**St. John's C. of E.
Primary School**

Mathematics Calculation Policy
September 2017

Children are introduced to the processes of calculation through practical, oral and mental activities. As they begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods, so that they develop both conceptual understanding and fluency in the fundamentals of mathematics. Whilst interpreting signs and symbols involved with calculation, orally in the first instance, children use models and images to support their mental and written methods of calculation. As children's mental methods are strengthened and refined they begin to work more efficiently, which will support them with using succinct written calculation strategies as they are developed.

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice through progression in relevant practical maths experiences and visual representations.

By the end of Year 6, children will be equipped with efficient mental and written calculation methods, which they use with fluency. Decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. At whatever stage in their learning, and whatever method is being used, children's strategies must still be underpinned by a secure understanding and knowledge of number facts that can be recalled fluently.

The overall aims are that when children leave primary school they:

- Are able to recall number facts with fluency, having developed conceptual understanding through being able to visualise key ideas – such as those related to place value - through experience with practical equipment and visual representations;
- Make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads;
- Have an efficient, reliable, written method of calculation for each number operation that they can apply with confidence when undertaking calculations that they cannot carry out mentally;
- Are able to make connections between all four number operations, understanding how they relate to one another, as well as how the rules and laws of arithmetic can be applied

Mathematical Vocabulary

Addition	**Subtraction**	**Multiplication**	**Division**
Add	Take away	Repeated addition	Groups of
Plus	Count back	Times	Into groups of
More	Less	Array	Halve
Altogether	Minus	Multiply	Share
Total	Fewer	Groups of	Equally
Increase	Difference	Double	Into lots of
Make	Count on	Multiplication	Divided by
And	How many more than…	Multiples	Half
Carry	Subtract	Factor	Quarter
Symbol	Decrease	Product	Remainder
Operation	Exchange	Lots of	Factor
Equals	Symbol	Arrays	Divisible
Addend	Operation	Symbol	Divisor
Sum*	Equals	Operation	Dividend
		Equals	Quotient
			Regroup
			Symbol
			Operation
			Equals

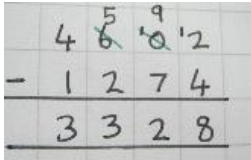* 'sum' is a term used for an addition calculation. No other operation uses this term.

St John's Mathematics Calculation Policy

Year 5

Addition

Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
5	• Add and subtract numbers mentally with increasingly large numbers	• Year 4 revision: 4 digit + 4 digit totals to 10 or above carrying in one or all columns (except thousands column) including decimals (use of dienes) • Year 4 revision: 4 digit + 4 digit: carrying in one or all columns – including decimals • Totalling amounts of differing length including carrying e.g. 4 digit + 2 digit including decimals • Children should extend the carrying method to number with any number of digits. • Add positive and negative numbers using a number line	$\begin{array}{r} 7648 \\ +\ 1486 \\ \hline 9134 \\ \hline {\scriptstyle 1\ 11} \end{array}$ $\begin{array}{r} 6584 \\ +\ 5848 \\ \hline 12432 \\ \hline {\scriptstyle 1\ 11} \end{array}$ $\begin{array}{r} 42 \\ 6432 \\ 786 \\ 3 \\ +\ 4681 \\ \hline 11944 \\ \hline {\scriptstyle 1\ 2\ 1} \end{array}$ $\begin{array}{r} 3.345 \\ +2.530 \\ \hline 5.875 \end{array}$ *Top Tips* *Make sure PV columns are lined up correctly especially for numbers of different lengths*

Subtraction

Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
5	• Add and subtract numbers mentally with increasingly large numbers	• Year 4 Revision - 4 digit - 4 digit exchanging in all 4 columns including decimals (decomposition) • Subtracting where there is a zero above • Subtract positive and negative numbers using a number line	$\begin{array}{r} {\scriptstyle 5\ 13\ 1} \\ 6467 \\ -\ 2684 \\ \hline 3783 \end{array}$ $\begin{array}{r} 4\ 6\ 0\ 2 \\ -\ 1\ 2\ 7\ 4 \\ \hline 3\ 3\ 2\ 8 \end{array}$ $\begin{array}{r} 5.589\ km \\ -\ 3.291\ km \\ \hline 2.298\ km \end{array}$

Multiplication

Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
5	• Multiply and divide numbers mentally drawing upon known facts	• Revise year 4 expanded multiplication column method (2 digit by 1 digit, 3 digit by 1 digit) • Children should be able to estimate and approximate first. • Children to use compact short multiplication (formal). TU x O, HTO x O, THTO x O • Use short multiplication to solve money calculations (decimal) by a single digit	$\begin{array}{r}64\\\times7\\\hline\end{array}$ $\begin{array}{r}2\\64\\\times7\\\hline 8\end{array}$ $\begin{array}{r}2\\64\\\times7\\\hline 448\end{array}$ $4\times7=28$ $6\times7=42$ $42+2=44$ $\begin{array}{r}£3.50\\x\quad 4\\\hline 14.00\end{array}$ *Top Tips* *Carry on the top when multiplying* *Carry underneath when adding*

Division

| Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
5	• Multiply and divide numbers mentally drawing upon known facts	• Children should be able to estimate and approximate first. • Short formal division with and without remainder • Division of money by a single digit with no remainder	$6\overline{)2532}$ $6\overline{)2532}$ $6\overline{)7584}=1264$ $5\overline{)437}=87\,r\,2\,or\,\frac{2}{5}$ $5\overline{)437.0}=87.4$

The Bar Model Method

The bar model method is a strategy used by children to visualise mathematical concepts and solve problems. The method is a way to represent a situation in a word problem, usually using rectangles.

The bar model is to be used alongside the appropriate calculation/calculations (refer to calculation policy)

The bar model method uses the concrete pictorial and abstract (CPA) sequence when teaching problem solving. The process starts by using real world, tangible representations, before moving onto showing the problem using a pictorial diagrams before then introducing the abstract algorithms and notations.

The bar model method is pictorial and it develops from children handling actual objects, to drawing pictures and then drawing boxes to represent objects. Eventually, they will no longer

need to draw all the boxes, which represents individual units, instead they just draw one long bar and label it with a number. At this stage the bars do need to be somewhat proportional, so

in the example above the purple bar representing 12 cookies is longer than the orange bar representing 8 cookies.
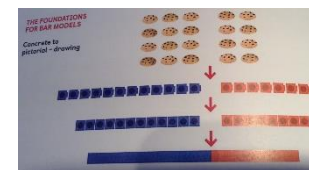
The particular power of the bar modelling pictorial approach is that it is applicable across a large number of topics. Once children have the basics of the approach secured, they can easily

extend it across many topics.

A good understanding of the four operations is needed to use bar models. Children need to have strategies to add, subtract multiply and divide for them to use bar models. Bar models don't

give you an answer – it gives you an understanding of what to do to get to the answer. The what to do part is where children would normally use the four operations.

There are two types of bar model:

Part Part Whole Model:	Comparison Model:
$20 + 5 = 25$ $a + b = c$	In a cross country race there were 21 girls running and 7 boys. How many more girls were there than boys?

As a school we have decided to write the total above the bar model and the parts underneath. The brackets are to be straight.