

Bury C of E Primary School

Mathematics Calculations Progression Document

YEAR 4

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://trockstars.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 4 – Addition

VOCABULARY: add, addition, more, plus, increase, sum, total, augend, addend, altogether, score, double, near double, tens boundary, hundreds boundary, thousands boundary, inverse

Method:

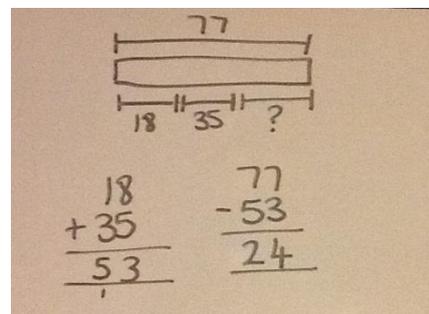
Children will add numbers with up to 4-digits using the formal written method of **formal column addition**.

Example/Representation:

$$\begin{array}{r} 2345 \\ + 1792 \\ \hline 4137 \\ \hline \end{array}$$

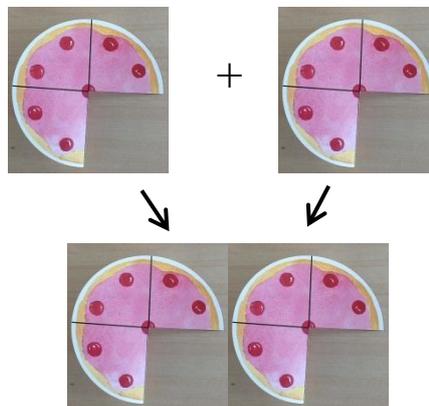
Solve two-step problems using formal jottings and explaining reasoning behind their calculations (for example, using the bar model method).

Seb has 77 cubes. He builds two towers. One tower uses 18 cubes and one tower uses 35 cubes. How many cubes does he have left over?



Pupils continue practise in adding fractions with the same denominator to become fluent through a variety of increasingly complex problems beyond one whole

$$\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$$



EXPECTATIONS:

- Add numbers mentally, including:
 - a four digit number and multiples of one thousand.
- Use knowledge of doubles to derive related facts (e.g $15 + 16 = 31$ because $15 + 15 = 30$ and $30 + 1 = 31$)
- Know number pairs that total 1000 (multiples of 10).
- The position of the digit determines the value of the number.
- = (equals) means 'the same as'.
- Estimate the answer to a calculation and use inverse operations to check answers.
- Rounding can be used to approximate numbers.

YEAR 4 – Subtraction

VOCABULARY: subtract, subtraction, minuend, subtrahend, minus, *decrease*, leave, 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. Column subtraction, decomposition, exchange, multiples of thousand, inverse.

Method:

Children will subtract numbers with up to 4-digits using the **formal written method of column subtraction with decomposition**

Example/Representation:

$$\begin{array}{r} 3271 \\ -1691 \\ \hline 1580 \end{array}$$

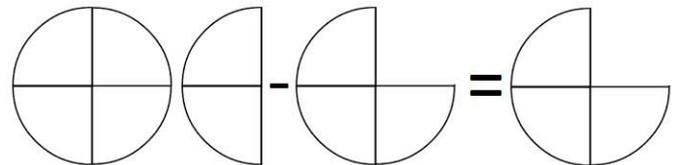
Solve two-step problems using formal jottings (for example the bar model method) and using formal calculations, explaining reasoning behind their choice of operation and calculations.

It is Grandad's birthday soon and he wants to hire a sports car for his present. A Ferrari costs £49.50 initial payment then £29.50 per hour. Grandad is bought 4 hours hire. How much did Grandad's present cost?



Pupils continue practise in subtracting fractions with the **same denominator** to become fluent through a variety of increasingly complex problems beyond one whole

$$6/4 - 3/4 = 3/4$$



EXPECTATIONS:

- Subtract numbers mentally, including:
- Subtracting multiples of one thousand from a 4-digit number
- Use of number pairs that total 1000 (multiples of 10) to calculate subtraction (e.g. $1000 - 300 = 700$)
- Number facts can be approximated or calculated by using approximation e.g. $398 + 195$ is the same as $400 + 200$, subtract 2 then subtract 5 (593).
- Estimate the answer to a calculation and use inverse operations to check answers

YEAR 4 – Multiplication

VOCABULARY: multiply, multiplicand, multiplier, multiplied by, product, short multiplication, partition, distributive law, commutative, groups of, times, multiples, inverse.

Method:

Children will be taught to multiply numbers (TO x O) by partitioning the 2digit number and using two short multiplications along with addition to solve the problem (**Distributive Law**)

When using the distributive law method, it is helpful to start with the ones before moving onto the tens.

Example/Representation:

$$24 \times 7 = 168$$

$$\begin{array}{r} 20 \\ \times 7 \\ \hline 140 \end{array} \quad \begin{array}{r} 4 \\ \times 7 \\ \hline 28 \end{array} \quad \begin{array}{r} 140 \\ + 28 \\ \hline 168 \end{array}$$

Children will be taught to multiply numbers (TO x O) using **the formal written method of short multiplication** and will link with the Distributive Law method

$$24 \times 7 = 168$$

$$\begin{array}{r} 20 \\ \times 7 \\ \hline 140 \end{array} \quad \begin{array}{r} 4 \\ \times 7 \\ \hline 28 \end{array} \quad \begin{array}{r} 140 \\ + 28 \\ \hline 168 \end{array} \rightarrow \begin{array}{r} 24 \\ \times 7 \\ \hline 168 \end{array}$$

Distributive Law Short Multiplication

Children will be taught to multiply numbers (HTO & O) by partitioning the 3-digit number and using two short multiplications along with addition to solve the problem

$$235 \times 6 = 1410$$

$$\begin{array}{r} 200 \\ \times 6 \\ \hline 1200 \end{array} \quad \begin{array}{r} 30 \\ \times 6 \\ \hline 180 \end{array} \quad \begin{array}{r} 5 \\ \times 6 \\ \hline 30 \end{array} \quad \begin{array}{r} 1200 \\ 180 \\ + 30 \\ \hline 1410 \end{array}$$

Children will be taught to multiply numbers (HTO x O) using the **formal written method of short multiplication** and will link with the Distributive Law method

$$235 \times 6 = 1410$$

$$\begin{array}{r} 235 \\ \times 6 \\ \hline 1410 \end{array}$$

Solve problems involving multiplying and adding to multiply two or three-digit numbers by one digit

Harriet has 7 friends who each have 24 apples. Joseph has 3 friends who each have 27 apples. How many apples do Harriet and Joseph's friends have

$$24 \times 7 = 168$$

$$27 \times 3 = 81$$

$$\begin{array}{r} 168 \\ + 81 \\ \hline 249 \end{array}$$

249 apples altogether

altogether?

EXPECTATIONS:

- Know all times tables up to and including 12 x 12 (by the end of Year 4)
- Recognise and use factor pairs (e.g factor pairs for numbers up to and including 10)
- Know that TO x 5 is TO x 10 then divide by 2 (e.g $18 \times 5 = (18 \times 10) \div 2 = 90$)
- Know that TO x 9 is TO x 10 then subtract TO (e.g $18 \times 9 = (18 \times 10) - 18 = 162$)

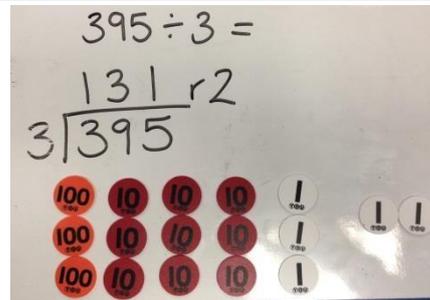
YEAR 4 - Division

VOCABULARY: factor, divisor, dividend, quotient, divided by, divided into, remainders, divisible by, equivalent, short division, derive, inverse, remainder, multiples, exchange.

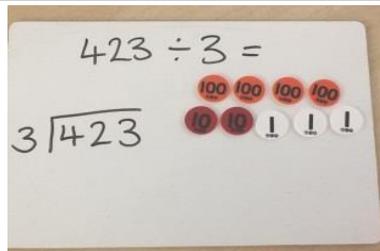
Method:

Children will use concrete apparatus such as place value counters or dienes apparatus, and pictorial representations to support solving division number sentences with remainders ($HTO \div O$)

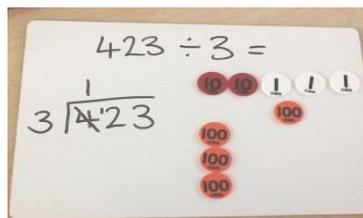
Example/Representation:



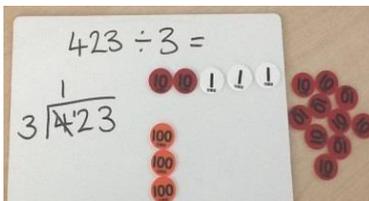
Children will use concrete apparatus such as place value counters or dienes apparatus, and pictorial representations to support the short division method where exchange across place value columns occurs. ($HTO \div O$)



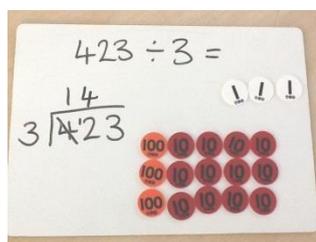
Create the dividend using Place Value counters.



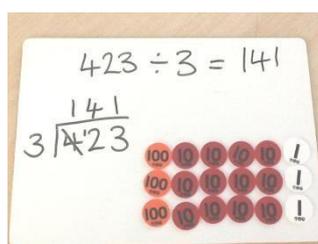
Group the hundreds counters according to the divisor. Write the number of groups above the line in the hundreds column.



Exchange the left over 100s counter for ten 10s counters and represent this beneath the line in the tens column.



Next, group the 10s counters according to the divisor and write the number of groups above the line in the tens column.



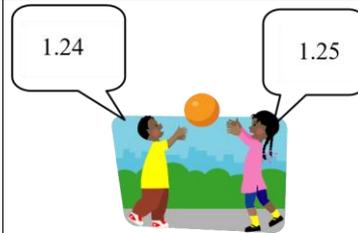
Group the ones counters according to the divisor and write the number of groups above the line in the ones column.

The quotient can be seen across each group.

Find the effect of dividing a 1 or 2-digit number by 10 and 100; identifying the value of the digits in the answer as ones, tenths and hundredths

$$7 \div 10 = 0.7$$
$$7 \div 100 = 0.07$$
$$7 \cdot \frac{1}{10} = \frac{7}{10}$$
$$7 \cdot \frac{1}{100} = \frac{7}{100}$$
$$0.7 \quad (\div 10)$$
$$0.07 \quad (\div 100)$$

Count up and down in **hundredths**; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten



What should I cut my pizza into if I have 100 people to serve?



EXPECTATIONS:

- Know all related division facts for all times tables up to 12 times table (by the end of Year 4)