



Luddendenfoot Academy

Calculation Policy

Name of Policy Writer/Amendments	Date Written/Amended	Next Review Date
Rebecca Denham	November 2015	November 2017
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Luddendenfoot Academy

Calculation Policy

Progression towards a standard written method of calculation

INTRODUCTION

This calculation policy has been written in line with the programmes of study taken from the revised National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression. The content is set out progressively under the following headings:

- addition,
- subtraction
- multiplication
- division.

Children will use mental methods as their first port of call when appropriate, but for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence.

AIMS OF THE POLICY

- To ensure consistency and progression in our approach to calculation
- To ensure that children develop an efficient, reliable, formal written method of calculation for all operations
- To ensure that children can use these methods accurately with confidence and understanding

HOW TO USE THIS POLICY

- Use the policy as the basis of your planning but ensure you use previous or following years' guidance to allow for personalised learning
- Always use Assessment for Learning to identify suitable next steps in calculation for groups of children
- If, at any time, children are making significant errors, return to the previous stage in Calculation
- Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate
- Encourage children to make sensible choices about the methods they use when solving problems

Calculation Policy

Addition Sequence

<p>Step 1: Counting all and counting on using objects/ Numicon</p>	<p>Children begin by counting all objects in a set/ group to find a total</p> <p>They then move on to counting on usually from the largest number (this can be a set of objects)</p>	<p>Expected: End of EYFS</p> <p>Vocabulary: add, more, and make, sum, total altogether score double one more, two more, ten more... how many more to make... ? how many more is... than...? is the same as</p>
<p>Step 2: Counting on using a pre-numbered number line</p>	<p>Children locate the starting number, which is the largest number, and initially count on in ones .</p> <p>They may move on to counting on in steps of different sizes before moving to a blank number line.</p>	<p>Expected: Reception & Year 1</p> <p>Vocabulary: +, add, more, plus make, sum, total, altogether, score, double, near double one more, two more... ten more, how many more to make...? how many more is... than...? how much more is...? =, equals, sign, is the same as</p>
<p>Step 3: (If needed) Counting on using a blank number line in tens and ones</p>	<p>Children are able to label the start point of their number line with the biggest number.</p> <p>They can partition a two digit number into tens and ones and count on in tens and then ones in order to calculate the answer.</p>	<p>Expected : Year 2</p> <p>Vocabulary: +, add, more, plus make, sum, total, altogether, score, double, near double one more, two more... ten more, how many more to make...? how many more is... than...? how much more is...? =, equals, sign, is the same as</p>
<p>Step 4: Column Addition</p>	<p>Formal recording strategy which progresses in the following way:</p> <ul style="list-style-type: none"> • 2 digit + 2 digit without bridging ten/ hundred • 2 digit + 2 digit bridging ten/ hundred • 3 digit + 2 digit without bridging ten/ hundred • 3 digit + 2 digit bridging ten/ hundred <p>The above will be in line with the value of number that you are teaching to.</p>	<p>Expected: Year 2</p> <p>Vocabulary: +, add, more, plus make, sum, total, altogether, score, double, near double one more, two more... ten more, how many more to make...? how many more is... than...? how much more is...? =, equals, sign, is the same as</p>

Calculation Policy

Subtraction Sequence



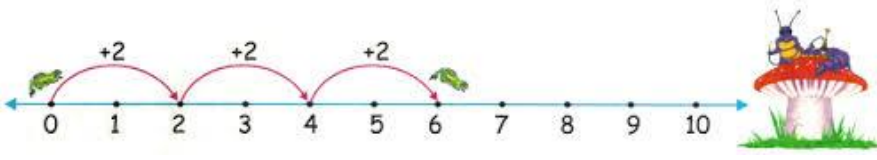
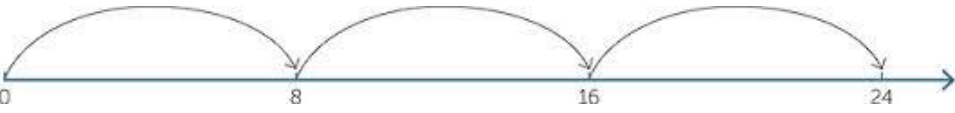
Step 1: Taking away using objects/ Numicon covers	Children begin by counting removing the required number of objects from the set to find a how many are left.	Expected Mastery: End of EYFS Vocabulary: take (away), leave how many are left/left over? how many have gone? one less, two less... ten less... how many fewer is... than...? difference between is the same as
Step 2: Counting back using a pre-numbered number line	Children locate the starting number, which is the largest number, and initially count back in ones . They may move on to counting back in steps of different sizes before moving to a blank number line.	Expected Mastery: Reception & Year 1 Vocabulary: –, subtract, take (away), minus Leave, how many are left/left over? how many have gone? one less, two less, ten less... how many fewer is... than...? how much less is...? half, halve
Step 3: Counting back using a blank number line in tens and ones	Children are able to label the end point of their number line with the biggest number. They can partition a two digit number into tens and ones and count back in tens and then ones in order to calculate the answer.	Expected Mastery: Year 2 Vocabulary: –, subtract, take (away), minus Leave, how many are left/left over? how many have gone? one less, two less, ten less... how many fewer is... than...? how much less is...? half, halve
Finding the Difference		
Step 1: Using Objects/ Numicon (single digit)	Children begin by laying out two sets of objects next to each other (if using counters etc) or placing the numicon tiles on top of each other, so that they can see the physical difference between the size of the two sets. They then count the difference by counting the total.	Expected Mastery: End of EYFS Vocabulary: difference between
Step 2: Finding the Difference using a pre-numbered number line	Children locate both numbers from the calculation they have been presented with. Starting from the smaller number they count on in ones to the second number. Their answer is how many they have counted on.	Expected Mastery: Reception & Year 1 Vocabulary: difference between
Step 3: Finding the difference using a blank number line in tens and ones	<ol style="list-style-type: none"> 1. Put the smallest number at the beginning of the number line. 2. Jump to reach the nearest ten. 3. Jump in tens until you reach the number of tens in the target number. 4. Jump the units. 5. Count up your jumps. 	Expected Mastery: Year 2 Vocabulary: difference between
Column Subtraction		
Step 4: Column Subtraction	Children begin to use this strategy without the need for decomposition. Place value of digit should be reinforced throughout. <ul style="list-style-type: none"> • 2 digit - 1 digit without borrowing • 2 digit – 10s • 2 digit - 2 digit without borrowing • 2 digit – 1 digit with borrowing • 2 digit – 2 digit with borrowing 	Expected : Year 2 (Decomposition: Year 2 Mastery) and Year 3 Vocabulary: –, subtract, take (away), minus Leave, how many are left/left over? how many have gone? one less, two less, ten less... how many fewer is... than...? how much less is...? half, halve, increase

- | | | |
|--|---|--|
| | <ul style="list-style-type: none">• 3 digit + 2 digit without bridging ten/ hundred• 3 digit + 2 digit bridging ten/ hundred | |
|--|---|--|

The above will be in line with the value of number that you are teaching to.

Calculation Policy

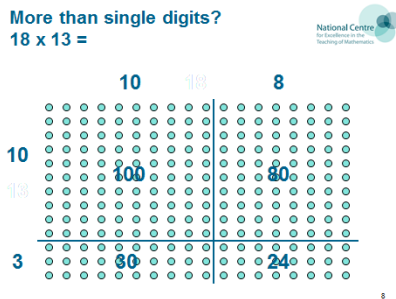
Step 1:	Children begin by organising a set of objects into groups and then counting the totals in	Expected Mastery: End of EYFS
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Counting groups objects/ Numicon	<p>the groups e.g 2 groups of 3 makes 6 altogether</p> 	Vocabulary: lots of, groups of
<p>Step 2: Using Arrays</p>	<p>Children organise objects or represent a given number or calculation using arrays</p>  <div data-bbox="875 376 1189 639" style="border: 1px solid black; padding: 5px;"> <p>This array represents: 3 groups of 2 OR 3 lots of 2 OR 3×2</p> </div> <div data-bbox="1458 437 1767 695" style="border: 1px solid black; padding: 5px;"> <p>This array represents: 2 groups of 3 OR 2 lots of 3 OR 2×3</p> </div>	<p>Expected Mastery: Reception & Year 1</p> <p>Vocabulary: lots of, groups of, arrays</p>
<p>Step 3: Repeated addition on a pre-numbered number line</p>	<p>Children are able to locate the start number and then add on repeated steps of the same number:</p>  <p style="text-align: right;">$3 \times 2 = 6$</p>	<p>Expected Mastery: Year 2</p> <p>Vocabulary: lots of, groups of \times, times, multiply, multiplied by multiple of; once, twice, three times... ten times...; times as (big, long, wide... and so on); repeated addition</p>
<p>Step 4: Repeated addition on a blank number line</p>	<p>Children label the start of their number line and count on in steps of the same number labelling the number they "land on" each time.</p>  <p>$8 \times 3 = 24$</p>	<p>Expected Mastery: Year 2</p> <p>Vocabulary: lots of, groups of, product \times, times, multiply, multiplied by multiple of; once, twice, three times... ten times...; times as (big, long, wide... and so on); repeated addition</p>
<p>Step 5:</p>	<p>This supports children in understanding 2 digit x 1 digit and then 2 digit x 2 digit</p>	<p>Expected Mastery: Year 3</p>

Grid method

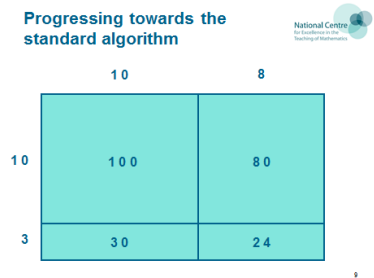
The use of models and images showing arrays should be used when introducing this method to children

First:



Children then add together the numbers inside the grid
 e.g. $100+80+30+24$
 or $180 + 54$

Then:



Vocabulary:
 lots of, groups of, product
 ×, times, multiply, multiplied by
 multiple of
 once, twice, three times... ten times...
 times as (big, long, wide... and so on)
 repeated addition
 array
 row, column
 double,

Step 6:
 Short multiplication

Short multiplication (formal method) of a two-digit number multiplied by a one-digit number:

$36 \times 4 = 144$

$$\begin{array}{r} 36 \\ \times 4 \\ \hline 144 \\ 2 \end{array}$$

Use the language of place value to ensure understanding.
 Ensure that the digit 'carried over' is written under the line in the correct column.

If children are confident, continue to develop short multiplication with three-digit numbers multiplied by a one-digit

Expected Mastery: Year 4

Vocabulary:
 lots of, groups of, product
 ×, times, multiply, multiplied by
 multiple of
 once, twice, three times... ten times...
 times as (big, long, wide... and so on)
 repeated addition
 array
 row, column
 double,

Expected Mastery: Year 5

Step 7:
Long Multiplication

Compact long multiplication (formal method):

$$23 \times 13 = 299$$

$$\begin{array}{r} 23 \\ \times 13 \\ + 69 \text{ (3 x 23)} \\ \underline{230} \text{ (10 x 23)} \\ 299 \end{array}$$

Use the language of place value to ensure understanding.

Add the partial products.

$$124 \times 26 = 3224$$

$$\begin{array}{r} 124 \\ \times 26 \\ 71424 \text{ (6x124)} \\ + \underline{2480} \text{ (20x124)} \\ \underline{3224} \\ 11 \end{array}$$

Use the language of place value to ensure understanding.


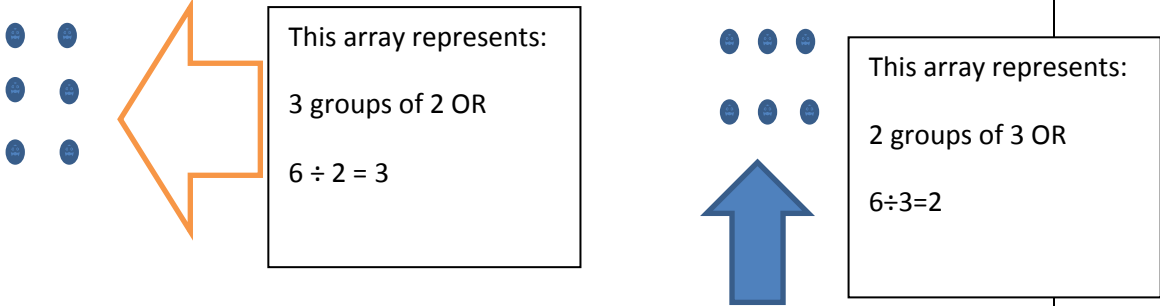
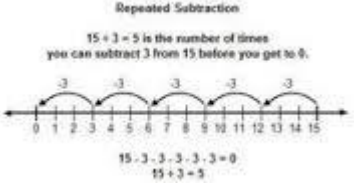
Add the partial products.

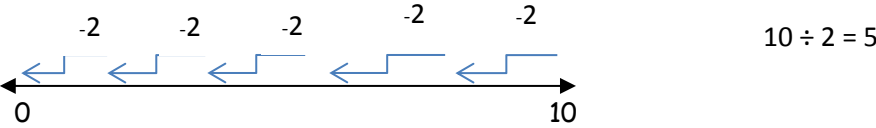
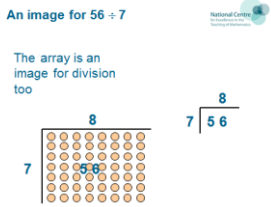

The prompts (in brackets) can be omitted if children no longer need them.

Vocabulary:

lots of, groups of, product
×, times, multiply, multiplied by
multiple of
once, twice, three times... ten times...
times as (big, long, wide... and so on)
repeated addition
array
row, column
double,

Division Sequence

<p>Step 1: Counting groups of objects/ Numicon</p>	<p>Children begin by sharing a set of objects between a set number of groups and then counting the total number in each group e.g 6 shared by 2 is 3</p> 	<p>Expected Mastery: End of EYFS</p> <p>Vocabulary: share, share equally one each, two each, three each... group in pairs, threes... tens equal groups of</p>
<p>Step 2: Using Arrays</p>	<p>Children organise objects or represent a given number or calculation using arrays</p> 	<p>Expected Mastery: Reception & Year 1</p> <p>Vocabulary: array, row, column,</p>
<p>Step 3: Repeated subtraction on a pre-numbered number line</p>	<p>Children are able to locate the start number and then add on repeated steps of the same number:</p> 	<p>Expected Mastery: Year 2</p> <p>Vocabulary: lots of, groups of ×, times, multiply, multiplied by multiple of; once, twice, three times... ten times... times as (big, long, wide... and so on); repeated addition; array; row, column; double,</p>
<p>Step 4:</p>	<p>Children label the end of their number line with the number to be divided. They count</p>	<p>Expected Mastery: Year 2</p>

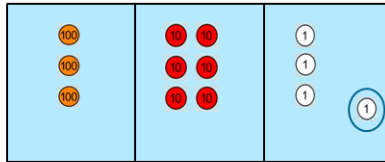
<p>Repeated subtraction on a blank number line</p>	<p>back in steps of the number they are dividing by, labelling the number they “land on” each time. They then count the number of “jumps backwards” they have made.</p> 	<p>Vocabulary: halve share, share equally one each, two each, three each... group in pairs, threes... tens equal groups of ÷, divide, divided by, divided into left, left over</p>
<p>Step 5: Bus Stop method with Arrays</p>	<p>This supports children in understanding 2 digit x 1 digit and then 2 digit x 2 digit</p> <p>The use of models and images showing arrays should be used when introducing this method to children</p> <p>First:</p>  <p>An image for $56 \div 7$</p> <p>The array is an image for division too</p>	<p>Expected Mastery: Year 3</p> <p>Vocabulary: halve, column, row share, share equally one each, two each, three each... group in pairs, threes... tens equal groups of ÷, divide, divided by, quotient, divided into</p>
<p>Step 6:</p>	<p>$363 \div 3 =$</p> 	<p>Expected Mastery: Year 4</p>

Without a remainder

Short division (initially with place value counters)

$$364 \div 3 =$$

$$\begin{array}{r} 121 \text{ rem } 1 \\ 3 \overline{) 364} \end{array}$$



With a remainder

Vocabulary: halve, column, row
share, share equally
one each, two each, three each...
group in pairs, threes... tens
equal groups of
÷, divide, divided by, quotient, divided into

Step 7:
Long Division

Children will need to select the most effective method for each calculation/problem they meet, including whether to use the standard, formal written method of long division:

$$\begin{array}{r} 28 \text{ r } 12 \\ 15 \overline{) 432} \\ \underline{300} \quad (20 \times 15) \\ 132 \\ \underline{120} \quad (8 \times 15) \\ \underline{12} \end{array}$$

Multiples of the divisor (15) have been subtracted from the dividend (432)
'20 (lots of 15) + 8 (lots of 15) = 28
12 is the remainder'

$$432 \div 15 = 28 \text{ r } 12$$

The remainder can also be expressed as a fraction, (the remainder divided by the divisor) or as a decimal, 0.8 (see next example)

The answer is: 28 $\frac{12}{15}$ or 28.8

Expected Mastery: Year 5

Vocabulary: halve, column, row
share, share equally
one each, two each, three each...
group in pairs, threes... tens
equal groups of
÷, divide, divided by, quotient, divided into