Weston Shore
Infant School

Weston Park
Primary School

Weston Schools Federation

Calculations Policy

The progression of skills for the four operations

Date of last review: January 2021 **Date of next review: July 2022**

Policy Outline:

This policy outlines both the informal and formal written methods taught at Weston Park Primary School from Year 1 through to Year 6 and Weston Shore Infant school in year 1 and 2. It has been written in line with the National Curriculum 2014 and should be read alongside the Weston Park Primary School and Weston Shore Infant School Mathematics Policy and the progression of skills document. The attached appendix provides a visual progression of calculation skills across the school. The aim of this document is to support teachers in enabling children to reach the most efficient formal written method, in line with the National Curriculum.

This policy outlines the expectation for pupils at the end of each year group in order for them to be mathematically fluent in each operation. Teachers will use AfL and their discretion to return to earlier methods to consolidate learning or address any misconceptions to support the needs of individual pupils. Pupils will be expected to show that they can use the appropriate written strategies correctly in all maths learning, including arithmetic practice at the start of the lesson.

Formal written methods are usually only applied correctly when taught conceptually; enabling children to understand the processes they are going through. Therefore, alongside the teaching of both expanded and formal written methods should be opportunities for the use of concrete apparatus such as place value counters and dienes. Children should also be given the opportunity to represent pictorially the process of the formal written method if this aids a pupil's conceptual understanding. This deeper level of understanding behind the formal written method will be instrumental in helping the children reason effectively.

While the skill of addition might be taught separately to the skill of subtraction, and the same for multiplication and division, it is important for the children to see the mathematical link between these pairs of operations and teaching must therefore allow for this.

Addition

Year 1

Drawing and jottings

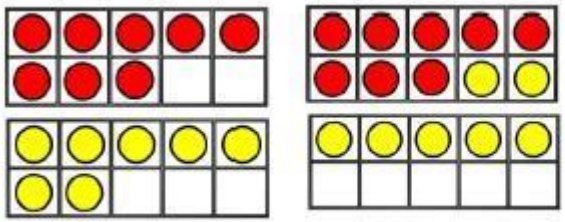
2+3=

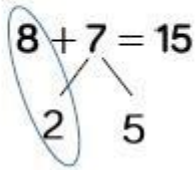
4 + 9 = 13

5 + 4 = 9

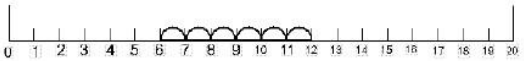
Put your finger on number 5 and count on 4'
Then progress onto a structured number line.

'Think 10' bridging strategy.



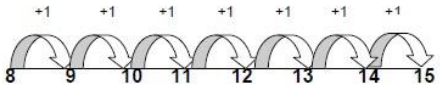


6 + 6 = 12



'Put your finger on number six and count on six.'

8 + 7 = 15 'Put your finger on number eight and count on seven.'



These are ways of completing addition in a written process. Year 1 will be focused on developing a bank a number bonds and using mental strategies such as bridging to add.

Year 2

Concrete and Pictorial representations

9 +3=12.

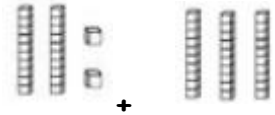
Two digit and ones:

+ = 27

22+5=27

Children should be taught to count on in their heads or use their skill of bridging/ "Think 10" to make the method more efficient.

Two digit add tens:

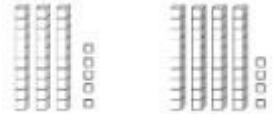


+ = 52

22+30=52

Use in conjunction with a 100 square to show jumps of tens
Children should be taught to notice that if they are adding on tens, the tens number changes and ones number stays the same.

2 digit add 2 digit:



+ = 79

35+44=79

Children are taught to count the tens and then count the ones.

This works for bridging over the tens:

+ =91

56+35=91

Children are shown how to exchange ten ones for one ten piece if they are ready to start to prepare them for the formal written method in year 3

Partitioning:

Partitioning method to add two two-digit numbers.

43 + 25 = 68
3 + 5 = 8
40 + 20 = 60 60
+ 8 = 68

„Partition the numbers into tens and ones
Add the ones together and then add the tens together.
Recombine to give the answer".
We choose to teach the children to add the ones first and then tens to mimic the formal written process taught in year 3 where they add from right to left.

Partition bridging the tens:
48 + 36 =
8 + 6 = 14
40 + 30 = 70 70
+ 14 = 84

These are ways of completing addition in a written process.
Year 2 will continue to focus on using the bank of number bonds and a range of mental strategies such as bridging to add.

Year 2 will start preparing children for the formal written method if they feel the child has a secure enough place value knowledge and is developmentally ready for it.

Year 3

Teachers will use the formal written method to teach the children how to add 3 digit numbers together.

$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

Language focus:

3 ones and 8 ones is 11 ones. This can be **regrouped** into 1 ten and 1 one. I will **carry** the ten to under the tens column and remember to add that later. I will put the one in ones column. 4 tens add 6 tens add 1 ten is 11 tens. This can be **regrouped** into 1 hundred and 1ten. I **carry** the 1 hundred under the hundreds column and add it later. The one ten goes in the tens column. 2 hundreds add 3 hundreds add 1 hundred is 6 hundreds. I will put this in the hundreds column.

Year 4

Teachers will use the formal written method (as shown in Year 3) to teach the children how to add 4 digit numbers together.

Year 5

Teachers will use the formal written method (as shown in Year 3) to teach the children how to add multi digit numbers together.

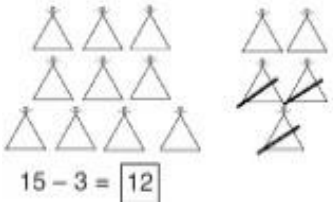
Year 6:

Teachers will use the formal written method (as shown in Year 3) to teach the children how to add multi digit numbers together.

Subtraction

Year 1

In Year 1 children will taught how to subtract and find the difference through pictorial and concrete representations and on a numberine. CPA:



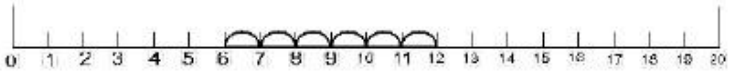
This method would come after the concrete understanding of taking away 3 objects from a set of 15 objects and having to count the remaining to find the answer.

Children will then use a number line to count back from the largest number

Put your finger on number 9 and count back 5"

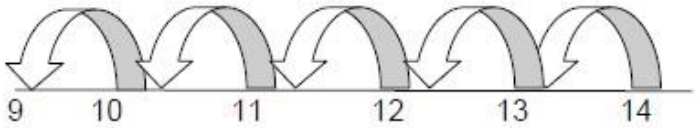
9 – 5 = 4

12 - 6 = 6



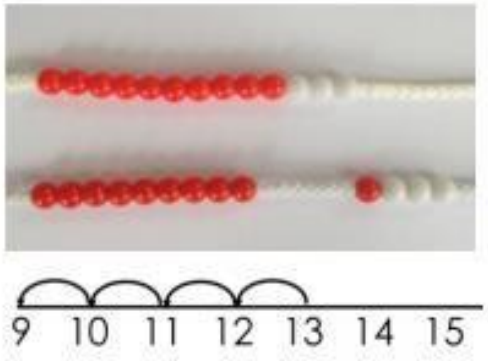
'Put your finger on number twelve and count back six.'

14 – 5 = 9



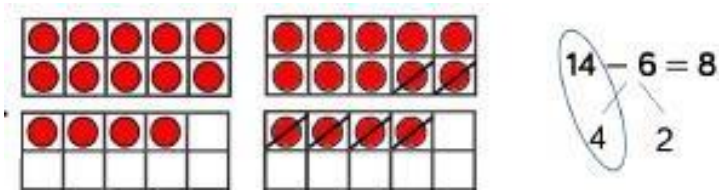
'Put your finger on number 14 and count back five.'

Bead strings can match and show a practically what happens on a number line and helpful when using bridging to subtract.

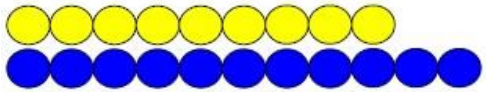


13 – 4 = 9

Bridging "Think 10"



<u>Finding the Difference</u>



11 – 9 = 2

The difference between nine and eleven is two.

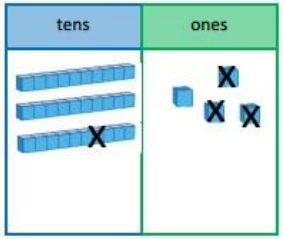
When the teacher feels certain children are ready they will be shown how to find the difference between 2 numbers by counting up a number line. This will then be compared to subtraction for the children to see the relationship.

These are ways of completing subtraction in a written process. Year 1 will be focused on developing a bank of number bonds and using mental strategies such as bridging to subtract.

Year 2

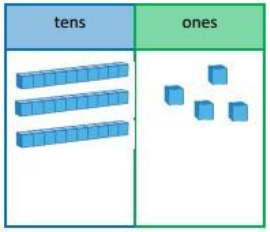
Children will be taught subtraction by using dienes and exchanging getting the children ready for the formal written method in Year 3.

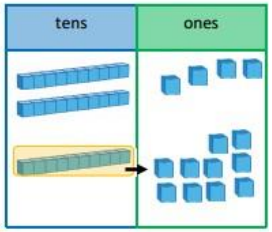
34-13=21

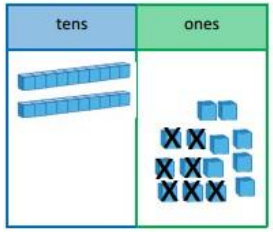


21

34-17=27







27

Some children will move away from this pictorial representation and use partitioning to complete the calculation in an abstract manner. We teach the children to only partition the second number. We take away the ones first and then the tens as this mimics the formal written process taught in year 3.

57-23=

57-3=54

54-20=34

43-18=
43-8=35
35-10=25

Counting on to find the difference.
Children will be taught to find the difference by counting on using a number line or mental methods to build on understanding from year 1.

This will be taught alongside subtraction so the children see the relationship between the two processes. In Year 2 we would discuss with the children based on the numbers involved in the calculation which method is the most efficient.

These are ways of completing subtraction in a written process. Year 2 will continue to focus on using the bank of number bonds and a range of mental strategies such as bridging to subtract.

Year 3
Children will be taught the formal written method for subtraction alongside the concrete and pictorial representations of dienes and place value counters. Where appropriate, children should also be shown the expanded written method to help place value understanding.

942—214

Expanded method

		30	12
	900	~~40~~	~~2~~
-	200	10	4
	700	20	8

Compact Method

		3	12
	9	~~4~~	~~2~~
-	2	1	4
	7	2	8

Language focus:
I can"t take away 4 ones from 2 ones so I will need to**exchange** a ten for 10 ones. 40 will become 30 and 2 will be come 12. 12-4 is 8 ones so I will write this into the ones column. 3 tens take away 1 ten is 2 tens. I will put this in the tens column. 9 hundreds take away 2 hundreds is 7 hundreds and I will put this in the hundreds column.

Year 4 Teachers will use the formal written method (as shown in Year 3) to teach the children how to subtract 4 digit numbers.
Year 5 Teachers will use the formal written method (as shown in Year 3) to teach the children how to subtract 5 digit numbers.
Year 6 Teachers will the formal written method (as shown in Year 3) to teach the children how to subtract multi digit numbers.

Multiplication

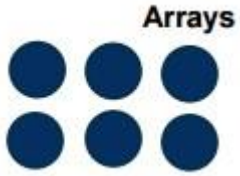
Year 1

Use of visual models to support counting in 2, 5, 10. Ensure children begin to see the patterns of counting in 2, 5, 10.
Children do not need to record number sentences using the symbols. Develop the vocabulary by encouraging children to explain what they are doing using the language **groups of** and **lots of**.

Children use this knowledge to solve problems supported by the teacher.

4 lots of 2

4 lots of 5

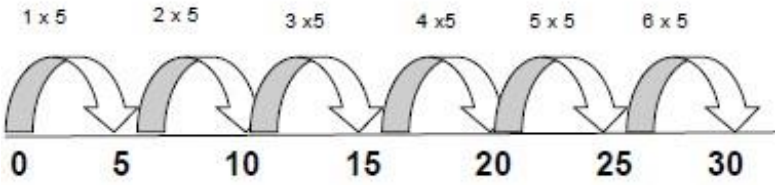


3 groups of 2

Year 2

Using repeated addition

6 x 5 = 30



Using the bar model to support repeated addition

6	6	6	6	6
30				

5	5	5	5	5	5
30					

Using arrays to support multiplication

6 x 5 = 30

Underpinning this is the understanding that children should be using their mental strategies and learnt timetables, if the calculation allows this.

Year 3

Continue to use number lines and arrays to support multiplication, as appropriate from year 2.

Grid method based on an array.

×	10	2
3		

×	10	2
3	30	6

3 x 12 = 36

13 x 8 =

Partition 13 into 10 + 3 then multiply each number by 8. Add the partial products (80 and 24) together."

X	10	3
8	80	24

80 + 24 = 104

Expanded written method

13 x 8 = 104

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

Then…

```
  13
x  8
  24   (3 x 8)
+ 80   (10 x 8)
 104
```

Model the same calculation using the grid method, if necessary, to ensure understanding.

Some children, when ready should be introduced to formal short multiplication to ready them for year 4.

```
  1 3
  x 8
 104
  2
```

Ensure that the digit „carried over" is written under the line in the correct column.

Continue to develop the formal written method of multiplication using teen- numbers multiplied by a one-digit number.

Underpinning all of these methods should be sound understanding and recall of statutory multiplications. If there is quicker mental method for certain calculations, children should be taught to spot these.

Year 4

Expanded short multiplication (two-digit number by a one-digit number): 26 x 4 = 144

```
 30 + 6
 X    4
    24     (4 x 6 = 24)
 + 120     (4 x 30 = 120)
   144
```

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

```
  36
  x 4
 144
   2
```

:

Language focus:

4 times 6 ones are 24. The 2 tens will be **carried** over to under the tens column and the 4 ones will be written in the ones column. 4 times 30 is 120 plus 2 more tens so we have 140. The 1 hundred and the 4 tens will be written in the hundreds and tens column.

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

342 × 7 becomes

	3	4	2
×			7
2	3	9	4
	2	1	

Answer: 2394

Language focus:

7 times 2 ones is 14. I **carry** the ten to under the tens column and write the 4 ones in the ones column. 7 times 4 tens is 28 tens I also need to add on another ten. 29 tens can be **regrouped** into 2 hundreds and 9 tens. The 2 hundreds is **carried** to under the hundreds column. The 9 tens is written in the tens column. 7 times 3 hundreds is 21 hundreds. I need to add on the 2 hundreds **carried** over. Now I have 23 hundreds. This can be **regrouped** to 2 thousands and 3 hundreds. I do not need to **carry** because I do not need to times any thousands. So the 2 thousands can be written in the thousands column and the 3 hundreds is the hundreds column.

Underpinning all of these methods should be sound understanding and recall of statutory multiplications. If there is quicker mental method for certain calculations, children should be taught to spot these.

Year 5

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 (two-digit numbers multiplied by a teen- number):

23 x 13 = 299

```
   23
 X 13
    9   (3 x 3)
   60   (3 x 20)
 + 30   (10 x 3)
  200   (10 x 20)
  299
```

```
     56
   X 27
     42   (7x6)
    350   (7x50)
  + 120   (20x6)
   1000   (20x50)
   1512
    1
```

Compact long multiplication (formal method):

23 x 13 = 299

```
   23
 X 13
  +69   (3 x 23)
  230   (10 x 23)
  299
```

```
      1 2 4
  ×     2 6
  -------
      7 4 4
      1 2
  2   4 8 0
  -------
  3 2 2 4
  -------
  1 1
```

Language focus:

6x 4 ones is 24. The 2 tens will be **carried** over to under the tens column and the 4 ones written in the ones column. 6x 2 tens is 12 tens. Now I add on the 2 tens that were **carried** so I have 14 tens. This can be **regrouped** into 1 hundred, which is **carried** under the hundreds column, and 4 tens written in the tens column. 6x 1 hundreds is 6 hundreds but I must remember to add on the 1 hundred carried. The 7 hundreds is written in the hundreds column. **The 2 in twenty six represents 20. To be able to use it as a 2 we need to put the place holder 0 in the ones column. Now we can say the 20 is a 2.**

(Repeat steps as above). Now we have completed 124x 6 and 124 x 2 we need to add our answers together. See formal written addition language focus for support with this.

Year 6

Children in year 6 will continue to use the formal written method of long multiplication with multi digit numbers and will start to use it to multiply decimal numbers

```
   2 . 7
 ×     3
 -------
   8 . 1
 -------
   2
```

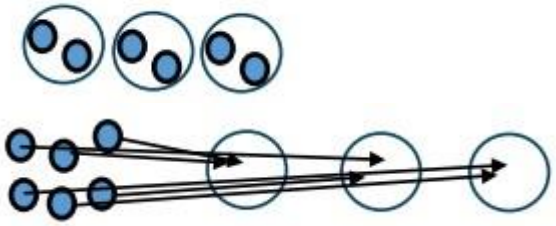
```
      6 . 1 2
 ×           4
 -----------
   2 4 . 4 8
```

Division

Year 1:

Children will solve practical problems using sharing and grouping and their knowledge of counting in 2"s 5"s and 10"s.
Like multiplication, children are not expected to form calculations using the symbols at this stage.
Children should solve both grouping and sharing problems but not necessarily be introduced to the difference unless the teacher feels certain children are ready.

Grouping and sharing



Sam has 10 sweets and wants to share them with his friend:

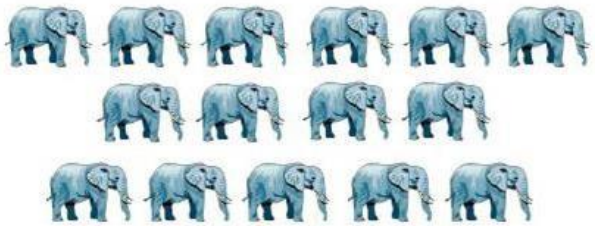
Carla has 6 wheels and wants to make bikes. How many bikes can she make?
Children can record this pictorial as jotting.

Year 2:

Division grouping:

Put the elephants into **groups of 5**.

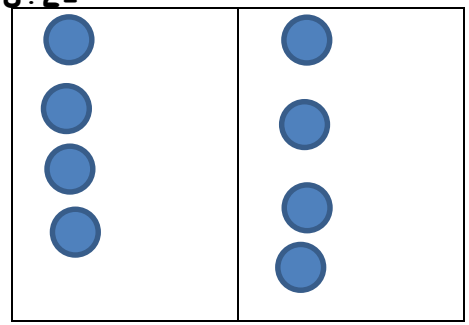
How many groups can you make?



15 ÷ 5 = _____

Division using sharing:

8÷2=



Children should be able to see division as grouping and sharing. Some children will be able to read a problem and know if it asking for them to group or share.

Underpinning these written calculations should be sound understanding and recall of known timetables. Children should use their times table to recall division facts if this is a more efficient process to get to the answer.

Year 3

Children continue to use Year 2 methods to solve problems but with statutory timetables.
To access formal division children need to move towards more of a grouping understanding of division.
"How many groups of 4 can you make out of 12" is the verbal understanding before "How many 4" s in 12"

Formal division
Use multiplication/division facts that the children know:

24 ÷ 3 = 8

This can also be recorded as…

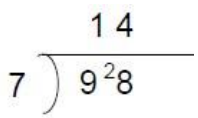
$$\begin{array}{r} 8 \\ 3\overline{)\,24} \end{array}$$

„Twenty four divided by three equals eight." „How many threes are there in twenty four?"

Underpinning these written calculations should be sound understanding and recall of known timetables. Children should use their times table to recall division facts if this is a more efficient process to get to the answer.

Year 4

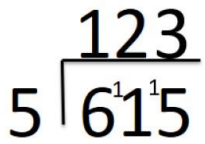
Language focus:



Formal short division

How many groups of 5 are in 6 (hundreds)? 1 (hundred) in each group with 1 (hundred) **remaining**. I can **exchange** the 1 (hundred **remaining** for 10 tens) so I now have 11(tens). **How many groups of** 5 are in 11 (tens)? 2 groups with 1 (ten) **remaining**. I can **exchange** this ten (into ten ones) so now I have 15 (ones). **How many groups of** 5 are in 15? 3 groups.

If children are confident develop further, by dividing three-digit numbers by a one-digit number using the formal method of short division with whole number answers (no remainders).



Brackets to be used when modelling alongside place value counters at the start of the journey towards fluently using the formal written method of short division.

Underpinning these written calculations should be sound understanding and recall of known timetables. Children should use their times table to recall division facts if this is a more efficient process to get to the answer.

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 as in Year 4 and start to introduce remainders:

432 ÷ 5 = 86 r2

$$\begin{array}{r} 86\text{ r }2 \\ 5\,\overline{)\,43^{3}2} \end{array}$$

Underpinning these written calculations should be sound understanding and recall of known timetables. Children should use their times table to recall division facts if this is a more efficient process to get to the answer.

Year 6

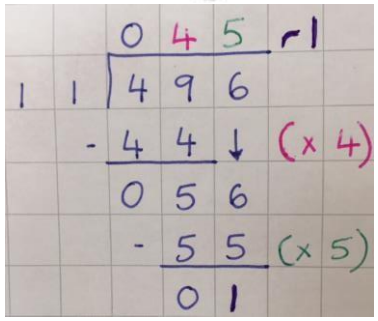
Continue to practise the formal method of short division, with and without remainders, using the language of place value to ensure understanding (see Y5 guidance).

```
        4 5 r 1
11 ) 4 9 5 6
```

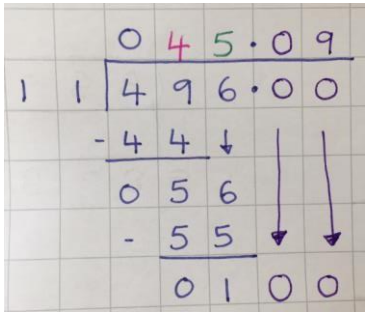
496 ÷ 11 = 45 r1

Dividing by a two-digit number using a formal method of long division:

```
     0 2 1 2
12 | 2 5 4 4
     24
     ------
       14
       12
     ------
        24
        24
     ------
         0
```



The remainder can also be expressed as a fraction, (the remainder divided by the divisor) 1/11 and teach how to find the remainder as a fraction.



45r1 or 45 $\frac{1}{11}$ or 45·09

Children will need to be taught to select the most effective method for each calculation / problem they meet.

Weston Shore Infant School | Weston Park Primary School

Signed Chair of Governing Body:

[date]

Signed Headteacher:

[date]

Date of last review: January 2021 **Date of next review: July 2022**