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

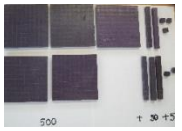
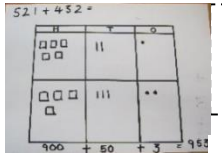
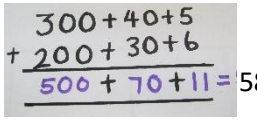
Addition	Subtraction	Multiplication	Division
Add	Take away	Repeated addition	Groups of
Plus	Count back	Times	Into groups of
More	Less	Array	Halve
Altogether	Minus	Multiply	Share
Total	Fewer	Groups of	Equally
Increase	Difference	Double	Into lots of
Make	Count on	Multiplication	Divided by
And	How many 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.

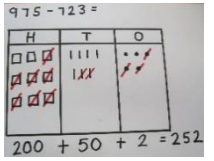
St John's Mathematics Calculation Policy

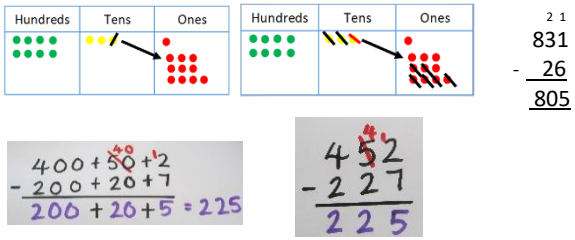
Year 3

Addition

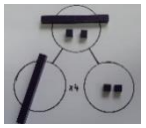
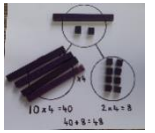
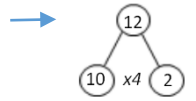
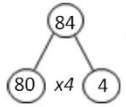
Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
3	• Add and subtract numbers mentally, including: ➢ a three-digit number and ones ➢ a three-digit number and tens ➢ a three-digit number and hundreds	Children to use inverse to check their work. Children can answer missing number and word problems using methods. • 3 digit + 3 digit no carrying (dienes) • 3 digit + 3 digit: totals to 10 or above carrying in the ones columns only (dienes). Expanded method initially, moving to compact method. • 3 digit + 2 digits –multiple of ten- carrying in tens columns only (dienes) • 3 digit + 3 digit totals to 10 or above carrying in the tens columns only (dienes)	  *Top Tip* *add the ones first* 500+ 20 + 1 + 400 + 30 + 2 900 + 50 + 3 = 953  581 236 +345 581 1 692 + 70 762 1 *Top Tip* *use the PV columns* *carry digit below* 236 +391 627 1

Subtraction

Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
3	• Add and subtract numbers mentally, including: a three-digit number and	Children to use inverse to check their work. Children can answer missing number and word problems using methods. • 3 digit - 3 digit no carrying (dienes) Column method *(top tip – keep columns aligned)*	 900 + 70 + 5 - 700 + 20 + 3 200 + 50 + 2 975 - 723 252 *Top Tip* *Subtract the ones first*

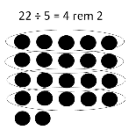
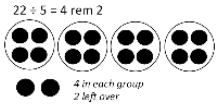
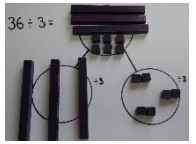
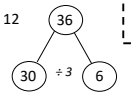
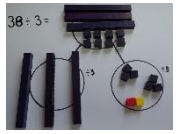
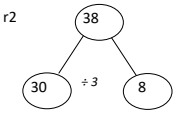
		• 3 digit - 2 digit - exchange from (dienes) • 3 digit - 3 digits – exchanging from the ones initially	

Multiplication

Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
3	• Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	• Children to use arrays and repeated addition to solve multiplication calculations. Children to use Numicon and cubes. • Children to practice the new times table objectives for their year group. (3, 4, 8x tables) and continue to practice 2, 5 and 10. • 2 digit x 1 digit (teen numbers). Concrete objects e.g. Dienes to be used initially to partition the number and then multiply. • 2 digit x 1 digit (2-9 times tables) carrying into both columns. Concrete objects e.g. Dienes to be used initially • Children to begin to use grid method 2 digit x 1 digit. Place value counters to be used initially.	 12 x 4 =    10 x 4 = 40 2 x 4 = 8 40 + 8 = 48 Top Tip Use number families e.g. 1 x 4 = 4 so 10 x 4 = 40 4 x 8 = 32 so 4 x 80 = 420  84 x 4 = 336 80 x 4 = 320 4 x 4 = 16 320 + 16 = 336 Top Tip Multiply the ones first 23 x 8 = × 20 3 8 160 24 160 + 24 184

St John's C of E Primary School - Calculation Policy (Year 3)

Division

Year Group	Number Facts Pupils should be taught to:	Written Calculations and Appropriate Models and Images to Support Conceptual Understanding	
3	• Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	• Children to revise using arrays and dots to solve simple division calculations • Two digit ÷ 1 digit without remainder. Concrete objects e.g. Dienes to be used initially to partition the number and then divide. • Two digit ÷ 1 digit with remainder (No regrouping) Concrete objects e.g. Dienes to be used initially to partition the number and then multiply.	  *Top Tip* *Use number families e.g.* *3 ÷ 1 = 3 so 30 ÷ 10 =*  36 ÷ 3 = 12  30 ÷ 3 = 10 6 ÷ 3 = 2 10 + 2 = 12  38 ÷ 3 = 12 r2  30 ÷ 3 = 10 8 ÷ 3 = 2 r2 10 + 2 r2 =12 r2

St John's C of E Primary School - Calculation Policy (Year 3)

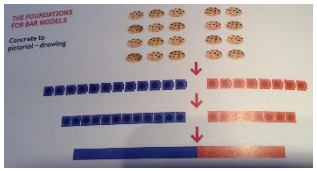
The Bar Model Method

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.

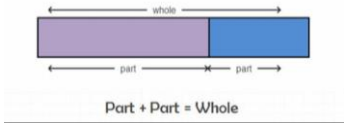
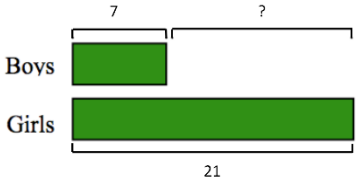
The bar model method is pictorial and it develops from children handling actual objects, to drawing pictures and then drawing boxes to represent objects. Eventually, they will no longer need to draw all the boxes, which represents individual units, instead they just draw one long bar and label it with 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:  20 + 5 = 25 a + b = c	Comparison Model:  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.