



Perton Primary
Academy
Calculation Policy
2023 -2024
Year 3 — Year 4

Maths calculation Policy 2023-2024

This policy supports the White Rose maths scheme used throughout the school alongside Numicon, Nrich and NCTEM. Progression within each area of calculation is in line with the programme of study in the 2014 National Curriculum.

This calculation policy should be used to support children to develop a deep understanding of number and calculation. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations.

Concrete representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.

Pictorial representation - a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations , such as a diagram or picture of the problem.

Abstract representation—a pupil is now capable of representing problems by using mathematical notation, for example $12 \times 2 = 24$.

It is important that conceptual understanding , supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

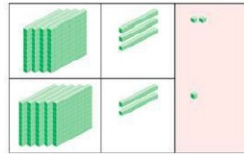
Addition (Year 3)

Add two three digit numbers.

Children need to first use equipment to support understanding of place value. Start without renaming then gradually move onto renaming.

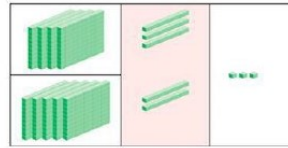
$$432 + 521 =$$

Step 1 Add the ones.
2 ones + 1 one = 3 ones



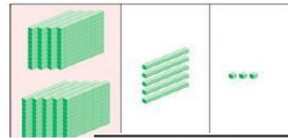
h	t	o
4	3	2
+	5	2
		1
		3

Step 2 Add the tens.
3 tens + 2 tens = 5 tens



h	t	o
4	3	2
+	5	2
	5	3

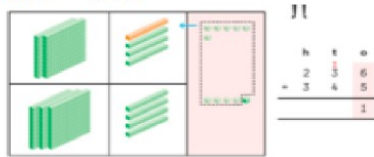
Step 3 Add the hundreds.
4 hundreds + 5 hundreds = 9 hundreds



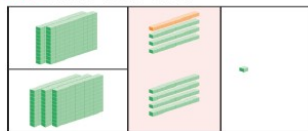
h	t	o
4	3	2
+	5	2
	5	3
9	5	3

Represent the place value counters pictorially, remembering to show what has been exchanged.

$$236 + 345 =$$

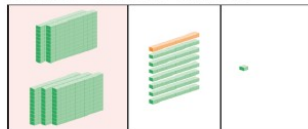


Step 2 Add the tens.
1 ten + 3 tens + 4 tens = 8 tens



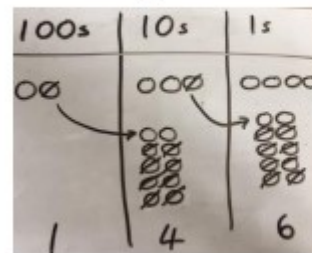
h	t	o
2	3	6
+	3	4
	8	1

Step 3 Add the hundreds.
2 hundreds + 3 hundreds = 5 hundreds



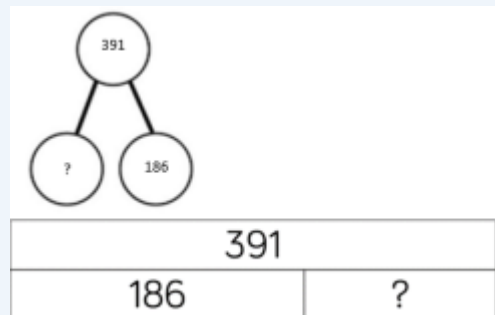
h	t	o
2	3	6
+	3	4
	8	1
5	8	1

$$236 + 345 = 581$$



Bar Modelling

It is important for the children to use the bar model in this way to encourage the use of it to aid problem solving.

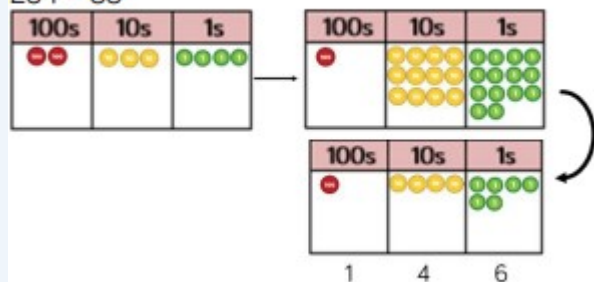


Subtraction (Year 3)

Use counters to practically calculate the answer

Column method using place value counters.

$$234 - 88$$



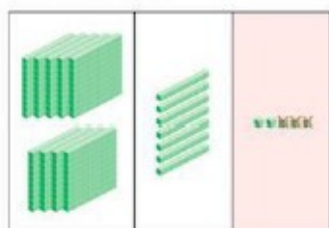
Subtract up to 3 digits from 3 digits.

Children need to first use equipment to support understanding of place value.

Only when children are secure with method should exchanging be introduced.

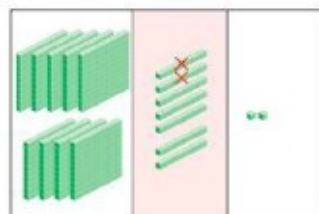
Subtract 723 from 975.

Step 1 Subtract the ones.
5 ones - 3 ones = 2 ones



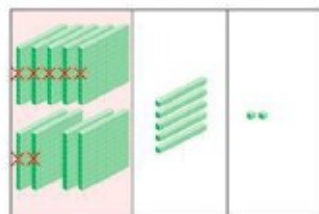
h	t	o
9	7	5
-	7	2
		3
		2

Step 2 Subtract the tens.
7 tens - 2 tens = 5 tens



h	t	o
9	7	5
-	7	2
	5	2

Step 3 Subtract the hundreds.
9 hundreds - 7 hundreds = 2 hundreds

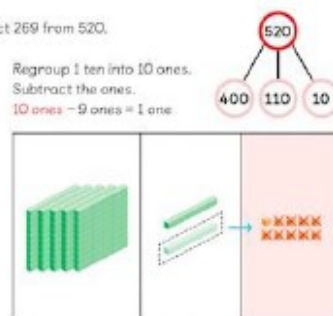


h	t	o
9	7	5
-	7	2
2	5	2

$$975 - 723 = 252$$

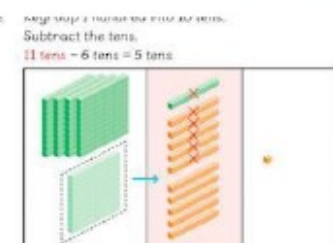
Subtract 269 from 520.

Step 1 Regroup 1 ten into 10 ones.
Subtract the ones.
10 ones - 9 ones = 1 one



h	t	o
5	2	0
-	2	6
		9
		1

Step 2 Regroup 1 hundred into 10 tens.



h	t	o
5	2	0
-	2	6
	6	9
		1

Step 3 Subtract the hundreds.
4 hundreds - 2 hundreds = 2 hundreds



h	t	o
5	2	0
-	2	6
2	5	1

$$520 - 269 = 251$$

Bar Modelling

It is important for the children to use the bar model in this way to encourage the use of it to aid problem solving.

315	315 - 185 = ?
185	185 + ? = 315

?	185 + 315 = ?
185	? - 185 = 315

Multiplication (Year 3)

Children should be able to recall the 2, 5, 10, 3, 4 and 8 multiplication tables.

Multiply a 2 digit number by a 1 digit number.

Let's Learn

1

There are 4 groups of 23 fish. How do we multiply 23 by 4?

4 ones $\times$ 3 = 12 ones
12 ones = 1 ten 2 ones

Step 1

Multiply the ones by 4.

t

o

2

3

$\times$

4

1

2

Step 2

Multiply the tens by 4.

t

o

2

3

$\times$

4

1

2

8

0

Step 3

Add the products.

t

o

2

3

$\times$

4

1

2

+

8

0

9

2

Bar Modelling
It is important for the children to use the bar model in this way to encourage the use of it to aid problem solving.

4 children go to the cinema. They each pay £15. How much do they spend altogether?

Whole unknown

?

15

15

15

15

Dividing and grouping understanding the concept of remainders.



 $13 \div 4 = 3 \text{ Remainder } 1$

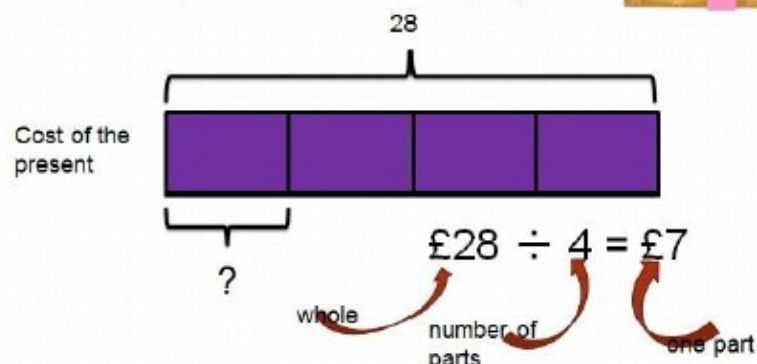
The diagram shows three ten-frames and a number line. The first ten-frame has 10 yellow beads in the top row and 4 green beads in the bottom row. An arrow points to a second ten-frame with 3 yellow beads in the first column and 11 green beads (6 in the bottom row and 5 above the frame). A curved arrow points from the second ten-frame to a third ten-frame with 3 yellow beads in the first column and 1 green bead in the second column. A number line below shows 14 marked with a dot.

Once the children are secure with division as grouping and can demonstrate this on number lines, arrays etc. short division should be introduced for dividing larger 2 digit numbers. Initially with carefully chosen calculations requiring no remainders. Compare the layout of short division o that of an array.

100s	10s	1s
1	2	3

1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

It is important for the children to use the bar model in this way to encourage the use of it to aid problem solving.

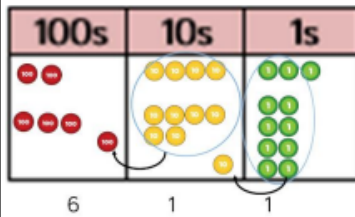


Addition (Year 4)

Adding numbers with up to 4 digits.

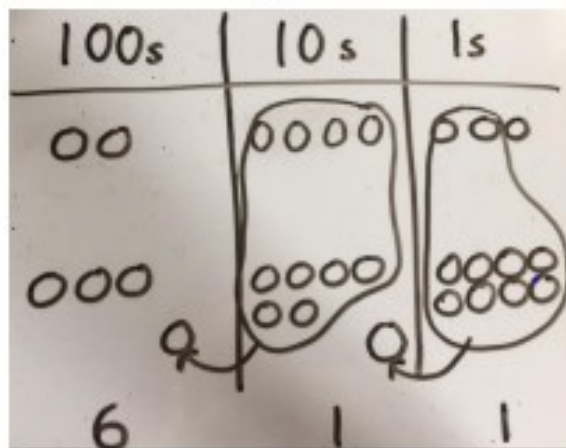
Again this should start with the children using equipment to support and lots of discussion about the values of digits.

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.



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

Children to represent the counters in a place value chart, circling when they make an exchange.



Using the bar model to find missing digits.

This is not a form of getting the correct answer but helping to guide children to the correct operation.

Alison jogs 6,860 metres and Calvin jogs 5,470 metres. How far do they jog altogether?

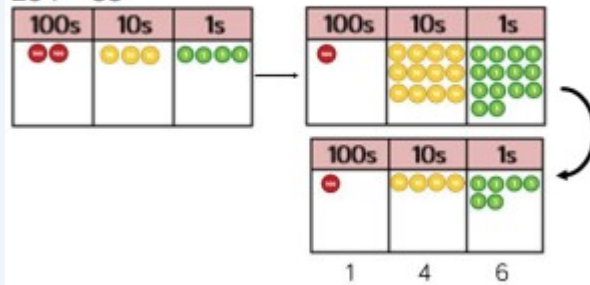


Subtraction (Year 4)

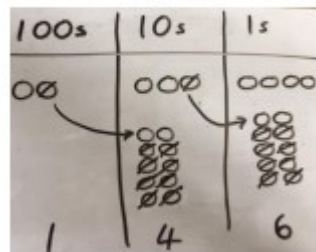
Subtract with numbers up to four digits, including exchanging.

Column method using place value counters.

$$234 - 88$$

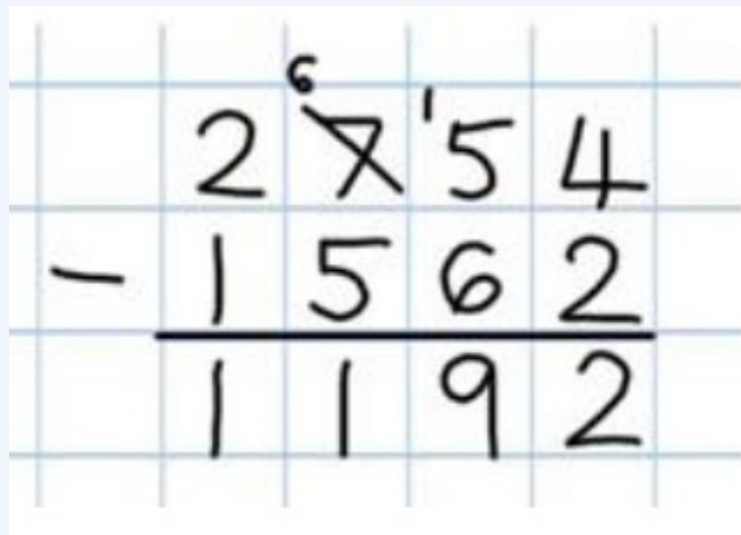


Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal column method. Children must understand what has happened when they have crossed out digits.

$$\begin{array}{r} \overset{2}{2} \overset{1}{3} 4 \\ - 88 \\ \hline 146 \end{array}$$



Using the bar model to find missing digits.

There are 3,160 books in a shop. 1,226 are in English and the rest are in French. How many French books are there?



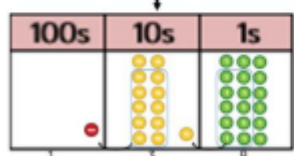
Multiplication (Year 4)

Children know all times tables up to 12×12 .

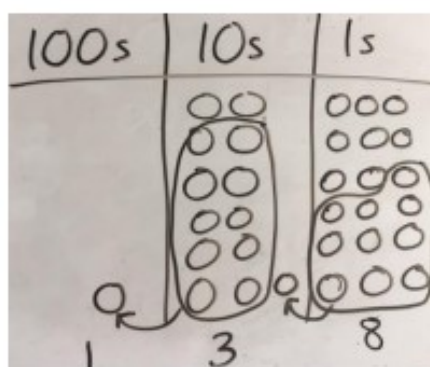
Children use expanded column multiplication

Formal column method with place value counters.

6×23



Children to represent the counters/base 10, pictorially e.g. the image below.



Formal written method

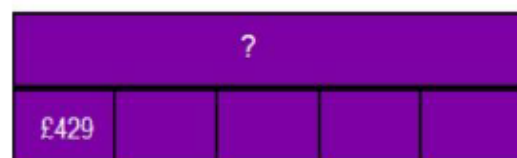
$$\begin{array}{r} 6 \times 23 = \\ 23 \\ \times 6 \\ \hline 138 \\ \hline 1 \quad 1 \end{array}$$

Multiply using the bar model

A computer costs 5 times as much as a television. The television costs £429.

How much does the computer cost?

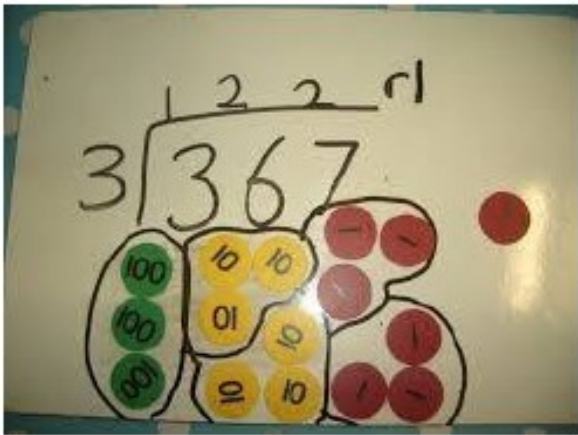
Cost of the computer



Division (Year 4)

Dividing 3 digit numbers by a 1 digit number using short division.

	H	T	U	
	0	2	5	r1
5	1	2	6	
				



Divide using the bar model

Desmond and Melissa collect cards. They have 192 cards in all. Melissa has three times as many cards as Desmond. How many cards does Desmond have?

