Bury C of E Primary School

Mathematics Calculations Progression Document

YEAR 3

At Bury CE Primary, we believe that children should be introduced to the processes 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 and calculation methods; use particular methods that apply to special cases and learn to interpret and use the signs and symbols involved.

Choosing the appropriate strategy, recording in mathematics and in calculation in particular is an important tool both for furthering the understanding of ideas and for communicating those ideas to others. Children use age appropriate calculations in order to become **fluent** in that strategy, they will then use calculation strategies to support their thinking and **reasoning,** making connections in their mathematical understanding and for them to become efficient at **problem solving**.

Written methods are complementary to mental methods and should not be seen as separate from them. The aim is that children use mental methods when appropriate, but for calculations that they cannot do mentally they use an efficient written method accurately and with confidence. It is important children acquire secure mental methods of calculation and one efficient written method of calculation for addition, subtraction, multiplication and division which they know they can rely on when mental methods are not appropriate.

This document identifies progression in calculation strategies.

By the end of Year 6, children should be able to choose the most appropriate approach to solve a problem: making a choice between using jottings (an extended written method), an efficient written method or a mental method.

This policy contains the key procedures that will be taught within our school alongside practical resources. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement.

For a further understanding of mathematics terminology, please see the NCETM 'mathematics glossary' on our school website for an explanation of terms used in each Key Stage.

Recommended websites/ blogs:

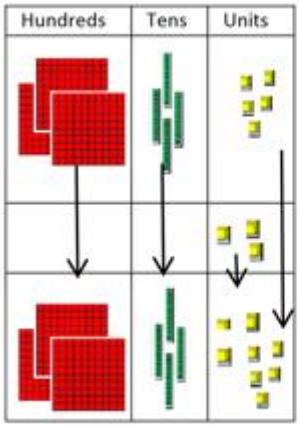
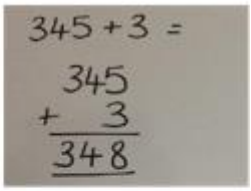
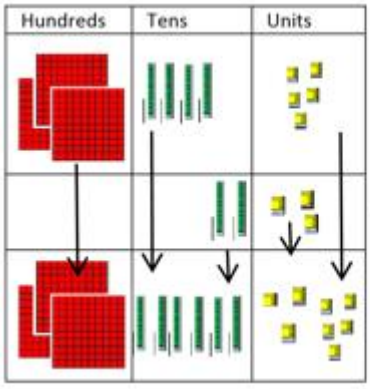
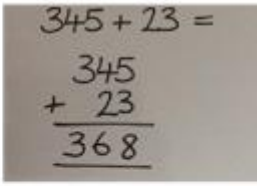
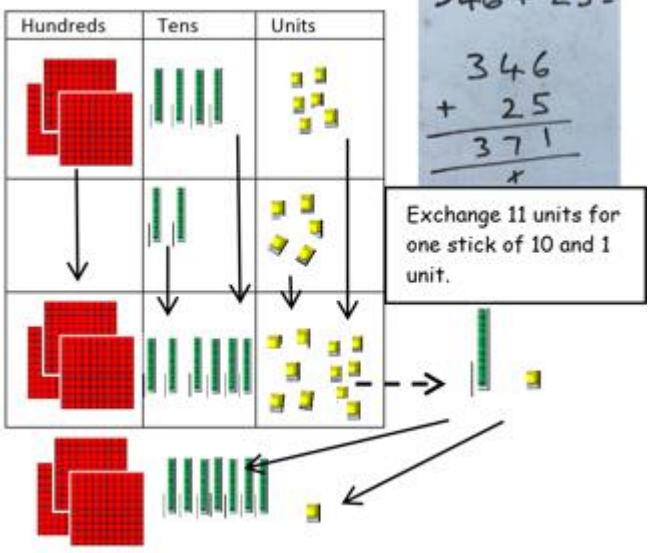
https://www.bbc.co.uk/bitesize/primary
https://garethmetcalfe.wordpress.com/
http://www.mathematicshed.com/
https://ttrockstars.com/
https://nrich.maths.org/
https://www.ncetm.org.uk/

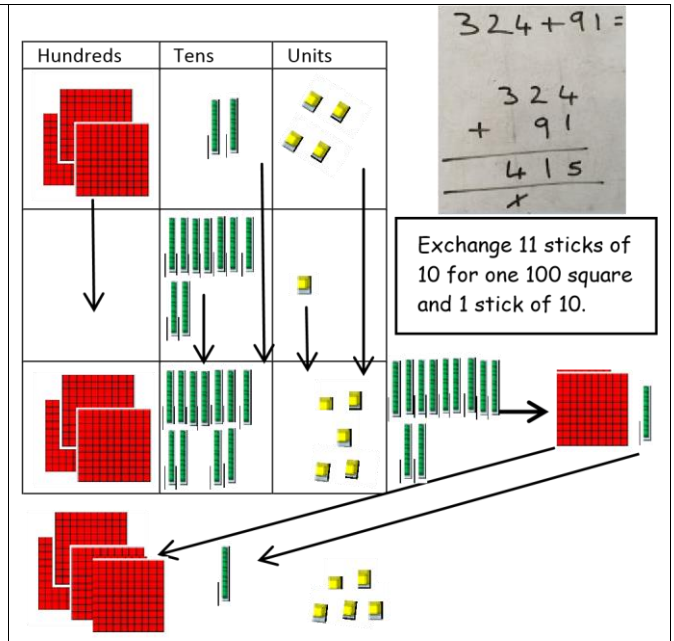
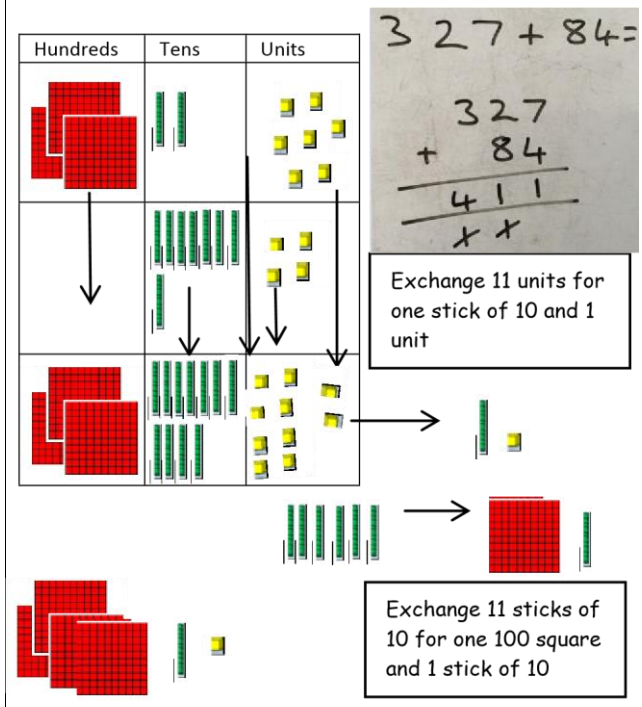
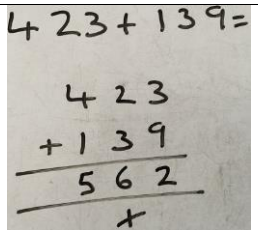
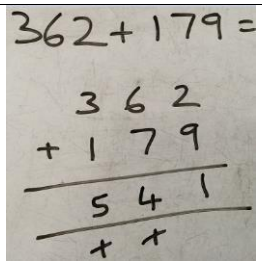
*Note: the terminology of 'ones' and 'units' in the following diagrams is the same concept, meaning a single value.

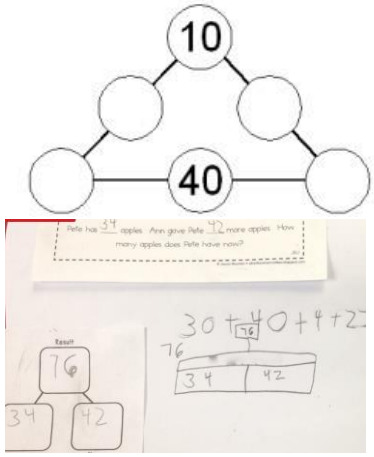
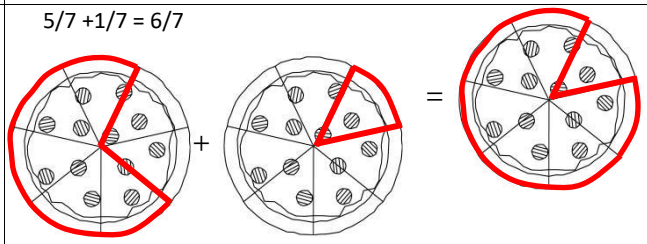
Year 3 – Addition

VOCABULARY: add, increase, total, plus, sum, more, altogether, augend, addend, column addition, estimate, inverse, double, near double, one more, ten more…, one hundred more…., 'how many more make….?', 'How many more is….than….?' 'How much more is…?' Tens boundary, hundreds boundary.

Across all year groups, the questions 'what is the same/ different?' is asked. This supports children with noticing patterns, making connections and making comparisons.

Method:	**Example/ representation:**
Children set out addition with HTO + Ones as a formal column method using a **formal column method.**	345 + 3 =  
Children set out addition with HTO + TO as a formal column method using a **formal column method.**	345 + 23 =  
Children set out addition with HTO + TO that cross the tens boundary as a formal column method using a **formal column method.**	346 + 25 = 

Children set out HTO + TO (that cross the hundreds boundary) in columns and record as **column addition.**	
Children set out HTO + TO (that cross the hundred and tens boundaries) in columns and record as **column addition**.	
Children set out HTO + HTO (that cross the tens boundary) in columns and record as **column addition.**	
Children set out HTO + HTO (that cross the tens and hundreds boundaries) in columns and record as **column addition**.	

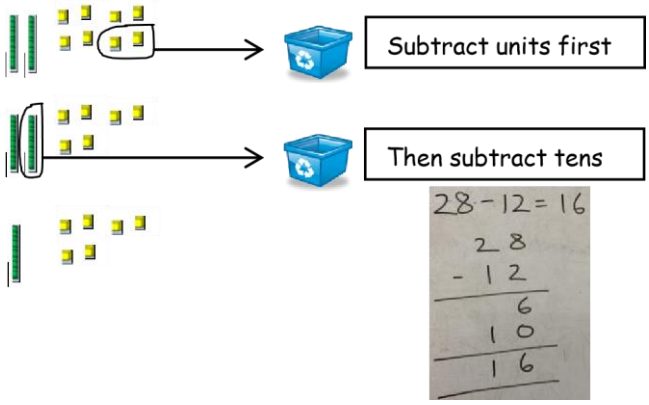
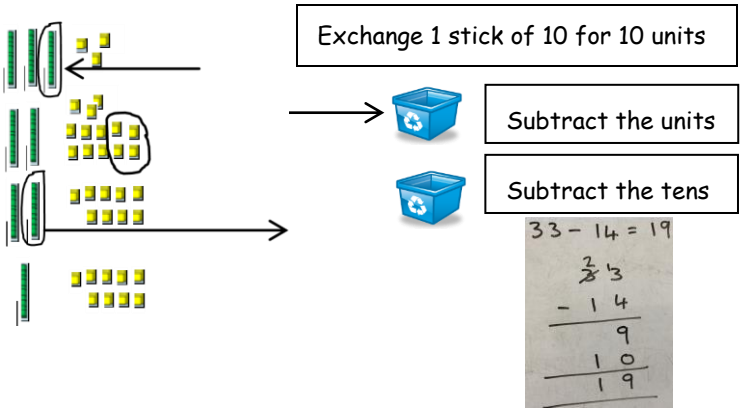
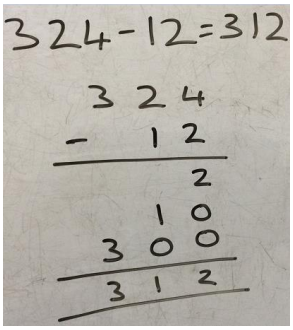
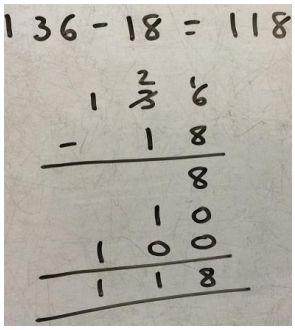
Children will solve one and two-step addition problems (including missing number problems) using concrete objects and pictorial representations, including bar models.	This number triangle has missing numbers. The numbers along each edge must add up to 90. Put all the numbers: 20, 30, 50 and 60 in the circles to make the totals correct. 
Pupils practise adding fractions with the same denominator through a variety of increasingly complex problems to improve fluency	5/7 +1/7 = 6/7 

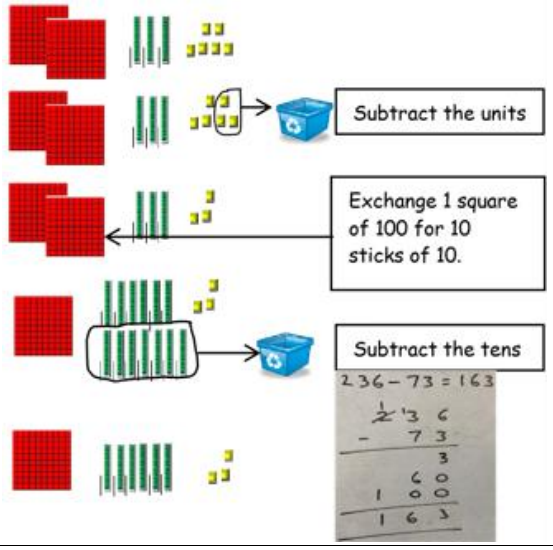
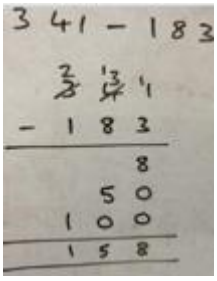
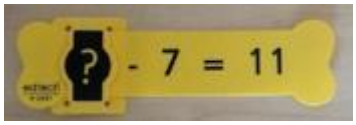
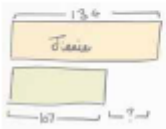
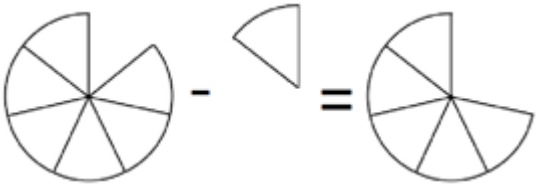
EXPECTATIONS:

- Add numbers mentally, including:
  - a three-digit number and a single digit number
  - a 3-digit number and multiples of 10
  - a 3-digit number and multiples of 100
- Estimate the answer to a calculation and use inverse operations to check answers e.g. 17 + 8 = 25 can be checked by 25 – 8 = 17
- Know number pairs that total 1000 (multiples of 100).
- Know that 10 tens is 100, so 210 is the same as 2 hundreds and 1 ten or 21 tens.
- The position of a digit in a number determines the value e.g. 210 is larger than 120.
- Partitioning could be used to add numbers mentally e.g. 23 + 34 = 20 + 30 (50) + 3 + 4 (7) = 57.
- Calculate 10 or 100 more than any given number.
- = (equals) means 'the same as' and the = sign can be in any position in the number sentence e.g. 160 = 140 + 20 is the same as 20 + 140 = 160
- A formal column method might be quicker in answering a question

YEAR 3 – Subtraction

VOCABULARY: leave, subtract, less, minus, minuend, subtrahend, column subtraction, inverse, decomposition, exchange, how many are left/left over?, difference between, how many more/fewer is… than…?, how much more/less is…?, Is the same as, equals, sign. multiples of tens and hundreds.
Across all year groups, the questions 'what is the same/ different?' is asked. This supports children with noticing patterns, making connections and making comparisons.

Method:	**Example/Representation:**
Children begin to set out Tens and Ones – Tens and Ones (that lie within the tens boundary) in columns and record as column subtraction	
Children begin to set out TO - TO (that cross the tens boundary) in columns and record as **column subtraction with decomposition**	
Children begin to set out HTO - TO (that lie within the tens boundary) in columns and record as **column subtraction**	
Children begin to set out HTO - TO (that cross the tens boundary) in columns and record as column subtraction with decomposition	

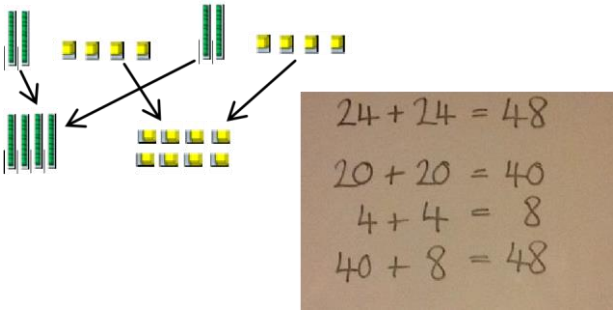
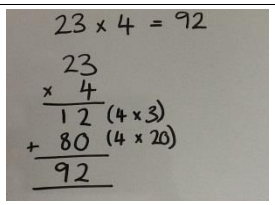
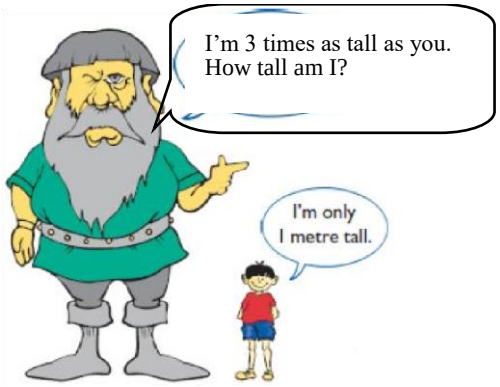
Children begin to set out HTO – TO that cross the hundreds boundary in columns and record as **column subtraction with decomposition.**	
Children begin to set out HTO – HTO in columns and record as a **column subtraction with decomposition**.	
Children will solve one and two-step subtraction problems, including missing number problems using concrete, pictorial and formal written methods for subtraction.	 Jinnie is 134cm tall. Her sister is 107cm tall. How much taller is Jinnie than her sister? 
Children practise subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.	6/7 – 1/7 = 5/7 

EXPECTATIONS:

- Mentally subtract numbers, including:
- A single digit number from a 3-digit number and a multiple of 10 from a 3-digit number.
- Estimate and approximate and answer, using **inverse operation** to check.
- Subtraction can be done by **counting back** or **finding the difference** (counting on).
- Written methods may be more appropriate in order to answer certain questions.

YEAR 3 – Multiplication

VOCABULARY: multiply, times, groups of, equal groups of, multiple of, multiplied by, multiplicand, multiplier, estimate, inverse, expanded column multiplication, partition, commutative, associative, product.

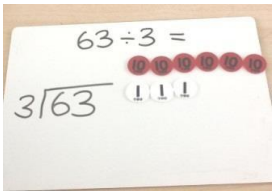
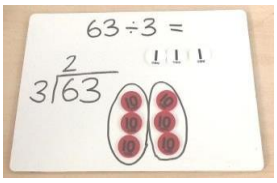
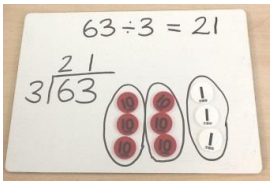
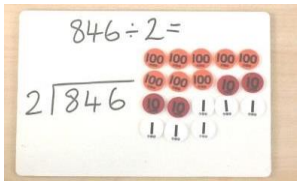
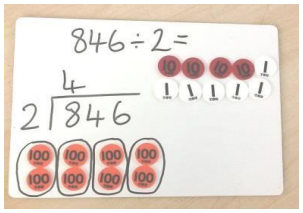
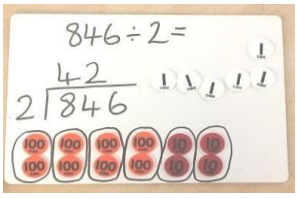
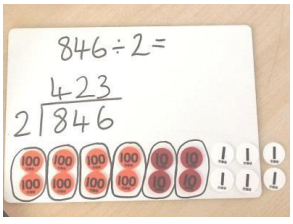
Method:	**Example/Representation:**
Children will learn to **calculate doubles of 2-digit numbers** through partitioning	Double 24 = 24 + 24 = 48 
Children will be taught to multiply numbers (TO x O) using the **formal written method of expanded column multiplication.**	
Children will **solve problems** involving multiplication, including scaling. They will be encouraged to use concrete apparatus and pictorial representations (such as a bar model method).	

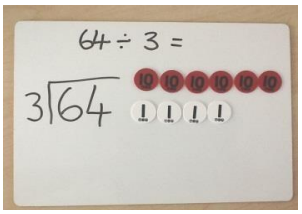
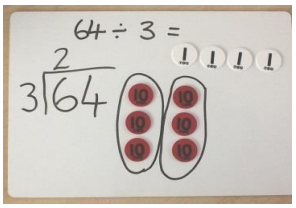
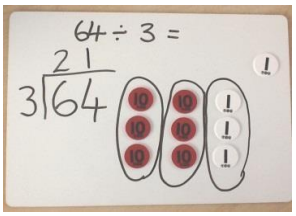
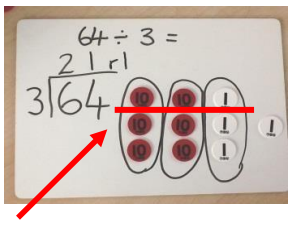
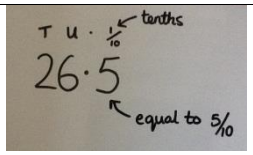
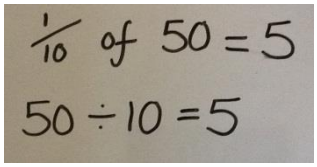
EXPECTATIONS:

- Know that multiplication is repeated addition of the same number.
- Count forwards and backwards in multiples of 4, 8, 50 & 100
- **Know the 2, 3, 4, 5, 8 and 10 times tables (in and out of order)**
- Connect the 2, 4 and 8 times tables through doubling
- Use knowledge of place value to calculate multiplication (e.g. 2 x 2 = 4, 2 x 20 = 40, 2 x 200 = 400)
- Multiplication and division are the inverse operation and this can be seen in arrays.

YEAR 3 - Division

VOCABULARY: divided by, divide, divided into, grouping, divisor, dividend, quotient, short division, remainder, inverse, quotient divisor, dividend.

Method	**Example/ representation**
Children will use concrete apparatus such as place value counters or dienes apparatus, and pictorial representations to support the short division method and will be encouraged to use multiples of the divisor to assist (TO ÷ O).	 Create the dividend using Place Value counters.  Group the tens counters according to the divisor and write the number of groups above the line in the tens column.  Group the ones counters according to the divisor and write the number of groups above the line in the ones column.
Children will use concrete apparatus such as place value counters or dienes apparatus, and pictorial representations to support the short division method and will be encouraged to use multiples of the divisor to assist (HTO ÷ O)	 Create the dividend using Place Value counters.  Group the 100s counters according to the divisor. Write the number of groups above the line in the hundreds column.  Next, group the 10s counters according to the divisor. Write the number of groups above the line in the tens column.  Next, group the ones counters according to the divisor. Write the number of groups above the line in the ones column. The quotient can be seen across the representation.

Children will use practical resources to support solving division number sentences with remainders (TO ÷ O)	 Create the dividend using Place Value counters.  Starting with tens counters, group them according to the divisor. Write the number of groups in the tens column above the line.  Next, group the ones according to the divisor and arrange next to the groups of ten. Write the number of groups above the line in the ones column.  Any counters that cannot be grouped are the remainder. Write this at the end as 'r1'. As you look across each group, the quotient can be seen.
Pupils connect tenths to place value and decimals. They know that **tenths is to divide by 10**.	 1 / 10  

EXPECTATIONS:

- Know that division is sometimes easier by grouping and sometimes by sharing.
- Division calculations use multiplication facts.
- Know the division facts from the 2, 3, 4, 5, 8 and 10 times tables
- Use knowledge of place value to calculate division (e.g. 14 ÷ 2 = 7, 140 ÷ 2 = 70, 1400 ÷ 2 = 700)
- Know that to find a 'tenth' of a number, you need to divide by 10.