Bilston C of E Primary School

CALCULATION POLICY

2017

About our Calculation Policy

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the Development Matters EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Age stage expectations

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the stage that they are currently working at, being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on.

The overall aim is that when children leave primary school they

-have a secure knowledge of number facts and a good understanding of the four operations

-children can use efficient written methods for each operation with confidence and understanding

Addition

Year 1

Conceptual understanding and procedural fluency

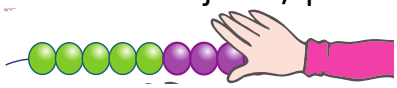
- Understand the concept of addition as combining two or more groups of objects, and counting on
- Recall addition number facts to 10 then 20

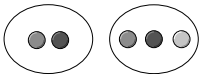
- Solve one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems such as 9 + ☐ = 16

Mental calculation Strategies

- Use models and images, e.g.

- concrete objects / pictorial representations





5 + 2 = 7
2 + 5 = 7
7 – 2 = 5
7 – 5 = 2

1	2	3	4	5	6	7	8	9	10

+1 +1 +1 6+3=

6 7 8 9

+1 +1 +1 14+3=

14 17

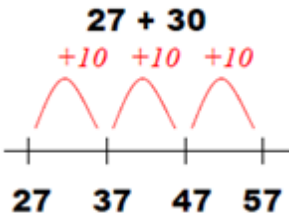
Children should:

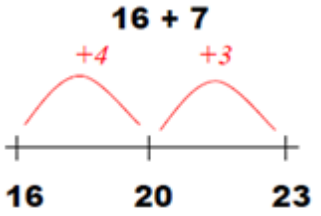
- Have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different con-texts.

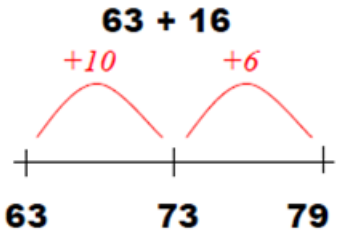
- Read and write the addition (+) and equals (=) signs within number sentences.

 Interpret addition number sentences and solve missing box problems, using concrete objects and number line addition to solve them:

Year2- add 2, 2 digit numbers







leading to Expanded written method

$$\begin{array}{r} 38 \\ +\ 25 \\ \hline 13 \\ 50 \\ \hline 63 \end{array}$$

Year 3- add numbers with up to 3 digits

Written methods

$$\begin{array}{r} 548 \\ +\ 387 \\ \hline 15 \end{array}$$

120
800
935

Leading to

Formal written method

548
+ 387
935
1 1

Year 4

Add numbers with up to 4 digits, including money and measures

Expanded written method

2476
+ 6847
13
110
1200
8000
9323

Leading to

Formal written method

2476
+ 6847
9323

1 1 1

Year 5

– Add whole numbers with more than 4 digits
– Add decimals with up to two decimal places, including a mix of whole numbers and decimals, and decimals with different numbers of decimal places

Formal written method

```
  12 957
+ 14 635
  27 592
   1  1
```

Year 6

– Add whole numbers with more than 4 digits
– Add decimals with up to three decimal places, including a mix of whole numbers and decimals, and decimals with different numbers of decimal places

```
  8.438
+ 5.386
 13.824
  1 1
```

Carry digits are recorded below the line, using the words ‘carry one tenth’, ‘carry one hundredth’, or ‘carry thousandth’ not ‘carry one’.

Subtraction

Year 1

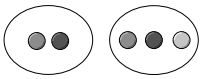
Conceptual understanding and procedural fluency

- Understand the concept of subtraction as 'take away' (counting back) and 'difference' (counting up)
- Recall subtraction number facts to 10 then 20
- Solve one-step problems that involve subtraction, using concrete objects and pictorial representations, and missing number problems as 7 = ☐ – 9

Mental Methods

Use models and images, e.g.

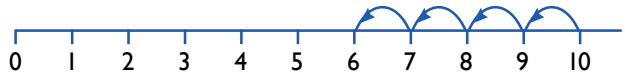
- concrete objects / pictorial representations



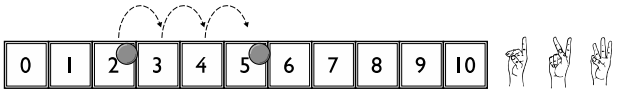
5 + 2 = 7
2 + 5 = 7
7 – 2 = 5
7 – 5 = 2

- number track or number line

e.g. 'take away' – counting back



e.g. 'difference' – counting up

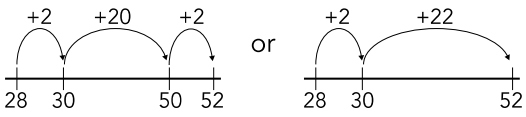


Written methods

- Read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs

Year 2

- empty number line ('difference' – counting up)



Leading to

– Subtract two two-digit numbers (without borrowing)

Record subtraction calculations without borrowing in columns to support place value and prepare for formal written methods with larger numbers.

87
– 32
55

Year 3

Formal written method (decomposition)
– Subtract numbers with up to three digits

~~435~~
– 168
267

Year 4

Formal written method (decomposition)
– Subtract numbers with up to 4 digits, including money and measures

~~5761~~
– 2854
2907

Year 5
Formal written method (decomposition)
– Subtract whole numbers with more than 4 digits
– Subtract decimals with up to two decimal places, including a mix of whole numbers and decimals, and decimals with different numbers of decimal places

~~45 257~~
– 17 488
27 769

Year 6

Formal written method (decomposition)
– Subtract whole numbers with more than 4 digits
– Subtract decimals with up to three decimal places, including a mix of whole numbers and decimals, and decimals with different numbers of decimal places

~~7.416~~
– 3.548
3.868

Multiplication

Year 1

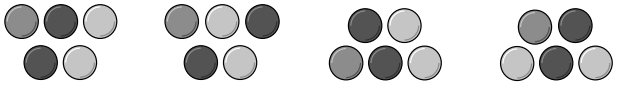
Conceptual understanding and procedural fluency

- Understand the concept of multiplication as repeated addition
- Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays

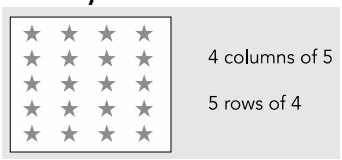
Mental strategies

- Use models and images, e.g.

- concrete objects / pictorial representations



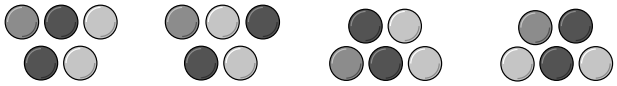
- arrays



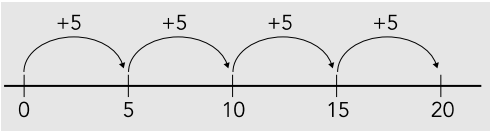
Year 2

- Use model and images, e.g.

- concrete objects / pictorial representations



number lines



- arrays

5 x 4 = 20
4 x 5 = 20

- Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs

Year 3

- Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs

Eg. 23 x 8 = 184

X	20	3
8	160	24

160 + 24 = 184

Expanded written method

H	T	O	
	7	3	
×		4	
	1	2	(3 x 4)
	2	8	0 (70 x 4)
	2	9	2

Year 4

Short multiplication

– Multiply a two-digit or three-digit number by a one-digit number

Eg. 136 x 5 = 680

X	100	30	6
5	500	150	30

500
150
+30
680

Move onto short multiplication (see Y5) if and when children are confident and accurate multiplying 2 and 3-digit numbers by a single digit this way, and are already confident in ‘‘carrying‘‘ for written addition.

Leading to

Expanded written method

H T O

3 7 8
× 4
3 2 (8 x 4)
2 8 0 (70 x 4)
1 2 0 0 (300 x 4)
1 5 1 2

Year 5

Multiply numbers up to four digits

Expanded written method

H T O
3 7 8
× 4
3 2 (8 x 4)
2 8 0 (70 x 4)
1 2 0 0 (300 x 4)
1 5 1 2
1

Year 6

Multiply multi-digit numbers up to 4 digits by a two-digit whole number

Multiplying the most significant digit first

2 8 4
x 6 3
1 $7^{5}0^{2}4\ 0$ (284 x 60)
$8^{2}5^{1}2$ (284 x 3)
1 7 8 9 2

Multiplying the least significant digit first

2 8 4
x 6 3
$8^{2}5^{1}2$ (284x3)
1 $7^{5}0^{2}4\ 0$ (284x60)
1 7 8 9 2

Division

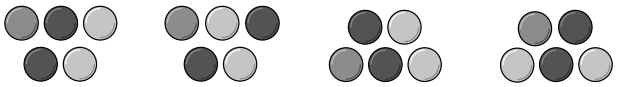
Conceptual understanding and procedural fluency

- Understand the concept of division as grouping (repeated subtraction) or sharing
- Find simple fractions of objects, numbers and quantities
- Solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays

Mental strategies

- Use models and images, e.g.

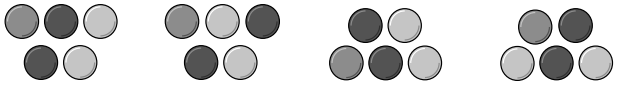
- concrete objects / pictorial representations



- arrays

Year 2

- Use model and images, e.g.



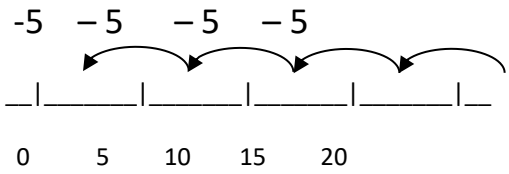
- concrete objects / pictorial representations

arrays

$20 \div 5 = 4$

$20 \div 4 = 5$

- number lines



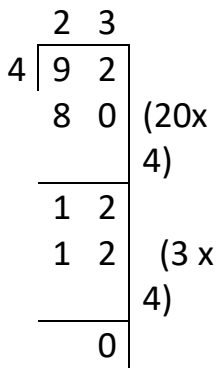
Recognise and use the inverse relationship between multiplication and division, including doubling and halving

Calculate mathematical statements for multiplication within the multiplication tables and write them using the division (÷) and equals (=) signs

Year 3

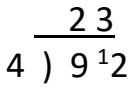
Short division (without a remainder)
– Divide a two-digit number by a one-digit number

The first step is to show all of the calculations involved.
Expanded written method



Leading to

Formal written method

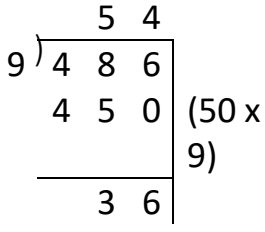


Year 4

Short division (without a remainder)
– Divide a two-digit or three-digit number by a one-digit number

The first step is to show all of the calculations involved.

Expanded written method



3 6 | (4 x 9)

0

Leading to
Formal written method

$$\begin{array}{r} 5\ 4 \\ 9\ \overline{)\ 4\ 8\ ^{3}6} \end{array}$$

<u>Year 5</u>

Short division (including with remainders – as a whole number, fraction or decimal, or by rounding)

– Divide numbers up to 4 digits by a one-digit number

$$\begin{array}{r} 2\ 6\ 2\ R\ 4 \\ 7\ \overline{)\ 1\ 8\ ^{4}3\ ^{1}8} \end{array}$$

<u>Year 6</u>

– Divide multi-digit numbers up to 4 digits by a one-digit whole number

– Divide one-digit or two-digit numbers up to two decimal places by a one-digit number

Whole numbers

$$\begin{array}{r} 2\ 6\ 2\ R\ 4 \\ 7\ \overline{)\ 1\ 8\ ^{4}3\ ^{1}8} \end{array}$$

Decimals

1. Calculating with decimals

$$\begin{array}{r} 7\ .\ 5\ 6 \\ 6\ \overline{)\ 4\ 5\ .\ ^{3}3\ ^{3}6} \end{array}$$

– Divide multi-digit numbers up to 4 digits by a two-digit whole number

$$\overline{2\ 3\ R\ 4}$$

```
1 8 ) 4 1 8
  – 3 6 0      (20x18)
    5 8
  – 5 4        ( 3x18)
    4
```

Formal written method

```
     2 3 R 4
1 8 ) 4 1 8
  – 3 6 ↓
    5 8
  – 5 4
    4
```

To be reviewed 2018