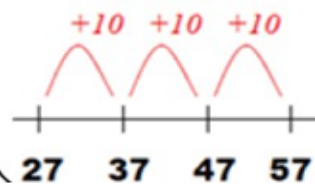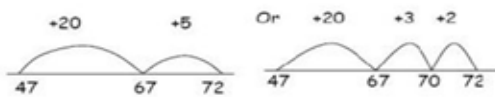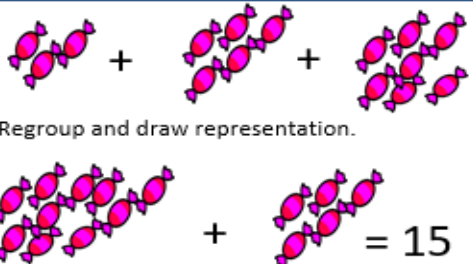
Objective & Strategy	Concrete	Pictorial	Abstract
Adding multiples of ten	50= 30 = 20 Model using dienes and bead strings	3 tens + 5 tens = _____ tens 30 + 50 = _____ Use representations for dienes.	20 + 30 = 50 70 = 50 + 20 40 + □ = 60
Use known number facts Part part whole	20 Children explore ways of making numbers within 20	20 < □ □ □ + □ = 20 20 − □ = □ □ + □ = 20 20 − □ = □	□ + 1 = 16 16 − 1 = □ 1 + □ = 16 16 − □ = 1
Using known facts	□□ + □□ = □□□□ III + III = IIIIII	· + · = · III + IIII = IIIIIII ■ + ■ = ■ Children draw representations of H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700
Bar model	3 + 4 = 7	7 + 3 = 10	23 | 25 ? 23 + 25 = 48

Brookland Infant and Nursery School

Year 2 Addition

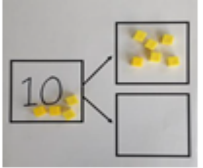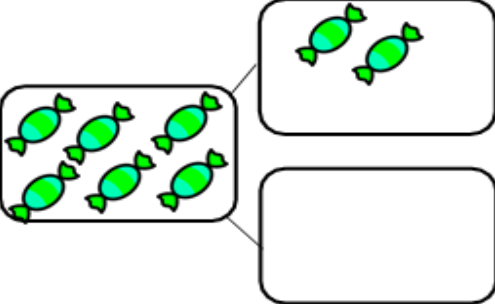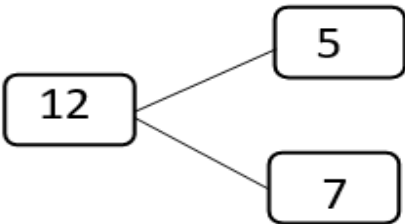| Objective & Strategy	Concrete	Pictorial	Abstract
Add a two digit number and ones	$17 + 5 = 22$ Use ten frame to make 'magic ten. Children explore the pattern. $17 + 5 = 22$ $27 + 5 = 32$	$17 + 5 = 22$ Use part part whole and number line to model. $16 + 7$	$17 + 5 = 22$ Explore related facts $17 + 5 = 22$ $5 + 17 = 22$ $22 - 17 = 5$ $22 - 5 = 17$
Add a 2 digit number and tens	$25 + 10 = 35$ Explore that the ones digit does not change	$27 + 30$ $+10$ $+10$ $+10$ 27 37 47 57	$27 + 10 = 37$ $27 + 20 = 47$ $27 + \square = 57$
Add two 2-digit numbers	Model using dienes, place value counters and numicon	$+20$ $+5$ Or $+20$ $+3$ $+2$ 47 67 72 47 67 70 72 Use number line and bridge ten using part whole if necessary.	$25 + 47$ $20 + 5$ $40 + 7$ $20 + 40 = 60$ $5 + 7 = 12$ $60 + 12 = 72$
Add three 1-digit numbers	Combine to make 10 first if possible, or bridge 1o then add third digit	Regroup and draw representation. $+ = 15$	$4 + 7 + 6 = 10 + 7$ 10 $= 17$ Combine the two numbers that make/bridge ten then add on the third.

Brookland Infant and Nursery School

Year 1 Subtraction
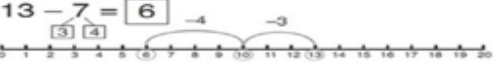
Objective & Strategy	Concrete	Pictorial	Abstract
Taking away ones.	Use physical objects, counters, cubes etc to show how objects can be taken away. $6-4 = 2$ $4-2 = 2$	$15 - 3 = \boxed{12}$ Cross out drawn objects to show what has been taken away.	$7-4 = 3$ $16-9 = 7$
Counting back	Move objects away from the group, counting backwards. Move the beads along the bead string as you count backwards.	-1 -1 -1 $5 - 3 = 2$ Count back in ones using a number line.	Put 13 in your head, count back 4. What number are you at?
Find the Difference	Compare objects and amounts 7 'Seven is 3 more than four' 4 'I am 2 years older than my sister' 5 Pencils 3 Erasers ? Lay objects to represent bar model.	Count on using a number line to find the difference. +6	Hannah has12 sweets and her sister has 5. How many more does Hannah have than her sister?

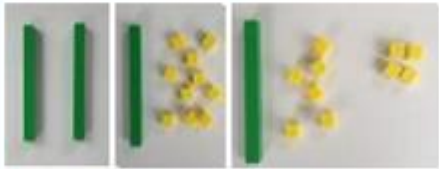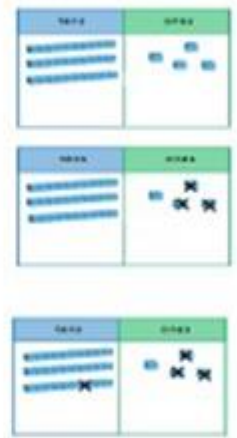**Brookland Infant and Nursery School**

Year 1 Subtraction

Objective & Strategy	Concrete	Pictorial	Abstract
Represent and use number bonds and related subtraction facts within 20 Part Part Whole model	Link to addition. Use PPW model to model the inverse. 10 If 10 is the whole and 6 is one of the arts, what s the other part? $10 - 6 = 4$	Use pictorial representations to show the part.	Move to using numbers within the part whole model. 12 → 5 12 → 7
Make 10	$14 - 9$ Make 14 on the ten frame. Take 4 away to make ten, then take one more away so that you have taken 5.	$13 - 7$ $13 - 7 = 6$ Jump back 3 first, then another 4. Use ten as the stopping point.	$16 - 8$ How many do we take off first to get to 10? How many left to take off?
Bar model	$5 - 2 = 3$		8 | 2 $10 = 8 + 2$ $10 = 2 + 8$ $10 - 2 = 8$ $10 - 8 = 2$

Year 2 Subtraction
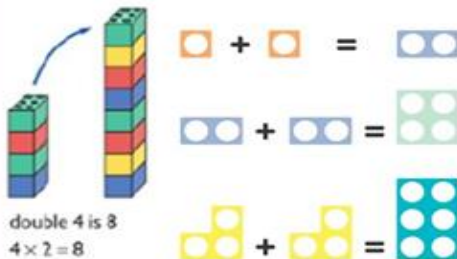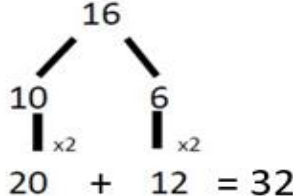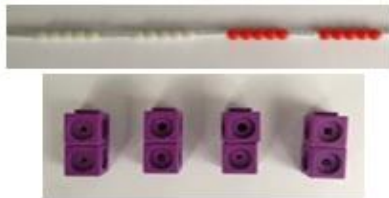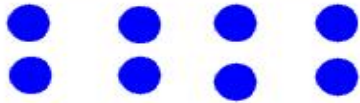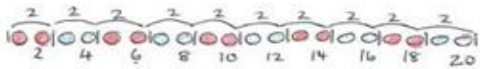
Objective & Strategy	Concrete	Pictorial	Abstract
Regroup a ten into ten ones	Use a PV chart to show how to change a ten into ten ones, use the term 'take and make'	$20 - 4 =$	$20 - 4 = 16$
Partitioning to subtract without regrouping. 'Friendly numbers'	$34 - 13 = 21$ Use Dienes to show how to partition the number when subtracting without regrouping.	Children draw representations of Dienes and cross off. $43 - 21 = 22$	$43 - 21 = 22$
Make ten strategy Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.	$34 - 28$ Use a bead bar or bead strings to model counting to next ten and the rest.	$76 \quad 80 \quad 90 \quad 93$ 'counting on' to find 'difference' Use a number line to count on to next ten and then the rest.	$93 - 76 = 17$

Year 1 Multiplication
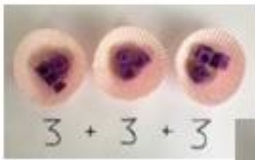
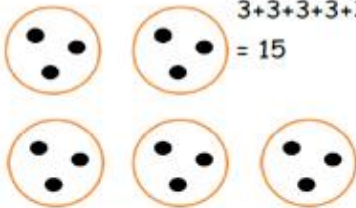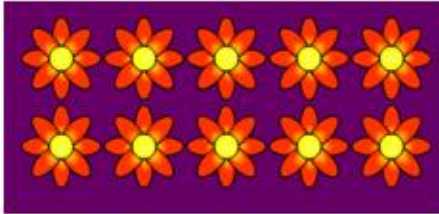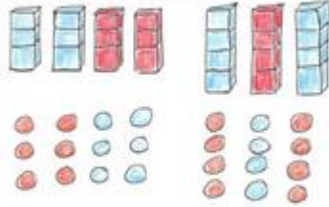**Brookland Infant and Nursery School**

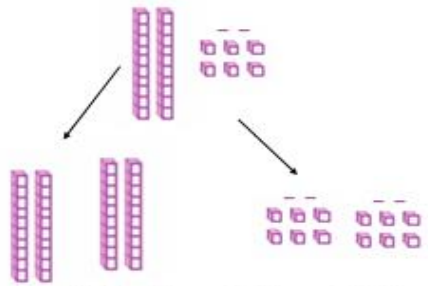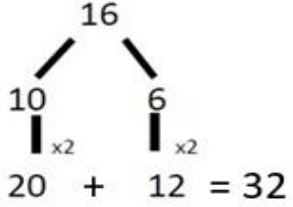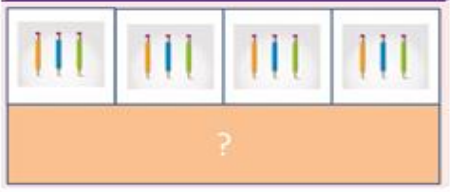| Objective & Strategy	Concrete	Pictorial	Abstract
Doubling	Use practical activities using manipultives including cubes and Numicon to demonstrate doubling double 4 is 8 $4 \times 2 = 8$	Draw pictures to show how to double numbers Double 4 is 8	Partition a number and then double each part before recombining it back together. 16 / 10 \ 6, x2, x2, 20 + 12 = 32
Counting in multiples	Count the groups as children are skip counting, children may use their fingers as they are skip counting.	Children make representations to show counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Making equal groups and counting the total	$\square \times \square = 8$ Use manipulatives to create equal groups.	Draw 🐟 to show $2 \times 3 = 6$ Draw and make representations	$2 \times 4 = 8$

Year 1 Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract
Repeated addition	Use different objects to add equal groups	Use pictorial including number lines to solve problem. There are 3 sweets in one bag. How many sweets are in 5 bags altogether? 3+3+3+3+3 = 15	Write addition sentences to describe objects and pictures. 2 + 2 + 2 + 2 + 2 = 10
Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc.	Draw representations of arrays to show understanding	3 x 2 = 6 2 x 5 = 10

Year 2 Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract
Doubling	Model doubling using dienes and PV counters. $40 + 12 = 52$	Draw pictures and representations to show how to double numbers	Partition a number and then double each part before recombining it back together. 16 10 ×2 6 ×2 $20 + 12 = 32$
Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition)	Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models. $5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40$?	Number lines, counting sticks and bar models should be used to show representation of counting in multiples. | 3	3	3	3 | ?	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30 $4 \times 3 = \square$