

Lickey Hills Calculation Policy<br>$$
\text { Reception - Year } 6
$$

This calculation policy sets out the methods used to help our pupils with calculations and has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics. It is also designed to give pupils a consistent and smooth progression of learning in calculations across the school, encompassing a mastery approach using Maths No Problem! as a vehicle for this.

Pupils are taught strategies to develop their mental calculation skills and overall number sense, to enable them to become efficient mathematicians. Pupils are regularly exposed to opportunities in which they can apply these mental calculation strategies whilst also being equipped with the reasoning skills to recognise when a written method is more appropriate.

The Calculation Policy shows methods that pupils will be taught within their respective year group. It is oxganised by operation in oxder to show progression throughout the school. Children should be confident in choosing and using a strategy that they know will get them to the correct answer; pupils are free to choose their preferred method to solve calculations but are guided towards working most efficiently.

Mathematical understanding is developed through use of representations that are initially concrete (e.g. Dienes, concrete apparatus), combined with pictorial (e.g. arrays, bar models, part whole diagrams) to then facilitate abstract working (e.g. columnar addition, long multiplication). It is important that conceptual understanding, supported by the use of representation, is secure for procedures and if at any point a pupil is struggling with a procedure, they should revert to concrete and/or pictorial resources and representations to solidify understanding.

Where possible, concepts should be taught in the context of real life. Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploxing cross-curricular links) to deepen their understanding.

## Addition - EYFS

In EYFS pupils should be developing their concept of the number system through the use of concrete materials and pictorial representations under the guidance of NCETM's Mastering Number programme. They experience practical calculation opportunities using a wide variety of equipment, e.g. small world play, role play, counters, cubes etc. They develop ways of recording calculations using pictures, etc.

## Strategies

- Pupils must be provided with opportunities to develop their skills so that they are able to count reliably, including one to one coxrespondence and count on from a given number.
- Pupils should be given the opportunity to count sets of objects and then combine them to make a total e.g. $6+2=8$
- Emphasis is placed upon subitising quantities - 'amount not count'

苞昜
- First count out a group of 6 .
- Then count out a group of 2 .
- Finally combine them to make a total.
- Pupils should recognise different ways of making numbers. Eg 6 can be made as:

- Children make a record in pictures, words and symbols.
- Solve different problems using fingers.
- Rekenreks are introduced to count up and to find one more.
- Number lines can be used alongside rekenreks and practical apparatus to solve addition calculations and word problems.
- Children will need opportunities to look at and talk about different models and images as they move between representations.
- Children become very familiar with part whole relationships, such that they can find smaller numbers within larger numbers.


Use numbered number lines to add, by counting on in ones. Encourage children to start with the larger number and count on.


Add by using number bond knowledge in oxder to make 10 / add the ones.

$$
\begin{aligned}
& 10
\end{aligned}
$$

bar method. Use
Introduce to the
visual bars to show the calculation.


Addition - Year 2
Before moving onto the written method, children should add using a

##  <br> 


$\circ$

Use a range of resources to add and associate to a written method (column method)





## Use

knowledge of number bonds to add numbers.
When renaming, show the expanded method, but link straight to the
Step $1 \begin{aligned} & \text { Add the ores. } \\ & \text { Sones. } 8 \text { nose }=13 \text { ones } \\ & \text { Regroup the ones. }\end{aligned}$

$\qquad$ compact method.


Children should use bars as a visual model to solve addition calculations and exposed to word problems.



| Addition Year 3 |
| :--- |
| Partition both numbers and recombine. Count on by partitioning the second number |
| only e.g.: $247+125=247+100+20+5$ |
| $=347+20+5$ |
| $=367+5$ |
| $=372$ |

Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10 . Number lines can still be used.

Introduce the expanded column method using manipulatives first.


Add the ones first in preparation for the compact method.
Introduce addition with renaming using the compact method with manipulatives first. Show how to rename, with partitioning.


- Add the ones first.
$\square$ Carry the numbers directly above the next number, ensuring that the renamed number is recoxded first above the digits.
- The + symbol is positioned to the left away from the digits

Continue to use bars as a visual model to calculations and exposed to word problems.


## Addition- Years 5 and 6

Carry on using previous methods taught in previous years to add, using the same terminalogy.
When adding decimals, use place value counters to show addition and use when renaming.


## Subtraction - EYFS

Using quantities and objects, subtract two single-digit numbers either count back to find the answer, or utilise their understanding of part whole relationships to identify a missing part.
Pupils should count out a group of abjects, move some away and recount the total. 8-3 = 5


After pupils have recognised different ways of making numbers, they should use this number bond knowledge to help with subtraction facts.


Children should use concrete materials to start counting back in order to solve subtraction problems. $8-3=5$


Children can make a record in pictures, words and symbols.
Emphasis is placed upon subitising quantities - 'amount not count'
Solve different problems using fingers.
Children will need opportunities to look at and talk about different models and images as they move between representations.

| Subtraction - Year 1 | Subtraction- Year 2 |
| :---: | :---: |
| Building on from the EYFS methods, children consolidate understanding of subtraction practically. Use physical objects to count back, which is then reinfoxced on different number squares and number lines. <br> Understand subtraction as finding the difference by counting on. <br> Pupils use knowledge of place value to partition 2 digit numbers in oxder to subtract ones from the number. They will be exposed to language such as "How much more" and "What is the difference between". | Before moving onto the written method, children should add using a cange of resources and methods, including using knowledge of number bonds to subtract numbers. <br> Use knowledge of subtraction to take away groups of 10 . <br> $4-1=3$ therefore $40-10=30$. <br> Continue to use number lines to model take-away and difference. E.g. <br> The link between the two may be supported by an image like this, with 47 being taken away from 72, leaving the difference, which is 25 . |

Pupils will be exposed to the idea of commutativity to understand the idea of fact families.


Children should start recalling subtraction facts up to and within 10 and 20, and should be able to subtract zero.

Use a range of resources to subtract and associate to a written method (column method)


| tens | ones |
| ---: | ---: |
| -3 | 7 |
| $-\quad 2$ | 4 |
| 1 | 3 |

$$
37-24=13
$$

When renaming, you subtract the ones first, and then cross out the number you need to rename and write
new


Use knowledge of number bonds to subtract.

Children should use bars as a visual model to solve subtraction calculations and exposed to word problems.


## Subtraction - Year 3

Children should use mental strategies to subtract 1-digit numbers and multiples of 10 from 3 digit numbers.

Introduce subtraction with renaming using the compact method with manipulatives first. Show how to rename, with partitioning.


- Subtract the ones first.
-Cross out a number which needs renaming and write the new number directly on top.
-The - symbol is positioned to the left, away from the digits Carry on, introducing multi-step renaming in single calculations.


Continue to use bars as a visual model to solve subtraction calculations and expose
to word problems.


136 © $43=93$

## Subtraction - Year 4

Reinforce column method by using concrete materials first, including for renaming.


Move onto pictorial, using bar modelling.


Show expanded method to make link of place value. Move straight onto compact method.

$5280-3169=2111$

When renaming, the number is crossed out and rewritten directly above. Use concrete resources to show renaming.


Subtraction - Years 5 and 6
Carry on using previous methods taught in previous years to subtract, using the same terminalogy. When subtracting decimals, use place value counters to show subtraction and use when renaming



## Multiplication - EYFS

The link between addition and multiplication can be introduced through doubling. Use a range of concrete materials to show a number and then repeat the number to show doubling. Then move onto pictorial representations.


Children will experience equal groups of objects. They should work on practical problem-solving activities. Real life contexts and use of


Start to count in $2 s, 5 s$ and $10 s$ aloud with objects.

Children are encouraged to visualise and draw multiplication problems in a real-life context. E.g How many fingers on 2 hands? How many legs on 4 ducks?

| Multiplication - Year 1 | Multiplication - Year 2 |
| :---: | :---: |
| Children should practise making equal groups first and add them to associate repeated addition with multiplication and doubling. Use a range of concrete materials before pictorial representations. <br> Washing line, and other practical resources for counting. Concrete objects. Numicon; bundles of straws, bead strings $2+2+2+2+2=10$ $\begin{aligned} & 2 \times 5=10 \\ & 2 \text { multipled by } 5 \end{aligned}$ <br> 5 pairs <br> 5 hops of 2 $\begin{aligned} & 5+5+5+5+5+5=30 \\ & 5 \times 6=30 \end{aligned}$ <br> 5 multiplied by 6 <br> 6 groups of 5 <br> 6 hops of 5 <br> Use cuisenaire and bar method to develop the vocabulary relating to 'times' - Pick up five, 4 times <br> Associate grouping to equal rows so children learn to count up in the same number. <br> $\because \Leftrightarrow 3$ cookies in 1 row <br> $\because \Leftrightarrow 6$ cookies in 2 rows <br> $\because(\% 12$ cookies in 4 rows <br> There are 20 toy soldiers altogether. | Begin with consolidating Year I repeated addition and associate to multiplication. <br> Before moving onto the written method, children should add using a range <br> of resources and methods <br> Children will associate the law of commutativity to multiplication using arrays and practical resources to show. <br> $2 \times 4$ is equal to $4 \times 2$ <br> $2 \times 8$ is equal to $8 \times 2$ <br> Move onto abstract route with problems. |

```
Use arrays to understand multiplication can be done in any order
(commutative)
0000 4\times2=8
0 0 0 0
    2\times4=8
        l00 2\times4=8
            <<
```


manipulatives to show.

Consolidate repeated addition before moving onto multiplication of 2 digit numbers.

- Multiply the ones digit by the single-digit number
- Multiply the tens digit by the single-digit number

Show partition to show how this looks, using manipulatives as a supporting mechanism. Show column method alongside.


Demonstrate multiplication on a number line - jumping in larger groups of amounts: $13 \times 4=10$ groups of $4+3$ groups of 4 Develop written methods using understanding of visual images.


Develop onto the grid method

|  | 10 | 8 |
| :---: | :---: | :---: |
| 3 | 30 | 24 |
|  |  |  |

## Multiplication - Year 4

Pupils should continue to develop their knowledge and understanding of multiplying by a single digit, using short multiplication (the formal written method of compact multiplication). Show expanded method but move straight onto compact method, as in Year 3, to show why and how to regroup.


Use different CPA approaches to show the same calculation.


Pupils must be 2-digit number by a single digit, before moving onto 3-digit
numbers. Repeat using same process as 2 -digit numbers.


$$
\begin{aligned}
400 \times 2 & =800 \\
70 \times 2 & =140 \\
3 \times 2 & =6 \\
\hline 473 \times 2 & =946
\end{aligned}
$$

Continue to develop the use of the grid method for 2 and 3 digit $x$ I digit calculations.

Show expanded method for conceptual understanding, but move straight onto the compact method using same techniques and breakdowns. When regrouping, always start with the larger value and write on top of the next digit.


Continue to use CPA approach and visual bars when solving multiplication and division in woxd problems.


## Multiplication - Years 5 and 6

Carry on using previows methods taught in previous years to multiply, using the same terminology. Start with 4 digits multiply by 1 digit before slowly adding further digit.
(1) There are 28 rows.

There are 28 rows.
Each row consists of 26 seats.
Develop the use of the grid method for 2 and $3 \times 2$ digit multiplication and to explore how Grid method supports and understanding of long multiplication.


Use partitioning and known multiplication facts, such as multiplying by 10 , to calculate 2 and 3 digit multiplication.


$$
\begin{aligned}
& 28 \times 26= \\
& 20 \times 26=520 \\
& 8 \times 26=208 \\
& \hline 28 \times 26=728 \\
& \hline
\end{aligned}
$$

$$
\begin{aligned}
& 26 \times 2=52 \\
& \text { So, } 26 \times 20=
\end{aligned}
$$

$$
\begin{array}{ll}
26 \times 2=52 & 26 \times 2=52 \\
\text { So, } 26 \times 20=520 & 26 \times 4=104
\end{array}
$$

$$
\begin{aligned}
& 2064=104 \\
& 26 \times 8=208
\end{aligned}
$$

Use column methods, both short and long multiplication, in the abstract form, regrouping above the digits as shown.

56

728 $\quad$| $\frac{10736}{24156}$ |
| :--- |

Pupils should have many practical experiences
finding $1 / 2$ of a group of abjects.
Grouping Model - Mum has 6 socks. She
pairs - how many pairs did she make?

Sharing Model - I have 10 sweets. I want to share them with my friend. How many will we have each?


Use a xange of pictorial
concrete materials to show a number and then share them equally. Then move onto representations.


Use of arrays as a pictorial representation for division.
$15 \div 3=5$ There are 5 groups of $3.15 \div 5=3$
There are 3 groups of 5 .


Children should be able to find $1 / 2$ and $1 / 4$ and simple fractions of abjects, numbers and quantities.

Continue work on arrays. Support children to understand how multiplication and division are inverse. Look at an array - what do you see?


| Division - Year 3 | Division - Year 4 |
| :---: | :---: |
| Introduce division by using manipulatives to divide (working on times tables; 2, 5, 10, 3, 4, 6 and 8). Show partitioning to link in division. <br> Show 'chunking' method of division, using known division facts to take away churks.$48 \div 4=12$81 <br> 8 <br> 9 <br> $-\quad 8$ <br> -11 <br> Also show 'short division' method and link 2 methods <br> $5 \longdiv { 7 \quad 5 } \begin{array} { r } { 7 7 ^ { 2 } 6 } \\ { \text { remainder 1 } } \end{array}$ together. <br> Continue to use CPA approach and visual bars when solving multiplication and division in word problems. | Pupils should continue to develop their knowledge and understanding of dividing by two-digits, using chunking and short division. Move onto 3-digit using same approach. <br> If there is a remainder, this should be noted after the quatient. <br> Move onto 3 -digit numbers divided by a single digit number after children are secure with 2-digit numbers. Use same concept; show chunking and short division, with CPA approach. |

Develop use of partitioning to support understanding of division

$68 \div 2=30+4=34$
$96 \div 8=12$


Develop understanding of short division method with the use of place value counters.

## Division Years - 5 and 6

Carry on using previous methods taught in previous years to divide, using the same terminology. Start with 4 digits divide by 1 digit before slowly adding further digit.

Show chunking and short division method. When chunking, show partitioning with correct place value.


With remainders, continue with same method but replace new value with a crossing out. Put remainders as $x$ $\qquad$ and fraction. In year 6, show to continue with $0 s$ after the decimal point.

$$
\begin{aligned}
5 \begin{array}{r}
376 \\
-350 \\
26
\end{array} & \rightarrow 70 \\
\begin{array}{r}
-25 \\
-\quad 2 \mathrm{ml} \div 5=75 \frac{1}{5} \mathrm{ml}
\end{array}>\frac{5}{1} & \rightarrow \frac{1}{5}
\end{aligned}
$$



