## Calculations Policy <br> Pencil and paper procedures <br> Key Stages 1 \& 2

St Joseph's Catholic Primary

Facilitating a 'concrete' experience- and using models and images.


## PROGRESSION OF NUMBERLINES

| Number track | Has the numbers inside the sections, rather than on the divisions | 0 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Calibrated, numbered numberline | Equal divisions marked on the numberline and each division is numbered |  |  |  |  |  |  |  |  |  |  |  |  |
| Calibrated, unnumbered numberline | Equal divisions are marked, but left unnumbered for children to add relevant numbers to |  |  |  |  |  |  |  |  |  |  |  |  |
| Blank numberline | No divisions or numbers marked for the children |  |  |  |  |  |  |  |  |  |  |  |  |

## Background to policy.

This policy contains the key pencil and paper procedures that will be taught within our school. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement.

Although the focus of the policy is on pencil and paper procedures it is important to recognise that the ability to calculate mentally lies at the heart of mathematics. The mental methods for teaching mathematics will be taught systematically from Reception onwards and pupils will be given regular opportunities to develop the necessary skills. However mental calculation is not at the exclusion of written recording and should be seen as complementary to and not as separate from it.
In every written method there is an element of mental processing. Sharing written methods with the teacher encourages children to think about the mental strategies that underpin them and to develop new ideas. Therefore written recording both helps children to clarify their thinking and supports and extends the development of more fluent and sophisticated mental strategies.

During their time at this school children will be encouraged to see mathematics as both a written and spoken language. Teachers will support and guide children through the following important stages:

- Developing the use of pictures and a mixture of words and symbols to represent numerical activities;
- Using standard symbols and conventions;
- Use of jottings to aid a mental strategy;
- Use of pencil and paper procedures;
- Use of a calculator.

This policy concentrates on the introduction of standard symbols, the use of the empty number line as a jotting to aid mental calculation and on the introduction of pencil and paper procedures. It is important that children do not abandon jottings and mental methods once pencil and paper procedures are introduced. Therefore children will always be encouraged to look at a calculation/problem and then decide the best method to choose - pictures, mental calculation with or without jottings, structured recording or a calculator. Our long-term aim is for children to be able to select an efficient method of their choice (whether this be mental, written or in upper Key Stage 2 using a calculator) that is appropriate for a given task. They will do this by always asking themselves:

- 'Can I do this in my head?
- 'Can I do this in my head using drawings or jottings?'
- 'Do I need to use a pencil and paper procedure?
- 'Do I need a calculator?


## Addition

## Stage 1

$\pm=$ signs and missing numbers
$3+4=$
$3+\square=7$
$\square+4=7 \quad 7=3+\square$
$\square+\nabla=7 \quad 7=\square+\nabla$

## $\begin{array}{lllll}28 & 8 & 08 & 08 & 08 \\ 28 & 8 & 08 & 0 & 0 \\ 10= & 1+9 & 2+8 & 3+7 & 4+6\end{array}$

$3+4$ is the same as 7 as modelled using Numicon Use Numicon to further understand the equivalence in a number sentence.
Promoting covering up of operations and numbers.
Using Number lines
(Teacher model number tracks and lines with numbers and with missing numbers)

$\left.$| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |$\quad$| 1 | 1 |
| :--- | :--- |
| 0 | 1 | \right\rvert\,

$7+4=11$ Children go up in 1 s
-
Able to use a hundred square securely for addition.


## Number Square

Partition the second number only

$$
23+12=23+10+1+1=33+
$$



Stage 2
$\pm=$ signs and missing numbers

## Adding three numbers

$34+5=30+\square+\square$
$32+\square+\square=100 \quad 35=1+\square+5$


## Stage 3

Partition into tens and ones and recombine
Consolidate:-
$36+53=53+30+6$
$=83+6$
$=89$
Partition into hundreds, tens and ones and recombine Partition the second
number only
$358+73=358+70+3$
$=428+3$
$=431$
358
431
Adding 9 or 11 by adding 10 and adjusting by 1


## Addition



## Stage 6

Pencil and paper procedures
Explore addition of numbers through games, puzzles, arithmagons Extend to use of decimals.
Extend to decimals (same number of decimals
places) and adding several numbers (with different numbers of digits).
Adoíng decimals using column odafion. $\overline{0} 0, \frac{1}{10}$



$\square+\square=\square+\square$






## Stage 1

## Pitures and symbols

Counting in 2's e.g. socks, shoes, Counting in 5's Counting in 10 's e.g. fingers, toes..

## 

Counting in 2p's, 5p's, 10p's

## 

(Recording on a number line modelled by the teacher when solving problems)


Use bead strings, bars \& Numicons to model groups of


Use cubes and pegs to show arrays and repeated


Begin to learn 2,5 and 10 times tables.



$$
\left.\left.\left.\left.\left.\prod_{0}\right|_{1}\right|_{20} I_{20}\right|_{1}\right|_{30}\right|_{40}| |_{50}
$$

## Multiplication

## Stage 2


or repeated addition $2+2+2+2$


Repeated addition using a number line. Understanding multiplication as repeated addition is key to understanding formal


Use known times table 2 facts.

## Stage 3

x = signs and missing numbers
Continue using a range of equations as in Stage 2 but with appropriate numbers.

$$
24 \times 8=192 \quad \begin{aligned}
& 24 \text { lots of } 8 \\
& \text { have been added } \\
& \text { in total. }
\end{aligned}
$$



Add 8 in lots of 10 The answer


$$
15 \times 2=30
$$

Partition $(10 \times 2)+(5 \times 2)$





