

Bury C of E Primary School

Mathematics Calculations Progression Document

YEAR 5

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 5 – Addition

VOCABULARY: Efficient written method, add, addition, augend, addend, more, plus, increase, sum, total, altogether, score, tens boundary, hundreds boundary, thousands boundary, ones boundary, tenths boundary, inverse

Method:

Example/Representation:

Children will add numbers with more than 4-digits using the **formal written method of column addition**

$$\begin{array}{r} 45867 \\ + 32192 \\ \hline 78059 \\ \hline \end{array}$$

Children will add decimal numbers with the same number of decimal places using the **formal written method column addition**.

$$\begin{array}{r} 3.17 \\ + 4.25 \\ \hline 7.42 \\ \hline \end{array}$$

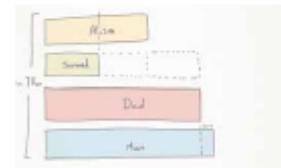
Children will add decimal numbers with a different number of decimal places using the **formal written method column addition using 0 as a place value holder**

$$\begin{array}{r} 3.460 \\ + 3.792 \\ \hline 7.252 \\ \hline \end{array}$$

Zero used as a place value holder.

Solve multi-step problems using formal jottings – such as the bar method model - and explaining reasoning behind their choice of operation and calculation

Alisa is double the height of her brother, Samuel. Samuel is 3 times smaller than his Dad. His mum is 10cm taller than his Dad. How tall could Alisa be if the family's total height is 4 meters 78cm?

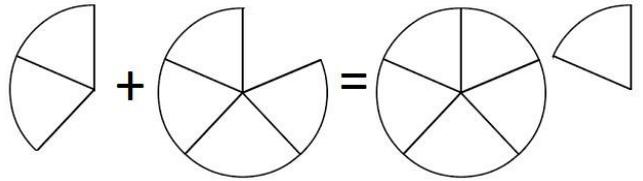


Recognise mixed numbers and improper fractions and convert from one to the other

$$1\frac{1}{4} = \frac{5}{4}$$

Practise adding fractions where calculations exceed one as a mixed number

$$\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$$



EXPECTATIONS:

- Add numbers mentally with increasingly large numbers (e.g. $10,162 + 2,300 = 12,462$)
- Numbers can be broken down in different ways e.g. 4000 is 4 thousands, 40 hundreds or 400 tens.
- Large numbers are read in patterns of three digits.
- Roman number symbols are to be introduced in Year 5
- Mentally add tenths (e.g. $0.2 + 0.6 = 0.8$) and 1-digit whole numbers and tenths ($8 + 0.3 = 8.3$)
- Use number bonds to 100 knowledge to calculate complements to one using hundredths (e.g. $0.83 + 0.17 = 1$)
- To understand when it is appropriate to use (or not use) a written method
- Use rounding to estimate and approximate, check answers to calculations and determine, in the context of a problem, levels of accuracy
- Fractions can be compared using benchmarks and equivalent fractions e.g. more than/less than $1/2$.

YEAR 5 – Subtraction

VOCABULARY: efficient written method, subtract, subtraction, minus, minuend, subtrahend, decrease, difference between, inverse, decimals, units and tenths boundary, column subtraction, decomposition, exchange.

Method:

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

Example/Representation:

$$\begin{array}{r} 63719 - 32831 = \\ \underline{63719} \\ - 32831 \\ \hline 30888 \end{array}$$

Children will subtract **decimal numbers** with the **same number of decimal places** with decomposition; ensuring decimal points are aligned.

$$\begin{array}{r} 4.63 - 2.91 = \\ \underline{4.63} \\ - 2.91 \\ \hline 1.72 \end{array}$$

Solve multi-step problems using formal jottings (such as the bar model method) and formal calculation methods, explaining reasoning behind their calculations.

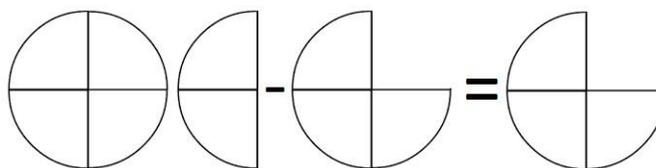
Olivia has a container that when filled, holds 4 litres of water. She has some empty jugs that can contain $\frac{2}{3}$ of a litre each. How many jugs can she completely fill?



Practise subtracting fractions **where calculations exceed one as a mixed number**

$$1 \frac{1}{2} - \frac{3}{4} = \frac{3}{4}$$

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



EXPECTATIONS:

- Subtract increasingly large numbers mentally (e.g. $12, 654 - 1,341 = 11, 313$)
- Mentally **subtract tenths** (e.g. $0.7 - 0.5 = 0.2$) and 1-digit whole numbers and tenths ($8 - 0.3 = 7.7$)
- **Use rounding** to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Number facts can be approximated or calculated by adjusting numbers e.g. $3415 - 2996$ is equivalent to $3419 - 3000$ (419).

YEAR 5 – Multiplication

VOCABULARY: composite numbers, prime number, prime factor, cube number, square number, derive, factor pairs, formal written method, times, multiply, multiplicand, multiplier, multiplied by, multiple of, product, short multiplication, partition, long multiplication, scaling, decimal place, units, tenths and hundreds.

Method:

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

Example/Representation:

$$42 \times 24 = 1008$$

$$\begin{array}{r} 42 \\ \times 20 \\ \hline 840 \end{array} \quad \begin{array}{r} 42 \\ \times 4 \\ \hline 168 \end{array} \quad \begin{array}{r} 840 \\ + 168 \\ \hline 1008 \end{array}$$

Children will be taught to multiply numbers (TO x TO) using the **formal written method of long multiplication**

$$42 \times 24 = 1008$$

$$\begin{array}{r} 42 \\ \times 24 \\ \hline 168 \\ 840 \\ \hline 1008 \end{array}$$

Children will be taught to multiply numbers (HTO x TO) using the **formal written method of long multiplication**

$$324 \times 26 = 8424$$

$$\begin{array}{r} 324 \\ \times 26 \\ \hline 1944 \\ 6480 \\ \hline 8424 \end{array}$$

Children will be taught to multiply numbers (ThHTO x O) using the **formal written method of short multiplication**

$$1423 \times 6 = 8538$$

$$\begin{array}{r} 1423 \\ \times 6 \\ \hline 8538 \end{array}$$

Children will be taught to multiply numbers (ThHTO x TO) using the **formal written method of long multiplication**

$$3216 \times 17 = 54672$$

$$\begin{array}{r} 3216 \\ \times 17 \\ \hline 22512 \\ 32160 \\ \hline 54672 \end{array}$$

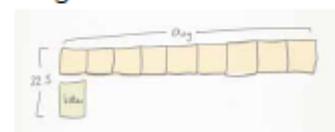
Children will learn to multiply whole numbers and those involving **decimals by 10, 100 and 1000** by moving the digits around the fixed decimal on a place value grid

$$\begin{array}{l} 35 \times 10 = 350 \\ 35 \times 100 = 3500 \\ 35 \times 1000 = 35000 \end{array}$$

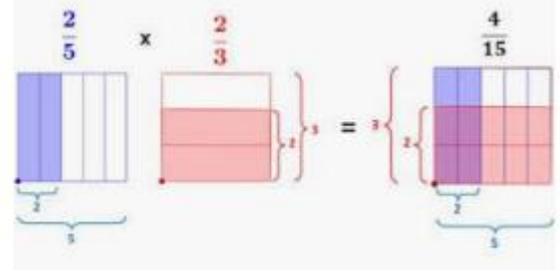
Tk	H	T	U	$\frac{1}{10}$	$\frac{1}{100}$
		3	5		
		3	5	0	
	3	5	0	0	
3	5	0	0	0	

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).

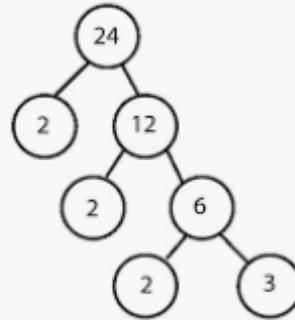
A vet weighs a large dog and a kitten. The large dog weighs 9 times more than the kitten. Altogether they weigh 22.5kg. What does the dog weigh?



With the use concrete apparatus and pictorial representations, pupils will multiply proper fractions and mixed numbers by whole numbers



Children will recognise and calculate factor pairs for any number, using factor trees



EXPECTATIONS:

- Use times table knowledge to derive multiples of any number
- Establish whether a number is a prime number (up to 100) or a composite number (not prime) and recall prime numbers up to 19
- To know what a square number is and recall all square numbers (up to and including 144)
- To know what a cube number is and recall the first 5 cube numbers

YEAR 5 - Division

VOCABULARY: divide, divided by, divided into, divisible by, remainder, divisor, dividend, quotient, inverse, decomposing, factor, decimal place, units, tenths, scaling, short division, divisor, dividend.

Method:

Children will continue to 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. (ThHTO ÷ O)

Example/Representation:



Children will use a **formal short division method** with remainders (HTO ÷ O)

432 ÷ 5 becomes

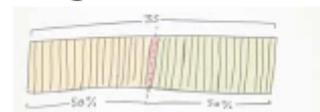
$$\begin{array}{r} 8 \quad 6 \quad r2 \\ 5 \overline{) 432} \end{array}$$

Answer: 86 remainder 2

Children will learn to divide whole numbers and those involving decimals by 10, 100 and 1000 by moving the digits around the fixed decimal

Children will solve problems involving division, using pictorial representations (such as the bar model method), including scaling.

There are 35 children in Elephant Class. Laurie says that 50% of the class are boys. Explain why she is wrong.



EXPECTATIONS:

- Multiply and divide numbers mentally drawing upon known facts, including factors, multiples and prime numbers.
- Associate fractions with division