Staverton C of E Primary School

Calculation Policy 2024

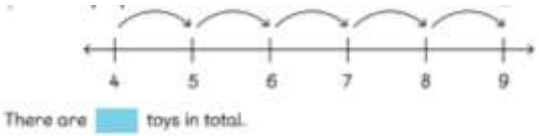
STAVERTON
CHURCH OF ENGLAND
PRIMARY SCHOOL

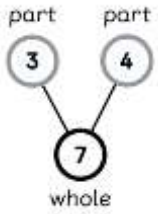
Addition

Year 1

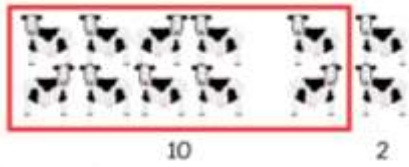
Methods start with physical manipulatives to represent the calculation

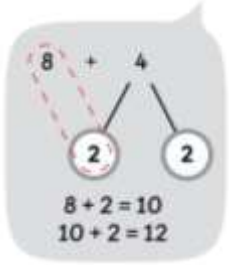
This then progresses to representations on a number line and a part, part whole model.

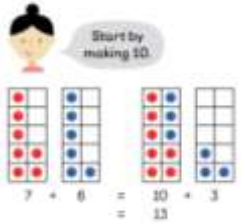




When pupils begin crossing the 10s boundary (regrouping and renaming), children are taught to find pairs that equal 10 and then add on the rest. This is done through images, part whole models and other representations.



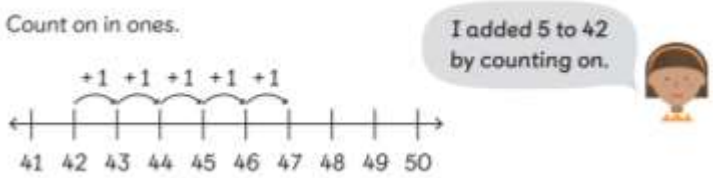




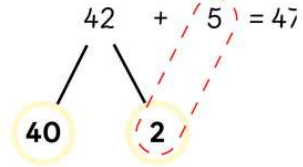
Children are then introduced to the number sentence and equations without a representation.

Year 2

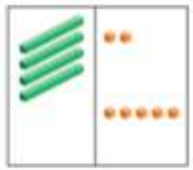
Methods start with the introduction of a number line for counting on. This starts with counting in 1s. This method is then adapted to counting in multiples of 10 and for adding three numbers.

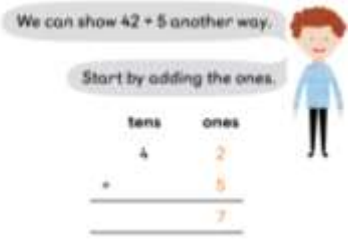


Part whole models, physical representations using base 10 and column addition are introduced simultaneously. These are initially used for adding 1s and then adapted for adding 10s.

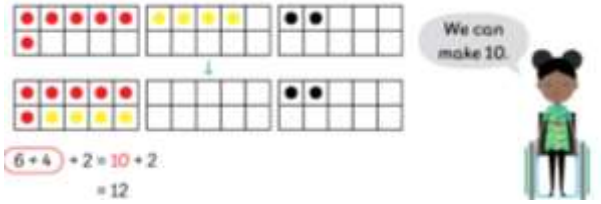


2 + 5 = 7
42 + 5 = 47



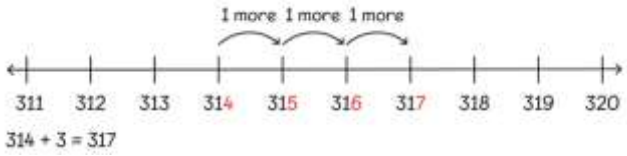


For adding three numbers, a 10 grid is introduced to encourage children to find pairs that total 10 before adding on.

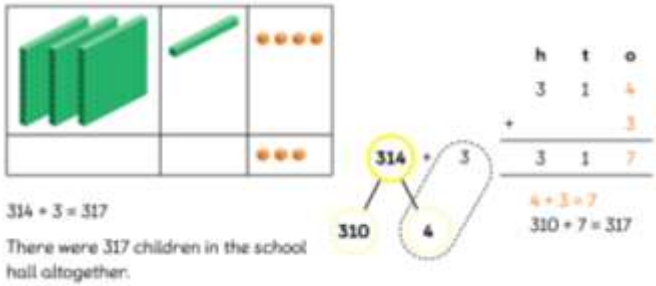


Year 3

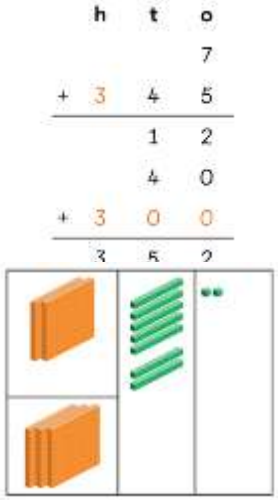
Methods start with the introduction of a number line for counting on. This starts with counting in 1s. This method is then adapted to counting in multiples of 10 and 100.

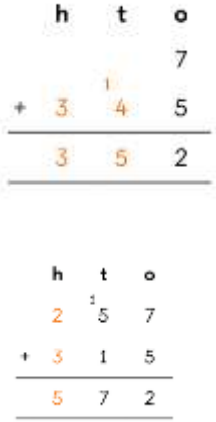


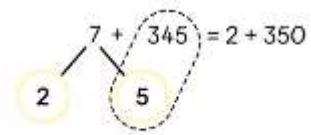
Part whole models, physical representations using base 10 and column addition are introduced simultaneously. These are initially used for adding 1s and then adapted for adding 10s and 100s.

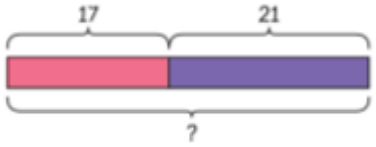


Expanded addition, part whole models and compact column addition are used when crossing the 10s boundary. This is called regrouping and renaming. Bar models are then introduced alongside these methods to help solve addition problems.



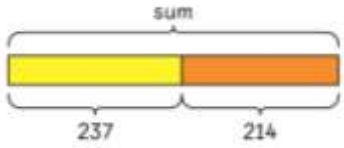




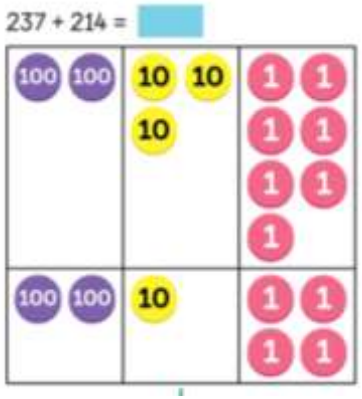


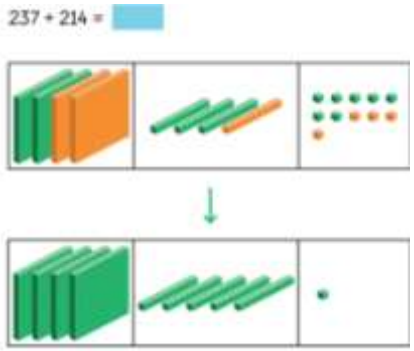
Year 4

Bar models are introduced early in Y4 to represent addition problems.



Physical representations using base 10 and place value counters are then used alongside expanded and compact forms of column addition including where regrouping and renaming are needed.



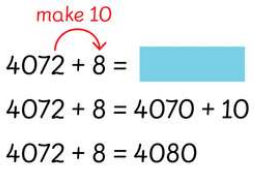


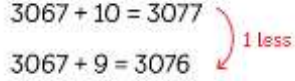
Add the ones.
Add the tens.
Add the hundreds.

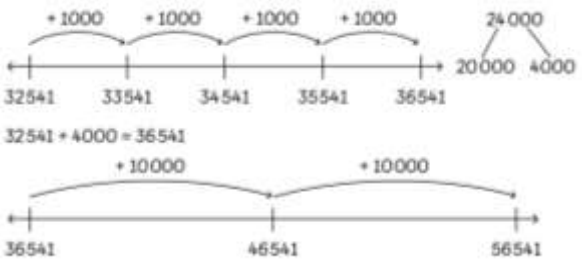
	2	3	7
+	2	1	4
		1	1
		4	0
+	4	0	0
	4	5	1

	4	5	1	0
+	3	1	2	5
	7	6	3	1

Mental calculation strategies are specifically introduced. Children are taught to find pairs that make multiples of 10, 100 or 1000. They are then taught to use new multiples and adjust.



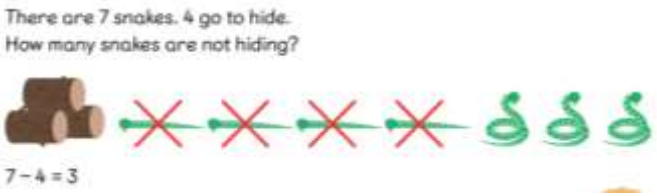


Year 5	Year 6
Methods start with counting on before progressing to more formal methods of column addition are used.  When children are confident, they are encouraged to estimate using rounding before they solve the calculation. $\begin{array}{r} {\scriptstyle 1} \\ 238\,000 \\ +\,139\,000 \\ \hline 377\,000 \\ \hline \end{array}$ 238000 ≈ 240000 139000 ≈ 140000 240000 + 140000 = 380000 $\begin{array}{r} {\scriptstyle 1} \\ 15\,473 \\ +\,16\,524 \\ \hline 31\,997 \\ \hline \end{array}$ Children are then taught to apply these skills with decimals and money. $\begin{array}{r} {\scriptstyle 1} \\ £1.80 \\ +£0.70 \\ \hline £2.50 \\ \hline \end{array}$	No new methods of addition are introduced at Year 6. However, BODMAS is introduced and the order of operations is taught. First, carry out all the operations in ( ). Next, perform all the multiplication and division. Then, calculate all the addition and subtraction.

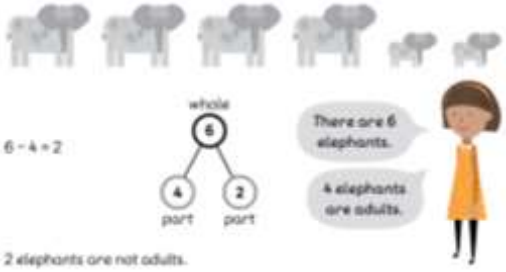
Subtraction

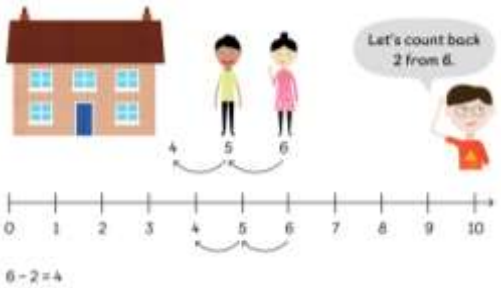
Year 1

Subtraction is initially introduced using physical manipulatives and pictorial images. Subtraction equations are then introduced e.g. '7 minus 4 = 3'.

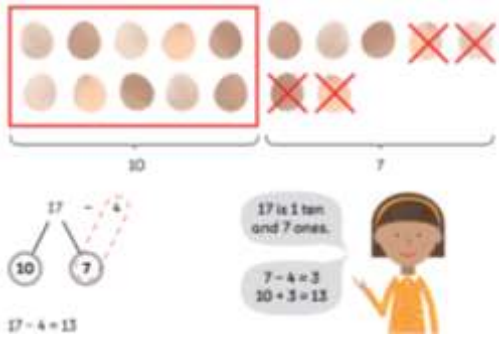


Part-whole models are then use alongside pictorial representations and subtraction equations.





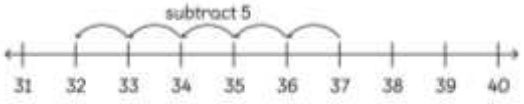
Counting back strategies are introduced using a number line.



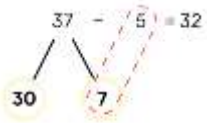
Later in the year, the part-whole model is used to partition larger numbers into tens and ones before subtracting.

Year 2

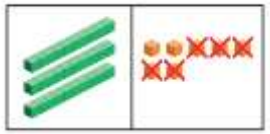
Subtraction at Year 2 is initially introduced using counting back on a number line. Part-whole models and pictorial representations are then used to support the teaching a formal column method.



37 − 5 = 32



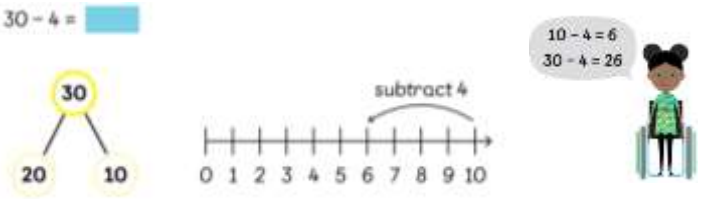
7 − 5 = 2
37 − 5 = 32

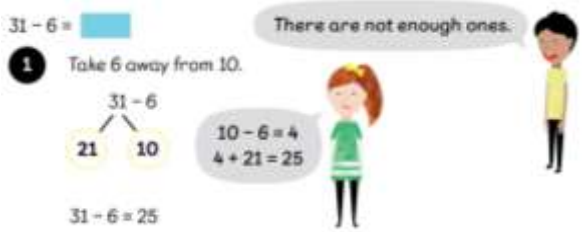


7 ones − 5 ones = 2 ones

	tens	ones
	3	7
−		5
	3	2

After the column method without renaming is secure, children are taught to partition numbers in order to subtract. Renaming is then introduced and children are taught how to adapt the previously learnt methods to solve these.





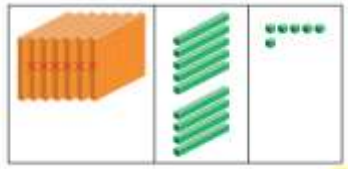
	tens	ones
	~~2~~ 1	~~1~~ 11
−		6
	2	5

Year 3

587 – 5 = 582

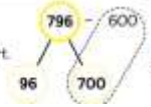
Subtraction is introduced using counting back on a number line.

After this, pictorial representations are used alongside part-whole models and the formal column method.



796 – 600 = 196

There were 196 people left at the airport.



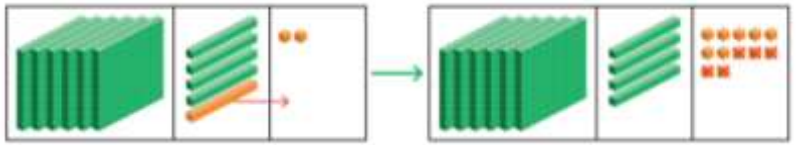
700 – 600 = 100

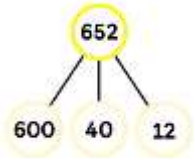
96 + 100 = 196

h	t	o
7	9	6
– 6	0	0
1	9	6

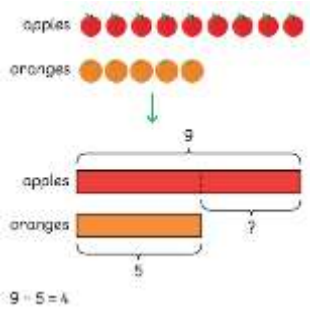
h	t	o
7	4	8
– 4	2	5
3	2	3

When children are secure with the methods they are taught how to adapt them to use with regrouping and renaming.





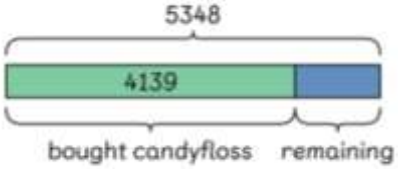
h	t	o
6	4 5	12 2
–	2	5
6	2	7



Models are also introduced to represent subtractions.

Year 4

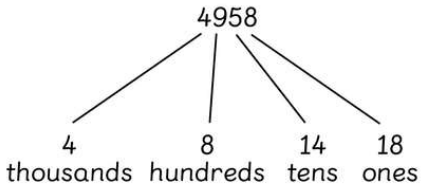
At Year 4, children are introduced to using bar models to express he difference and to subtract. Children are expected to draw their own to help them represent problems before solving them.



Children continue to use the column method from Year 3 and subtracting from the thousands column is introduced. Initially subtraction without renaming is taught before children use part-whole models and column method to regroup and rename.

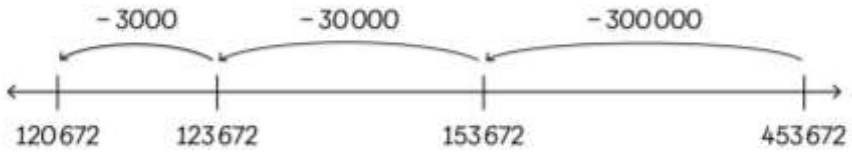
	5	8	9	7
–	3	7	2	5
	2	1	7	2

	4	8 ~~9~~	14 ~~5~~	18 ~~8~~
–	1	6	7	9



Year 5

In Year 5, subtraction is initially introduced with counting back on a number line. This starts with counting back in steps of the same size and progresses to counting back in steps of different sizes.



Column subtraction is the main method taught in Year 5. This builds on the learning from Year 4 and children are taught to apply the method to numbers within 1,000,000.

```
  4 14
  5 4 6 7 2
- 3 6 4 1 1
-----------
  1 8 2 6 1
-----------
```

```
    9  12 10
  6 10  7  0 12
  7  0  3  1  2
- 5  9  4  4  3
---------------
  1  0  8  6  9
---------------
```

This method is then applied to decimals and money.

```
    2  14
  £ 3 . 4 0
- £ 2 . 5 0
-----------
  £ 0 . 9 0
-----------
```

Year 6

No new methods of subtraction are introduced at Year 6. However, BODMAS is introduced and the order of operations is taught.

First, carry out all the operations in ( ).
Next, perform all the multiplication and division.
Then, calculate all the addition and subtraction.

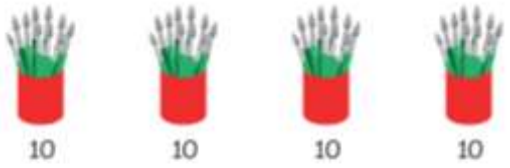
Multiplication

Year 1

Multiplication at Year 1 is introduced with the concept of placing objects into equal groups.

There are 5 flowers in each group.
There are 4 equal groups.

There are 4 groups of 10 .



4 groups of 10 = 40
4 tens = 40

There are 40 .

3 rows of 5
3 fives = 15

Children are then taught to add the groups before being taught to arrange them in rows as preparation for arrays in later year groups.

When grouping is secure, the concept of doubling is introduced.

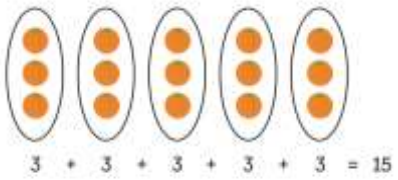
double 1 = 2 ones
double 1 = 2

double 2 = 2 twos
double 2 = 4

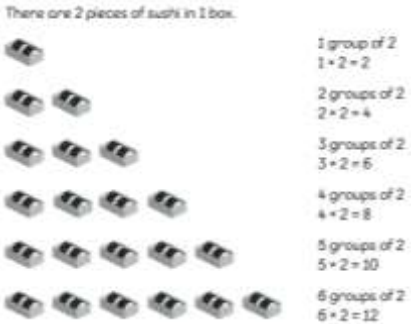
Year 2

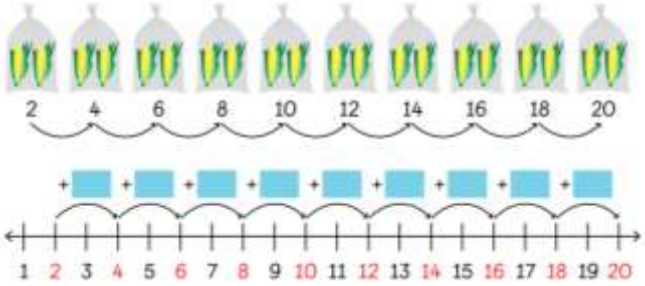
In Year 2, children are introduced to multiplication by building on the concept of equal groups previously learnt in Year 1.

Children are then taught to count groups of 2, 5 and 10 and this forms the initial teaching of these times tables.



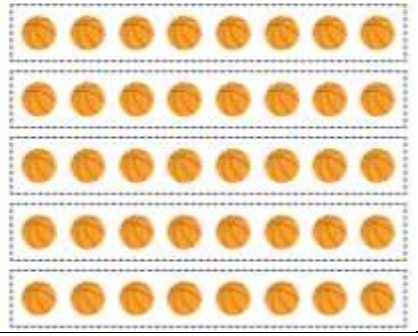
There are 15 oranges in total.





Once grouping with the 2, 5 and 10 times is secure, children are then taught to skip count using number lines.

Multiply 8 by 5.



Items are then grouped into arrays.

Year 3

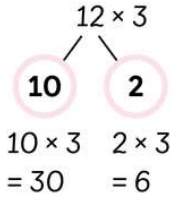
When starting to learn and represent multiplication in Year 3, children continue to use arrays (see Year 2).

Children are then taught to use repeated addition.

12 + 12 + 12 = 36

There are 36 eggs in the three boxes.

Children are then taught to partition a number and multiply each part separately before adding together the answers.



	t	o
	3	2
×		3
		6
	9	0
	9	6

Formal multiplication methods are then introduced and are initially taught alongside the partitioning method.

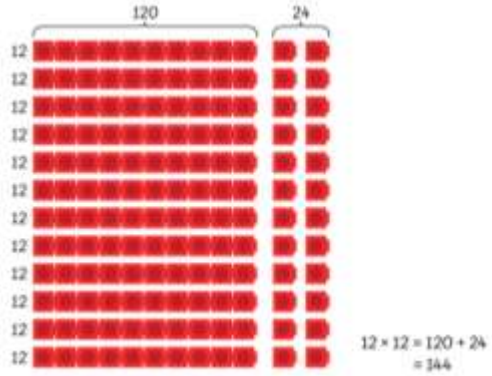
First, an expanded form of the formal method is taught before short multiplication is introduced to multiply a 2-digit number by a single digit.

	h	t	o
		2 4	3
×			8
	3	4	4

Year 4

Initially in Year 4, pupils are taught methods to help them work out and visualise times table facts.

Arrays are use to work out the 11 and 12 times tables.



The repeated addition and partitioning methods from Year 3 continue to be taught to provide mental methods of calculating.

Step 1 Multiply 2 ones by 4.

	1	2
×		4
		8

→ 2 × 4 = 8

Step 2 Multiply 1 ten by 4.

	1	2	
×		4	
		8	
+	4	0	→ 10 × 4 = 40
	4	8	

Formal multiplication methods are then taught. Initially, children revise the expanded method without the need for renaming previously taught in Year 4

Renaming is then introduced and children are taught the short multiplication method to solve 3-digit numbers by a single digit.

	1 2	6	2
×			3
	7	8	6

Year 5

Multiplication in Year 5 begins by building on the methods learnt in Year 4.

Children begin by multiplying a 4-digit number by a single digit using an expanded form of the method (before revising short multiplication from Year 4.

```
  1218
×    9
------
    72   → multiply by ones
    90   → multiply by tens
  1800   → multiply by hundreds
+ 9000   → multiply by thousands
------
 10962
```

Pupils are then taught to use short multiplication when multiplying a 2-digit number by a 2-digit number.

```
   35
×  28
------
  280   → 35 × 8
+ 70    → 35 × 20
------
  980
```

This skill is then built on through multiplying a 3-digit number by a 2-digit number.

```
  231
×  13
------
  693   → 231 × 3 = 693
+2310   → 231 × 10 = 2310
------
 3003
```

Year 6

Year 6 multiplication builds on the learning from Year 5. Children revise using short multiplication to multiply a 3-digit number by a 2-digit number before applying this skills to multiplying 4-digit numbers by 2-digits.

```
  1229
×   28
------
  9832   → 1229 × 8 = 9832
+24580   → 1229 × 20 = 24580
------
 34412   → 1229 × 28 = 34412
```

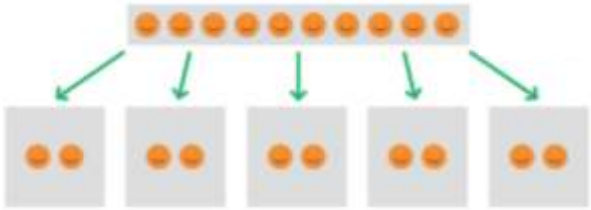
Children are then taught to multiply decimals by a single digit using short multiplication.

```
  17.23
×     6
------
 43.38
```

Division

Year 1

In Year 1, division is introduced through the concept of equal groupings.



Children are then taught to share into equal groups.

Emma takes one sticker for herself and gives one sticker to Charles.

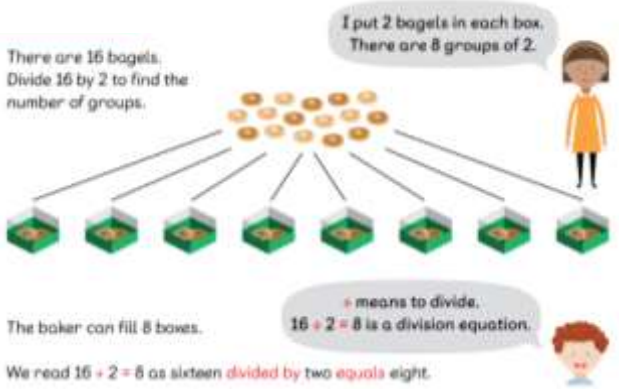
She takes another sticker for herself and gives another to Charles.

Emma does this until she has finished sharing the 8 stickers.

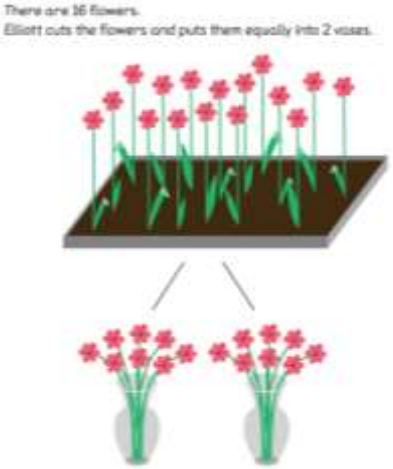
Emma and Charles each have 4 stickers.

Year 2

In Year 2, children are taught the concept of division through grouping and sharing.



Grouping

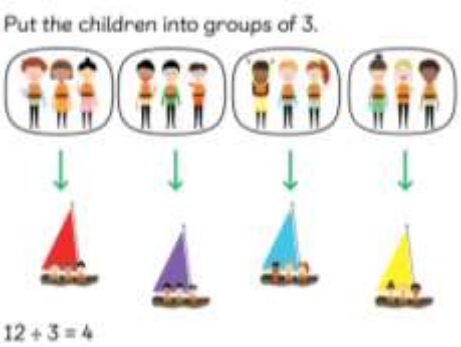


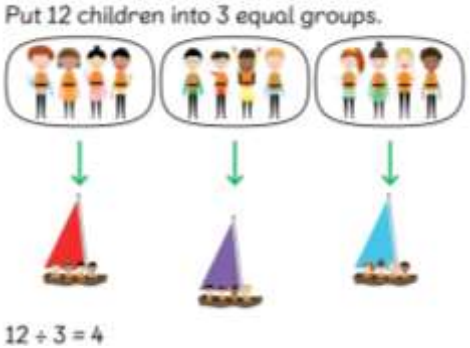
Sharing

These methods are then used to divide numbers by 2, 5 and 10.

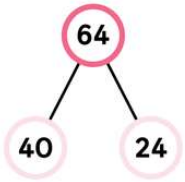
Year 3

In Year 3, children begin division by revising grouping and sharing from Year 2.





Children are then taught to partition the number and divide each part separately using their tables before recombining to gain an answer. Where numbers are more complicated, children are taught to partition in different ways to make the final division easier.



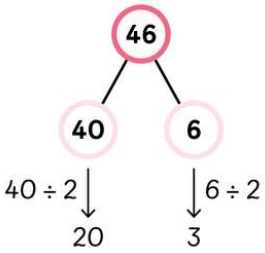
40 ÷ 4 = 10
24 ÷ 4 = 6
64 ÷ 4 = 16

$$
\begin{array}{r|l}
4 & 16 \\
\hline
- & 64 \\
 & 40 \\
\hline
 & 24 \\
- & 24 \\
\hline
 & 0
\end{array}
$$

Once pupils are secure with the partitioning method, children are taught an expanded form of short division.

Year 4

In Year 4, children initially revise grouping and sharing but with numbers where there will be a remainder.



Children then revise the partitioning method from Year 3 for 2-digit numbers including numbers with remainders.

Children revising expanded short division, this time for 2-digit and 3-digit numbers. Initially these methods are taught without remainders. Once children are secure, examples with remainders are introduced.

$$
\begin{array}{r|l}
3 & 102 \\
\hline
 & 306 \\
- & 300 \\
\hline
 & 6 \\
- & 6 \\
\hline
 & 0
\end{array}
$$

306 ÷ 3 = 102

$$
\begin{array}{r|l}
4 & 14 \\
\hline
 & 59 \\
- & 40 \\
\hline
 & 19 \\
- & 16 \\
\hline
 & 3
\end{array}
$$

59 ÷ 4 = 14 remainder 3

Year 5

In Year 5, children revise the methods from Year 4 (see below) before moving on to dividing 3 and 4-digit numbers by a single digit with and without remainders using short division.

```
   3 2 8
6 ) 1 9 6 8
  - 1 8 0 0
  -------
      1 6 8
    - 1 2 0
    -------
        4 8
    -   4 8
    -------
          0
```

```
     7 8  remainder 1
6 ) 4 6 9
  - 4 2 0   → 420 ÷ 6 = 70
  -------
      4 9
      4 8   → 48 ÷ 6 = 8
      -----
        1
```

Year 6

In Year 6, shirt and long division are taught. Children are expected to divide 2 and 3-digit number by a 2-digit number with and without remainders.

```
     3 2  remainder 5
18 ) 5 8 1
```

Short division

```
       1 0 2
24 ) 2 4 4 8
   - 2 4       → 24 hundreds ÷ 24 = 1 hundred
   -------
       4 8
   -   4 8     → 48 ones ÷ 24 = 2 ones
   -------
         0
```

Long division without a remainder

```
       3 2  remainder 5
18 ) 5 8 1
   - 5 4       → 3 tens × 18 = 54 tens
   -------
       4 1
   -   3 6     → 2 ones × 18 = 36 ones
   -------
         5
```

Long division with a remainder

```
       1 . 2 3
5 ) 6 . 1 5
   - 5         → 5 × 1
   -------
     1 . 1 5
   - 1 . 0     → 5 × 0.2
   -------
     0 . 1 5
   - 0 . 1 5   → 5 × 0.03
   -------
           0
```

6.15 ÷ 5 = 1.23

Children are then taught to use these methods to divide decimals with up to 2 decimal places by a single digit or 2-digit whole number.