# Brampton Village Primary School

Calculation Policy

Acknowledgements –

This policy is extensively based on the White Rose Calculation Policy as this is the core scheme used at Brampton. Many of the images and explanations, although adapted to suit the needs of our school have been used from the White Rose policy.

Addition

add   plus   more

increase   total   sum

altogether

Skill Add 1-digit numbers within 10	Year 1
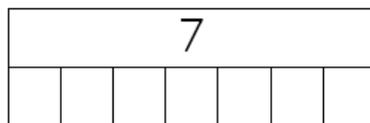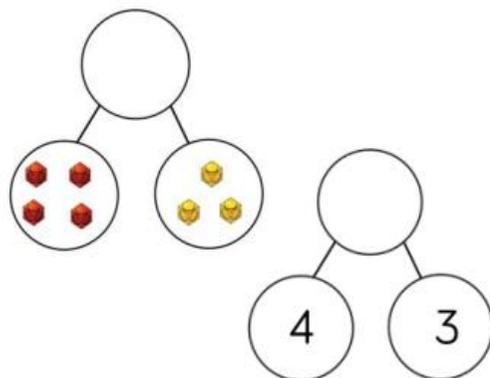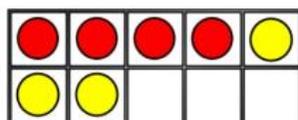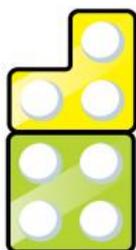
When adding numbers to 10, children can explore both aggregation and augmentation.

The part-whole model, discrete and continuous bar model, number shapes and ten frames support aggregation.

The combination bar model, ten frame and bead string and number track support augmentation.

$4 + 3 = 7$

Start with expressions Number =
e.g. 7 = 4 + 3 and missing number sentences.

3

Skill - Add 1-digit numbers to 20	Year 1 and 2

15	
8	7

$8 + 7 = 15$

$8 + 7 = 15$

2   5

$+2$ $+5$

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

$8 + 7 = 15$

2   5

When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.

4

Skill: Add three 1-digit numbers	Year 2
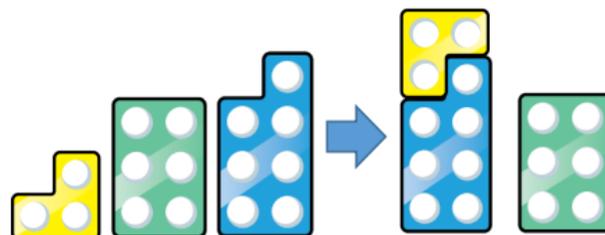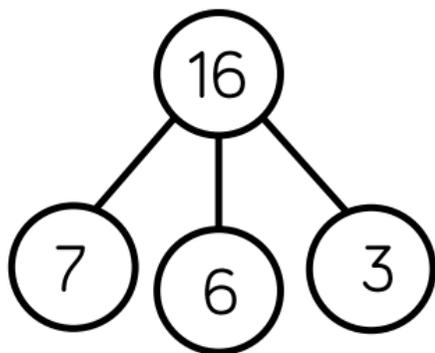
$$7 + 6 + 3 = 16$$
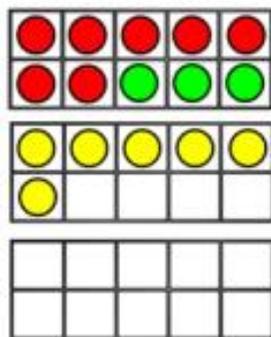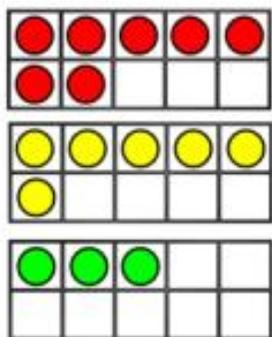
$$7 + 6 + 3 = 16$$

10

When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently.

This supports children in their understanding of commutativity.

Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

5

Skill: Add 1-digit numbers and 2-digit numbers to 100	Year 2 / 3
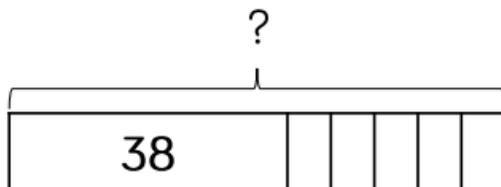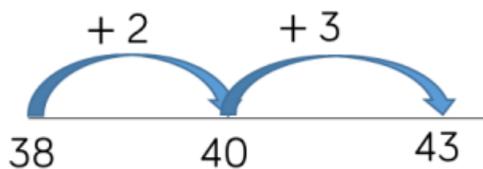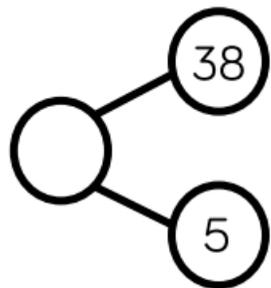
38 + 5 = 43
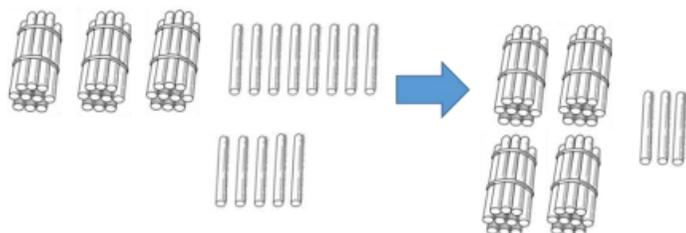
When adding single digit numbers to a two digit number, children should be encouraged to count on from the larger number.

They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43.

Ten frames, hundred squares and straws can support children to find the number bond to ten.

Skill: Add two 2-digit numbers to 100	Year 2 / 3

38 + 23 = 61

Tens	Ones
|||	: : : : :
||	: : :

$$38$$
$$+ 23$$
$$\overline{61}$$
$$1$$
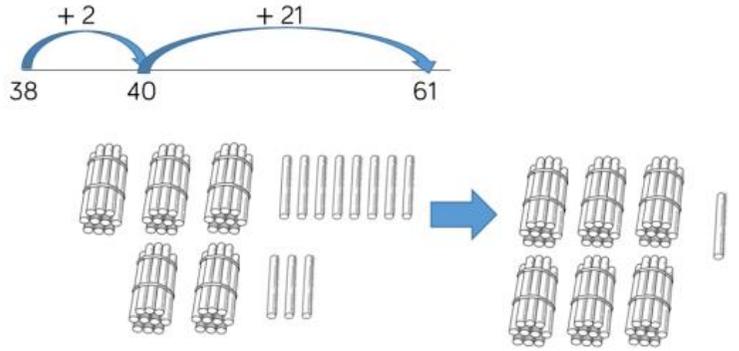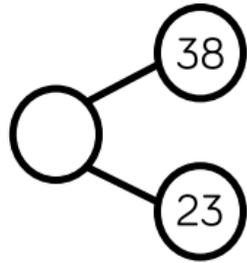
Tens	Ones
10 10 10	1 1 1 1 1 1 1 1 1
10 10	1 1 1
10	

? = 38 | 61

+ 2 / + 21
38 → 40 → 61

Tens	Ones
				x x x x x
	x x x
			x x x

Sticks and crosses.
(Draw it).

Mental Jottings
38 + 23 =
30 + 20 = 50
8 + 3 = 11

At this stage, introduce the children to the formal column method when they are confident calculating using manipulatives and drawings. Mental jottings can also be used to support the children.
As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the total. Encourage them to jump in multiples of 10 to become more efficient.

Skill: Add numbers with up to 3-digits	Year 3
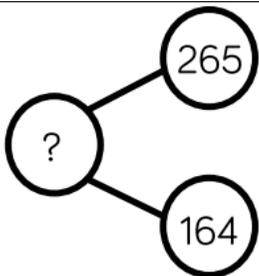
?	
265	164

$$265 + 164 = 429$$
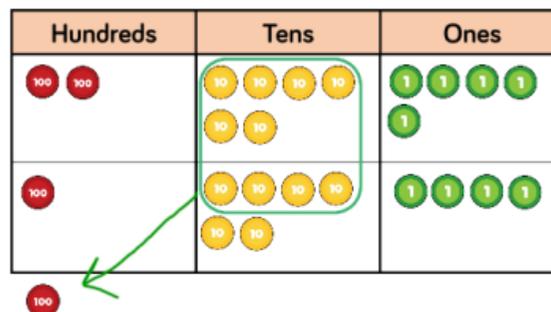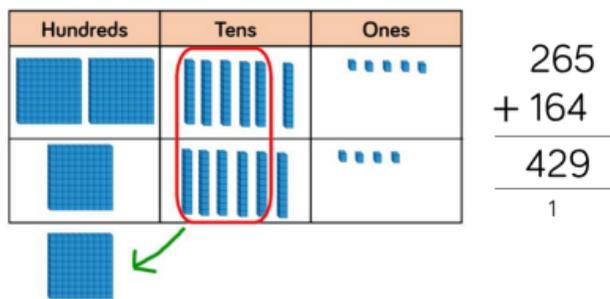
Hundreds	Tens	Ones

$$\begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ \scriptstyle 1 \end{array}$$

Hundreds	Tens	Ones

Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3-digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Skill: Add numbers with up to 4-digits	Year 4

1,378

2,148

?
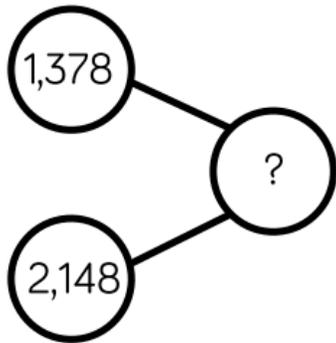
```
  1 3 7 8
+ 2 1 4 8
---------
  3 5 2 6
    1 1
```

?	
2,138	1,378

$$1,378 + 2,148 = 3,526$$
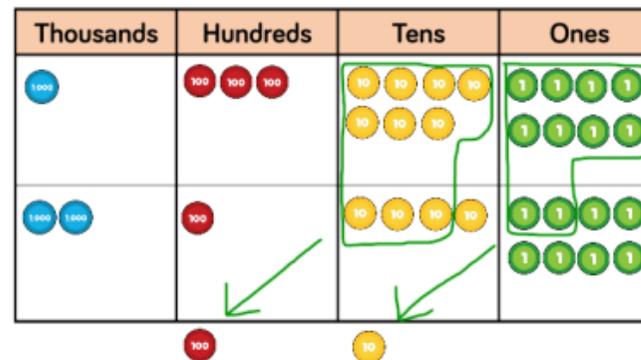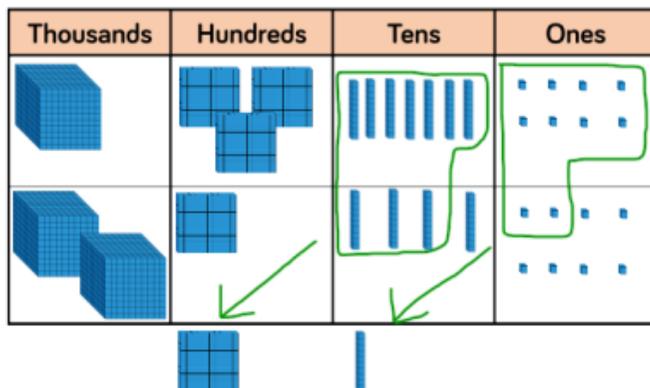
Thousands	Hundreds	Tens	Ones

Thousands	Hundreds	Tens	Ones

Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4-digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.
Plain counters on a place value grid can also be used to support learning.

Skill: Add numbers with more than 4-digits	Year 5 /6
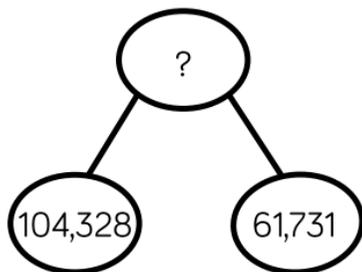
?	
104,328	61,731

$$104{,}328 + 61{,}731 = 166{,}059$$

HTh	TTh	Th	H	T	O

		1	0	4	3	2	8
+		6	1	7	3	1
	1	6	6	0	5	9
		1				

Place value counters or plain counters on a place value grid are the most effective concrete resources when adding with more than 4-digits.

At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

10

Skill: Add with up to 3 decimal places	Year 5

Part-whole model: 2.41, 3.65, ?

?	
3.65	2.41

$$3.65$$
$$+ 2.41$$
$$\overline{6.06}$$
$$1$$

$3.65 + 2.41 = 6.06$

Ones		Tenths	Hundredths

Ones	Tenths	Hundredths

Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

11

Subtraction

subtract   minus   less

decrease   take away   fewer

          leave   difference

Skill: Subtract 1-digit numbers within 10	Year 1

Part-whole models, bar models, tens frames and number shapes support partitioning.

Ten frames, number tracks, single bar models and bead strings support reduction.

Cubes and bar models support finding the difference.

$7 - 3 = 4$

First   Then   Now
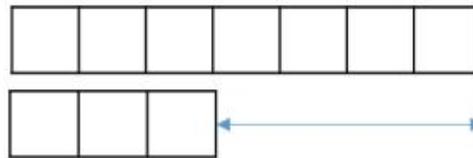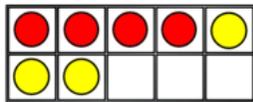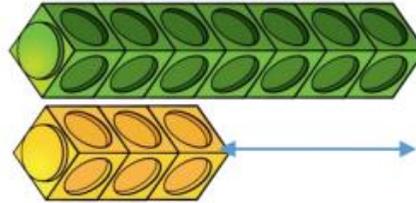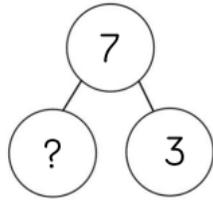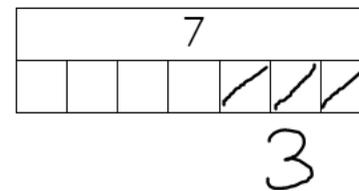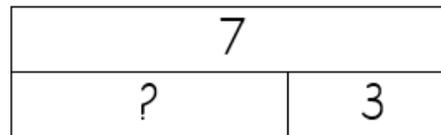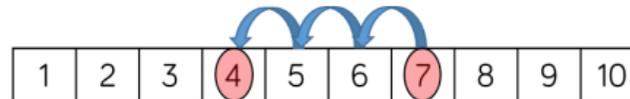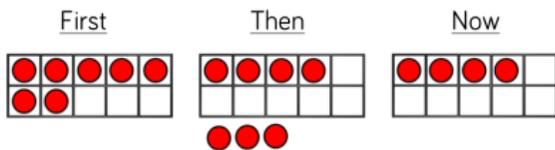
Start with expressions Number =
e.g.? = 7 − 3 and missing number sentences.

7

? | 3

7

3

Skill: Subtract 1 and 2-digit numbers to 20	Year 1 /2
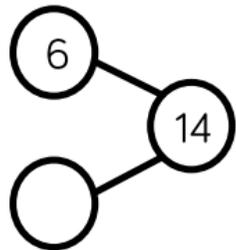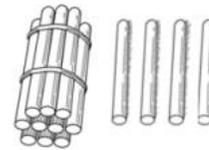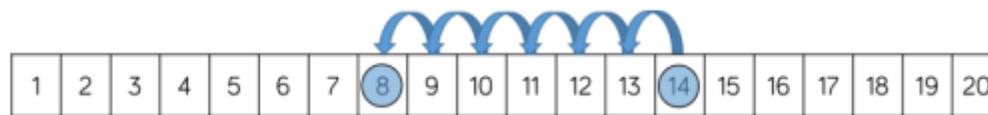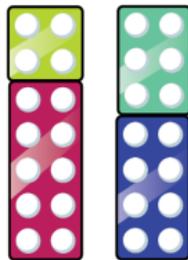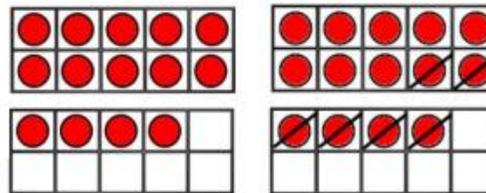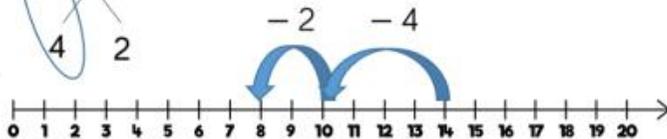
When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

$$14 - 6 = 8$$

$$14 - 6 = 8$$

14	
6	?

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

$14 - 6 = 8$

4 2

-2 -4

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

$14 - 6 = 8$

4 2

Skill: Subtract 1 and 2-digit numbers to 100	Year 2 / 3

$+ 2$ $+ 30$ $+ 5$

28   30   60   65

65	
?	28
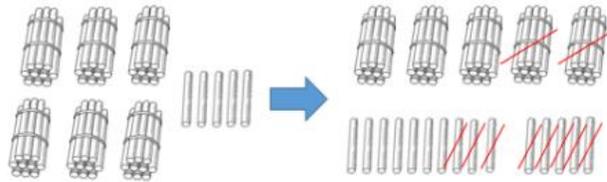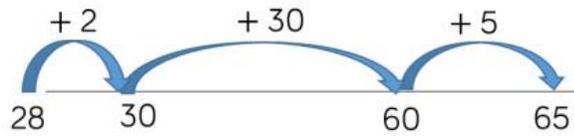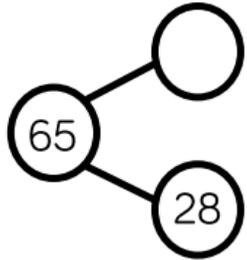
$$65 - 28 = 37$$

? = 65-28

65 - ? = 28

Tens	Ones
||||+++	x x x x x
	x x x x x
	x x x x x

Tens	Ones

5 1
$$\begin{array}{r} 65 \\ - 28 \\ \hline 37 \end{array}$$

| Tens	Ones

Mental jottings   65 − 20 = 45 − 8 = 37

At this stage, introduce the children to the formal column method when they are confident calculating using manipulatives and drawings. Use the formal column method alongside manipulatives.
As numbers become larger straws become less efficient.

Children can also use a blank number line, draw sticks and crosses or mental jottings. When using number lines encourage them to jump to multiples of 10 to become more efficient.

15

Skill: Subtract numbers with up to 3-digits	Year 3

435

273 | ?
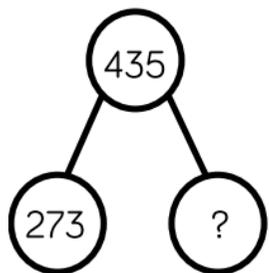
? = 435-273

435 - ? = 273

$$435 - 273 = \boxed{162}$$

Hundreds	Tens	Ones

$$\begin{array}{r} {}^{3}\cancel{4}{}^{1}35 \\ -\ 273 \\ \hline \boxed{162} \end{array}$$

Hundreds	Tens	Ones

Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3-digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

16

Skill: Subtract numbers with up to 4-digits	Year 4
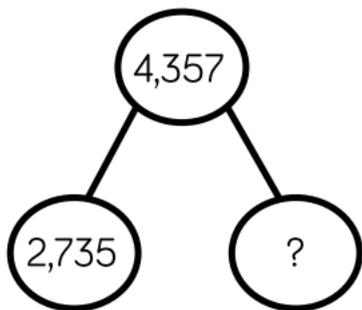
4,357 − 2,735 = 1,622

$$\begin{array}{r} ^{3}\cancel{4}^{1}357 \\ -\ 2735 \\ \hline 1622 \end{array}$$

Thousands	Hundreds	Tens	Ones

Thousands	Hundreds	Tens	Ones

Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4-digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

17

Skill: Subtract numbers with more than 4-digits	Year 5/6
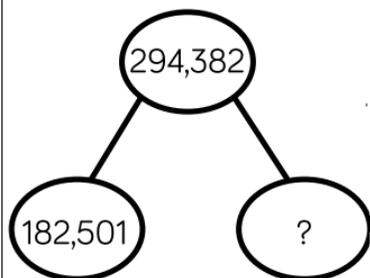
294,382	
182,501	?

294,382 (top)
182,501 — ?

$$294,382 - 182,501 = 111,881$$

HTh	TTh	Th	H	T	O
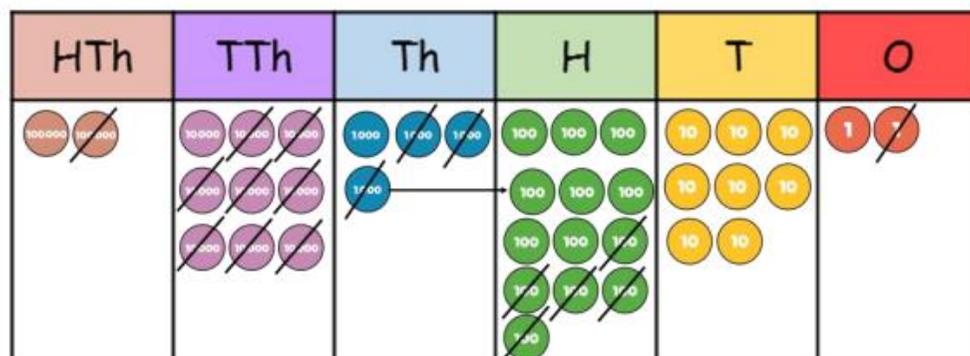
	2	9	³3̸	¹3	8	2
−	1	8	2	5	0	1
	1	1	1	8	8	1

Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4-digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

18

Skill: Subtract with up to 3 decimal places	Year 5/6
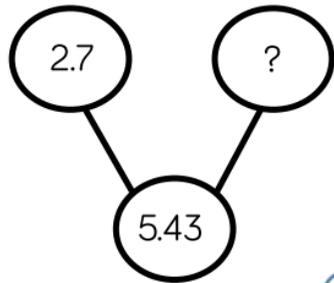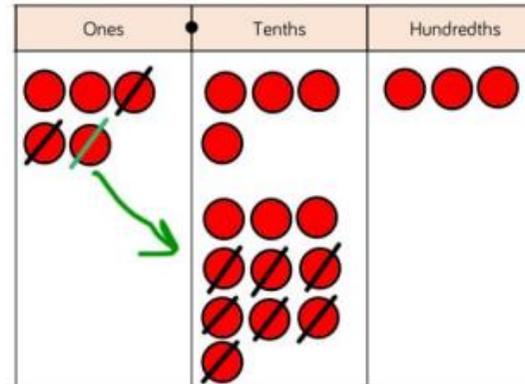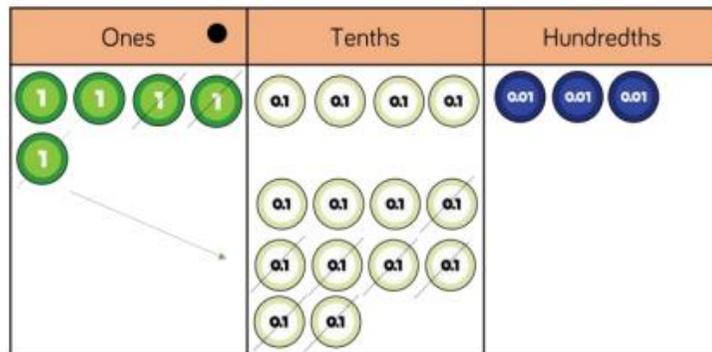
Part-whole model with 2.7 and ? as parts, 5.43 as whole.

5.43	
2.7	?

$$5.43 - 2.7 = 2.73$$

$$\begin{array}{r} {}^{4}\cancel{5}.{}^{1}43 \\ -\ 2.7 \\ \hline 2.73 \end{array}$$

Ones	Tenths	Hundredths

Ones	Tenths	Hundredths

Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

19

Glossary

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative – numbers can be added in any order.

Complement – in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference – the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange – Change a number or expression for another of an equal value.

Minuend – A quantity or number from which another is subtracted.

Partitioning – Splitting a number into its component parts.

Reduction – Subtraction as take away.

Subitise – Instantly recognise the number of objects in a small group without needing to count.

**Subtrahend -** A number to be subtracted from another.

Sum - The result of an addition.

**Total –** The aggregate or the sum found by addition.

Multiplication

multiply   times   lots of

groups of   repeated addition

product   multiplied by   array

multiple   multiplier   multiplicand

Skill: Solve 1-step problems using multiplication	Year 1 and 2

One bag holds 5 apples.
How many apples do 4 bags hold?

$$5 + 5 + 5 + 5 = 20$$
$$4 \times 5 = 20$$
$$5 \times 4 = 20$$

Begin by exploring unequal groups and then equal groups.

Repeated addition can be used to represent multiplication in many ways.

In Year 1, children use concrete and pictorial representations to solve problems. They do not record multiplication formally.

In Year 2, children are introduced to the multiplication symbol.

Develop fluency by counting in 2s, 5s and 10s.

Skill: Multiply 2-digit numbers by 1-digit numbers	Year 3
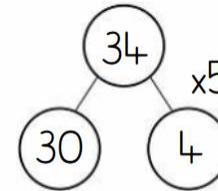
$$34 \times 5 = 170$$

There is an option to first look at the expanded column method before moving onto the short multiplication method.

The place value counters should be used to support understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

Numberlink boards can be used to encourage estimation

Skill: Multiply 3-digit numbers by 1-digit numbers	Year 4
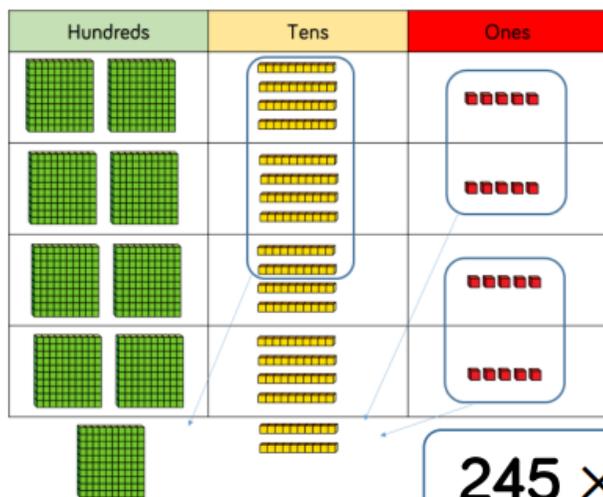
$$245 \times 4 = 980$$
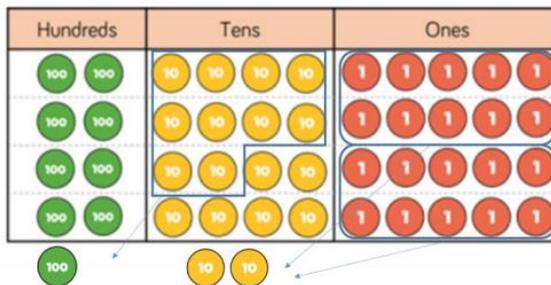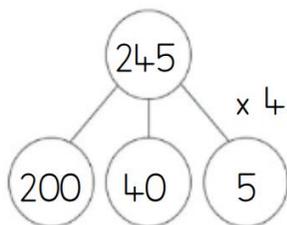
When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.

Base 10 and place value counters continue to support the understanding of the written method.

Limit the numbers of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Continue to use Numberlink boards to encourage estimation.

Skill: Multiply 4-digit numbers by 1-digit numbers	Year 5

$$1,826 \times 3 = 5,478$$

	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
		2		1
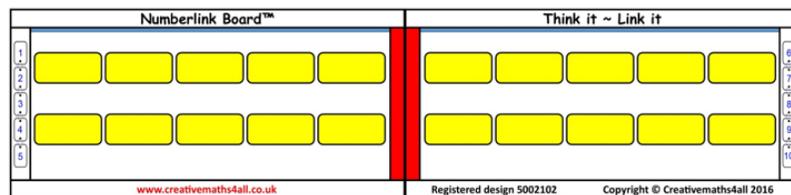
When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.
Continue to use Numberlink boards to encourage estimation.

Skill: Multiply 2-digit numbers by 2-digit numbers	Year 5
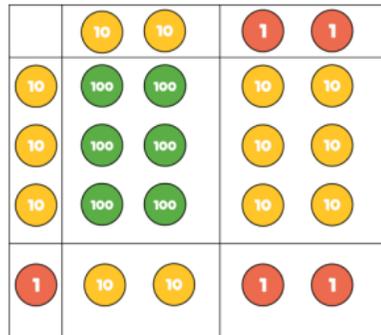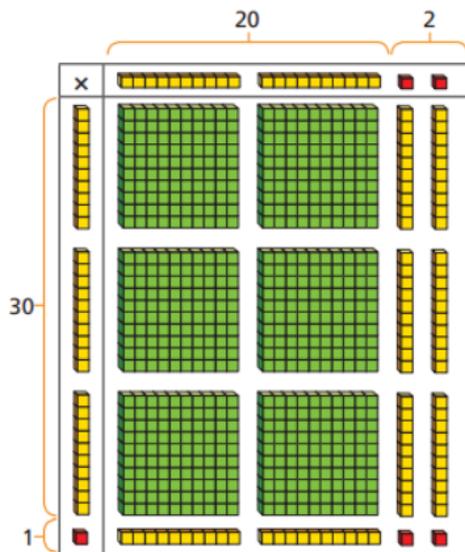
$$22 \times 31 = 682$$

×	20	2
30	600	60
1	20	2

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by Base 10. The grid method matches the area model as an initial written method before moving on to a formal written multiplication method.

26

Skill: Multiply 3-digit numbers by 2-digit numbers	Year 5
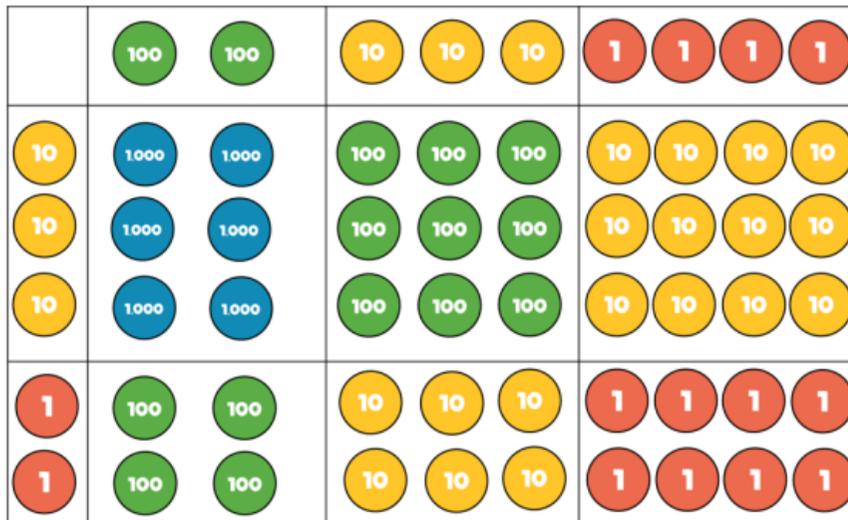
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
+7	+0	2	0
7	4	8	8

Cross out when its job is done.

$$234 \times 32 = 7{,}488$$

×	200	30	4
30	6,000	900	120
2	400	60	8

Children can continue to use the area model when multiplying 3-digit numbers by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of the numbers.

Encourage children to move towards the formal written method, seeing the links to the grid method.

	Skill: Multiply 4-digit numbers by 2-digit numbers					Year 5/6

	TTh	Th	H	T	O
		2	7	3	9
×				2	8
	2 ₂	1 ₅	9 ₃	1 ₇	2
	5 ₁	4	7 ₁	8	0
	7	6	6	9	2
			1		

Cross out when its job is done.

$$2,739 \times 28 = 76,692$$

When multiplying 4-digits by 2-digits, children should be confident in the written method.

If they are still struggling with times tables, provide multiplication grids to support when they are focussing on the use of the method.

Exchanged digits should be placed consistently as shown.

Division

divided by   share   divisible by

share equally   divide   group

divide into   dividend   quotient

divisor   factor

Skill: Solve 1-step problems with division (sharing)	Year 1 and 2
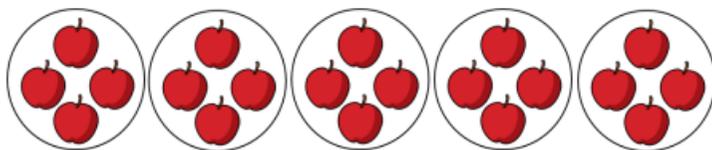
There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?
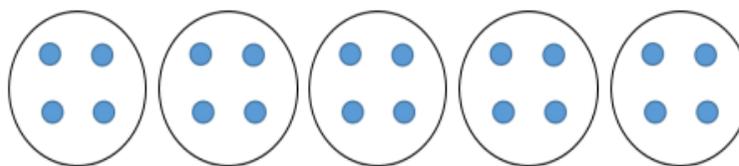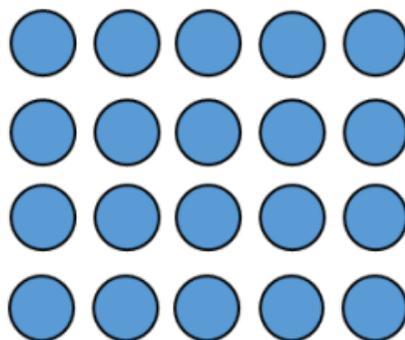
$$20 \div 5 = 4$$

Children solve problems by sharing amounts into equal groups.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally.

In Year 2, children are introduced to the division symbol.

Skill: Solve 1-step problems using division (grouping)	Year 1 and 2
There are 20 apples altogether. They are put in bags of 5. How many bags are there? $20 \div 5 = 4$	Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.
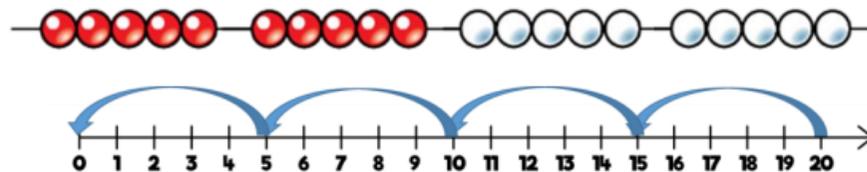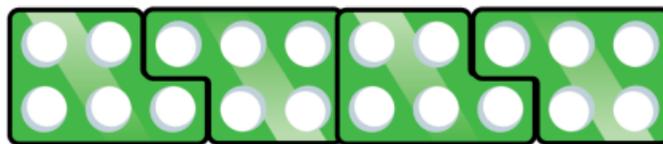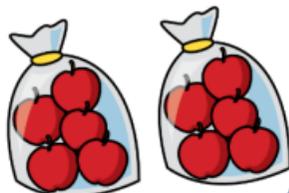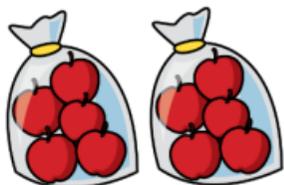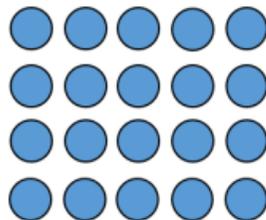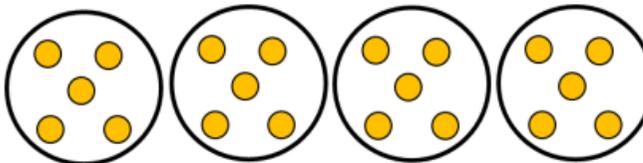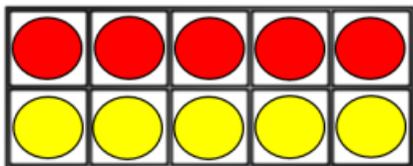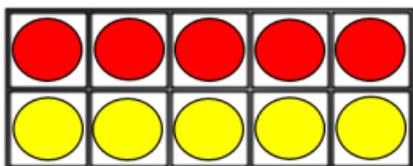
Skill: Divide 2-digits by 1-digit (sharing with no exchange)	Year 2/3

	Ones
Tens	Ones
10 10	1 1 1 1
10 10	1 1 1 1

$$48 \div 2 = 24$$

48

40   8

÷ 2   ÷ 2

20 lots of 2   4 lots of 2
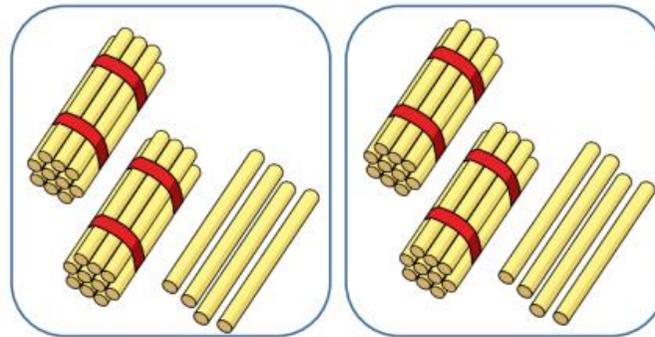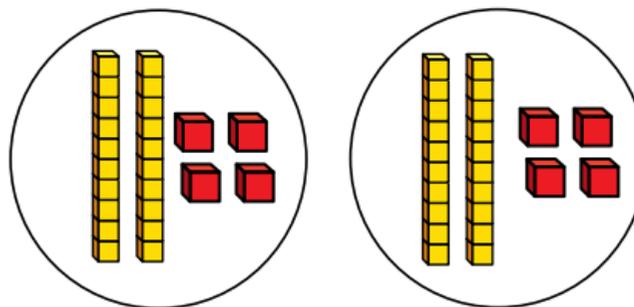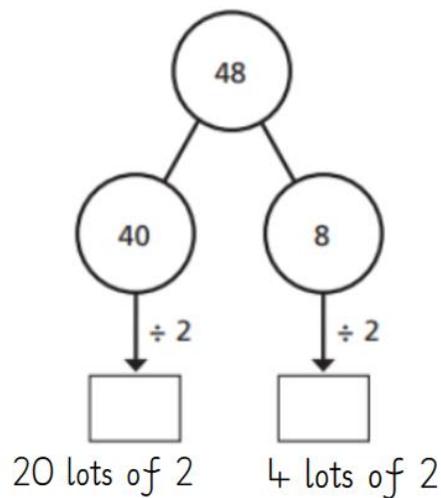
When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Drawings (such as sticks and crosses) could also be used.

Straws, Base 10 and place value counters can all be used to share numbers into equal groups.

Part-whole models can provide children with a clear written method that matches the concrete representation.

32

Skill: Divide 2-digits by 1-digit (sharing with exchange)	Year 3/4

Tens	Ones

52

?	?	?	?

52 ÷ 4 = 13
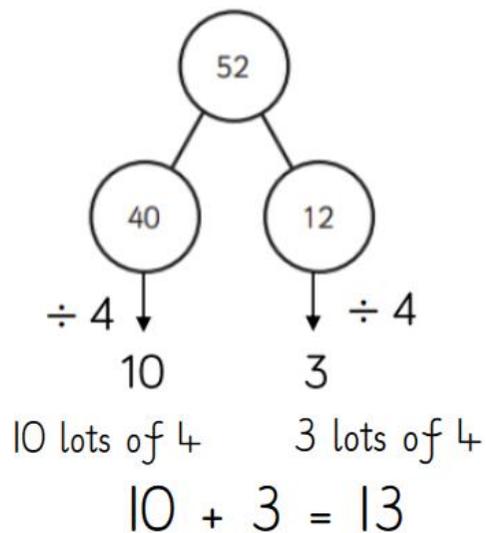
Tens	Ones
10	1 1 1
10	1 1 1
10	1 1 1
10	1 1 1

52

40   12

÷ 4   ÷ 4

10   3

10 lots of 4   3 lots of 4

10 + 3 = 13

When dividing numbers involving exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.

Children should start with equipment outside the place value grid before sharing the tens and ones equally between the rows.

Flexible partitioning in a part-whole model supports this method.

33

Skill: Divide 2-digits by 1-digit (sharing with remainders)	Year 3/4

Tens	Ones

53

13	13	13	13	r1

$$53 \div 4 = 13 \; r1$$

53

40   13

÷ 4

12   1

10   ÷ 4
      3

10 lots of 4   3 lots of 4

remainder 1

10 + 3 = 13 r1

Tens	Ones
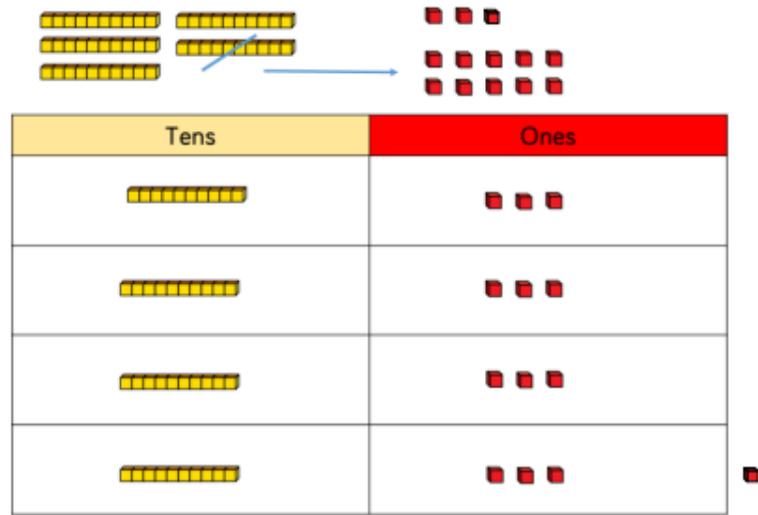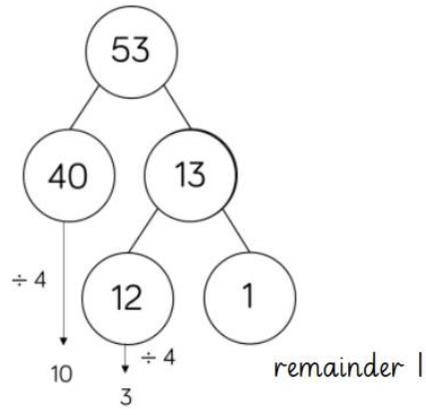
When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones.

Starting with equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.

Flexible partitioning in a part-whole model supports this method.

34

Skill: Divide 2-digits by 1-digit (grouping)	Year 4/5
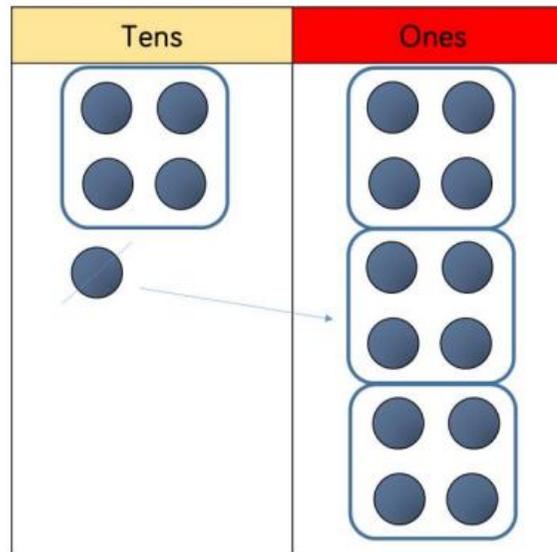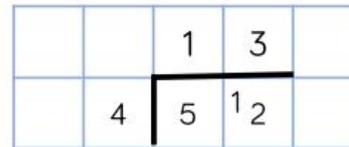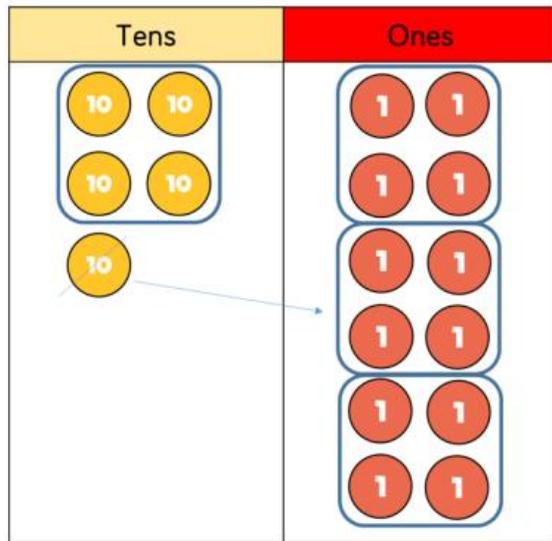
$$52 \div 4 = 13$$

When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

Remainders can also be seen as they are left ungrouped.

Skill: Divide 3-digits by 1-digit (sharing)	Year 4

$844 \div 4 = 211$

844			
?	?	?	?

H	T	O
100 100	10	1
100 100	10	1
100 100	10	1
100 100	10	1

844

800   40   4

÷ 4   ÷ 4   ÷ 4

200 lots of 4   10 lots of 4   1 lot of 4

$856 \div 4 = 214$

856

800   40   16

÷ 4   ÷ 4   ÷ 4

200   10   4

200 lots of 4   10 lots of 4   4 lots of 4

Hundreds	Tens	Ones
100 100	10	1 1 1 1
100 100	10	1 1 1 1
100 100	10	1 1 1 1
100 100	10	1 1 1 1
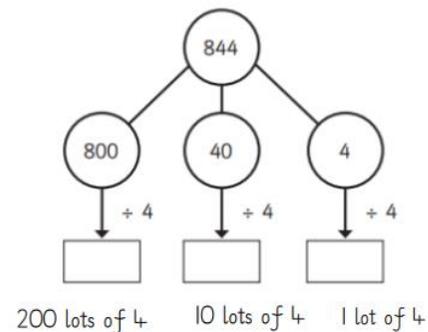
Children can continue to use place value counters to share 3-digit numbers into equal groups.

Children should tsart with the equipment outside the place value grid before sharing hundreds, tens and ones equally between the rows.

This method can also help to highlight remainders.

Flexible partitioning in a part-whole model supports this method.

Skill: Divide 3-digits by 1-digit (grouping)	Year 5
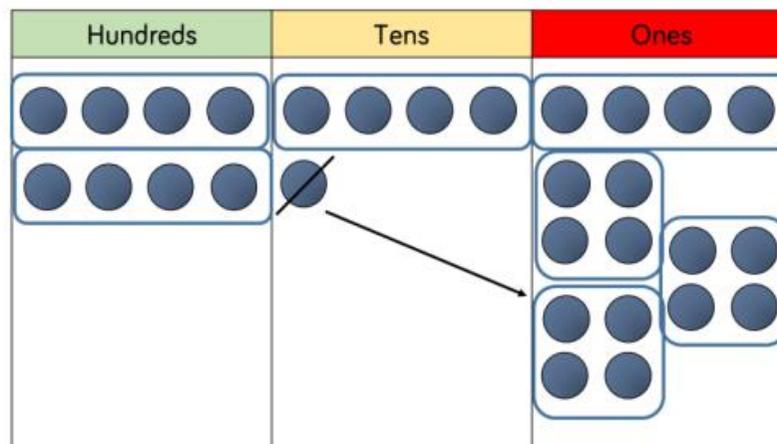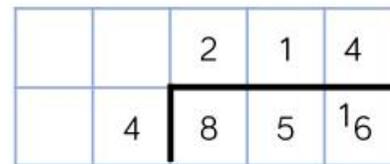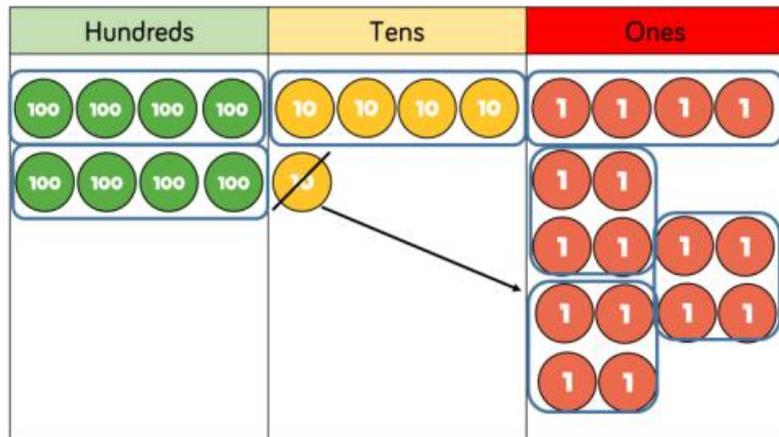
$$856 \div 4 = 214$$

Children can continue to use grouping to support their understanding of short division when dividing a 3-digit numbers by a 1-digit number.

Place value counters or plain counters can be used on a place value grid to support this understanding.

Children can also draw their own counters and group them through a more pictorial method.

Skill: Divide 4-digits by 1-digit	Year 5
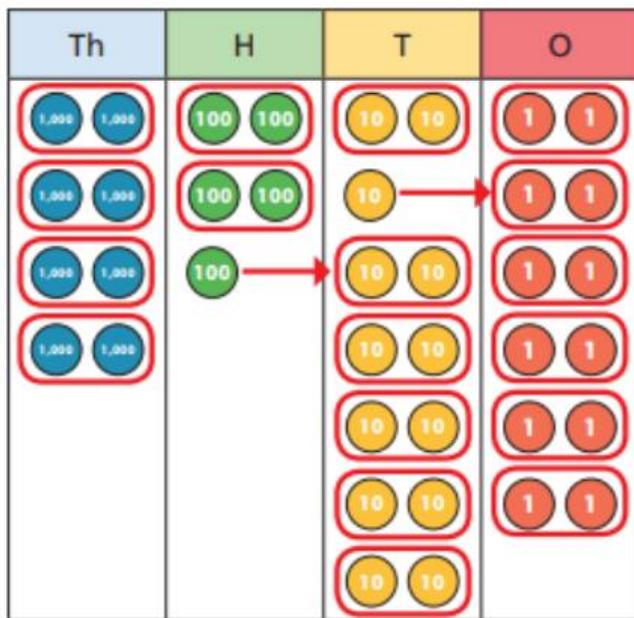
		4	2	6	6
	2	8	5	^{1}3	^{1}2

$$8,532 \div 2 = 4,266$$

Place value counters or plain counters can be used on a place value grid to support children to divide 4-digit numbers by 1-digit.

Children can also draw their own counters and group the, through a more pictorial method.

Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

		0	3	6
12	4	4_3	7_2	

$$432 \div 12 = 36$$

$$7,335 \div 15 = 489$$

		0	4	8	9
15	7	7_3	13_3	13_5	

15	30	45	60	75	90	105	120	135	150

When children begin to divide up to 4-digit numbers by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective.

Children can write out multiples to support their calculations with large remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi-digits by 2-digits (long division) — Year 6

			0	3	6
1	2	4	3	2		(×30)
	−	3	6	0	
				7	2	(×6)
		−		7	2
					0

$12 \times 1 = 12$
$12 \times 2 = 24$
$12 \times 3 = 36$
$12 \times 4 = 48$
$12 \times 5 = 60$
$12 \times 6 = 72$
$12 \times 7 = 84$
$12 \times 8 = 96$
$12 \times 7 = 108$
$12 \times 10 = 120$

$$432 \div 12 = 36$$

$$7{,}335 \div 15 = 489$$

		0	4	8	9
15	7	3	3	5	
−	6	0	0	0		(×400)
	1	3	3	5	
−	1	2	0	0		(×80)
		1	3	5	
−		1	3	5		(×9)
				0	

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

Children can also divide 2-digit numbers using long division.

Children can write out multiples to support their calculations with large remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi-digits by 2-digits (long division)	Year 6

When a remainder is left at he end of a calculation, children can either leave it as a remainder or convert it to a fraction. This will depend on the context of the question.

Children can also answer question where the quotient needs to be rounded according to the context.

$$372 \div 15 = 24 \ r12$$

$$
\begin{array}{cccccccc}
 & & & 2 & 4 & r & 1 & 2 \\
1 & 5 & 3 & 7 & 2 & & & \\
 & - & 3 & 0 & 0 & & & \\
 & & & 7 & 2 & & & \\
 & - & & 6 & 0 & & & \\
 & & & 1 & 2 & & & \\
\end{array}
$$

$1 \times 15 = 15$

$2 \times 15 = 30$

$3 \times 15 = 45$

$4 \times 15 = 60$

$5 \times 15 = 75$

$10 \times 15 = 150$

$$
\begin{array}{cccccc}
 & & & 2 & 4 & \frac{4}{5} \\
1 & 5 & 3 & 7 & 2 & \\
 & - & 3 & 0 & 0 & \\
 & & & 7 & 2 & \\
 & - & & 6 & 0 & \\
 & & & 1 & 2 & \\
\end{array}
$$

$$372 \div 15 = 24\frac{4}{5}$$

Glossary

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor