Beeston Primary School

Calculation Policy: Overview and Aims

Agreed by Governing Body	
Review date	
Responsible for this policy	

Overview:

This document outlines the calculation policy for Beeston Primary School. This has been devised to meet the requirements of the National Curriculum 2014 and ensure a consistent approach to the teaching and learning of mathematics. The policy places specific focus on students' ability to:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing argument, justification or proof using mathematical language
- solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

Aims

This calculation policy aims to ensure that all students:

- understand important concepts and make connections within mathematics
- show high levels of fluency in performing written and mental calculations
- are taught a range of consistent calculations strategies which prepares them for the next stage of learning
- are able to add, subtract, multiply and divide effectively using a range of strategies (including mental strategies)
- are competent in fluency, reasoning and problem solving
- are able to explore and choose concrete, pictorial or abstract ways of working

Beeston Primary School: Progression in Addition

These notes show the stages in building up to a formal written method for addition. Our aim is that children use mental methods when appropriate but for calculations that they cannot do in their heads they choose an appropriate written method which they can use accurately and with confidence. Time must be taken building up to the formal written method to ensure complete understanding at each stage.

Common Misconceptions: Put the biggest number on top

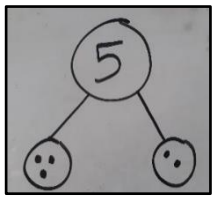
Stage 1 - Practical Addition

Children should add single digit numbers together using practical objects. Children will first add by counting all the objects. Later (when they are able to subitise) they will start with the largest group of objects and count on. Children should not be exposed to number sentences at this stage.



Children should:

1. Use practical objects such as dinosaurs, toy cars, toy sheep etc.
2. Use mathematical representations of numbers e.g. Numicon, counters, multilink cubes, part-whole models, ten frames, etc.







Use number tracks and numbered number lines to show addition by counting on in ones.


Children need to be able to:

Foundation

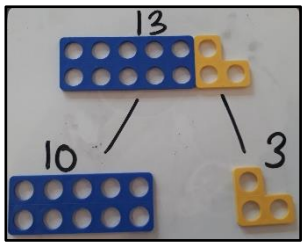
- Have one to one correspondence
- Reliably count objects up to 20.
- Recognise numerals up to 20.
- Say one more than any number up to 20.
- Subitise up to 5 objects. (Instantly recognise how many there are without having to count).

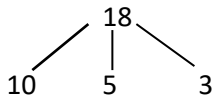
Key Vocabulary:

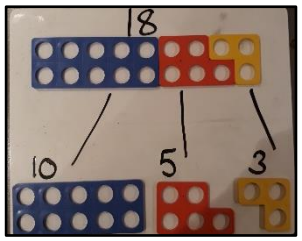
Add, more, and, make, altogether, total, equals.

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Stage 2 – Introduce concept of partitioning numbers into tens and ones







Number lines

1. Numbered number lines

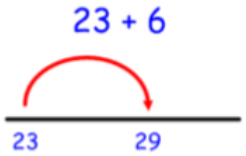
   Children should be able to count on using a numbered number line. They should first be able to count on in ones, then by adding tens and ones

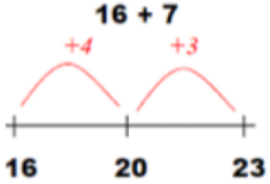
2. Empty number lines

   The empty number line helps to record the steps on the way to calculating the total. The steps often bridge through a multiple of ten. Allow children to experiment with the order of adding to allow them to understand that addition can be done in any order. Eventually refine this to starting with the largest number, adding the tens and then adding the ones.

   Progression:

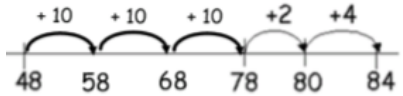
   1. 2digit + 1 digit – within the tens then move on to bridging over ten.



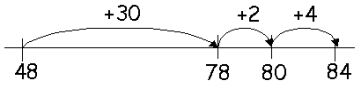


   2. 2 digit + 1 digit – within the tens then when secure move on to adding groups of tens.

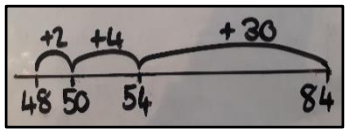
48 + 36 = 84



48 + 36 = 84



Or



Children need to be able to:

Key Stage 1: Year 1/2

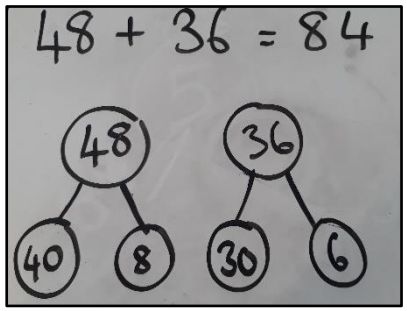
- Read and write numbers to 100 in numerals.
- Recall number bonds to 20 and addition facts within 20.
- Solve one step problems involving addition using practical resources, pictorial representation and number lines.
- Show that adding can be done in any order (the commutative law).
- Recognise that addition is the inverse of subtraction.
- Secure place value of two-digit numbers.

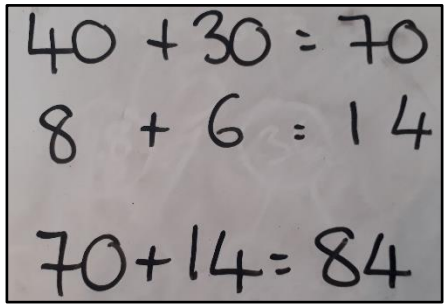
Key Vocabulary:

Add, more, and, make, altogether, total, equals,
plus, sum, addition, partition, count on, tens boundary.

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

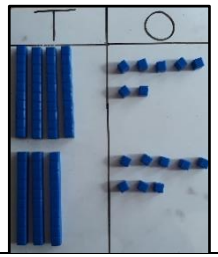
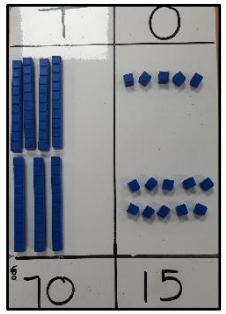
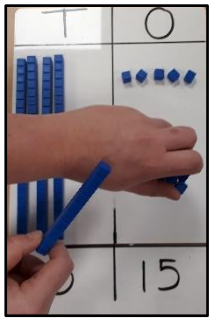
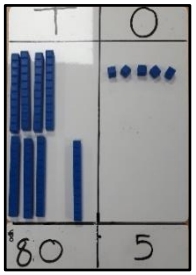
3. Children can solve number problems such as 13 + 9 or 15 + 11 by using the number facts 9 = 10 – 1 and 11 = 10 + 1
Children should also be encouraged to partition numbers using a range of representations e.g. part whole models and Numicon.





Stage 3 - Expanded Column Method

The expanded column method leads children on to the compact column method. It should be taught using base ten apparatus and it is important that children can do this practically before they start to record their method. e.g. 47 + 38 = 85

	T Ones 40 7 + 30 8	Written Method for books: 40 + 7 + 30 8 10 80 + 5	Children should partition both numbers and create these numbers using base ten. They should then set them out on a place diagram mat as shown in the photo.
	T Ones 40 7 + 30 8 70 15		Children should group all the ones together and all the tens together.
	T Ones 40 7 + 30 8 1 70 ~~15~~ 5		Children then physically compare ten ones to one ten and exchange the ten ones for the ten. Move the newly formed ten into the tens column and remove the ones.
	T Ones 40 7 + 30 8 ~~1~~ 80 5		Children should then count up how many tens and how many ones they have. They can then recombine them to attain their answer. The sum of 47 and 38 is 85

Children need to be able to:

Lower KS2 - Year 3/4

- Estimate answers.
- Have a secure understanding of place value up to 1000.
- Understand subtraction as the inverse of addition.
- Read and write numbers in words and digits up to 1000.
- Add multiples of ten together.
- Solve two step problems (including missing number problems) involving addition

Key Vocabulary:

Add, more, and, make, altogether, total, equals,
plus, sum, addition, partition, increase, exchange.

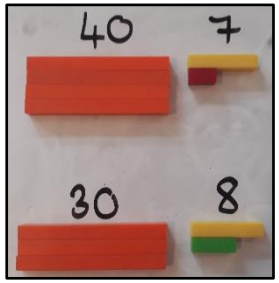
Progression

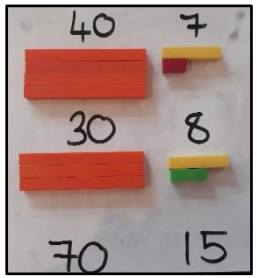
1. Add two 2-digit numbers with exchange e.g. 47 + 38
2. Add two 2-digit numbers with a sum greater than 100

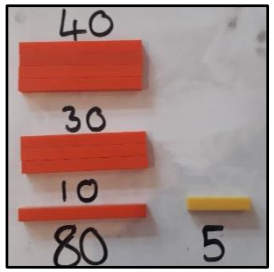
Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Children should be encouraged to use a range of representations to understand expanded column method:

Cuisenaire rods:







Bar Modelling:

47	38
85	

Stage 4

Compact column method

This is the formal standard method of addition. This method should be taught when children are completely confident in using the expanded column method and can prove this by using base ten apparatus. Use the words "exchange ten" or "exchange one hundred" **not** "carry".

e.g. 789 + 642 = 1431

	Th	H	T	Ones
		7	8	9
+		6	4	2
		1	1	
	1	4	3	1

It is important that children say "8 tens add 4 tens" not "8+4".

Progression

1. Addition of two, three and four digit numbers. (Two or more numbers).
2. Addition of two, three and four digit numbers (more than two numbers).
3. Additional of decimal numbers to 1, 2 and 3 decimal places; including amounts of money and other measures (fractions used as place holders for decimal numbers).

	T	Ones	.	$\frac{1}{10}$	$\frac{1}{100}$
	1	2	.	3	4
+	2	1	.	5	2
	3	3	.	8	6

Ones could also be written upwards so that it only takes up a single column.

4. Addition of decimal numbers where the two numbers have a different number of decimal places e.g. 1.78 + 54.

Children needs to be able to:
Upper Key Stage 2: Year 5/6

- Have a secure understanding of the expanded column method.
- Have a secure understanding of place value to 10 000 000.
- Have a secure understanding of decimal numbers to 3 decimal places.
- Understand subtraction as the inverse of addition.
- Solve complex multi-step problems (including missing number problems) involving addition.
- Estimate answers and use this to check their answer.
- Have fluent mental addition skills.

Key vocabulary:
Add, more, make, altogether, total, equals, plus, sum, addition, partition, increase, exchange, decimal, decimal point, tenths, hundredths, thousandths, inverse

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?