## St. Mark's Catholic Primary School Calculations Policy



Proudly and joyfully, we love, live and learn as God's children
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Person/s responsible for policy: L. Stewart and D.Linley
Issued to: Staff, governors, parents and children

## St. Mark's Calculation Policy

The following calculation policy has been largely adapted from the Master the Curriculum Resources (https://masterthecurriculum.co.uk) which works in line with White Rose Maths (https://whiteroseeducation.com). Additional material has been taken from the Number Sense Fluency programme (https://numbersensemaths.com) and Times Tables fluency programme (https://numbersensemaths.com/ttf) as well as the use of Fluent in Five Arithmetic from Third Space Learning (https://thirdspacelearning.com/resources/fluent-in-five-arithmetic-pack-years-3-6-weeks-1-6).

The policy aims to meet the requirements of the National Curriculum 2014 for the teaching and learning of mathematics, in accordance with an increased emphasis on fluency and mastery of concepts. It is designed to provide pupils with a clear and smooth progression of learning through KS1 and KS2 and ensure that the teaching of calculation methods remains consistent across the 4 operations of addition, subtraction, multiplication and division. The consistent use of the concrete, pictorial and abstract approach helps children develop mastery across all the operations in an efficient and reliable way. This policy shows how these methods develop children's confidence in their understanding of both written and mental methods. The school calculation policy builds progressively from the content and methods established in EYFS, with a recognition that concrete and pictorial representations of problems continue to play a valuable role throughout all key stages.

## Context for calculation:

It is important that children are given real-life contexts and problems to use and apply their calculation methods. As a result, children will develop a more secure understanding of the purpose of calculations and learn to choose their operations with accuracy. This is a priority in an increasingly-challenging curriculum, with its focus on mastery.

## Choosing a calculation method:

Children must be taught and encouraged to use a simple process in deciding what approach to take to a calculation, ensuring that they select the most appropriate method for the problem, whether mental or written. Children need to be comfortable with a wide variety of strategies and representations in order to demonstrate this. The aim is that the children will have efficient methods that they are comfortable with and will apply with independence and accuracy.

|  | Year 1 |  |  |
| :---: | :---: | :---: | :---: |
|  | Concrete | Pictorial | Abstract |
| Number bonds: | Children will learn number bonds to numbers within 10 by using egg boxes and tens frames. | Using images to show the number bonds. <br> Number Sense: Stage 2 - Make and break numbers to 10 looks at different arrangement of numbers to make numbers $2-10$. This is taught through visual animations. | Systematic teaching: $\begin{aligned} & 0+5=5 \\ & 1+4=5 \\ & 2+3=5 \\ & 3+2=5 \\ & 4+1=5 \\ & 5+0=5 \end{aligned}$ |
| Addition | Children will learn to add by using cubes, tens frames and the Part- whole model. $\square$ $\square$ $5+3=8$ | Using images to represent the concrete objects. $2+6=8$ | $\begin{aligned} & 3+4=7 \\ & 6+2=8 \\ & 5+1=6 \end{aligned}$ |


|  | $4+3=7$ <br> $4+2=6$ <br> Counting forward on a number line. | Number Sense - Stage 3 animations uses pictorial representations to support the children's early addition within 10. |  |
| :---: | :---: | :---: | :---: |
| Subtraction | Children will learn to subtract by using cubes, tens frames and the Part- whole model. Other physical objects can also be used to show how these objects can be physically taken away. <br> Counting back on a number line. | Using images to represent the concrete objects and crossing off the objects being taken away. <br> Part- whole model 7-5 $=2$ <br> Counting backwards on a number line. | $\begin{aligned} & 9-1=8 \\ & 8-3=5 \\ & 3-2=1 \end{aligned}$ |


|  |  |  |  |
| :---: | :---: | :---: | :---: |
| Multiplication: <br> Chn will learn to count in 2's 5's and 10 's. <br> They will solve one step problems by calculating the answer using concrete objects, pictorial representations and arrays. | Repeated addition: <br> Children will use different objects to add equal groups. <br> Arrays: <br> Chn will use cube and counters to create arrays. | Children will see pictorial representation of repeated additions such 3 bowls with 2 fish in each. <br> Children will begin to draw simple arrays to answer calculations. They will begin to see the commutative law. | Children will write repeated addition to describe pictures and objects. $2+2+2=6$ <br> Children will use arrays to write multiplication sentences and reinforce repeated addition. $\begin{aligned} & 5+5+5=15 \\ & 3+3+3+3+3=15 \\ & 5 \times 3=15 \\ & 3 \times 5=15 \end{aligned}$ |
| Division | Sharing: <br> Children will begin to divide by sharing objects between people. | Children will use pictorial representations to share quantities. They will begin to draw dots or shapes to represent the calculation. | $\begin{aligned} & 4 \div 2=2 \\ & 8 \div 2=4 \end{aligned}$ |

9 objects shared between 3 people $=3$


8 cookies shared between 2 plates $=4$


Children will share into equal groups using tens frames.

$4 \div 2=2$

## Grouping:

Children will divide quantities into equal groups. They will use cubes, counters and objects to support their understanding.

$8 \div 2=4 \quad \therefore \quad \because$
They will use tens frames templates to draw the calculations onto.

$4 \div 2=2$

Children will use pictures to make equal groups.

$4 \div 2=2$
$8 \div 2=4$

|  | Year 2 |  |  |
| :---: | :---: | :---: | :---: |
|  | Concrete | Pictorial | Abstract |
| Number bonds: | Children will consolidate their knowledge of number bonds to numbers within 10 by using cubes, tens frames and the part-whole model. $\square$ $\square$ <br> $9+1=10$ <br> $8+2=10$ <br> Number bonds to 100 <br> Children will use base 10 equipment and other objects to support their finding of number bonds to 100. | Using images to show the number bonds as well as drawing images to show the number bonds. <br> Number bonds to 100 <br> Children will use pictorial representations of base 10 equipment to support them finding number bonds to 100 . <br> Children will use pictorial representations to find number bonds to 100 . | Answer questions related to number bonds <br> Number bonds to 100 <br> Children will use their knowledge of the number bond to 10 to support their understanding of number bonds to 100 . $\begin{gathered} 7+3=10 \\ 70+30=100 \end{gathered}$ |


|  |  |  | $\begin{aligned} & \underline{0}+100=100 \\ & Z^{+}+\ldots=100 \\ & Z^{+}+\ldots=100 \\ & Z^{+}+\ldots=100 \\ & Z_{+}^{+}=100 \\ & Z_{+}^{+}=100 \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| Addition | Children will learn to add by using cubes, tens frames and the Part- whole model, consolidating the skills that they have learnt in Year 1. $\square$ $\square$ <br> Children will begin to use base 10 equipment when adding tens and ones. | Using images to represent the concrete objects. $6+2=8$ <br> Children will use base images of tens and ones to add. | Children will begin to add mentally by counting on. $13+1=$ $\qquad$ $21+1=$ $\qquad$ |



|  | a) $65-23=$ $\qquad$ <br> Children will place objects into the part whole model and will practically subtract some to find the answer. | Subtracting 2-digit numbers. $34-12=22$ <br> a) $65-23=$ $\qquad$ |  |
| :---: | :---: | :---: | :---: |
| Multiplication | Making Equal groups: <br> Children will use objects to make equal groups. They will use equipment such as tens frames and base ten. <br> Making arrays: <br> Children will us counters to make arrays. | Making Equal groups: <br> Children will draw or use images such as tens frames and base ten. <br> There are $\square$ 5 equal groups with $\square$ 4 in each group. <br> Add equal groups: | Children will write and answer number sentences such as: <br> a) $5 \times 2=$ $\square$ 10 <br> f) $\square$ 22 $=11 \times 2$ <br> b) $\square$ 16 $=8 \times 2$ <br> g) $2 \times$ $\square$ $=0$ <br> c) $2 \times 3=$ $\square$ 6 <br> h) $2 \times 1=$ $\square$ 2 <br> d) $2 x$ $\square$ $=8$ <br> i) $18=2 \times$ $\square$ <br> e) $14=$ $\square$ 7 $\times 2$ <br> j) 12 $\times 2=24$ |




|  | Year 3 |  |  |
| :---: | :--- | :--- | :--- |
|  | Concrete | $\underline{\text { Pictorial }}$ | $\underline{\text { Abstract }}$ |
| Addition | The children will develop an understanding of using <br> a range of equipment to help them with their <br> addition skills. Eventually, the children will become | The children will develop their addition skills by using <br> pictorial representations to add quantities. | Children will learn <br> efficient methods to add. |

confident in choosing and using the resources
independently.
They will use:
Base 10 equipment:


Number lines:


Place Value Charts and Counters:


With exchanges:
Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the is column- we exchange for 1 ten, when there are 10 tens in the 10 s column- we exchange for 1 hundred.


$243+5=248$


Base 10


Number lines


Place value chart and counters.
With exchanges:
Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1 s column- we exchange for 1 ten, when there are 10 tens in the 10 s column- we exchange for 1 hundred.


Adding the 100s.
$221+500=$.
$421+200=$.
$621+100=$.

## Formal written methods:

The children will begin to use the column method for addition. Children will be taught to start with the ones first, then the tens and then the hundreds.

Without exchanges:

|  |  |  |  |
| :---: | :---: | :---: | :---: |
|  | $T$ | 0 |  |
|  | 2 | 3 |  |
| + | 3 | 2 |  |
|  | - |  |  |
|  |  |  |  |


|  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  | H | T | O |  |
|  | 2 | 0 | 5 |  |
| + | 3 | 2 | 4 |  |
|  | 5 | 2 | 9 |  |

With exchanges:


|  |  | Children will use pictorial representations of base 10 resources to exchange to solve subtractions. |      <br> H T 0   <br>  9 4 1 2 <br> - 6 2 7  <br> 3 2 5   <br>          <br> $H$ T 0   <br> $5 \not 6$ 12 8   <br> -3 5 2   <br> 2 7 6   |
| :---: | :---: | :---: | :---: |
| Multiplication | The children will use previous method learnt. Arrays <br> We can see $\mathbf{6}$ columns of $\mathbf{3}$. <br> They will use place value charts. <br> Without exchanges | The children will use previous methods learnt. <br> They will draw place value charts <br> Without exchanges | From Year 3, the children are given daily Times Tables Fluency lessons using the Number Sense Programme to develop their mental recall of multiplication facts. This will enable the children to recall multiplication facts with efficiency and accuracy: $\begin{aligned} & \text { a) } 5 \times 4=\underline{20} \\ & \text { b) } 2 \times 8=\underline{16} \\ & \text { c) } 6 \times 8=\underline{48} \\ & \text { d) } 11 \times 2=\underline{22} \\ & \text { e) } 4 \times 8=\underline{32} \\ & \text { f) } 2 \times 9=\underline{18} \\ & \text { g) } 4 \times 7=\underline{28} \\ & \text { h) } 8 \times 10=\underline{80} \end{aligned}$ |



## Year 4

| Concrete | $\underline{\text { Pictorial }}$ | Abstract |
| :--- | :--- | :--- |





Children who are not yet secure with the above methods, may use some of the below method to support practically.

They will draw number lines to aid calculations.

$4 \times 21=84$

Pictorial representations.

a) $5 \times 4=\underline{20}$
b) $2 \times 8=16$
c) $6 \times 8=\underline{48}$
d) $11 \times 2=\underline{22}$
e) $4 \times 8=32$
f) $2 \times 9=18$
g) $4 \times 7=\underline{28}$
h) $8 \times 10=\underline{80}$

Year 4 - Children will use the expanded written method.


They will then move on to using the compact written method.


|  |  |  |  |
| :---: | :---: | :---: | :---: |
| Division | Children will use place value counters where necessary to calculate division sums. | Children will use pictorial representations or drawings to divide. $66 \div 3=22$ <br> Flexibly partitioning $576 \div 4=144$ | The children have daily Fluent in Five lessons to embed and practise the skills/methods that have been taught. <br> The children are given daily Times Tables Fluency using the Number Sense Programme to develop their mental recall of division facts. <br> The children will begin to use formal written methods for division. <br> 282 $2 \longdiv { 5 6 4 }$ |


|  | Year 5 |  |  |
| :---: | :---: | :---: | :---: |
|  | Concrete | Pictorial | Abstract |
| Addition | Children will begin to move away from using concrete objects and will develop their abstract skills - written and mental methods. <br> Children who still require concrete objects, will use place value counters to support them practically. | Children will begin to move away from using pictorial representations and will develop their abstract skills - written and mental methods <br> Children who still require pictorial support will use place value images. | The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. <br> Children will be taught mental strategies such as $\begin{gathered} 4+6=10 \\ 40+60=100 \\ 4,000+6,000=10,000 \\ 40,000+60,000=100,000 \end{gathered}$ <br> Adding 99 <br> To add 99 first we add 100 then subtract 1. <br> Children will use formal written methods for addition |






|  | Year 6 |  |  |
| :---: | :---: | :---: | :---: |
|  | Concrete | Pictorial | Abstract |
| Addition | Children will move away from using concrete objects and will develop their abstract skills written and mental methods. <br> Where necessary to clarify, children will use place value counters. | Children move away from using pictorial representations and will develop their abstract skills - written and mental methods. <br> Where necessary, children will represent place value counters pictorially. | The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. <br> $54,183+17,614=71,797$ |
| Subtraction | Children will move away from using concrete objects and will develop their abstract skills written and mental methods. <br> Where necessary to clarify, children will use place value counters. | Children move away from using pictorial representations and will develop their abstract skills - written and mental methods. <br> Where necessary, children will represent place value counters pictorially. | The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. <br> Children will use formal written methods for efficiency. |




