Calculations Policy

Approved by:	Full Governing Body
Date:	April 2024
Review:	April 2025
Signed:	Chair: Mr C Harris

Calculation Policy

Note to Parents / Carers:

This document explains the methods we teach your children. Please support your child by helping them to learn all the basic mathematical skills. Children need to learn their number bonds, multiplication tables and division facts so that they can recall them instantly.

The methods that we use in school may or may not be familiar to you. Children are often confused when they ask parents for help at home and they then teach the methods that they themselves were taught. Knowing how the methods in this document work will help you to help your children. All of the staff in school work from this document so that we can ensure the consistency of our approach and can make sure that the children move onto the next step when they are ready.

The four operations that are covered by this document are addition, subtraction, multiplication and division. Whichever operation is being taught your child needs to experience all of the steps to completely conquer it: learning songs and rhymes, using objects, using pictures, using a number line, using partitioning and mental methods and lastly using a written method.

Children should always be encouraged to consider if a mental calculation would be appropriate before using written methods. Also before using a written method children should estimate the answer so that they can see if they have made an error.

Please help support us by:
* Teaching your children that to multiply by 10 you move the digits to the left and add a zero as a place holder rather than saying add a zero.
* Telling children that you can move the digits to the left or to the right but the decimal point never moves rather than telling children to move the decimal point.
* Encouraging your child to use www.mathletics.co.uk and / or www.timestablesrockstars.com to consolidate their calculation skills.

If you have any questions please speak to your child's class teacher.

Many thanks for your support

Mr J Stokes

Calculation Policy

Aims

The purpose of this calculation policy is to provide guidance for the teaching of calculation methods in order to ensure consistency of practice. This policy is in accordance with The 2014 Primary National Curriculum in England. In key stage 1 the children will learn about the four operations using practical resources, pictorial representations and arrays, before moving on to standard methods if appropriate. In lower key stage 2 pupils will become increasingly fluent with the four operations. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. In upper key stage 2 pupils will extend their understanding and use formal written methods for all four operations fluently including larger integers and decimals.

Progression

Children should have secure understanding before progressing onto the next stage. Pupils who are successful should be challenged through rich problems rather than accelerating to the next stage unless it is deemed appropriate.

Estimating

Before carrying out a calculation, children must estimate the answer first. e.g.432 ÷ 15 =
Start by multiplying 15 by multiples of 10 to get an estimate. As 15 × 20 = 300 and 15 × 30 = 450 we know the answer lies between 20 and 30.

Addition

Step 1: Counting rhyme and songs, learning through play.

Children are encouraged to hear and learn rhymes and songs, especially with actions to initiate their counting development and concepts of more than and bigger than. They will also, as part of the 'Foundation Stage Curriculum', learn through play.

Step 2: Objects

Children make use of a wide variety of concrete apparatus to support their counting and matching 1-1 and to support their basic concept of addition.

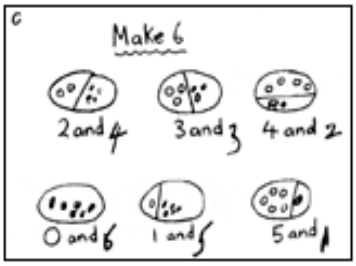
3 + 2 =

Pick out 3 dinosaurs and 2 dinosaurs and count them altogether.

Here children should use resources to support them e.g. counters.

Step 3: Pictures

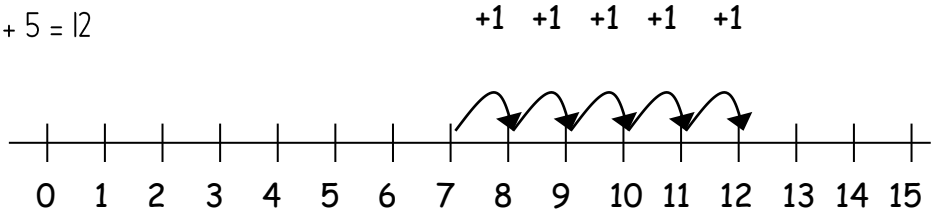
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



Step 4: The number line

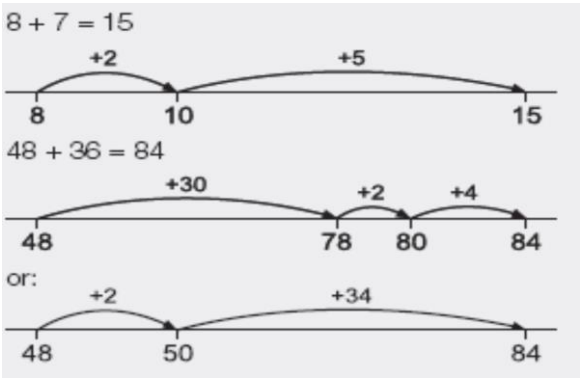
Children use number lines as a visual model to support calculations.

7 + 5 = 12



Once children are confident with number lines and as numbers are getting larger teachers should teach children how to use hundred squares.

The empty number line



Step 5: Mental Partitioning

Partition the smallest number into tens and ones. Add the tens and then the ones.

77 + 46 =
77 + 40 = 117
117 + 6 = 123

Or
70 + 40 = 110
7 + 6 = 13
110 + 13 = 123

This can be recorded in children's books.

Step 6: Column method

This is an efficient written method. Children must have good understanding of partitioning before this is introduced. Column addition remains efficient when used with larger whole numbers and decimals. Ensure the correct language is used:

```
  625
+  48
 673
  1
```

- Add the ones column first. 5 + 8 = 13. Record the 3 ones in the ones ten and carry the ten. Record the carried ten under the line in the tens column.
- Add the tens. 20 + 40 + the carried 10 = 70. Record 7 tens.
- 6 hundred and 0 = 600. Record the 6 hundreds.

When adding decimals ensure that the children line the decimal points up. If required they can use a square in their books for this.

Subtraction

Step 1: Counting Rhyme and Songs

Children are encouraged to hear and learn rhymes and songs, especially with actions to initiate their counting development and concepts of less than and smaller than. They will also, as part of the 'Foundation Stage Curriculum', learn through play.

Step 2: Objects

Children make use of a wide variety of concrete apparatus to support their counting and matching 1-1 and to support their basic concept of taking away.

5 - 2 =

Pack out 5 dinosaurs and take 2 dinosaurs away. How many are left?

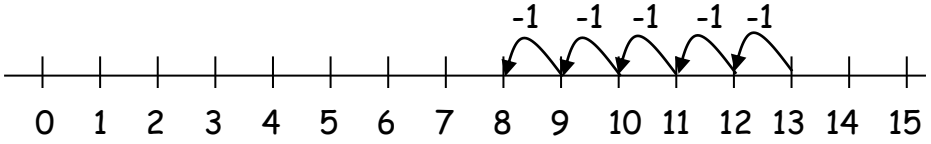
Here children should use resources such as counters.

Step 3: Pictures

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using dots, pictures, etc.

Step 4: The number line

Children use number lines as a visual model to support calculations.
13 – 5 = 8

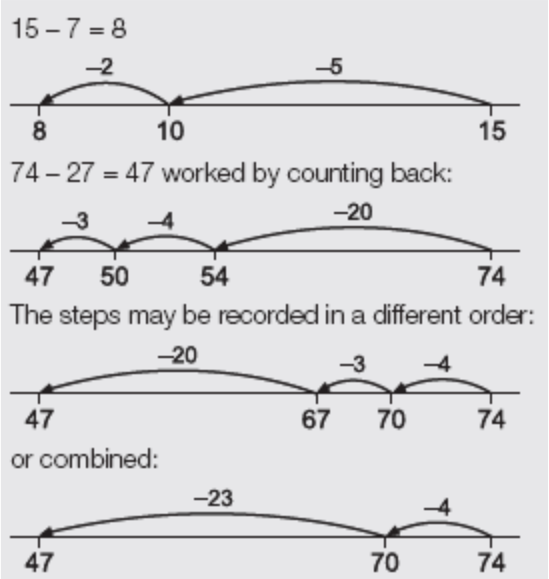


The number line should also be used to show that 6 - 3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.

Once children are confident with number lines and as numbers are getting larger teachers should teach children how to use hundred squares.

The empty number line

The empty number line helps to explain the steps in mental subtraction. Children will need to decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as 57 – 12, 86 – 77 or 43 – 28. It can also be used to demonstrate finding the difference.

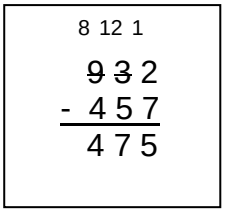


Step 5: Mental Partitioning

Partition the number to be subtracted into tens and ones. Subtract the tens and then the ones.
74 – 27
74 – 20 = 54
54 – 7 = 47

Step 6: Decomposition

This is an efficient written method. Ensure the correct language is used:



- 2 – 7 is not possible in this calculation (children need to know that 2-7 is possible as it produces a negative number), take 10 from the tens column, exchange it for ones, and record it above the 2 ones. 10 +2 = 12
- As a ten has been taken cross out the 3 tens and record 2 tens.
- Complete the ones column 12 – 7 = 5;
- Move onto the tens column 20 – 50 is not possible in this situation so take 100 from the hundreds column and exchange it for tens.
- As a ten has been taken cross out 9 hundreds and record 8 hundreds.
- Complete the calculation in the tens column 120 – 50 = 70
- Complete the hundreds column 800 – 400 = 400
- Do not use the term borrowing.

When subtracting decimals ensure that the children line the decimal points up. If required they can use a square in their books for this.

Multiplication

Step 1: Counting in multiples and songs

Children are encouraged to hear and learn songs. Children will be taught to count in multiples. They will also, as part of the 'Foundation Stage Curriculum', learn through play.

Step 2: Objects

Teachers demonstrate grouping using apparatus. Children make use of concrete apparatus to support their calculations.

Here children could use resources such as counters.

Step 3: Pictures

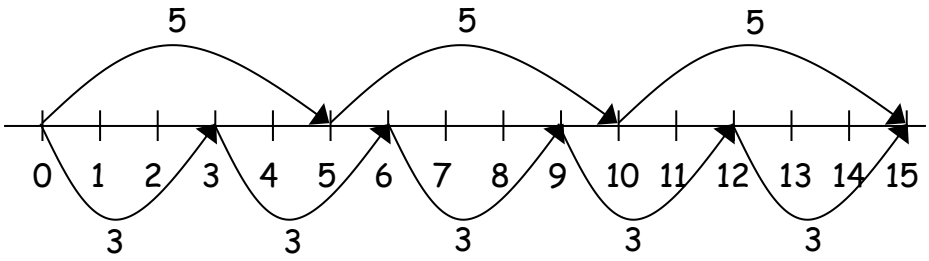
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures.

Step 4: The number line

Repeated addition can be shown easily on a number line:

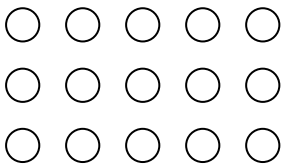
3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3

Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



Step 5: Arrays

Teachers should demonstrate multiplication using an array. Children should be able to model a multiplication calculation using an array. This knowledge will support multiplying with larger numbers.

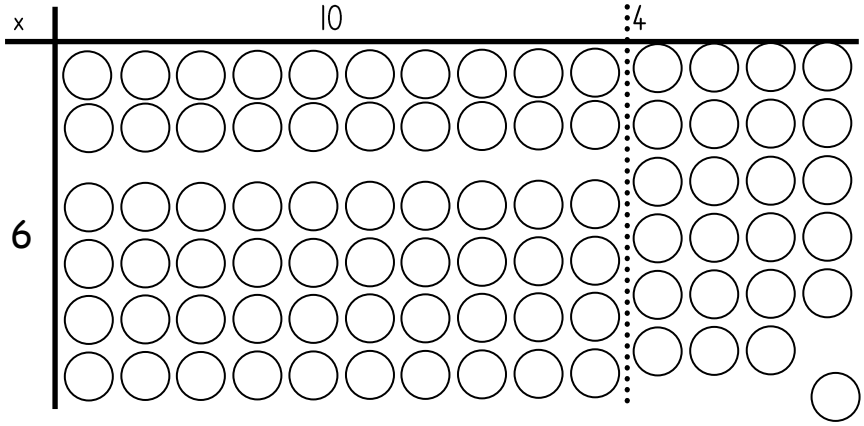


5 x 3 = 15

3 x 5 = 15

This is a visual model. **It is a good visual model in which to introduce the grid method.** It can also be demonstrated with diennes. Children <u>should not</u> draw out this diagram.

14 x 6



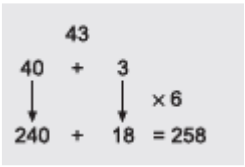
(6 x 10) + (6 x 4)

60 + 24

84

Step 6: Mental multiplication using partitioning

Children may need to begin with informal recordings:



$14 \times 3 = (10 + 4) \times 3$
$= (10 \times 3) + (4 \times 3) = 30 + 12 = 42$

$43 \times 6 = (40 + 3) \times 6$
$= (40 \times 6) + (3 \times 6) = 240 + 18 = 258$

Step 7: Grid Method

TO x O

23 x 8 =

x	20	3
8	160	24

160
+ 24
184

HTO x O

346 x 9 =

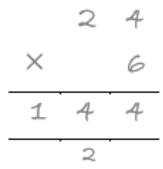
x	300	40	6
9	2700	360	54

2700
+ 360
+ 54
3114

Step 8: Short multiplication (HTO / TO x O)

This is an efficient written method. Ensure the correct language is used:

24 × 6 becomes



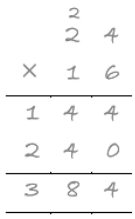
Answer: 144

- Multiply the ones first 4 x 6 = 24. Record the 4 ones in the ones column and carry the two tens.
- Multiply the tens 20 x 6 = 120. Add the carried tens on 120 + 20 = 140

Step 9: Long multiplication

This is an efficient written method. Ensure the correct language is used:

24 × 16 becomes

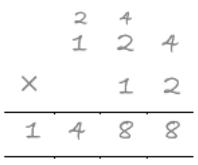


Answer: 384

- Begin by partitioning the 16 into 10+6. Multiply by the ones first. 24 x 6
- 6 x 4 = 24. Record the 4 and carry the 2 tens.
- 6 x 20 = 120 add the 2 tens = 140. Record one hundred in the hundreds column and forty in the tens column.
- Now multiply by the tens 10 x 24.
- Either record 240 or partition further.
- 10 x 4 = 40 record
- 10 x 20 = 200. Record the 2 hundreds in the hundreds column
- 144 + 240 using column methods

Step 10: Short multiplication HTO / TO x TO

124 × 12 becomes



Answer: 1 488

- 124 x 12. Partition the divisor into 10 and 2.
- Multiply by the ones 124 x 2
- Multiply 124 by the ones 4 x 2 = 8 Record the 8 in the ones column.
- Multiply the tens 20 x 2 = 40. Carry the 4 tens.
- 100 x 2 = 200. Carry the 2 hundreds.
- Multiply by the tens 124 x 10
- Now multiply by the ten. 4 x 10 = 40 add the 4 tens carried and the answer is 80. Record 8 tens in the tens column.

- 20 x 10 = 200 add the 2 hundreds carried equals 400. Record the 4 hundreds. 100 x 10 = 1000. Record the thousand.

When multiplying decimals ensure that the children line the decimal points up. If required they can use a square in their books for this.

Division

The relationship between multiplication and division must be emphasised.

Step 1: Objects

Children are introduced to division as equal sharing. Teachers demonstrate using apparatus. Children make use of concrete apparatus to support their calculations. Division should be linked to multiplication. Here children could use resources such as counters.

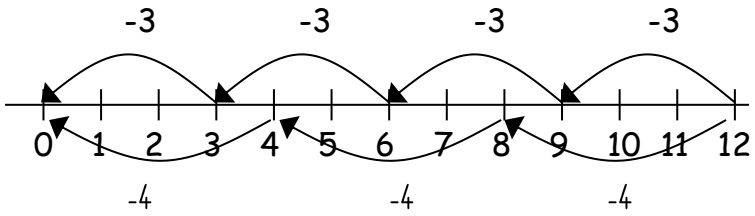
Step 2: Pictures

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.

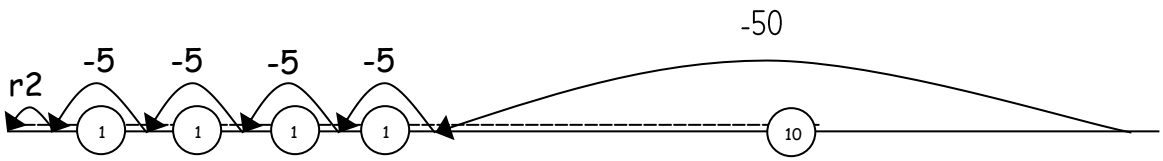
Step 3: The number line (Stage 2)

Repeated subtraction can be shown easily on a number line:

Children should know that 12 ÷ 3 = 4 and 12 ÷ 4 = 3



The empty number line can be used to demonstrate calculations involving remainders.

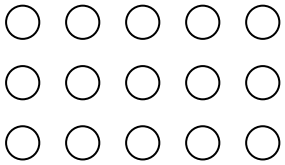


0 2 7 12 17 22 72

This can also be taught in the opposite direction using multiplication facts.
For example 10 x 5 = 50 up to 14 x 5 = 70 and 2 are left over (the remainder).

Step 4: Arrays

Teachers should demonstrate division using an array. Children should be able to model a division calculation using an array.



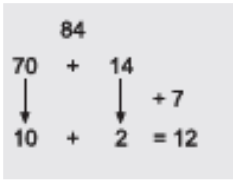
15 ÷ 3 = 5

15 ÷ 5 = 3

Step 5: Mental division using partitioning

Find a multiple of the divisor plus the remaining ones then divide each part separately.

84 ÷ 7 =



- Use knowledge of multiples. 84 is partitioned into 70 (the highest multiple of 7 that is also a multiple of 10 and less than 84) and 14.
- 70 ÷ 7 = 10
- 14 ÷ 7 = 2
- 10 + 2 = 12

Step 6: Chunking

This method is based on subtracting multiples of the divisor, or 'chunks'. When teaching for the first time model using a timeline so that children can see chunks being subtracted. Modelling with an array will suit some children. Initially children subtract several chunks, but with practice they should look for the largest multiples of the divisor that they can find to subtract.

162 ÷ 9 = 18

- Ask children to find make an estimate. e.g. 16 x 10 = 160 or 160 ÷ 10 = 16
- To find 162 ÷ 9, we start by multiplying listing the related facts of the divisor 9 (1x, 2x, 10x and 5x).
- 9 x 10 = 90 so subtract 10 chunks of 9 from 196. This leaves 72.
- Use related facts to find that 8 x 9 = 72. Subtract 8 chunks of 9 Leaving 0.
- Add together the chunks that have been subtracted (10 + 8). The answer is 18.
- Ask children to check their answer against the prediction.

Rf
1x9=9
2x9=18
10x9=90
5x9=45

9 ⟌ 162
- 90 (9x10)
72
- 72 (9x8)
0

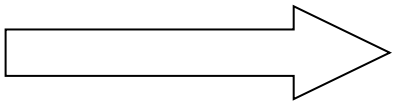
10 + 8 = 18

Progression in Chunking

97 ÷ 9

9⟌97
- 90 9x10
7
Answer: 10R7

6⟌196
- 60 6x10
136
- 60 6x10
76
- 60 6x10
16
- 12 6x 2
4 32
Answer: 32R4



6⟌196
- 180 6x30
16
- 12 6x 2
4 32
Answer: 32R4

- To find 196 ÷ 6, we start by multiplying listing the related facts (1x, 2x, 10x and 5x).
- Children to estimate first.
- Use related facts to find that 6 × 30 = 180 and 6 × 40 = 240.
- The number 196 is between the multiples 180 and 240 therefore this tells us that the answer to 196 ÷ 6 is between 30 and 40
- 6 x 30 = 180 so subtract 180 from 196. This leaves 16.
- Use related facts to find that 2 chunks of 6 is 12. Subtract 2 chunks which leaves a remainder of 4.
- The answer 32 (with a remainder of 4) lies between 30 and 40, as predicted.
- Ask children to check their answer against the prediction.

Step 7: Short division

This is an efficient written method. Ensure the correct language is used:

$$3\overline{)\,2^{2}9^{2}1}\quad 9\ 7$$

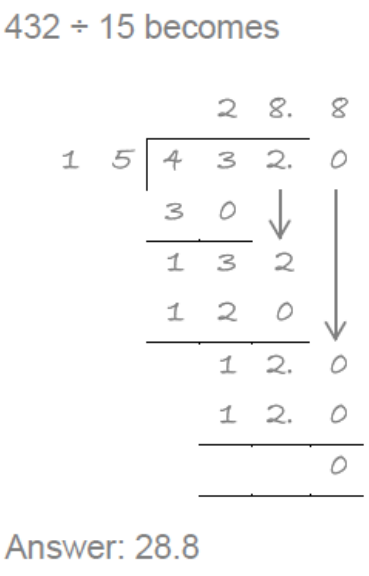
- 2 hundreds divided into 3 equal groups is not possible so I need to exchange the 2 hundreds for 20 tens.
- Carry the 20 tens into the next column and record it next to the 9 tens. 20 tens + 9 tens = 29 tens or 290.
- How many threes in 290? I know there are 9 3's in 27so 90 3's in 270. And I have 2 tens remaining. Record 9 tens above the line in the tens column.
- Carry the two tens into the ones column. 2 tens + one = 21 21 ÷ 3 = 7. Record the 7 above the line.

Children should be taught to express remainders as fractions then moving onto decimals.

Step 8: Long division

This is an efficient written method.

This is the method you will see on 'Mathletics'



Explain to children that although we know we are dividing 432 by 15 we are not treating each digit as it place value equivalent. Each digit is considered separately. A dividend is separated into multiples using the idea of remainders.

- As 4 is smaller than 15 we are going to start with 43.
- How many 15's in 43? I know that 15 x 2 = 30. I record 2 above the 3.
- Write 30 under 43. Underline 30.
- 43 – 30 = 13. My remainder is 13 so I record 13.
- I bring down the next digit and write it next to the 13.
- How many 15's in 32. I know that 15 x 8 = 120. I record 8 above the 2.
- Write 120 under 132. Underline 120.
- 132 – 120 = 12.
- I bring the decimal point down and the next digit.
- 15 is larger than 12 so I have a remainder.
- Decide how you want children to record their answer (remainder, fraction, decimal)
- 12/15 = 4/5 = 0.8

Ext: More able children who will be able to divide numbers larger than 12 mentally will use the 'Step 7' method for 'Step 8'

When dividing decimals ensure that the children line the decimal points up. If required they can use a square in their books for this.