Brompton-on-Swale Maths Policy 2017

Agreed by the Governing Body on:	July 2017
Review Date	September 2020
Review Schedule	Annual
Person(s) Responsible	Sam Marino

Rationale

"...teachers' knowledge of mathematics for teaching must be like an experienced taxi driver's knowledge of a city, whereby one can get to significant places in a wide variety of ways, flexibly and adaptively."

At Brompton-on-Swale we firmly believe that Mathematics starts from a desire to explain the real world. It is a creative subject in which ideas can be generated, investigated, tested and refined. It is a time to think and enjoy an exciting journey that is saturated with exploration, reasoning and finding key relationships.

Aims

We aim for all of our children to be strong mathematicians because they:

- ✓ Enjoy the wonders of mathematics and strive to challenge themselves
- ✓ Have a strong conceptual understanding of maths; its concrete, visual and abstract structures and their relationships
- ✓ Can recall, retain and apply their knowledge confidently and efficiently in a range of contexts
- ✓ Ask challenging questions that allow maths investigations to dig deeper and explore hidden patterns
- ✓ Are not afraid to answer incorrectly but will take that opportunity to ask 'how' 'why' 'what if' and 'why not'
- ✓ Take time to reason and explore other routes to problem solving at every opportunity

As a teaching staff, we aim to:

- ✓ Keep up-to-date with recent pedagogy and methods
- ✓ Ensure all children are challenged and supported throughout each mathematical topic
- ✓ Give children time to think, explore and discuss a range of mathematical avenues
- ✓ Think out loud to model mathematical thinking and methods
- ✓ Share our love of mathematics and how it links to everyday life and other contexts
- ✓ Illustrate how to build understanding of the formal methods by using a range of practical equipment and pictorial representations.

Teaching

Teaching aims

We aim to place investigations, problem solving and reasoning skills at the heart of our mathematics teaching. We recognise that collaboration and communication are crucial life skills and should be developed in our mathematics teaching. The expectation is that all children welcome challenge, can link mathematical topics to each other and build a strong understanding of the relationships between them.

Through careful assessment, planning and preparation we aim to ensure that all children progress once the basic concept is understood. All children are given the opportunity to use concrete manipulatives to enhance their understanding of each mathematical concept, they will then be asked to create or show examples of how this could look pictorially. This ensures that all children can make clear links between concepts and can see what is happening, the changes that have taken place and the outcomes of that method. Those who grasp new material quickly will be able to access a range of fluency challenges leading onto rich problem solving and reasoning tasks.

Achieving Mastery

'Go down deep enough into anything and you will find mathematics' ~ Dean Schlicter

In the Classroom

CPA (Concrete, Pictorial and Abstract)

Children are not grouped according to 'ability'; this allows every child to access the mastery curriculum. Once children have spent time exploring the concept using concrete manipulatives and can recognise how it can be represented pictorially, the teacher will then model how this method is expressed using abstract forms

This teaching model allows all children the opportunity to move children's thinking deeper and at a rapid pace (once the basic concept is understood). Teachers therefore have the opportunity to choose whatever route necessary to guide children who need more concrete and pictorial support in order fully understand and embed the basic concept.

Fluency

Children will complete a fluency challenge (this will ensure children can apply the new mathematical concept in a range of different contexts). Teachers will think carefully about the fluency questions they choose and may have key patterns/links running throughout. This allows teachers and pupils to discuss and question the topic in a much deeper way by unpicking key relationships. Please see appendix 1 for examples of fluency challenges.

Problem solving and reasoning

Once children are confident with the basic concept they will move through three stages of problem solving challenges. This will progressively deepen their understanding, drawing on the fluency they have been taught and into wider areas of maths**.** The final challenge should stretch children's knowledge and understanding and incorporate a range of mathematical concepts that allow for a range of reasoning and problem solving.

Expectations for CMM across the school

Foundation Stage:

The concrete: All children in FS to become confident in using a range of mathematical manipulatives to understand basic concepts and the relationships between numbers.

CPA: Maths mental oral starters and daily maths input will be used to model and explore the concrete and how it could be represented using abstract numbers. Children will learn to count in tens and ones while learning the 'real name' for each number;

10 1 = 11

10 2 = 12

Fluency: Children will complete a range of fluency challenges within their morning tasks and through 1-1/group tasks within the creative areas. Talking postcards offer children challenges and thought provoking questions, these are embedded into children's learning and are used to engage and deepen children's understanding.

Evidence: There will be recorded evidence of self-initiated investigations and mathematical enquiries. There will also be examples of structured or supported tasks where the children have been questioned and challenged.

Year 1:

Autumn Term – Focus on number using the CPA approach. Children to build a strong understanding of the number system and the relationships between numbers.

Teachers to model reasoning and problem solving as part of a hook/plenary and explore as a class to build a safe environment for deeper thinking and questioning

Spring Term: Children to work independently using the CPA approach. Teachers to explore reasoning and problem solving with the children as part of their daily teaching and begin to explore …why…what if… type questions. During this term children to be able to access problem solving in small groups (using postcards with the question recorded). Children to start and record independent thinking/strategies.

Summer Term: By the end of the summer term, children to be independent thinkers. Majority of children to explain how or why they think the answer is correct/incorrect. Children to access an independent maths wall (a simplified version of the full CMM working wall in y2-6)

In books: Evidence of investigating number and group questioning/challenges. Children to become more independent over the year and books will show evidence of number development and how this is used to problem solve and reason.

Years 2-6:

Feedback/next steps from the previous session. Children to complete any challenges, recaps or misconceptions.

Maths Starter – children to complete a short morning challenge. This can be an arithmetic/reasoning challenge based on children's gaps/needs. Starters that offer further relationships/links are advised to promote deeper mathematical discussions.

C- The Concrete: Children to use manipulatives to gain a solid understanding of the mathematical concept.

P- The Pictorial: Teachers to allow children to create ways to represent the concept. After sharing good examples the teacher will give a mathematical representation (in the form of a bar model etc)

Some children in upper ks2 may feel confident to start at this point and will be highlighted in their book as 'Show me.' Teachers to ensure all children have access to the concrete and move on at a rapid pace once any gaps have been filled and the concept is fully understood (in its most basic form).

A- The Abstract: Once children have a solid understanding of the mathematical concept and can visually see the links between the 'how' and 'why' teachers will demonstrate how this could be represented using number (the 'abstract'). Teachers are expected to refer to the concrete and the pictorial throughout this section to ensure the links are embedded.

Fluency: a vast variation of questions in an array of contexts – can children apply the mathematics in other ways? Can they make links between questions?

Think: Convince me that… Children to prove their answers to their teacher by explaining their reasoning.

Explain: Children to complete more complex reasoning and problem solving and explain their route to solving them. Children who complete this level must be able to find different ways to get to the answer and be able to explore the problem deeper if a variable changes.

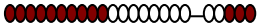
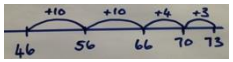
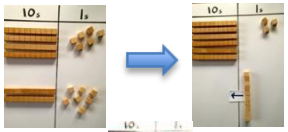
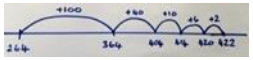
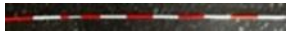
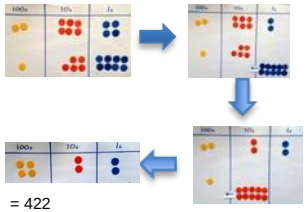
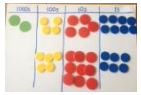
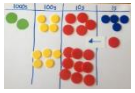
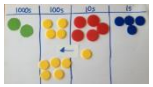
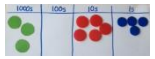
Solve: Pupils deepen their understanding by giving an example by investigating, sorting, comparing or by looking for patterns and rules in the representations they are exploring the problem with. Children will be expected to use a range of mathematical concepts to reason and problem solve.

Calculation Policy

We acknowledge the calculation policy that has been created by the AET maths hub. This has been adapted. Specific practical equipment and approaches have been suggested for each age group to support children in developing the conceptual understanding that will enable them to move more rapidly and efficiently towards the formal written methods expected.

The 'Foundations' section for each year group highlights the skills and knowledge that should be addressed on a regular basis within this year group to ensure that children have the requisite fluency to address the new approaches required.

Addition

Written Methods	Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs	Add and subtract two two-digit numbers using concrete objects, pictorial representations progressing to formal written methods 4 6 + 2 7 7 3 1	Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction 4 2 3 + 8 8 5 1 1 1 1	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition where appropriate 2 4 5 8 + 5 9 6 3 0 5 4 1 1 1	Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
Developing conceptual understanding	Number bonds  (Ten frame) Numicon Use bonds of 10 to calculate bonds of 20  Count all  Count on  Count on, on number track, in 1s 	Number track / Number line – jumps of 1 then efficient jumps using number bonds 18 + 5 = 23  46 + 27 = 73 Count in tens then bridge.  25 + 29 by + 30 then - 1 (Round and adjust)  Partition and recombine 46 + 27 = 60 + 13 = 73  24 +10 +10 +10 = 54 	Number line: 264 + 158 efficient jumps  40 + 80 = 120 using 4 + 8 = 12 So 400 + 800 = 1200  243 + 198 by +200 then -2 (Round and adjust) Pairs that make 100 23 + 77  Place value counters, 100s, 10s, 1s 264 + 158  = 422 (Also with £, 10p and 1p)	Place Value Counters 2458 + 596 Show 2458 and 596  Combine the 1s. Exchange ten 1s for a 10 counter.  Combine the 10s. Exchange ten 10s for a 100 counter.  Combine the 100s. Exchange ten 100s for a 1000 counter  Read final answer Three thousand and fifty-four. 	Set out the calculation In columns. Find the sum of the ones. 4 ones + 6 ones = 10 ones (or 1 ten and 0 ones) so record 0 in the ones and 1 below the line in the tens. Find the sum of the tens. 5 tens + 9 tens + 1 ten = 15 tens (or 1 hundred and 5 tens) so record a 5 in the tens and 1 below the line in the hundreds. Find the sum of the hundreds. 4 hundreds + 5 hundreds + 1 hundred = 10 hundreds (or 1 thousand and 0 hundreds) so record a 0 in the hundreds and a 1 in the thousands. Find the sum of the thousands. 3 thousands + 1 thousand = 4 thousands so record a 4 in the thousands column. Find the sum of the ten thousands. There are only 2 ten thousands so record a 2 in the final column	
With jottings **... or in your head**	Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ☐ – 9	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	Add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens * a three-digit number and hundreds	Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	Add and subtract numbers mentally with increasingly large numbers	Perform mental calculations, including with mixed operations and large numbers
Just know it!	Represent & use number bonds and related subtraction facts within 20 Add and subtract one-digit and two-digit numbers to 20, including zero	Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100				
Year	**1**	**2**	**3**	**4**	**5**	**6**
Foundations	1 more	10 more Number bonds: 20, 12, 13	Add multiples of 10, 100	Add multiples of 10s , 100s, 1000s	Add multiples of 10s , 100s, 1000s, tenths,	Add multiples of 10s , 100s, 1000s, tenths, hundredths
	Number bonds: 5, 6	Number bonds: 14,15 Add 1 digit to 2 digit by bridging.	Add single digit bridging through boundaries	Fluency of 2 digit + 2 digit	Fluency of 2 digit + 2 digit including with decimals	Fluency of 2 digit + 2 digit including with decimals

	Largest number first. Number bonds: 7, 8	Partition second number, add tens then ones	Partition second number to add Pairs of 100	Partition second number to add Decimal pairs of 10 and 1	Partition second number to add	Partition second number to add
	Add 10. Number bonds: 9, 10	Add 10 and multiples. Number bonds: 16 and 17	Use near doubles to add	Use near doubles to add	Use number facts, bridging and place value	Use number facts, bridging and place value
	Ten plus ones. Doubles up to 10	Doubles up to 20 and multiples of 5 Add near multiples of 10.	Add near multiples of 10 and 100 by rounding and adjusting	Adjust both numbers before adding Add near multiples	Adjust numbers to add	Adjust numbers to add
	Use number bonds of 10 to derive bonds of 11	Number bonds: 18, 19 Partition and recombine	Partition and recombine	Partition and recombine	Partition and recombine	Partition and recombine