MANEY HILL PRIMARY SCHOOL

MATHEMATICS CALCULATIONS POLICY

Reviewed By Staff:	May 2022
Governor Ratification Date:	May 2022
Next Review Date:	April 2025

Maney Hill Primary School Mathematics Calculations Policy

• This policy contains the key pencil and paper procedures that are to be taught throughout the school. It has been written to ensure consistency and progression throughout the school

• Although the main focus of this policy is on pencil and paper procedures it is important to recognise that the ability to calculate mentally lies at the heart of maths

• 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

• Written recording both helps children to clarify their thinking and supports and extends the development of more fluent and sophisticated mental strategies

• The long-term aim is for children to be able to select an efficient method of their choice that is appropriate for a given task. They should 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 written method?'

Addition

Reception (EYFS)

Children will engage in a wide variety of songs, rhymes, games and activities.

They will begin to relate addition to **combining two groups of objects**, first by **counting all** and then by **counting on** from the largest number.

They will find one more than a given number.

In practical activities and through discussion they will begin to use the vocabulary involved in addition.

'You have five apples and I have three apples. How many apples altogether?'

Year 1

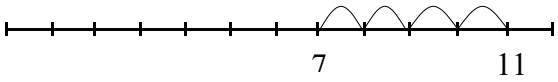
- Given a number identify one more
- Read, write and interpret mathematical statements involving addition (+) and the equals (=) sign
- Add 1 digit and 2 digit numbers within 20, including zero
- Solve missing number problems

3 + 4 = □ □ = 13 + 7
3 + □ = 7 15 = □ + 4
□ + 4 = 19 17 = 3 + □
□ + ∇ = 7 7 = □ + ∇

Number lines

Begin with a marked number line before moving onto a blank number line:

7 + 4 = 11



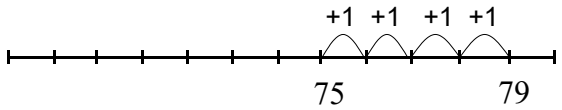
Children count on in 1s
'Put your finger on seven and count on four'

Addition

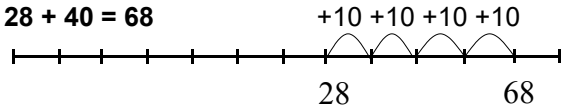
Year 2

Add numbers using concrete objects, pictorial representations and mentally, including:
- a 2 digit number and ones
- a 2 digit number and tens
- two 2 digit numbers
- three 1 digit numbers

Counting on in ones and tens using an empty number line, within 100…
75 + 4 = 79

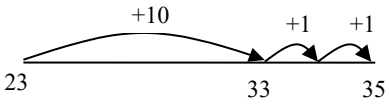


28 + 40 = 68

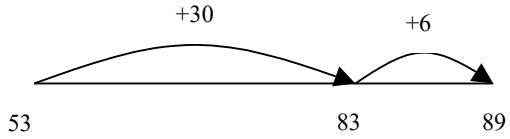


Use the partitioning method:
12 + 23 = 10 + 2 + 20 + 3 (use appropriately)
= 30 + 5
= 35

refine to partitioning the second number only:
23 + 12 = 23 + 10 +1 + 1
= 33 + 1 + 1
= 35



If children are confident use more efficient jumps:
36 + 53 = 53 + 30 + 6
= 83 + 6
= 89



Year 3

- Add numbers with up to 3 digits, using formal written method of column addition

Further develop the partitioning method with calculations that bridge 100:
85 + 37 = 80 + 5 + 30 + 7
80 + 30 = 110
5 + 7 = 12
110 + 12 = 122

Formal written method of column addition:

Expanded Method demonstrating partitioning:
83 + 42 = 125

```
  8 3
+ 4 2
    5    (3 +2)
  120    (80 + 40)
  125
```

Leading to formal method,

```
  63
+ 32
  95
```

This leads onto the formal written method where it is necessary to show numbers carried underneath:

```
  358
+  73
  431
   11
```

Addition

Year 4

- Add numbers with up to 4 digits using the formal written method of column addition

Extend to numbers with up to four digits:
Revisit the expanded method first, if necessary:

3587 + 675 = 4262

```
  3587
+  675
    12 (7+5)
   150 (80+70)
  1100 (500+600)
  3000
  4262
```

This will lead into the formal written method:

```
  3587
+  675
  4262
   111
```

The digits that have been carried should be recorded under the line in the correct column.

Continue to develop addition of two 4 digit numbers and with decimals (in the context of money or measures).

Year 5

- Add whole numbers with more than 4 digits, including using formal written method of column addition

Extend to numbers with more than 4 digits:
50,678 + 9281

```
  50678
+  9281
  59959
      1
```

Formal written method of column addition

Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.
124.9 + 117.25 = 242.15

```
  124.90
+ 117.25
  242.15
    11
```

add in a zero to keep the place value

Extend to decimals in different contexts e.g. money and measures

£2.50 + £ 1.75 = £ 4.25

```
  £ 2.50
+ £ 1.75
  £ 4.25
```

Addition

Year 6

No objectives have been included in the programmes of study explicitly related to written methods for addition in Y6. However, there is an expectation that children will continue to practise and use the formal written method for larger numbers and decimals and use these methods when solving problems.

Subtraction

Reception (EYFS)

Children will engage in a variety of counting songs and rhymes and practical activities.

In practical activities and through discussion they will begin to use the vocabulary associated with subtraction.

They will find one less than a given number.

They will begin to relate subtraction to **'taking away'** using objects to count **'how many are left'** after some have been taken away.

'Take two apples away. How many are left?'

Children will begin to count back from a given number.

Year 1

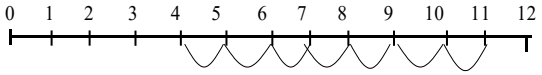
- Given a number, identify one less
- Read, write and interpret mathematical statements involving subtraction (-) and the equals (=) sign
- Subtract 1 digit and 2 digit numbers within 20, including zero
- Solve missing number problems

7 - 3 = □	□ = 7 - 3
7 - □ = 4	4 = □ - 3
□ - 3 = 4	4 = 7 - □
□ - ∇ = 4	4 = □ - ∇

<u>Visual / practical activities</u>
Number lines

11 – 7 = 4

'Put your finger on number eleven and count back seven.'

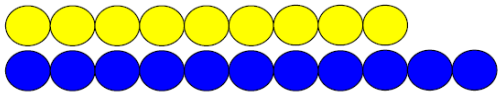


NB Ensure children are confident with using a marked number line before moving on to an empty number line

Counting on to find a small difference:
The use of models is extremely important here to understand the idea of **"difference".**

Count up from the smallest number to the largest to find the difference using resources, e.g. cubes, beads, number tracks/lines:

11 – 9 = 2



The difference between 9 and 11 is 2

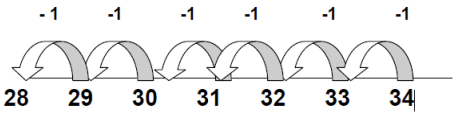
Subtraction

Year 2

Subtract numbers using concrete objects, pictorial representations and mentally, including:
- A 2 digit number and ones
- A 2 digit number and tens
- Two 2 digit numbers

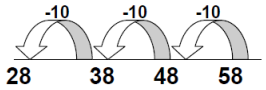
Counting back using an **empty number line** within 100, in ones…

34 - 6 = 28



…and in tens:

58 - 30 = 28

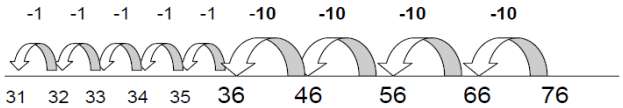


Use in conjunction with a **100 square** to show jumps of tens.

Subtraction, using partitioning, on an empty number line:
76 – 45 = 31

Subtraction, using partitioning, on an empty number line:

76 – 45 = 31

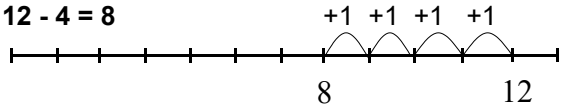


Use in conjunction with a **100 square** to show jumps of tens and ones.

NB If children are confident, use more efficient jumps

Counting on to find a small difference

12 - 4 = 8



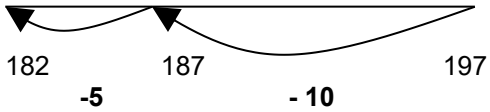
'The difference between 8 and 12 is 4'.

Year 3

- Subtract numbers with up to 3 digits, using formal written method of column subtraction

Further develop the use of the empty number line with calculations including 3 digit numbers e.g. 3 digit number – 2 digit number

197 – 15 = 182



<u>Formal written method of column subtraction (3 digits):</u>
Introduce the expanded written method with the calculation presented both horizontally and vertically (in columns). Use two-digit numbers when introducing this method, initially:

78 – 23 = 55

70 + 8
− 20 + 3
50 + 5 = 55

This will lead to the formal written method

78
- 23
55

Use the language of place value to ensure understanding: 'Eight subtract three, seventy subtract twenty.'

When confident introduce the formal method involving exchange

8 1
~~9~~ 2
- 3 8
5 4

Subtraction

Year 4

- Subtract numbers with up to 4 digits using the formal written method of column subtraction

Continue to develop the formal written method for subtraction by revisiting the expanded method first if necessary.

Move onto numbers with up to 4 digits, involving exchange:

352 – 178 = 174

```
 2 14 1
  3 5 2
-  1 7 8
   1 7 4
```

3625 – 1219 = 2406

```
  1 1
 3625
-1219
 2406
```

Year 5

- Subtract whole numbers with more than 4 digits, including using formal written method of column subtraction

Continue to develop the formal written method for subtraction by revisiting the expanded method first if necessary.

Formal written method:

```
 4  9  1
 5  0  3
-  2  7  8
   2  2  5
```

There is potential for error in this question. There are no tens in the first number (503) so we have to exchange a hundred for 10 tens before we can exchange a ten for ten ones/units.

Subtraction problems in context

When children are confident, develop with four digit numbers and decimal numbers (in the context of money and measures)

£34.50 - £4.25

```
  £34.50
- £ 4.25
  £30.25
```

Further develop the subtraction of decimals in different contexts e.g. money

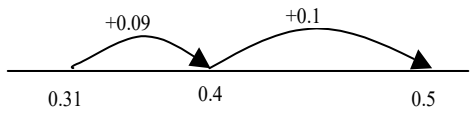
£48.42 – £37.61 =

```
     7
  £48.42
-  £37.61
   £10.81
```

Find a difference using decimals by counting up

e.g. 0.5 – 0.31 = 0.19

This can be modelled on an empty number line



Subtraction

Year 6

Year 6
No objectives have been included in the programmes of study explicitly related to written methods for subtraction in Y6. However, there is an expectation that children will continue to practise and use **the formal written method for larger numbers and decimals** and use these methods when solving problems.

Our aim is that by the end of Y6, children **use mental methods (with jottings)** when appropriate, but for calculations that they cannot do in their heads, they use an efficient **formal written method** accurately and with confidence.

Multiplication	
Reception (EYFS)	**Year 1**
Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving doubling.  *'Three apples for you and three apples for me. How many apples altogether?'*	**- Solve one step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher** **- Count in multiples of 2's, 5's and 10's.** Children will count repeated groups of the same size in practical contexts. They will use the vocabulary associated with multiplication in practical contexts. **<u>Pictures and symbols</u>**  **5 pairs of socks** *How many socks altogether?* 2, 4, 6, 8, 10 Use **arrays** to support early multiplication  Five groups of two faces. *How many faces altogether?* 2,4,6,8,10 Two groups of five faces. *How many faces altogether?* 5, 10 ' 2 groups of 5' 'double 5 is 10'

Multiplication

Year 2

- Recall and use multiplication facts for the 2, 3, 5 and 10 multiplication tables
- Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (x) and equals (=) sign
- Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods and multiplication facts, including problems in contexts
- Show that multiplication of two numbers can be done in any order

Children will use a range of vocabulary to describe multiplication and use practical resources, pictures, diagrams and the multiplication sign to record.

Combing groups (repeated addition):

'3 groups of 10 crayons – how many crayons altogether?'

10 + 10 + 10 = 30
3 x 10 = 30 or 10 x 3 = 30

Use **arrays** to support multiplication

5 + 5 + 5 = 15

3 rows of 5

5 x 3 = 15 or 3 x 5 = 15

Using a number line: 3 x 5 = 15

Year 3

- Recall and use multiplication facts for 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables)
- Write and calculate mathematical statements for multiplication using the multiplication tables they know, including 2 digit numbers multiplied by 1 digit numbers, using mental and progressing to a formal written method

Continue to use number lines and arrays to support multiplication:
3 x 8 = 24

Partitioning
13 x 5 = 65
10 x 5 = 50
3 x 5 = 15
50 + 15 = 65

Grid Method:
13 x 8 = 104

X	10	3
8	80	24

80 + 24 = 104

This will lead into **expanded short multiplication:**
13 x 8 = 104

```
  10 + 3
X      8
    24 (3 x 8)
+   80 (10 x 8)
  104
```

Formal short multiplication:

```
   13
X   8
  104
   2
```

Multiplication	
Year 4	**Year 5**
- Recall multiplication facts for multiplication tables up to 12 x 12 **- Multiply two and three digit numbers by a one digit number using formal written layout** Short multiplication: 137 x 7 137 x 7 49 (7 x 7) 210 (7 x 30) 700 (7 x 100) 959 This will lead into **short multiplication (formal method):** 137 X 7 959 2 4 Use the language of place value to ensure understanding. Ensure that the digits 'carried over' are written under the line in the correct column.	**- Multiply numbers up to 4 digits by a one or two digit number using a formal written method, including long multiplication for two digit numbers.** **Expanded long multiplication** 56 x 27 56 x 27 42 (7x6) 350 (7x50) 120 (20x6) 1000 (20x50) 1512 1 This will lead onto **compact long multiplication (formal method):** 56 x 27 56 X 27 4 392 (7x56) 1 1120 (20x56) 1512 1 **When children are confident** with long multiplication extend to 3 digit numbers.

Multiplication

Year 6

Year 6

- Multiply multi-digit numbers (including decimals) up to 4 digits by two digit numbers

With use of written formal method used in year 5, children will solve 4 digits by 2 digits.

Moving towards formal written method for long multiplication:

5 3 . 2
x 2 4 . 0
1
2 1 2 . 8 (53.2 x 4)
1 0 6 4 . 0 (53.2 x 20)
1 2 7 6 . 8

It is an option to include 0 in this example, but not essential.
The prompts (in brackets) can be omitted if children no longer need them.

Division	
Reception (EYFS)	**Year 1**
Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving halving and sharing.  Share the apples between two people. *'Half of the apples for you and half of the apples for me.'*	**- Solve one step problems involving division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher** **- Count in multiples of twos, fives and tens** Children to start with practical **sharing** using a variety of resources. They will share objects into **equal groups** in a variety of situations. They will begin to use the vocabulary associated with division in practical contexts.  *'Share these 8 apples equally between 2 children. How many apples will each child have?* Use **arrays** to support early division *How many faces altogether?*  *How many groups of 2? How many groups of 5?*  Five groups of 2 Two groups of 5

Division

Year 2

- Recall and use multiplication and division facts for 2, 5 and 10 multiplication tables
- Calculate mathematical statements for division within the multiplication tables they know and write them using the division (÷) and equals (=) signs
- Solve problems involving division, using materials, arrays, repeated subtraction, mental methods and multiplication and division facts, including problems in contexts

Sharing and grouping:

'30 crayons shared equally between 3 pots' (Sharing)
'We have 30 crayons and put ten crayons in each pot. How many pots do we need?' (Grouping)

30 divided by 10 = 3
30 divided by 3 = 10

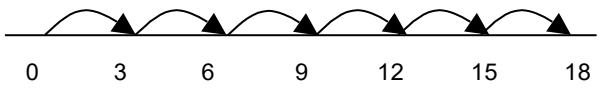
30 ÷ 10 = 3
30 ÷ 3 = 10

Using arrays to support division:

How many groups of 5? How many groups of 3?
15 shared between 3 people is…?
15 shared between 5 people is…?
15 ÷ 5 = 3
15 ÷ 3 = 5

Use an empty number line to count forwards:
18 ÷ 3 = 6

How many 3's make 18?



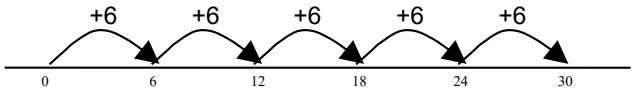
Children can also jump back to show repeated subtraction.

Year 3

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for division using the multiplication tables that they know, including for 2 digit numbers divided by 1 digit numbers, using mental and progressing to a formal written method

<u>Using an empty number line:</u>

30 ÷ 6 = 5



Introduce the formal layout using the multiplication/ division facts that the children know:

48 ÷ 4 = 12

		1	2	
	4	4	8	

'Forty eight divided by four equal twelve'
'How many fours are there in forty eight?'

Division

Year 4

- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Use place value, known and derived facts to divide mentally
- Divide two-digit and three-digit numbers by a one-digit number using formal written layout (not explicitly stated in the programmes of study but implied in the non-statutory guidance)

Continue using the **formal written layout** for division using **multiplication tables that they know:**

32 ÷ 8 = 4

			4	
	8	3	2	

'How many eights are there in thirty two?'

Continue using the formal written layout, introducing remainders:

25 ÷ 3 = 8 r1

			8	r 1
	3	2	5	

NB Remainders are not specifically referred to until Y5 in the National Curriculum.
However, this may be an appropriate point to introduce them using familiar multiplication facts.

Division using partitioning:
65 ÷ 5 = 13
50 ÷ 5 = 10
15 ÷ 5 = 3
10 + 3 = 13

98 ÷ 7 = 14

		10 + 4 =14
	7	70 + 28

This will lead into the formal written method of short division:

		1	4	
	7	9	$_{2}$ 8	

Year 5

- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

Continue to practise the **formal written method of short division** with **whole number answers and remainders:**

184 ÷ 8 = 23

		2	3	
	8	1 8	$_{2}$4	

432 ÷ 5 = 86 $\frac{2}{5}$

		8	6	r 2
	5	4 3	$_{3}$ 2	

The remainder can also be expressed as a fraction (the remainder divided by the divisor)

Division

Year 6

- Divide numbers up to 4 digits by a 2 digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- Divide numbers up to 4 digits by a 2 digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Continue to practise the formal method of short division, with and without remainders,

Dividing by a two-digit number using a **formal method of long division (remainders are given as both fractions and decimals):**

496 ÷ 11 = 45 r 1

		4	5	r 1
	11	4 9	6	
		- 4 4	0	(40 x 11)
		5	6	
		- 5	5	(5 x 11)
			1	(remainder)

Multiples of the divisor (11) have been subtracted from the dividend (496)
'40 (lots of 11) + 5 (lots of 11) = 45 (lots of 11)'
'1 is the remainder'
Answer: 45 1/11

432 ÷ 15 = 28.8

	2 8 .	8	r 1
1 5	4 3 2 .	0	
	- 3 0 0 .	0	(20 x 15)
	1 3 2 .	0	
	- 1 2 0 .	0	(8 x 15)
	1 2 .	0	(remainder)

This is an alternative way of recording formal long division:

432 ÷ 15 = 28·8

```
        28·8
    ┌──────
15  │ 432·0
    │ 30↓
    │ 132
    │ 120 ↓
    │  120
    │  120
    │    0
```

NB Only teach this method when children are completely secure with the previous method.

The remainder is expressed as a decimal.

NB If, at any time, children are making significant errors, return to the previous stage in calculation.