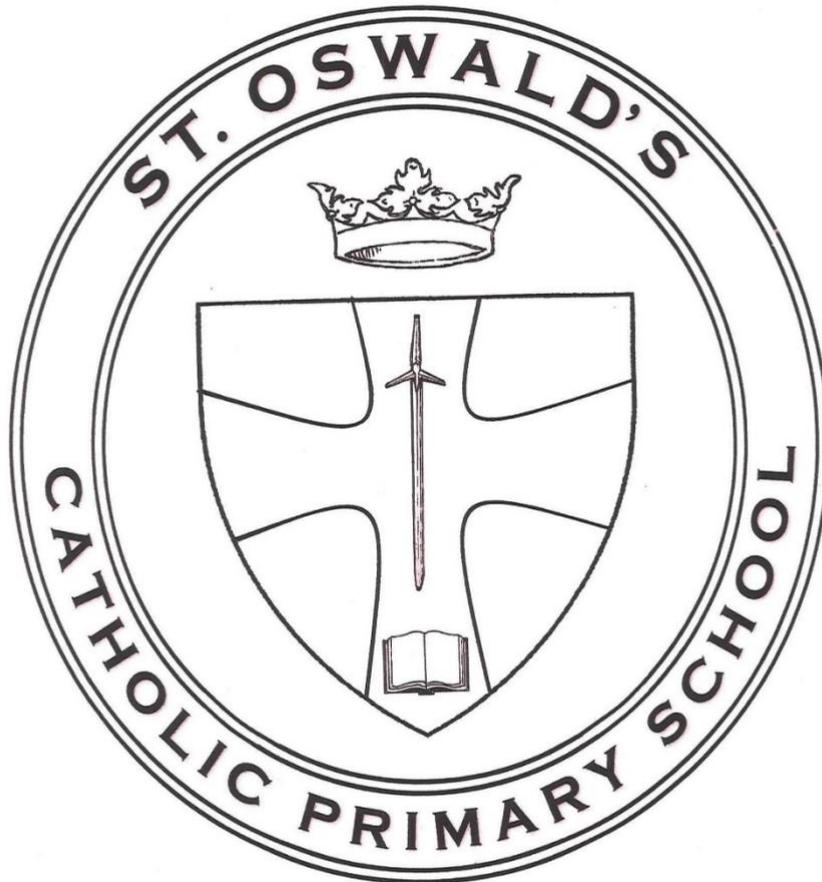


# Calculation Policy



St. Oswald's Catholic  
Primary School

## St Oswald's Catholic Primary School

This is the Calculation Policy for St Oswald's Catholic Primary School and it reflects the school's values and ethos as written in our mission statement:

*Together with Jesus, we will Learn and Grow in Faith.*

### Policy Statement:

This Calculation Policy has been developed to support the effective implementation of the 2014 Primary National Curriculum.

At St. Oswald's Catholic Primary School, we implement the Mastery approach. At the centre of this approach is the belief that all children have the potential to succeed. Children should have access to the same curriculum content outlined in the National Curriculum programmes of study for their year group. The Mastery approach encourages depth before breadth, so that children become fluent in the fundamentals of mathematics and can apply their knowledge rapidly and accurately.

This policy outlines the progression of calculation strategies that should be taught and used from EYFS – Year 6, in line with the requirements of the 2014 Primary National Curriculum.

It includes a list of the key mental maths skills that support written methods.

For each operation, there are sequential stages starting with the practical methods that support conceptual understanding moving through to methods that allow children to demonstrate efficiency in procedural approaches.

This policy only details the strategies; teachers must plan opportunities for pupils to apply these; for example, when solving problems, or where opportunities emerge elsewhere in the curriculum.

It is expected that children will be encouraged to build their fluency, problem solving and reasoning in all 4 operations by taking this approach:

**Concrete** – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

**Pictorial** – alongside this, children should use pictorial representations. These representations can then be used to help reason and solve problems.

**Abstract** – both concrete and pictorial representations should support children's understanding of abstract methods; using numbers and key concepts with confidence.

True understanding of a mathematical concept may require going back and forth between these representations and using them alongside one another.

There is a clear focus on manipulatives and visual images to support understanding in every year group. Each new concept or calculation strategy will be introduced using appropriate manipulatives, giving the children a clear picture of the theoretical mathematics they are

learning. It is important that the children have access to a wide range of manipulatives in every year group, when and where applicable.

These include:

| Addition             | Subtraction          | Multiplication         | Division                 |
|----------------------|----------------------|------------------------|--------------------------|
| 100 square           | 100 square           | Place value counters   | Arrays                   |
| Number lines/tracks  | Number lines/tracks  | Dienes                 | Multiplication squares   |
| Bead strings         | Bead strings         | Place value charts     | 100 square               |
| Straws               | Straws               | Arrays                 | Number lines             |
| Dienes               | Dienes               | Multiplication squares | Blank number lines       |
| Place value cards    | Counting stick       | 100 square             | Counting stick           |
| Place value dice     | Place value dice     | Number lines           | Place value counters     |
| Place value counters | Place value cards    | Blank number lines     | Dienes                   |
| Numicon              | Place value counters | Counting stick         | Numicon                  |
| Multi-link cubes     | Multi-link cubes     | Multi-link cubes       | Counting Stick           |
| Blank number lines   | Blank number lines   | Numicon                | Multi-link cubes counter |
| Counting stick       | Numicon              | Counters               |                          |

### Addition, Subtraction, Multiplication and Division

It is important that children’s mental methods of calculation are practised on a regular basis and secured alongside their learning and use of written methods for all 4 operations.

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use a written method accurately and with confidence.

Children are taught and acquire secure mental methods of calculation and one written method of calculation for the 4 operations, which they know they can rely on when mental methods are not appropriate.

### Addition

This policy shows the stages of each written method for addition, each stage building towards a more refined method.

**There are some key basic skills that children need to help with addition, which include:**

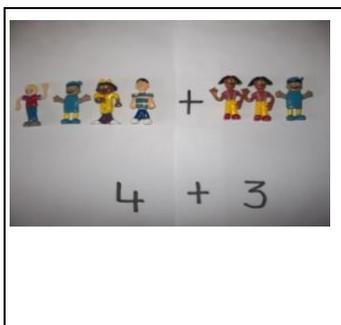
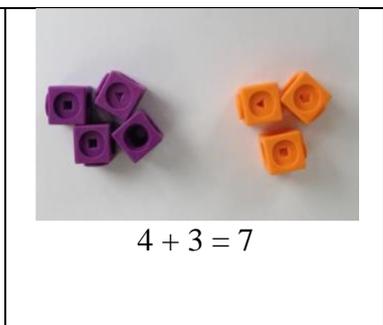
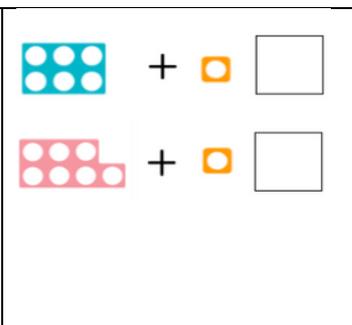
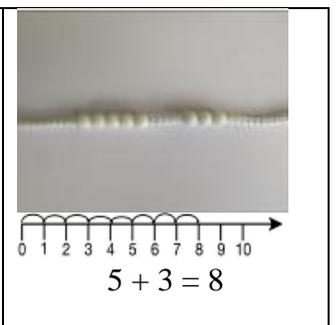
- counting
- estimating
- recalling all addition **pairs** to 10, 20 and 100 ( $7 + 3 = 10$ ,  $17 + 3 = 20$ ,  $70 + 30 = 100$ )
- knowing number **facts** to 10 ( $6 + 2 = 8$ )
- adding mentally a series of one-digit numbers ( $5 + 8 + 4$ )
- adding multiples of 10 ( $60 + 70$ ) or of 100 ( $600 + 700$ ) using the related addition fact,  $6 + 7$ , and their knowledge of place value
- partitioning two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways ( $432$  into  $400 + 30 + 2$  and also into  $300 + 120 + 12$ )
- understanding and using addition and subtraction as inverse operations

**Using and applying is a key theme and one of the aims of National Curriculum and before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts, these include:**

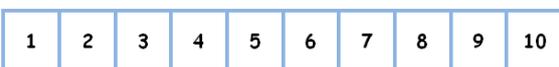
- using inverse
- missing box questions
- using units of measure including money and time
- word problems
- open ended investigations

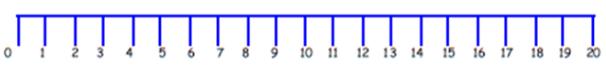
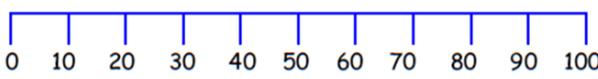
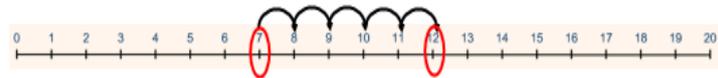
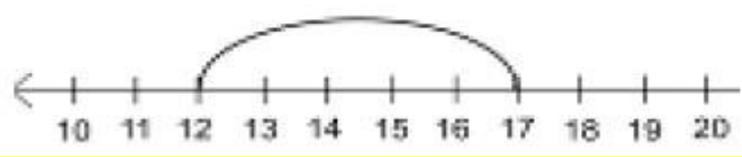
**Stage 1 : Practical (combining) and adding on ( increasing)**

Prior to recording addition steps on a number line, children will work practically with equipment where they are **combining** sets of objects. As they become more confident, this practical addition of sets of objects will be mirrored on a number line so that the two are being done together and children are **adding on**. This will prepare them for the abstract concept of adding numbers rather than objects.

|  |  |   |  |
|--|--|---|--|
|  |  |  |  |
|--|--|---|--|

**Stage 2 :Number Tracks and Number Lines**

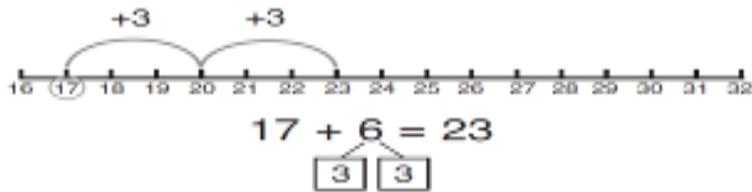


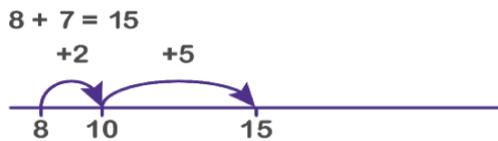


7 + 5 = 12

12 + 5 = 17



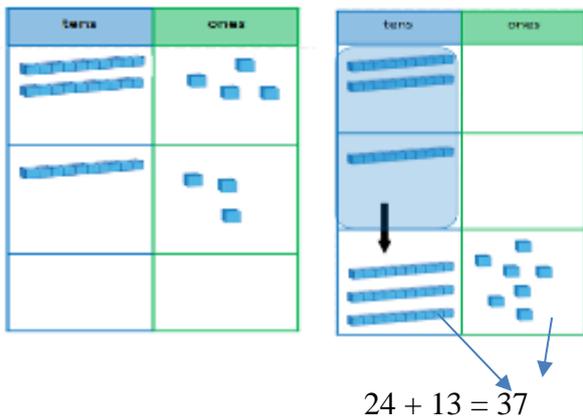
Steps in addition can be recorded on a number line. The steps often bridge through a multiple of 10 and, this is more efficient if children know how to partition 1-digit numbers.



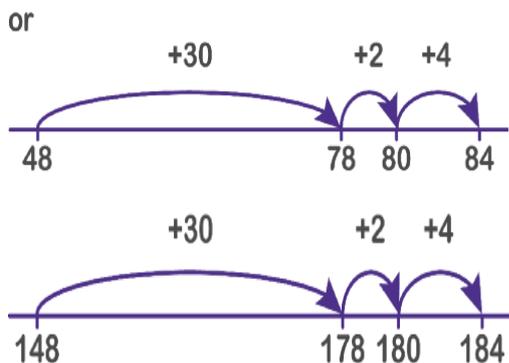
In this example, 7 has been partitioned into 2 and 5 which makes bridging through 10 more efficient

**Stage 3 :Partitioning**

Use partitioning to add at least two 2-digit numbers using concrete resources and/or a numbered number line and then progressing to an empty number line.



In these examples, the 6 in 36 has been partitioned into 2 and 4 which makes bridging through 10 more efficient



With practice, children will need to record fewer jumps.

**Stage 4 : Expanded columnar method**

Partition both numbers into tens and ones or hundreds, tens and ones (using a grid makes this easier). Use manipulatives alongside the calculation.

$$48 + 36 = 84$$

|   |    |    |    |
|---|----|----|----|
|   | 40 | 8  |    |
| + | 30 | 6  |    |
|   | 70 | 14 | 84 |

$$148 + 36 = 184$$

|   |     |    |    |     |
|---|-----|----|----|-----|
|   | 100 | 40 | 8  |     |
| + |     | 30 | 6  |     |
|   | 100 | 70 | 14 | 184 |

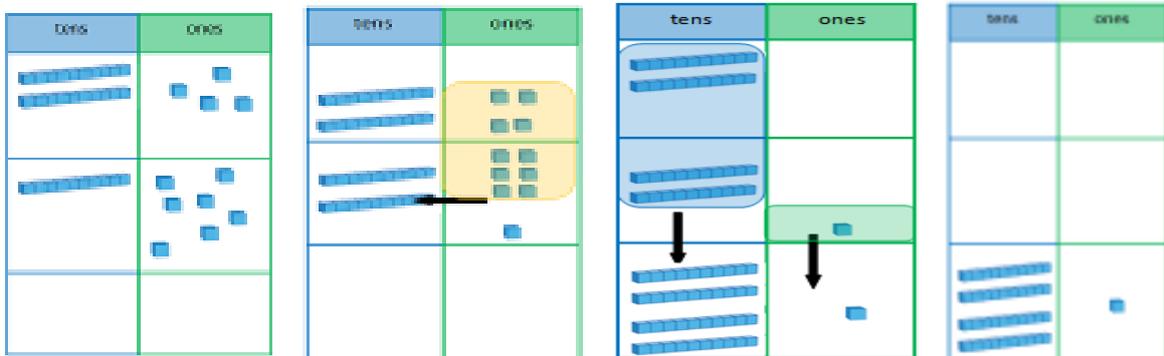
This builds on children's mental maths skills of partitioning and recombining

$$8 + 6 = 14$$

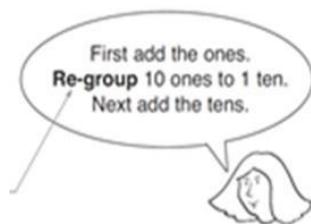
$$40 + 30 = 70$$

$$48 + 36 = 84$$

Leading to regrouping.



|                |    |   |
|----------------|----|---|
| $24 + 17 = 41$ |    |   |
|                | 20 | 4 |
| +              | 10 | 7 |
|                | 40 | 1 |
|                | 10 |   |



Using more abstract manipulatives as concrete understanding develops.

| H | T | O |
|---|---|---|
|   |   |   |
|   |   |   |

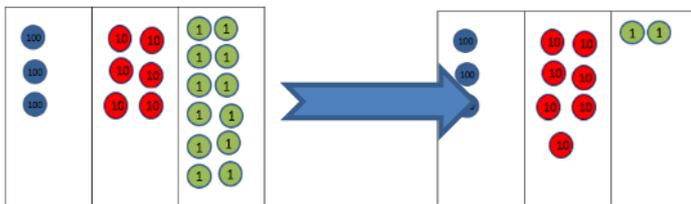
$$200 + 40 + 7$$

$$100 + 20 + 5$$


---


$$300 + 60 + 12 = 372$$

Leading to regrouping.



### Stage 5 : Efficient ( column method)

Children move on to the formal column algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

$$\begin{array}{r} 48 \\ + 36 \\ \hline 84 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 148 \\ + 36 \\ \hline 184 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 48.56 \\ + 32.23 \\ \hline 80.79 \\ \hline 1 \end{array}$$

Children should be encouraged to estimate their answers first

Column addition remains efficient when used with larger whole numbers or decimals, and when adding more than two numbers. Once learned, the method is quick and reliable.

### Subtraction

This policy shows the stages of each written method for subtraction, each stage building towards a more refined method.

**There are some key basic skills that children need to help with subtraction, which include:**

- counting
- estimating
- recalling all addition **pairs** to 10, 20 and 100 along with their inverses (7 + 3 = 10, 10 - 3 = 7, 17 + 3 = 20, 20 - 3 = 17, 70 + 30 = 100, 100 - 30 = 70)

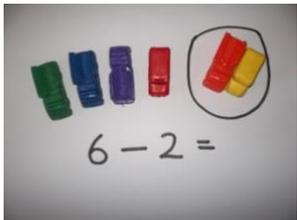
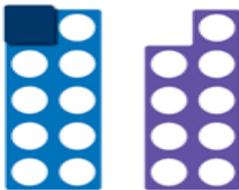
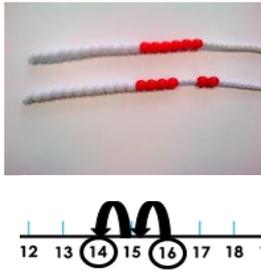
- knowing number **facts** to 10 and their inverses (  $6 + 2 = 8$ ,  $8 - 2 = 6$  )
- subtracting multiples of 10 (  $160 - 70$  ) using the related subtraction fact,  $16 - 7$ , and their knowledge of place value
- partitioning two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways (  $432$  into  $400 + 30 + 2$  and also into  $300 + 120 + 12$  )
- understanding and using subtraction and addition as inverse operations

**Using and applying is a key theme and one of the aims of National Curriculum and before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts, these include:**

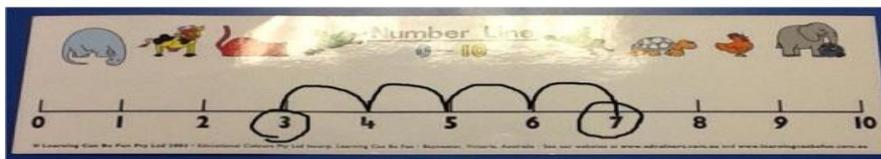
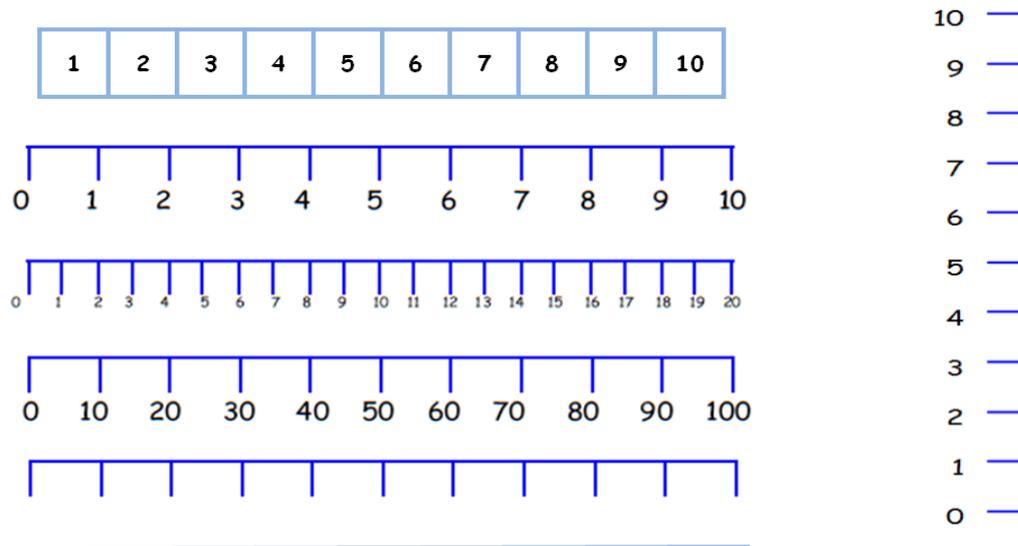
- using inverse
- missing box questions
- using units of measure including money and time
- word problems
- open ended investigations

**Stage 1 : Practical ( taking away )**

Prior to recording subtraction steps on a number line, children will work practically with equipment where they are ‘taking away’ a small group from a larger set of objects. As they become more confident, this practical subtraction will be mirrored on a number line so that the two are being done together. This will prepare them for the abstract concept of subtracting numbers rather than objects.

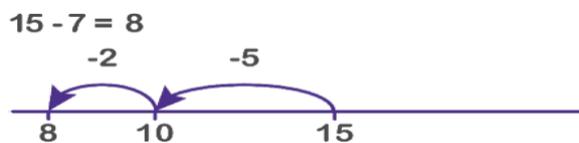
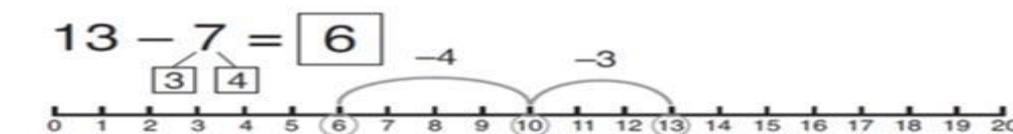
|   |   |   |   |
|---|---|---|---|
|  <p><math>6 - 2 =</math></p> |  <p><math>20 - 4 = 16</math></p> |  <p><math>10 - 1 = 9</math></p> |  <p><math>16 - 2 = 14</math></p> |
|---|---|---|---|

**Stage 2 :Number Tracks and Number Lines (Partitioning)**



$7 - 4 = 3$

Steps in subtraction can be recorded from right to left on a number line. The steps often bridge through a multiple of 10 and, this is more efficient if children know how to partition 1-digit numbers.



In this example on a blank number line, 7 has been partitioned into 2 and 5 which makes bridging through 10 more efficient

Use partitioning to subtract two 2-digit numbers using concrete resources and/or a numbered number line and then progressing to an empty number line.

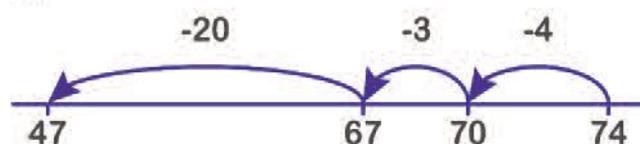


$$34 - 13 = 21$$

$$74 - 27 = 47$$

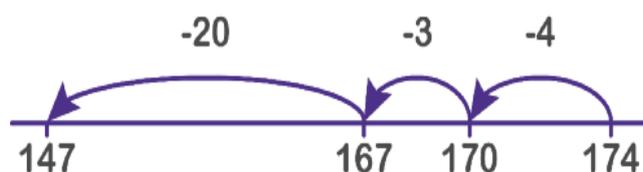


or



In these examples, 27 has been partitioned into tens and ones then the 7 in 27 has been partitioned into 3 and 4 which makes bridging through 10 more efficient.

$$174 - 27 = 147$$



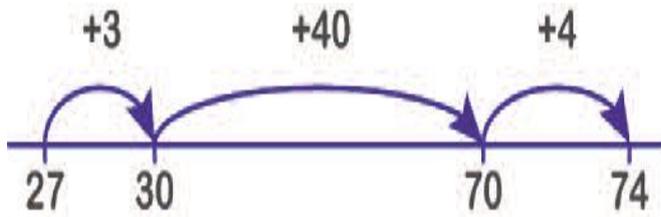
With practice, children will need to record fewer jumps.

### Counting up (to be introduced after counting back)

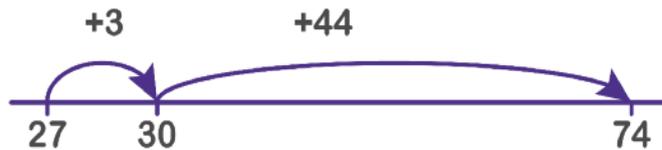
This strategy should be used when the language used is 'find the difference', 'difference between' and 'distance between'.

Steps in subtraction can be recorded from left to right on a number line. The steps often bridge through a multiple of 10.

$$74 - 27 = 47$$



or



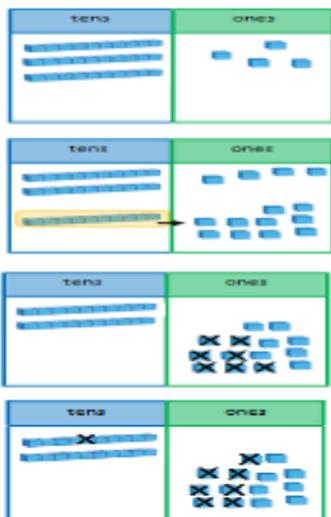
When carrying out money calculations that involve finding change or when calculating time duration, children should use this method

With practice, children will need to record fewer jumps. They will decide whether to count back or forwards, seeing both as 'finding the difference'. It is useful to ask children whether counting up or back is the more efficient for calculations such as  $57 - 12$  or  $86 - 77$ .

### Stage 3 : Expanded columnar method

Partition both numbers into tens and ones or hundreds, tens and ones (using a grid makes this easier). Use manipulatives alongside the calculation.

$$34 - 17 = 17$$



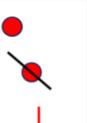
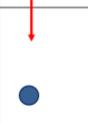
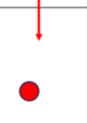
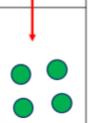
|                |      |      |
|----------------|------|------|
| $34 - 17 = 17$ |      |      |
|                | $20$ | $1$  |
| $30$           | $4$  |      |
| $- 10$         | $7$  |      |
| $10$           | $7$  | $17$ |

In this example, to subtract 7 ones from 4 ones, we need to regroup 10 ones for a ten. We now can subtract 7 ones from 14 ones.

|   |                              |                |    |
|---|------------------------------|----------------|----|
|   | <sup>60</sup> <del>7</del> 0 | <sup>1</sup> 4 |    |
| - | 20                           | 7              |    |
|   | 40                           | 7              | 47 |

|  |     |                              |                |     |
|--|-----|------------------------------|----------------|-----|
|  | 100 | <sup>60</sup> <del>7</del> 0 | <sup>1</sup> 4 |     |
|  |     | 20                           | 7              |     |
|  | 100 | 40                           | 7              | 147 |

Using more abstract manipulatives as concrete understanding develops.

|   |   |   |  |
|---|---|---|--|
|    |    |    |  |
| ↓   | ↓   | ↓   |  |
|  |  |  |  |

$$\begin{array}{r}
 200 \overset{20}{\cancel{30}} \overset{1}{2} \\
 - 100 \ 10 \ 4 \\
 \hline
 100 \ 10 \ 8
 \end{array}$$

#### Stage 4 Efficient (column method)

Children move on to the formal column algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

|  |  |  |   |
|--|--|--|---|
| $  \begin{array}{r}  \overset{6}{\cancel{7}}\overset{1}{4} \\  - 27 \\  \hline  47  \end{array}  $ | $  \begin{array}{r}  \overset{6}{\cancel{1}}\overset{1}{7}4 \\  - 27 \\  \hline  147  \end{array}  $ | $  \begin{array}{r}  48.56 \\  - 32.23 \\  \hline  16.33  \end{array}  $ | Children should be encouraged to estimate their answers first |
|--|--|--|---|

Column subtraction remains efficient when used with larger whole numbers or decimals, once learned, the method is quick and reliable.

### Multiplication

This policy shows the stages of each written method for multiplication, each stage building towards a more refined method.

**There are some key basic skills that children need to help with multiplication, which include:**

- counting
- estimating
- understanding multiplication as repeated addition
- recalling all multiplication facts to  $12 \times 12$
- partitioning numbers into multiples of one hundred, ten and one
- working out products ( $70 \times 5$ ,  $70 \times 50$ ,  $700 \times 5$ ,  $700 \times 50$ ,  $0.5 \times 7$ ,  $0.05 \times 7$ ) using the related fact  $7 \times 5$  and their knowledge of place value
- adding two or more single-digit numbers mentally
- adding multiples of 10 ( $60 + 70$ ) or of 100 ( $600 + 700$ ) using the related addition fact,  $6 + 7$ , and their knowledge of place value
- adding combinations of whole numbers
- understanding and using division and multiplication as inverse operations

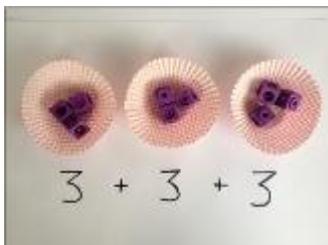
**Using and applying is a key theme and one of the aims of National Curriculum and before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts, these include:**

- using inverse
- missing box questions
- using units of measure including money and time
- word problems
- open ended investigations

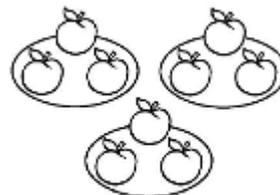
### **Stage 1 : Practical ( repeated addition)**

Children will work practically with equipment grouping objects to see multiplication as repeated addition.

As they become more confident, this practical grouping of objects will be mirrored on a number line using the vocabulary ‘lots of’, ‘groups of’, ‘how many lots’, ‘how many times’ so that the two are being done together. This will prepare them for the abstract concept of multiplying numbers rather than objects.



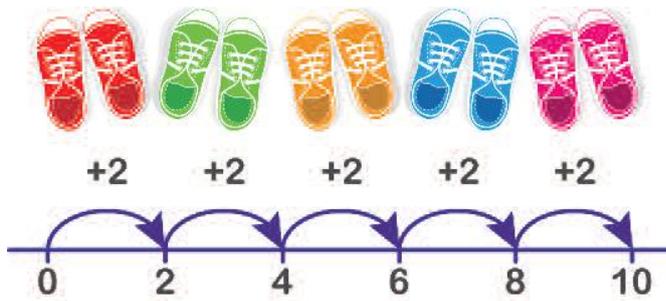
$$3 + 3 + 3 = 9$$



$$3 + 3 + 3 = 9$$

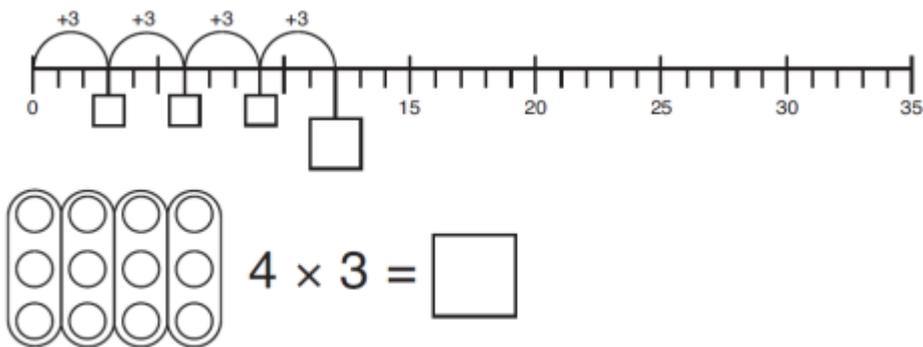


$$5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40$$



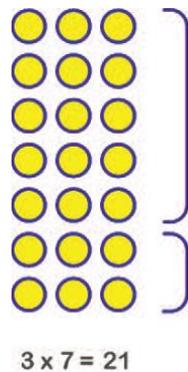
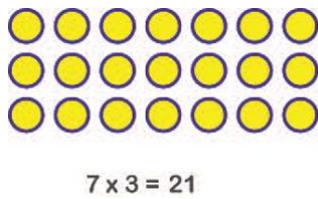
This image can be expressed as:

- 2 multiplied by 5
- two, five times
- 5 groups of 2
- 5 lots of 2
- 5 jumps of 2 on a number line

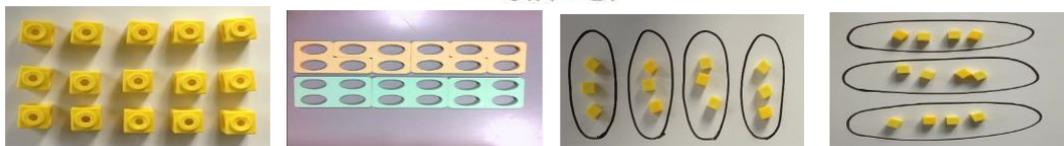


**Stage 2 : Practical and pictorial arrays( towards grid method)**

Children use arrays to demonstrate their understanding of commutativity for multiplication facts.



Children use their knowledge of known multiplication tables  
This 3 x 7 array can also be seen as  
 $3 \times 5$  add  $3 \times 2$



**Stage 3 : Partitioning ( grid method)**

Children will use concrete resources to develop conceptual understanding of the compact method introduced in Year 4. These should be used alongside the grid method.

|   |    |   |
|---|----|---|
| x | 10 | 2 |
| 3 |    |   |

|   |    |   |
|---|----|---|
| x | 10 | 2 |
| 3 | 30 | 6 |

$3 \times 12 = 36$

|   |    |    |
|---|----|----|
| x | 10 | 4  |
| 3 | 30 | 12 |

|   |    |    |
|---|----|----|
| x | 10 | 4  |
| 3 | 30 | 12 |

$14 \times 3 = 42$

$3 \times 14 = 42$

Using more abstract manipulatives as concrete understanding develops. Demonstrate the regrouping with the manipulatives. Use the grid method alongside.

|   |     |    |    |
|---|-----|----|----|
| × | 100 | 20 | 6  |
| 4 | 400 | 80 | 24 |

$$126 \times 4 = 504$$

Moving on to abstract.

$$24 \times 3 = 72$$

|   |    |    |    |
|---|----|----|----|
| x | 20 | 4  |    |
| 3 | 60 | 12 | 72 |

$$24 \times 32 = 768$$

|    |     |     |     |
|----|-----|-----|-----|
| x  | 20  | 4   |     |
| 30 | 600 | 120 | 720 |
| 2  | 40  | 8   | 48  |
|    |     |     | 768 |

**Stage 4 : Short ( column method)**

Use concrete resources if needed to demonstrate multiplying numbers by one digit using the compact short multiplication method.

$$24 \times 3 = 72$$

|     |
|-----|
| 24  |
| x 3 |
| 72  |
| 1   |

$$1241 \times 3 = 3723$$

|      |
|------|
| 1241 |
| x 3  |
| 3723 |
| 1    |

### Stage 5 : Long ( column method)

Reinforce the connection between the grid method to multiply numbers up to 4 digits by **two digit** using long multiplication.

$$\begin{array}{r} 24 \\ \times 32 \\ \hline 48 \\ 720 \\ \hline 768 \end{array}$$
$$\begin{array}{r} 1245 \\ \times 13 \\ \hline 3735 \\ 12450 \\ \hline 16185 \\ 1 \end{array}$$

In the examples given, it is also correct to multiply starting with the tens digit (ie multiplying by the most significant digit first), however as school policy, we will teach starting from the ones digit.

### Division

This policy shows the stages of each written method for division, each stage building towards a more refined method.

**There are some key basic skills that children need to help with division, which include:**

- counting
- estimating
- understanding division as repeated subtraction
- partitioning two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways (432 into 400 + 30 + 2 and also into 300 + 120 + 12)
- recalling multiplication and division facts to  $12 \times 12$
- recognising multiples of one-digit numbers and dividing multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value
- knowing how to find a remainder working mentally, for example, find the remainder when 48 is divided by 5
- understanding and using division and multiplication as inverse operations

**Using and applying is a key theme and one of the aims of National Curriculum and before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts, these include:**

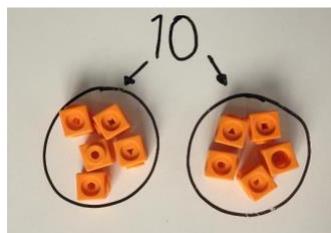
- using inverse
- missing box questions
- using units of measure including money and time
- word problems
- open ended investigations

**Stage 1 : Practical ( sharing)**

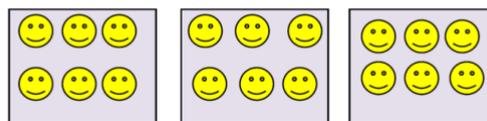
Children will work practically with equipment sharing objects one to one.



12 cakes are shared equally between 3 people.



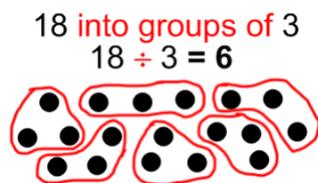
10 cubes between 2 people?



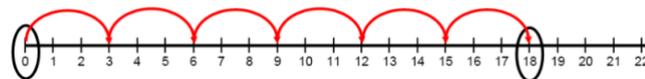
Can you share 18 smiley stickers between 3 people?

**Stage 2 : Number Lines ( grouping)**

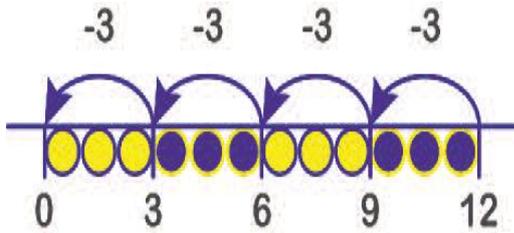
Children will move from sharing objects practically to grouping them, this will be mirrored on a number line, working from right to left so that they see division as repeated subtraction. This will prepare them for the abstract concept of dividing numbers rather than objects.



18 into groups of 3 = 6 groups  
 18 into jumps of 3 = 6 jumps  
 $18 \div 3 = 6$

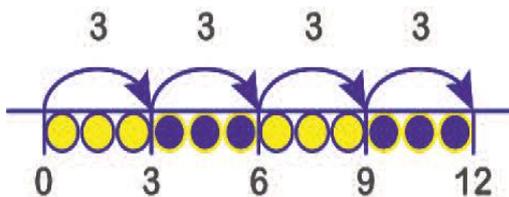


Each cake box holds 3 cakes, if I have 12 cakes, how many cake boxes will I need?



How many times can I subtract 3 from 12?

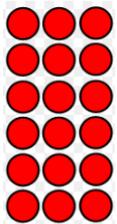
Using their knowledge of the inverse relationship between multiplication and division, children can use their multiplication tables when grouping on a number line, working from left to right.



How many groups of 3 are there in 12?

First without and then with remainders and ensuring that divisors offer an appropriate level of challenge.

Reinforce division through the use of arrays.

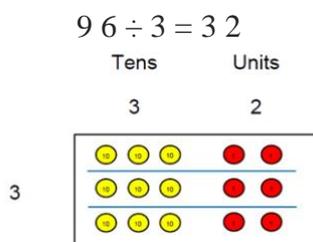


$$18 \div 3 = 6$$

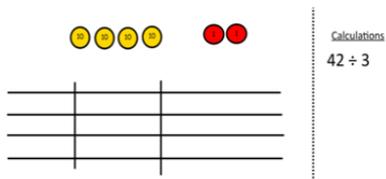
$$18 \div 6 = 3$$

### Stage 3 : Short Division

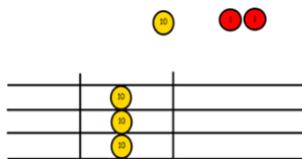
Use place value counters to divide using the bus stop method alongside.



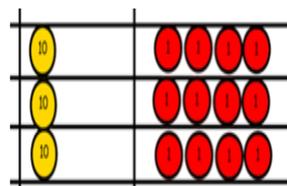
$$\begin{array}{r} 32 \\ 3 \overline{) 96} \end{array}$$



Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.



We regroup this ten for ten ones and then share the ones equally among the groups.



We look how much is in 1 group, it is 14.

$$\begin{array}{r} 14 \\ 3 \overline{) 42} \end{array}$$

Begin with divisions that divide equally with no remainder.  
Move onto divisions with a remainder.  
Move on to representing the remainder as a fraction, then a decimal.

|   |   |   |  |  |
|---|---|---|--|--|
| $372 \div 3 = 124$ $\begin{array}{r} 124 \\ 3 \overline{) 372} \end{array}$ | $432 \div 15 = 28 \text{ r}12$ $\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \end{array}$ | $\begin{array}{r} 28 \frac{12}{15} \\ 15 \overline{) 432} \end{array}$ <p>remainder as a fraction</p> | $\begin{array}{r} 28 \frac{4}{5} \\ 15 \overline{) 432} \end{array}$ | $\begin{array}{r} 28.8 \\ 15 \overline{) 432} \end{array}$ <p>remainder as a decimal</p> |
|---|---|---|--|--|

**Stage 4 : Long Division**

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

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

Fraction remainder –  $12/15 = 4/5$   
Decimal remainder –  $12 \div 15 = 0.8$

$$432 \div 15 =$$

$$\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \end{array} \quad 13$$

Fraction remainder –  $12/15 = 4/5$   
Decimal remainder –  $12 \div 15 = 0.8$

Children write the multiples of the divisor.

|    |     |     |
|----|-----|-----|
| 15 | 75  | 135 |
| 30 | 90  |     |
| 45 | 105 |     |
| 60 | 120 |     |

## The Calculation Sequence – Applying the Skills

| The Sequence  | Prompts  | Planning |
|---|--|----------|
| Provide an estimate for the calculation               | Using knowledge of number and the number system, rounding and approximating, make a reasonable estimate.   |          |
| Teach the calculation skill                           | What is the objective you are teaching?<br>Include example questions, increasing in complexity, for both operations.   |          |
| Ensure you have taught the inverse                    | Plan example questions, increasing in complexity.<br>Ensure methods used are in line with school calculation policy.<br>Check that children understand that inverse can also be used to check calculations |          |
| Devise similar calculations but include units         | Which units do you need to include? Check the measures applicable to your year group for length, weight, capacity, money and time.   |          |
| Complete missing box questions                        | Include units in these questions as above.<br>The box may cover single digits or an entire number.<br>Vary the position of the missing box within the calculation.   |          |
| Complete word problems, 1 and 2 step, including units | Write problems, ensuring the numbers are sized correctly in line with the objective and that units are also used.  |          |
| Provide opportunities for open ended investigations   | Plan example questions and investigations.<br>Ensure children are working with the correct operations, appropriate size of numbers and use of units for context.   |          |

## Progression across the year groups: Addition

|      | Typical Calculations  | Suitable Methods   |
|------|---|--|
| EYFS | $O + O$ ( no bridging) ( then bridging 10)<br>$TO + O$                                | Aggregation ( Dropping back)<br>Augmentation ( count on)<br>Practical<br>Number line |
| Y1   | $O+O$<br>$TO + O$ (to 20 including zero)  | Practical<br>Number line   |
| Y2   | $TO + O$<br>$TO +$ multiples of 10<br>$TO + TO$<br>$O + O + O$                        | Practical<br>Number Line<br>Partitioning on a number line<br>Expanded columnar       |
| Y3   | $HTO + O$<br>$HTO + TO$<br>$HTO + HTO$  | Number line<br>Expanded columnar<br>Column   |
| Y4   | $THTO + HTO$<br>$THTO + THTO$   | Expanded columnar<br>Column  |
| Y5   | $THTO.t + THTO.t$<br>$THTO.th + THTO.th$<br>Add whole numbers with more than 4 digits | Expanded columnar<br>Column  |
| Y6   | $THTO.thth + THTO.thth$<br>Add whole numbers with more than 4 digits                  | Column   |

## Progression across the year groups: Subtraction

|      | Typical Calculations   | Suitable Methods   |
|------|--|--|
| EYFS | 1.O – O<br>2.TO - O  | 1.no bridging 10<br>2. no bridging<br>3. bridging 10<br><br><b>Practical</b> (counting out, counting back from, count back to (counts the fingers)<br><b>Number line</b> |
| Y1   | O-O<br>TO - O (to 20 including zero)   | Practical<br>Number line   |
| Y2   | TO - O<br>TO - multiples of 10<br>TO - TO<br>O - O - O                                 | Practical<br>Number line<br>Expanded columnar  |
| Y3   | HTO - O<br>HTO - TO<br>HTO - HTO   | Number line<br>Expanded columnar<br>Column   |
| Y4   | THTO - HTO<br>THTO - THTO  | Expanded columnar<br>Column  |
| Y5   | THTO.t - THTO.t<br>THTO.th - THTO.th<br>Subtract whole numbers with more than 4 digits | Expanded columnar<br>Column  |
| Y6   | THTO.tht - THTO.tht<br>Subtract whole numbers with more than 4 digits                  | Column   |

## Progression across the year groups: Multiplication

|      | Typical Calculations   | Suitable Methods  |
|------|--|---|
| EYFS | Doubling as repeated addition  | Practical (repeated addition)   |
| Y1   | $O \times O$   | Practical (repeated addition)<br>Grouping on a number line<br>(arrays)  |
| Y2   | $O \times O$   | Practical (repeated addition)<br>Practical and pictorial arrays<br>Grouping on a number line  |
| Y3   | $TO \times O$  | Grouping on a number line progressing<br>into Expanded (grid) and into Short  |
| Y4   | $TO \times O$<br>$HTO \times O$  | Expanded (grid) progressing into Short  |
| Y5   | $HTO \times O$<br>$THTO \times O$<br>$TO \times TO$<br>$HTO \times TO$   | Expanded (grid) progressing into Short<br><br>Expanded (grid) progressing into Long   |
| Y6   | $THTO \times O$<br>$TO \times TO$<br>$HTO \times TO$<br>$THTO \times TO$<br>$O.t \times O$<br>$O.th \times O$<br>$O.t \times TO$<br>$O.th \times TO$ | Short<br><br>Expanded (grid) progressing into Long<br><br>Long<br>Expanded (grid) progressing into Short<br><br>Expanded (grid) progressing into Long |

## Progression across the year groups : Division

|           | Typical Calculations   | Suitable Methods   |
|-----------|--|--|
| Reception | Talk about halving<br>Sharing into equal groups  | Practical sharing into equal groups  |
| Y1        | $O \div O$<br>$TO \div O$  | Practical sharing<br>Number line grouping  |
| Y2        | $O \div O$<br>$TO \div O$  | Practical sharing<br>Number line grouping  |
| Y3        | $TO \div O$  | Grouping on a number line progressing into Short   |
| Y4        | $TO \div O$<br>$HTO \div O$  | Grouping on a number line progressing into Short<br><br>Short (remainders to be expressed as r)  |
| Y5        | $HTO \div O$<br>$THTO \div O$  | Short (remainders to be expressed as r, then as a fraction and as a decimal)   |
| Y6        | $THTO \div O$<br>$HTO \div TO$<br>$THTO \div TO$<br>$O.th \div O$<br>$TO.th \div O$<br>$HTO.th \div O$<br>$THTO.th \div O$ | Short (remainders to be expressed as r, then as a fraction and as a decimal)<br><br>Long (remainders to be expressed as r, then as a fraction and as a decimal)<br><br>Short (remainders to be expressed as a decimal) |



## Addition - Progression of skills

|           |  |
|-----------|--|
| Reception | <p>Count reliably with numbers from 1 to 20, place them in order.<br/>           Say which number is one more than a given number.<br/>           Using quantities and objects, they add two single-digit numbers and count on to find the answer.</p>   |
| Year 1    | <p>Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number<br/>           Given a number, identify one more.<br/>           Read, write and interpret mathematical statements involving addition (+), and equals (=) signs<br/>           Represent and use number bonds and related subtraction facts within 20<br/>           Add one-digit and two-digit numbers to 20, including zero.<br/>           Solve one-step problems that involve addition using concrete objects and pictorial representations, and missing number problems.</p>  |
| Year 2    | <p>Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts to 100.<br/>           Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.<br/>           Add numbers using concrete objects, pictorial representations, and mentally, including:</p> <ul style="list-style-type: none"> <li>• a two-digit number and ones</li> <li>• a two-digit number and tens</li> <li>• two two-digit numbers</li> <li>• adding three one-digit numbers.</li> </ul> <p>Solve problems with addition including those involving numbers, quantities and measures.</p> |
| Year 3    | <p>Find 10 or 100 more than a given number.<br/>           Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).<br/>           Add numbers with up to three digits, using formal written methods of columnar addition.</p>  |
| Year 4    | <p>Find 1000 more than a given number.<br/>           Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate.<br/>           Solve addition two-step problems in contexts, deciding which operations and methods to use and why,</p>  |
| Year 5    | <p>Add whole numbers with more than 4 digits using formal written methods of columnar addition.<br/>           Add numbers mentally, with increasingly large numbers.<br/>           Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.<br/>           Solve problems involving numbers up to three decimal places<br/>           Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign</p>  |
| Year 6    | <p>Solve more complex addition problems<br/>           Perform mental calculations, including with mixed operations and large numbers<br/>           Solve addition multi step problems in contexts, deciding which operations to use and why<br/>           solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate</p>  |

## Subtraction - Progression of skills

|                  |  |
|------------------|--|
| <b>Reception</b> | <p>Say which number is one less than a given number.</p> <p>Using quantities and objects, they subtract two single-digit numbers and count back to find the answer.</p>  |
| <b>Year 1</b>    | <p>Say which number is one less than a given number.</p> <p>Represent and use number bonds and related subtraction facts within 20.</p> <p>Read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs.</p> <p>Subtract one-digit and two-digit numbers to 20, including zero.</p> <p>Solve one-step problems that involve subtraction using concrete objects and pictorial representations, and missing number problems.</p>   |
| <b>Year 2</b>    | <p>Recall and use subtraction facts to 20 fluently, and derive and use related facts to 100.</p> <p>Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.</p> <p>Subtract numbers using concrete objects, pictorial representations, and mentally, including:</p> <ul style="list-style-type: none"> <li>• a two-digit number and ones</li> <li>• a two-digit number and tens</li> <li>• two two-digit numbers</li> <li>• adding three one-digit numbers.</li> </ul> |
| <b>Year 3</b>    | <p>Find 10 or 100 less than a given number.</p> <p>Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).</p> <p>Subtract numbers with up to three digits, using formal written methods of column subtraction.</p> <p>Subtract numbers mentally, including:</p> <ul style="list-style-type: none"> <li>• A three-digit number and ones</li> <li>• A three-digit number and tens</li> <li>• A three-digit number and hundreds.</li> </ul>  |
| <b>Year 4</b>    | <p>Find 1000 less than a given number.</p> <p>Subtract numbers with up to four digits, using formal written methods of columnar subtraction where appropriate.</p> <p>Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why.</p>   |
| <b>Year 5</b>    | <p>Subtract whole numbers with more than 4 digits using formal written methods of columnar subtraction.</p> <p>Subtract numbers mentally, with increasingly large numbers.</p> <p>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</p> <p>Solve problems involving numbers up to three decimal places.</p> <p>Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign</p>            |
| <b>Year 6</b>    | <p>Solve more complex subtraction problems</p> <p>Perform mental calculations, including with mixed operations and large numbers</p>   |

|  |  |
|--|--|
|  | <p>Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why</p> <p>solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate</p> |
|--|--|

## Multiplication - Progression of skills

|           |  |
|-----------|--|
| Reception | They solve problems, including doubling, halving and sharing.  |
| Year 1    | <p>Count in multiples of twos, fives and tens</p> <p>Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.</p>  |
| Year 2    | <p>Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.</p> <p>Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (<math>\times</math>), division (<math>\div</math>) and equals (=) signs.</p> <p>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.</p> <p>Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.</p> |
| Year 3    | <p>Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.</p> <p>Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.</p> <p>Solve problems, including missing number problems, involving multiplication including positive integer scaling problems and correspondence problems in which <math>n</math> objects are connected to <math>m</math> objects.</p>   |
| Year 4    | <p>Recall multiplication and division facts for multiplication tables up to <math>12 \times 12</math> multiplying by 0 and 1; multiplying together three numbers</p> <p>Use place value, known and derived facts to multiply and divide mentally, including: multiply two-digit and three-digit numbers by a one-digit number using formal written layout.</p> <p>Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as <math>n</math> objects are connected to <math>m</math> objects.</p>  |
| Year 5    | <p>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.</p> <p>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</p> <p>Multiply numbers mentally drawing upon known facts</p> <p>Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes</p> <p>Solve problems Involving multiplication and division, including scaling by simple</p>   |

|        |  |
|--------|--|
|        | <p>fractions and problems involving simple ratio</p> <p>Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign</p>   |
| Year 6 | <p>Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.</p> <p>Multiply one-digit numbers with up to two decimal places by whole numbers.</p> <p>Perform mental calculations, including with mixed operations and large numbers</p> <p>Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts</p> |

## Division - Progression of skills

|           |  |
|-----------|--|
| Reception | Solve problems, including halving and sharing.   |
| Year 1    | Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.   |
| Year 2    | Recall and use division facts for 2, 5 and 10 multiplication tables.<br>Calculate mathematical statements for multiplication and division within the multiplication tables and write then using the multiplication (x), division ( / ) and equals (=) signs.<br>Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.<br>Find $\frac{1}{3}$ ; $\frac{1}{4}$ ; $\frac{2}{4}$ ; $\frac{3}{4}$ of a length, shape, set of objects or quantity  |
| Year 3    | Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables<br>Write and calculate mathematical statements for division using the multiplication tables that they know, using mental and progressing to formal written methods<br>Solve problems, including missing number problems, involving division including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.   |
| Year 4    | Recall multiplication and division facts for multiplication tables up to $12 \times 12$<br>Use place value, known and derived facts to multiply and divide mentally, including: Dividing by 1<br>Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths<br>Divide two-digit and three-digit numbers by a one-digit number using formal written layout<br>Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number   |
| 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.<br>Divide numbers mentally drawing upon known facts<br>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000<br>Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes<br>Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign<br>Solve problems Involving multiplication and division, including scaling by simple fractions and problems involving simple ratio |

|        |   |
|--------|---|
| Year 6 | Divide numbers up to 4 digits by a two-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<br>Perform mental calculations, including with mixed operations and large numbers<br>Use written division methods in cases where the answer has up to two decimal places<br>Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts |
|--------|---|

### Role of the Subject leader

The role of the maths subject leader is to:

- Take the lead in policy development and the production of schemes of work designed to ensure progression and continuity in calculation throughout the school.
- Support colleagues in the development of planning and assessment.
- Monitor progress in maths and advise the head teacher on action needed.
- Conduct work sampling, pupil voice, teacher feedback forms and moderation, regularly focusing on the different aspects of teaching and learning.
- Take responsibility for the purchase and organisation of central resources for calculation.
- Keep up to date with developments in maths education through attending courses and reviewing relevant information/ data and disseminating information to colleagues as appropriate.

### Review

This policy will be reviewed and updated biannually.

Reviewed by Curriculum & Standards Governors committee Oct 2018