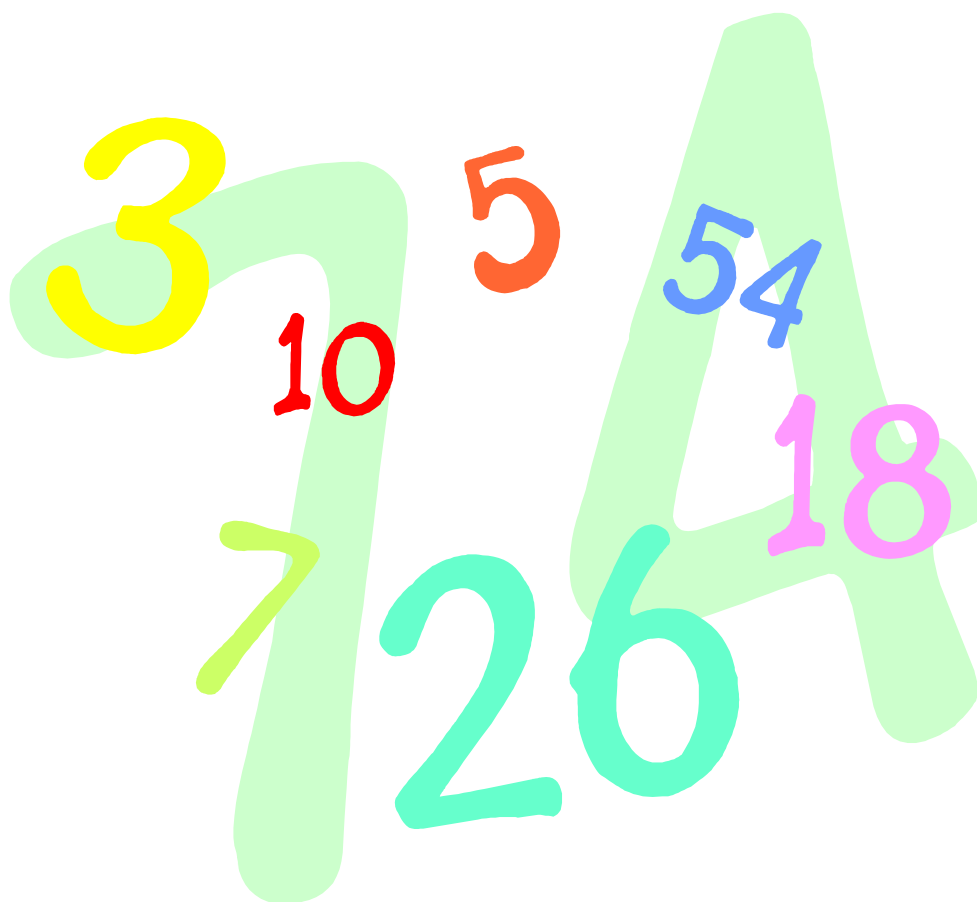


Brooke Weston
Primary Cluster
Calculation
Policy



- It is imperative that the correct vocabulary should be used when teaching short methods of calculation.

$$+124$$

$$\underline{223}$$

$$—$$

e.g. We begin by adding the 4 units and the 3 units, then we total the 2 tens and the 2 tens....

- Staff should be aware that operations should not be taught discretely. The inverse should be taught alongside to ensure the children understand links between operations.
- Staff should look at the programme of study for the 2014 Curriculum to see expected levels of calculation, then adjust their teaching to ensure the individual's level of understanding.
- Ensure

Early Calculation Skills.

Recognise numbers 0 to 20

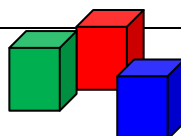
0 1 2 3 4 5 6 7 8 9 10



1,2,3,4,5,6
... there are 6
teddies

Count reliably up to 20
everyday objects

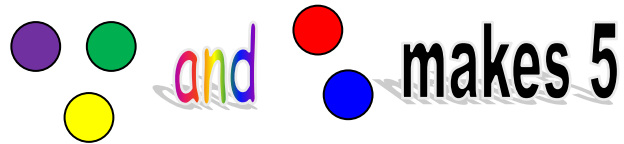
Find one more than a number



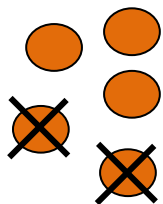
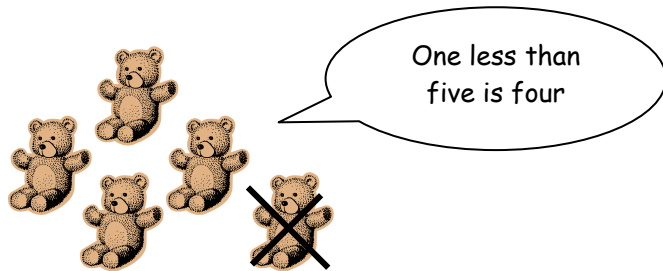
One more than
three is four



Begin to relate addition to combining two groups of objects



Find one less than a number from one to ten



Take away 2

Begin to relate subtraction to taking away

- Moving on to addition and subtraction of 2 single digit numbers and solving problems which involve doubling, halving and sharing up to 20. (see all other sections)

Addition

To use practical and informal written methods to support the addition of one-digit numbers and a one digit plus a 2-digit number..

$2 + 4 =$



Draw pictures to represent the number

$4 + 2 =$



Know that addition can be done in any order

$6 + 3 =$



Children could use dots or tally marks to represent the number (quicker than using pictures)

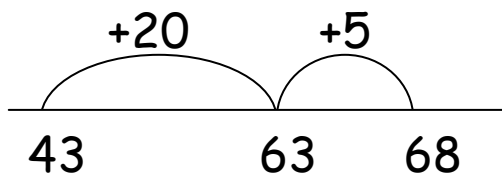
Extending to 2 digit + 1 digit number

$12 + 3 =$



Use practical and informal methods to support the addition of two-digit numbers.

$43 + 25 = 68$



Draw an empty number line. Children record the steps they have taken

$43 + 25 = 68$

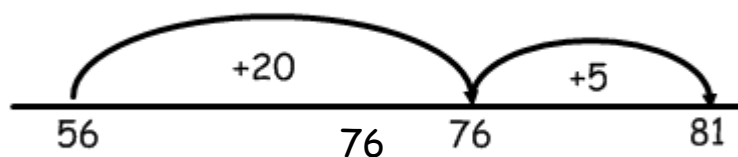
T	$40 + 20 = 60$
U	$3 + 5 = 8$
T + U	$60 + 8 = 68$

Partition the tens and units

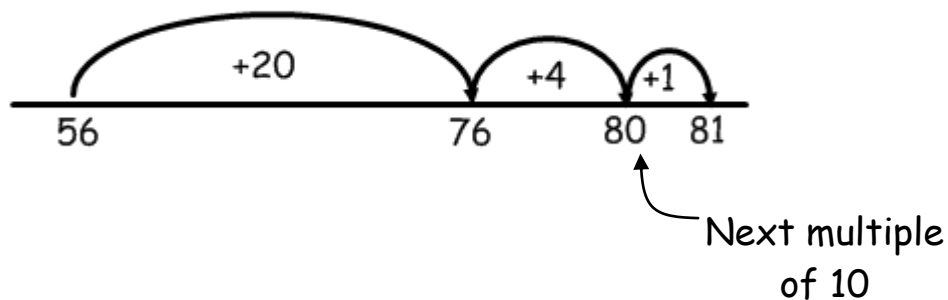
Develop and use written methods to record, support or explain addition of two-digit and three-digit numbers.

$56 + 25 = 81$

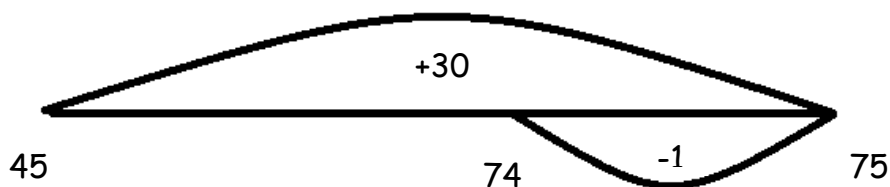
Using an number line:



Or



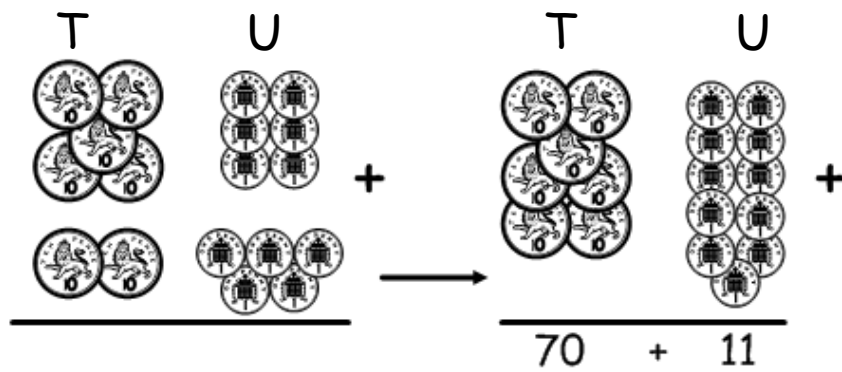
Compensation
 $29 + 45 = 74$



Or using expanded column addition:

It is important that children have a good understanding of place value and partitioning using concrete resources and visual images to their support calculations, for example, dienes and coins. This will enable them to understand what happens to numbers in the standard written method.

$56 + 25 = 81$



$$\begin{array}{r}
 50 + 6 + \\
 \underline{20 + 5} \\
 70 + 11 = 81
 \end{array}$$

$$347 + 143 = 490$$

$$\begin{array}{r}
 300 + 40 + 7 + \\
 \underline{100 + 40 + 3} \\
 400 + 80 + 10 = 490
 \end{array}$$

Refine and use efficient written methods to add two-digit and three-digit whole numbers and £.p.

$$56 + 25 = 81$$

$$\begin{array}{r}
 50 + 6 \\
 \underline{20 + 5} \\
 70 + 11 = 81
 \end{array}
 \quad \longrightarrow \quad
 \begin{array}{r}
 56 \\
 \underline{25} \\
 81 \\
 1
 \end{array}$$

Children need to understand how the expanded method for addition translates into compact column addition.

$$345 + 478 = 823$$

$$\begin{array}{r}
 300 + 40 + 5 \\
 \underline{400 + 70 + 8} \\
 700 + 110 + 13 = 823
 \end{array}
 \longrightarrow
 \begin{array}{r}
 345 \\
 \underline{478} \\
 823 \\
 \underset{1}{1}
 \end{array}$$

$$\pounds 3.72 + \pounds 4.56 = \pounds 8.28$$

	(£1)	(10p)	(1p)	
£	3	.7	2	
£	4	.5	6	+
£	8	.2	8	
	1			

Children need to understand what each digit represents and that 3 pound and four pence is written as £3.04 rather than £3.4

Use efficient written methods to add whole numbers and decimals with up to two places.

Above for whole numbers

$$3.4 + 5.7$$

$$\begin{array}{r}
 U . + \\
 3 . 4 \\
 \underline{5 . 7} \\
 9 . 1 \\
 \underset{1}{1}
 \end{array}$$

Children need to have a good understanding of decimal numbers through

use of concrete resources and visual images e.g. dienes, coins, metre sticks, etc.

$$3.12 + 2.7$$

$$\begin{array}{r} \text{U . t h} \\ 3 . 1 2 \\ \underline{2 . 7 0} \quad + \\ 5 . 8 2 \end{array}$$

Watch out for the child that gives 3.19 as their answer. They do not realise the importance of place value and have simply added 12 to 7 to derive the decimal part of their answer. Concrete resources would support them in this calculation.

Subtraction

To use practical and informal written methods to support the Subtraction of a one-digit number from a one-digit number and a one digit from a two digit number..

$8 - 3 =$



Draw pictures to visualise the problem

$9 - 3 =$



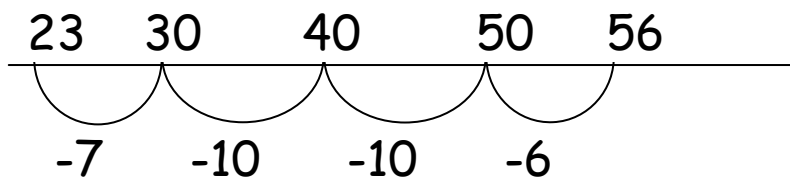
Children could use dots or tally marks to represent the number (quicker than using pictures)

To use practical and informal methods to subtract two-digit numbers.

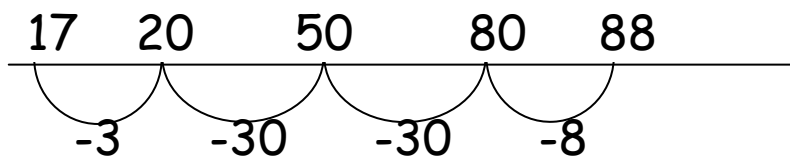
$56 - 23 =$

Jump back to the nearest 10

Find the difference by counting back on a number line



$88 - 17 =$

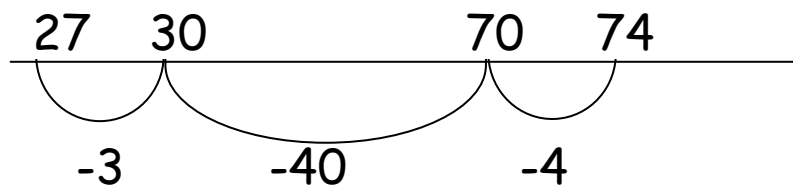


Jump back in multiples of 10 for higher numbers

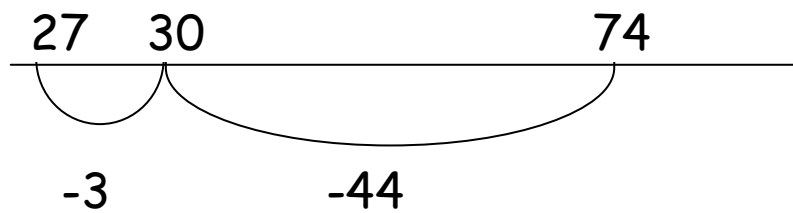
Develop and use written methods to record, support or explain subtraction of two-digit and three-digit numbers.

$$74 - 27 = 47$$

Using an number line:



or



Using expanded decomposition:

Children must have a good understanding of place value and partitioning using concrete resources such as dienes and coins to support their calculations. They must securely understand why the above strategy works before the apparatus is dispensed with.

$$43 - 27 = 16$$

$$\begin{array}{r} \text{T} \quad \text{U} \\ -40 + 3 \\ \hline 20 + 7 \end{array}$$

$$\begin{array}{r} \text{T} \quad \text{U} \\ \overset{30}{\cancel{40}} + \overset{1}{3} \\ \hline 20 + 7 \\ 10 + 6 = 16 \end{array}$$

$$843 - 156 = 687$$

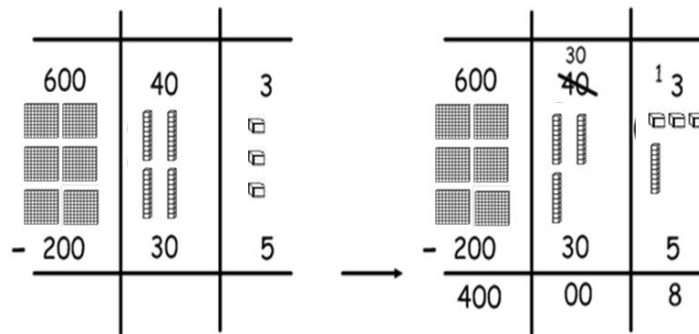
$$\begin{array}{r} \overset{30}{} + \overset{1}{\cancel{40}} + \overset{1}{3} \\ \underline{100 + 50 + 6} \\ + 7 \end{array} \rightarrow \begin{array}{r} \overset{700}{} \overset{130}{} + \overset{1}{\cancel{40}} + \overset{1}{3} \\ \underline{100 + 50 + 6} \\ 600 + 80 + 7 = 687 \end{array}$$

This method applies to all calculations with any number of digits e.g. 2-2 digit, 3-3 digit, 3-2 digit calculations

Refine and use efficient written methods to subtract two-digit and three-digit whole numbers and £.p.

Using expanded decomposition:

Children must have a good understanding of place value and partitioning using concrete resources such as dienes and coins to support their calculations. They must securely understand why the above strategy



works before the apparatus is dispensed with.

643 - 235 = 408

$$\begin{array}{r} 600 + 40 + 3 \\ \underline{200 + 30 + 5} \end{array}$$

$$\begin{array}{r} 600 + 40 + 3 \\ \underline{200 + 30 + 5} \\ 400 + 00 + 8 \end{array}$$

= 408

Be aware of tricky ones. This calculation is very difficult because it has a zero in it and involves two stages in order to deal with the units.

502 - 236 = 266

$$\begin{array}{r} 500 + 00 + 2 \\ \underline{200 + 30 + 6} \end{array} \rightarrow \begin{array}{r} \overset{400}{\cancel{500}} + \overset{100}{\cancel{100}} + 2 \\ \underline{200 + 30 + 6} \end{array} \rightarrow \begin{array}{r} \overset{400}{\cancel{500}} + \overset{90}{\cancel{100}} + \overset{12}{\cancel{2}} \\ \underline{200 + 30 + 6} \end{array}$$

$$200 + 60 + 6$$

$$= 266$$

Using compact decomposition.

Children need to see the relationship between expanded decomposition and straightforward decomposition.

$$\begin{array}{r}
 \overset{200}{\cancel{300}} + \overset{1}{30} + 8 \\
 - \underline{200 + 70 + 3} \\
 60 + 5
 \end{array}
 \rightarrow
 \begin{array}{r}
 \overset{2}{\cancel{3}} \overset{1}{3} 8 \\
 - \underline{2 \ 7 \ 3} \\
 6 \ 5
 \end{array}$$

$$\text{£}5.34 - \text{£}2.47 =$$

	(£1)	(10p)	(1p)	
£	⁴ 5	.	¹² 3	¹ 4 -
£	2	.	4	7
£	2	.	8	7

Children need to understand what each digit represents and that 3 pound and four pence is written as £3.04 rather than £3.4

Year 5: Use efficient written methods to subtract whole numbers and decimals with up to two places.

$$3338 - 1273 = 2065$$

$$\begin{array}{r}
 \overset{3^2}{\cancel{3}} \overset{1}{3} 8 \\
 -
 \end{array}$$

$$\begin{array}{r} 1273 \\ \underline{2065} \end{array}$$

$$8.4 - 3.6 = 4.8$$

$$\begin{array}{r} \text{U. t} \\ 7 \cancel{8} \cdot 4 \\ \underline{3 \cdot 6} \\ 4 \cdot 8 \end{array}$$

Children need to have a good understanding of decimal numbers through use of concrete resources and visual images e.g. dienes, coins, metre sticks, etc.

$$5.8 - 2.74 = 3.06$$

$$\begin{array}{r} \text{U. t h} \\ 5 \cdot \overset{7}{\cancel{8}} \overset{1}{0} \\ \underline{2 \cdot 74} \\ 3 \cdot 06 \end{array}$$

Children need to understand that 5.8 has no hundredths, so they can place a zero in this column. Calculations of this type can be related to pounds and pence which is often easier for them to visualise.

Multiplication

To represent repeated addition as multiplication.

Multiplication

Key Vocabulary used for multiplication

Lots of, groups of, times, product, multiply, multiplied by, multiple of, sets of, once, twice, three times, four times, five times, ten times as big, ten times as long, ten times as wide, repeated addition, *array, row, column, double,

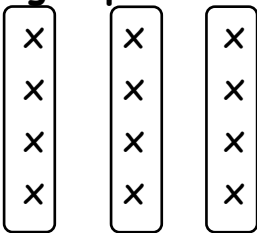
* an array is a series of dots laid out in rows and columns that demonstrates a multiplication e.g. 3×4

Children will be introduced to multiplication from a very young age through role play and practical activities. It is initially introduced as repeated addition, sets of, counting in 2s, 5s and 10s.

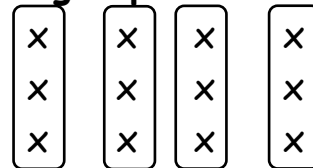
Formal written methods for multiplication are introduced once the child has a clear understanding of methods for multiplication

Grouping

3 groups of 4 = 12

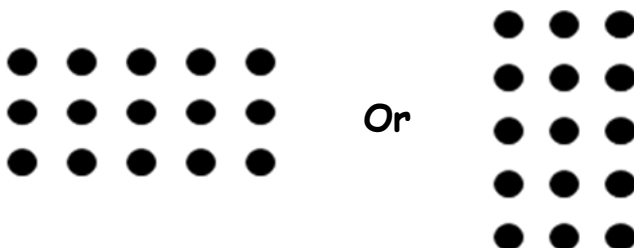


4 groups of 3 = 12



To represent multiplication as an array.

$5 \times 3 =$

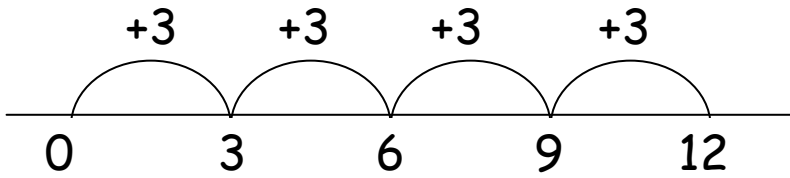


Repeated addition

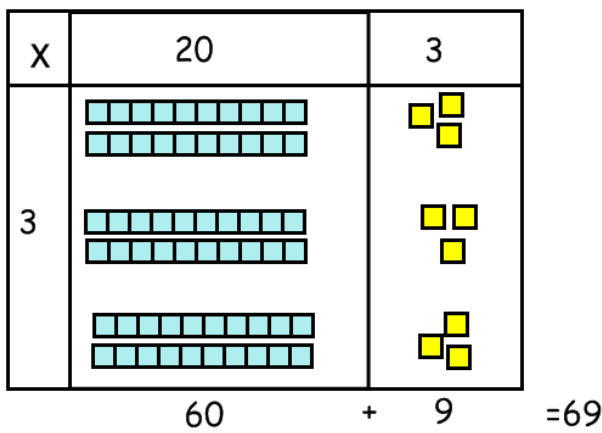
$3 \times 4 =$

4 jumps of 3

Use a number line to count on in equal groups



Children should be introduced to the grid method alongside use of place value equipment such as dienes or coins



Progressing to:

23 x 3 = 69

x	20	3
3	60	9

= 69

324 x 6 = 1944

x	300	20	4	
6	1800	120	24	= 1944

$$34 \times 75 = 2550$$

x	30	4	
70	2100	280	
5	150	20	=2550

Leading to:

$$3.4 \times 7 = 23.8$$

X	3	0.4	
7	21	2.8	= 23.8

$$3.4 \times 7 = 23.8$$

Method 1: Children could multiply decimals by 10 or 100 to make the numbers whole, calculate it and then re-adjust their answer at the end by dividing by 10 or 100.

(x10)

$$34 \times 7 =$$

X	30	4	
7	210	28	= 238

(÷10) =23.8

Long multiplication

x	3	4	6	
			9	
		5	4	
	3	6	0	
	2	7	0	0
	3	1	1	4

DIVISION

To represent sharing and repeated subtraction (grouping) as division.

$$8 \div 2 = 4$$

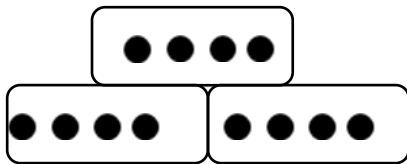


Sharing

Visual drawings to help solve the problem

Share into equal groups

$$12 \div 4 = 3$$



Grouping

Use pictures, dots or tally marks to group

Show as arrays and link to multiplication -

x x x x

x x x x $8 \div 4 = 2$

2 groups of 4

$$8 \div 2 = 4$$

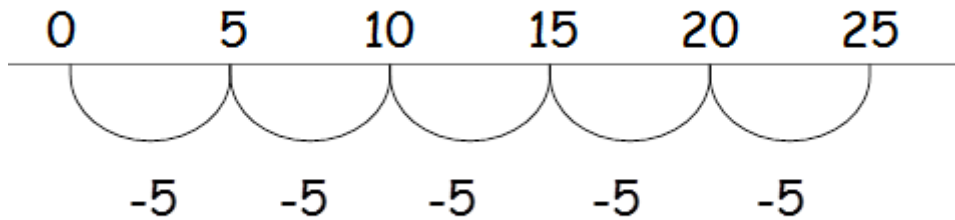
4 groups of 2

x x
x x
x x
x x

Use practical and informal written methods and related vocabulary to support division.

$$25 \div 5 = 5$$

Draw jumps back a number line using repeated subtraction.



Count the number of equal jumps made

Use practical and informal written methods to divide two-digit numbers (e.g. $50 \div 4$); round remainders up or down, depending on the context.

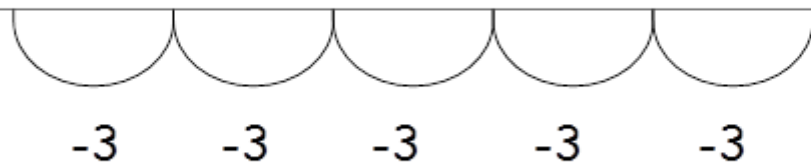
Children should see division as repeated subtraction (as well as sharing).

$15 \div 3 = 5$ i.e. How many groups of 3 are there in 15?

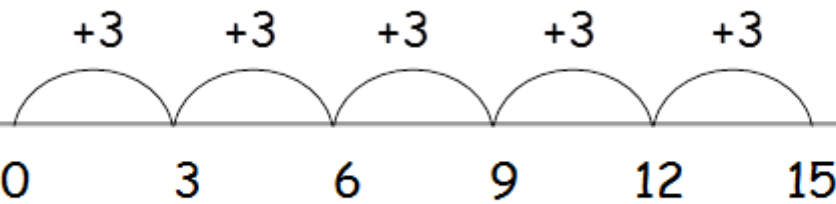
Teachers should show how groups of three are repeatedly subtracted. They should then show that the result is no different if we count up in threes to if we count down (subtract) in threes. It should be explained that it is much easier to count up and they can use their times table knowledge to help them.

See example...

0 3 6 9 12 15



Or



Develop and use written methods to record, support and explain division of two-digit numbers by a one-digit number, including division with remainders (e.g. $98 \div 6$).

Short division of 3-digit and 4-digit numbers by a single-digit number

$$\begin{array}{r}
 1 \quad 2 \quad 6 \quad 4 \\
 6 \overline{) 71564} \\
 \underline{7} \\
 15 \\
 \underline{15} \\
 8 \\
 \underline{8} \\
 4 \\
 \underline{4} \\
 0
 \end{array}$$

Long division of 3-digit and 4-digit numbers by two-digit numbers

$ \begin{array}{r} 200 + 50 + 1 \\ 15 \overline{) 3765} \\ \underline{3000} \\ 765 \\ \underline{750} \\ 15 \end{array} $	$ \begin{array}{l} 15 \\ 30 \\ 45 \\ 60 \\ 75 \\ 90 \end{array} $
--	--

<p>Bank</p> <p>$1 \times 15 = 15$</p> <p>$2 \times 15 = 30$</p> <p>$5 \times 15 = 75$</p> <p>$10 \times 15 = 150$</p>

Short division of decimals

$$\begin{array}{r} 7 \overline{) 87.5} \\ - 70.0 \quad 10 \\ \hline 17.5 \\ 14.0 \quad 2 \\ \hline 3.5 \\ 3.5 \quad 0.5 \\ \hline 0.0 \end{array}$$

Answer = 12.5