Date Adopted: **Spring 2020**
Date to be reviewed: **Spring 2022**

Quadring Cowley and Brown's Primary School

Progression Through Written Calculation Policy

At Quadring Cowley and Brown's Primary School we strive 'to nurture and inspire all children to be well-rounded, confident and resilient individuals who love learning and are ready for life beyond school.'

Article 3- The best interests of the child must be top priority in all actions regarding children.
Article 29- Children's education should develop each child's personality, talents and abilities to the full.

Progression towards a standard written method of calculation

'Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. Pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophistacted problems'
National Curriculum Framework, DfE 2014

Purpose of the Policy

This calculation policy has been written to meet the requirements of the National Curriculum 2014, for the teaching and learning of Mathematics. It provides guidance on appropriate calculation methods and is designed to give pupils a consistent and smooth progression in calculations across the whole school. This Policy must be used in conjunction with the 'Mathematics Policy'. It has also been written in line with the NCETM recommendations.

Aims of the Policy

- To ensure consistency and progression in our approach to calculation
- To support children in becoming more efficient and succinct in their recordings which will ultimately lead to efficient, reliable, formal written methods of calculation for all operations.
- To ensure that children can use these methods accurately with confidence and understanding
- To enable children to learn to interpret and use the signs and symbols.
- To facilitate children's use of models and images to support their mental and informal written methods of calculation.
- To enable children to strengthen and refine their mental methods in order to develop informal written methods.
- By the end of Key Stage 2 children should be equipped with mental and written methods that they understand and can use correctly, and when faced with a calculation, children will be able to decide which method is most appropriate and have strategies to check its accuracy

Age stage expectations

The calculation policy is organised according to the age stage expectations as set out in the National Curriculum 2014. However it is vital that pupils are taught according to the stage that they are currently working at not their age. Children should only be moved to the next stage when they conceptually understand their learning and have mastered the skills and knowledge and can apply this in a variety of contexts.

Providing a context for calculation

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

At whatever stage in their learning, and whatever method is being used, children's methods of calculating will 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 it was successful.

Mental methods of calculation

Oral and mental mathematics is essential, particularly so in calculation. Early practical, oral and mental work lays the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later learning and skill development must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. Ongoing oral and mental mathematics learning provides practice and consolidation of these ideas. It must give children the opportunity to apply what they have learned and allow children make decisions and choices for themselves.

The ability to calculate mentally forms the basis of all methods of calculation. A good knowledge and sense of numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills.

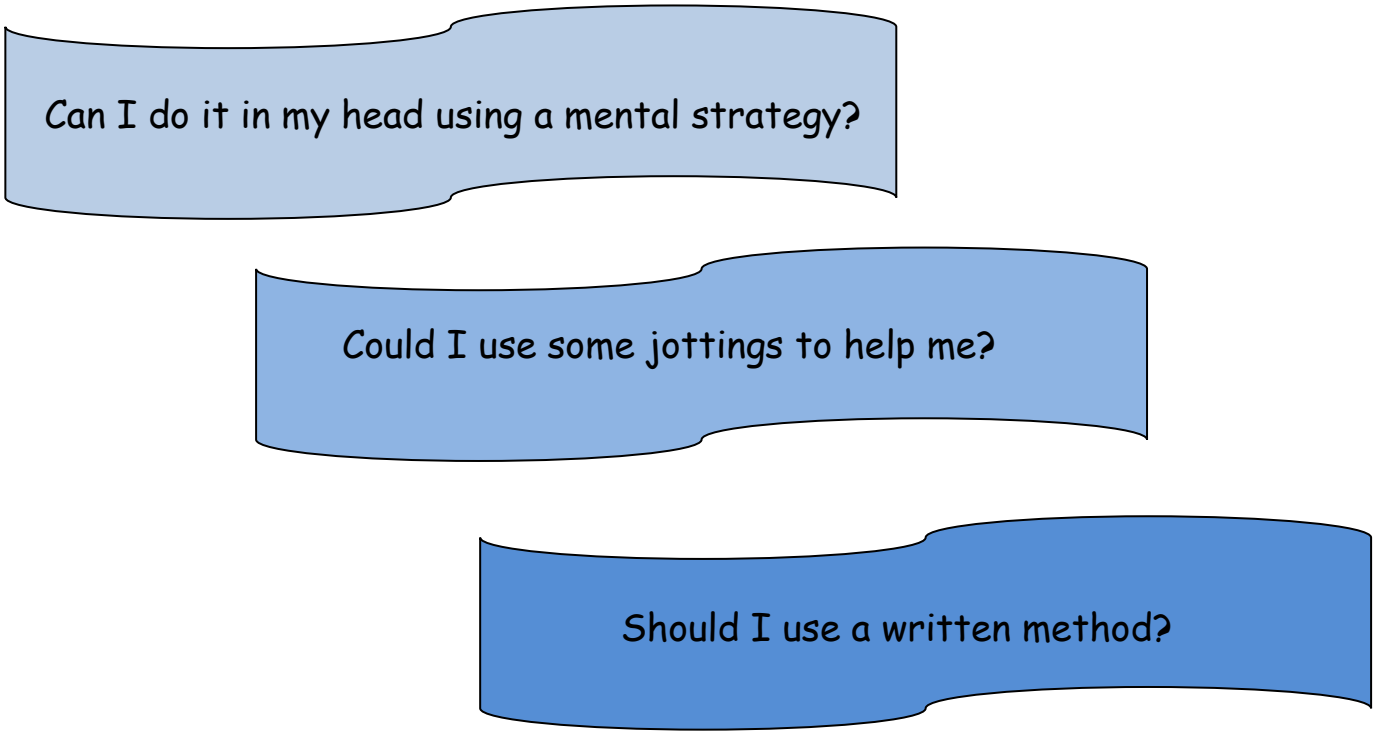
Children will use mental methods as their first port of call when appropriate, but for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence

Calculation in EYFS

The practice in Foundation Stage will follow the DfES curriculum guidance and will work towards the Early Learning Goals. This policy is designed to support and build on progressively from the content and methods established in the Early Years Foundation Stage.

Choosing a Calculation Method

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved.



Using the Policy Effectively

- The policy should be used as a basis of planning for calculation work and must be used in conjunction with the National Curriculum Programmes of Study for Mathematics 2014.
- Always use Assessment for Learning to identify suitable next steps in calculation for all children.
- If, at any time, children are making significant errors, return to the previous stage in calculation.
- Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate.
- Encourage children to make sensible choices about the methods they use when solving problems.
- Always ensure that the correct vocabulary is being used at each stage of learning.

Glossary of Terms

Cardinal Number	The number of items in a set, the quantity but not the order of things. E.g. There are five pencils in a pot.
Conservation of Number	If a group of objects is rearranged, the total number of objects stays the same.
Consecutive	Following in order Consecutive numbers are adjacent in a count. E.g.7, 8, 9 are consecutive numbers. 12, 18, 24 are consecutive multiples of 6
Commutativity	For addition and multiplication, the numbers in a calculation can be in any order and the result will be the same answer. E.g. 2 x 5 = 10 and 5 x 2 = 10 or 4 + 5 = 9 and 5 + 4 = 9 Addition and multiplication are commutative. Subtraction and Division are not commutative. But children must understand that the numbers in a calculation can also be in any order but will result in a different answer. E.g. 8 – 3 = 5 and 3 – 8 = -5
Digit	One of the symbols of a number system. Most common the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. E.g. the number 32 is a two digit number; 7 is a one digit number. The position or place of a digit in a number conveys its value.
Dividend	The quantity which is to be divided. E.g. 15 ÷ 3, the dividend is 15
Divisor	The quantity by which another quantity is to be divided. E.g. 15 ÷ 3, the divisor is 3
Estimate	Verb: to arrive a rough or approximate answer Noun: A rough or approximate answer
Fewer	Used to compare two or more sets of countable (discrete) objects. E.g. 'There are fewer cakes on this plate than on that plate' or 'There are fewer sweets in this bag'
Less	Used to compare 'uncountable' (continuous) quantities including measures. E.g. This cup has less water in it than that one'
Long Multiplication	A formal calculation strategy that builds on understanding of the grid method into a compact column method. The multiplier is larger than 12 and therefore is partitioned during the process to aid calculation. Long Multiplication is a multi-stage calculation which requires a final addition calculation in order to reach the final outcome.

Inverse of multiplication (as a method of division)	Counting up from 0 in multiples to reach a number in order to solve a division calculation. Inverse of Multiplication is used to see how many amounts make a given number. E.g. starting at 0 and counting up in steps of 4 until 16 is reached. Some children find counting on in multiples of 0 easier than repeated subtraction. But they must understand that they are using the inverse of multiplication rather than repeated subtraction.
Number Line	A line on which numbers are represented by points. Division marks are numbered, rather than spaces. They can begin at any number and can extend into negative numbers. They can show any number sequence
Number Track	A numbered track along which counters may be moved. The number in a region represents the number of single moves from the start. Each number occupies a cell and is used to number the cell. Numbers may have matching illustration Supports learning to read numbers in Numerals. Supports locating ordered numbers They should start at 1 and not 0
Numeral	A symbol used to denote a number. E.g 5, 26 and the Roman V are all numbers written in numerals.
Ordinal Numbers	A term that describes a position within an ordered set. E.g. first, second, third, fourth ……..fiftieth.
Partition	To separate a set into subsets. To split a number into component parts. E.g. the two digit number 56 can be partitioned into 50 and 6 or 28 and 28
Pattern	A systematic arrangement of numbers, shapes or other elements according to a rule.
Principle of Exchange	The naming system when counting collections. As soon as we have a group of ten we call them something else. The number we call ten (10 in numerals) is the most important in our naming system. E.g. ten ones are called one ten, ten tens are called one hundred, ten hundreds are called one thousand.
Proportionality	The relationship of one thing to another in terms of quantity, size, or number/out of the whole/3 out of 5
Quotient	The result of a division calculation. E.g. In the calculation of 15 ÷ 3, the quotient is 5

Ratio	The comparison of two properties e.g. 4:5 All ratio relationships are proportional

Repeated Subtraction	Repeatedly subtracting the same amount each time in order to solve a division calculation. The idea of repeated subtraction should be 'how many times can I take ……. away from……? e.g. 16 ÷4 using repeated subtraction we should start at 16 and repeatedly count down in steps of 4 until 0 is reached.
Representation	The wide variety of ways to capture an abstract mathematical concept or relationship. This may be visible, e.g. a number sentence, a display of manipulative materials or a graph. It may also be an internal way of seeing and thinking about a mathematical idea. Regardless of their form, mathematical representations can enhance children's communication, reasoning and problem solving abilities. It can help them to make connections among ideas and aid them in learning new concepts or procedures.
Sequence	An ordered set of numbers or shapes arranged to a rule
Short Multiplication	A formal calculation method that builds on understanding the grid method into a compact column method. The multiplier is 12 or less and therefore is not partitioned during the process as the calculations should rely on knowledge of key multiplication facts up to 12 x 12. An expanded short multiplication method details each stage in brackets and shows clear connections to the grid method. This will be used as a vital stage in bridging understanding from the grid method to short multiplication.
Subitising	This is the process where we recognize the size of a set, its cardinality, from the pattern or structure without having to count the number of objects. E.g. recognizing there are 5 dots on a dice
Zero	Nought or nothing In a place value system, a place holder. E.g. 107 The cardinal number of an empty set.

Vocabulary

Addition and Subtraction

❖ **Ensure the correct vocabulary is used at all stages of learning**

Addition	Subtraction
Add Addition More Most Count on plus increase sum total altogether double near double difference, same as, exchange value equals sign, partition column vertical expand compact tens boundary, hundreds boundary ones boundary tenths boundary inverse how many more to make...?,	Subtract subtraction, take away minus decrease leave, how many are left/left over? difference between count back count on partition exchange value half halve , how many more than, how many fewer is, how much more/less is..? is the same as equals, sign tens boundary hundreds boundary ones boundary tenths boundary, inverse

- Use the language 'calculation' not 'sum' ('sum' means 'plus' or 'total'
- Use the language 'digit' not number (number is the amount or quantity)

Vocabulary

Multiplication and Division

Multiplication	Division
counting	halve
steps	share
each	share equally
doubling	one each
scaling	two each
times	three each.....
twice as big ----times as big	divide
count in ones count in ------	division
column	divided by
row	divided into
sets of	left
lots of	left over
groups of	remainder
x	quotient
times	divisible by
multiply	inverse
multiplied by	exchange
multiple of	repartition
once twice three times -----times	divisor
times as (big/long/wide....)	scaling
repeated addition	repeated subtraction
array	array
row	row
column	column
double	equal groups of-------
group in pairs	------ equal groups
threes .....tens	Prime numbers
equal groups of	Prime factors
partition	Composite numbers (non-prime)
grid method	Common factor
multiplication	
product	
inverse	
factor	

Signed _____

(Headteacher)

Signed _____

(for and on behalf of the Governing body)

Date _____