Multiplication and Division Calculation Policy

Key Vocabulary

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.
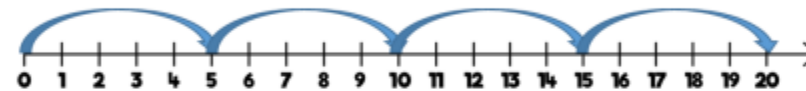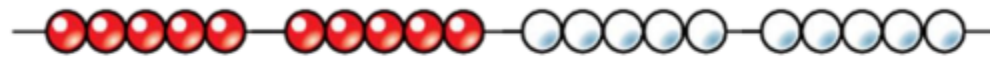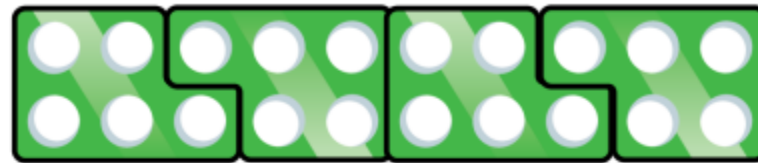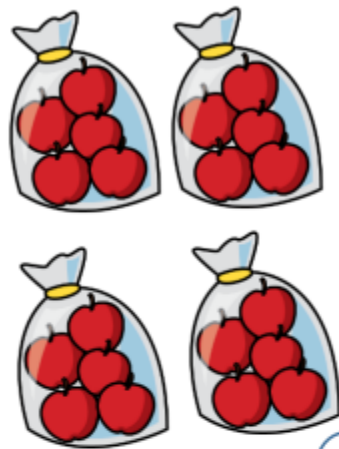
Quotient – The result of a division

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

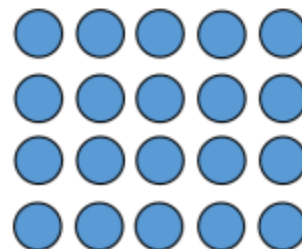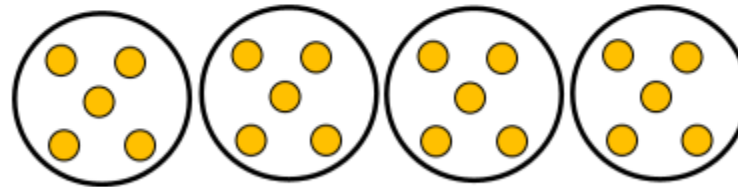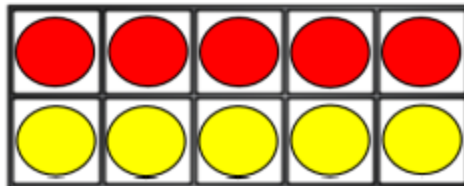**Scaling –** Enlarging or reducing a number by a given amount, called the scale factor
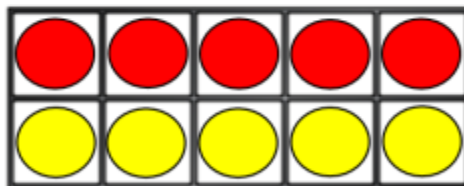
Multiplication

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

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

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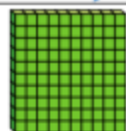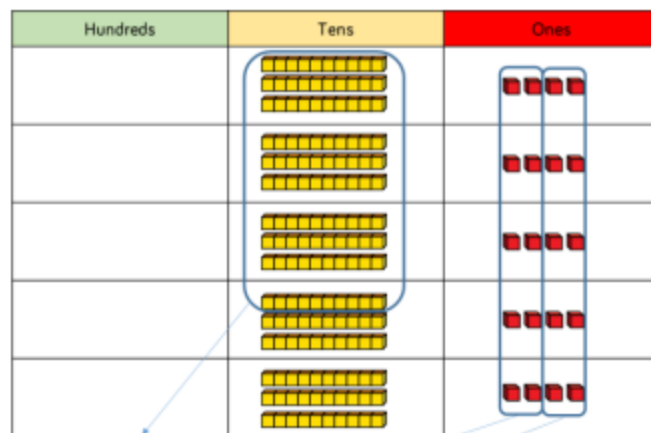
$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

Children represent multiplication as repeated addition in many different ways.

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

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

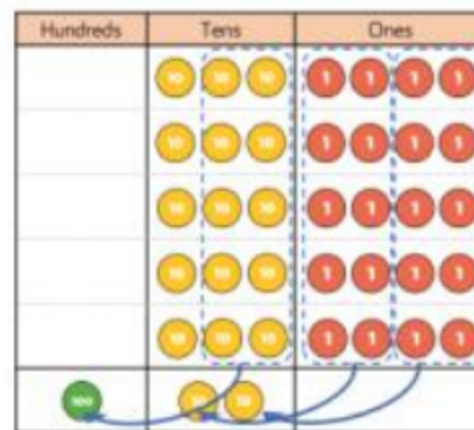|	Skill: Multiply 2-digit numbers by 1-digit numbers	Year: 3/4

Hundreds | Tens | Ones

	H	T	O	
		3	4	
×			5	
		2	0	(5 × 4)
+	1	5	0	(5 × 30)
	1	7	0	

$$34 \times 5 = 170$$

|	H	T	O
		3	4
×			5
	1	7	0
	1	2	

Hundreds | Tens | Ones

Teachers may decide to first look at the expanded column method before moving on to the short multiplication method.

The place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.
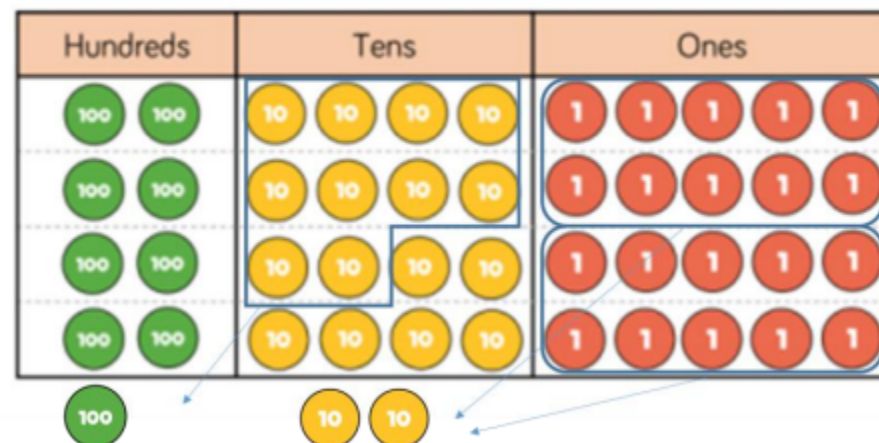
Skill: Multiply 3-digit numbers by 1-digit numbers	Year: 3/4
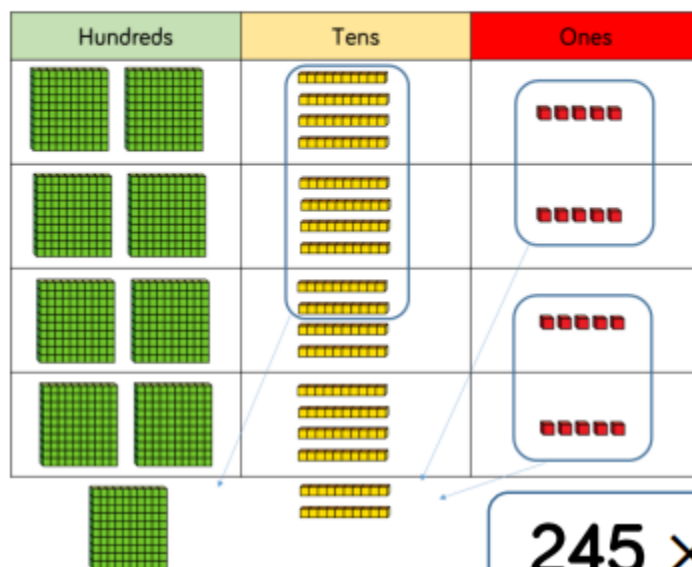
|	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

$$245 \times 4 = 980$$

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

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

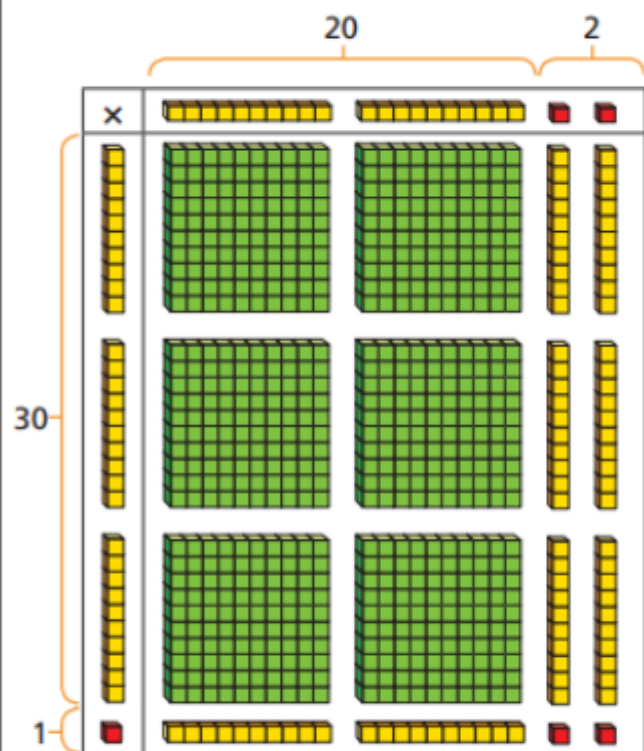| Thousands	Hundreds	Tens	Ones
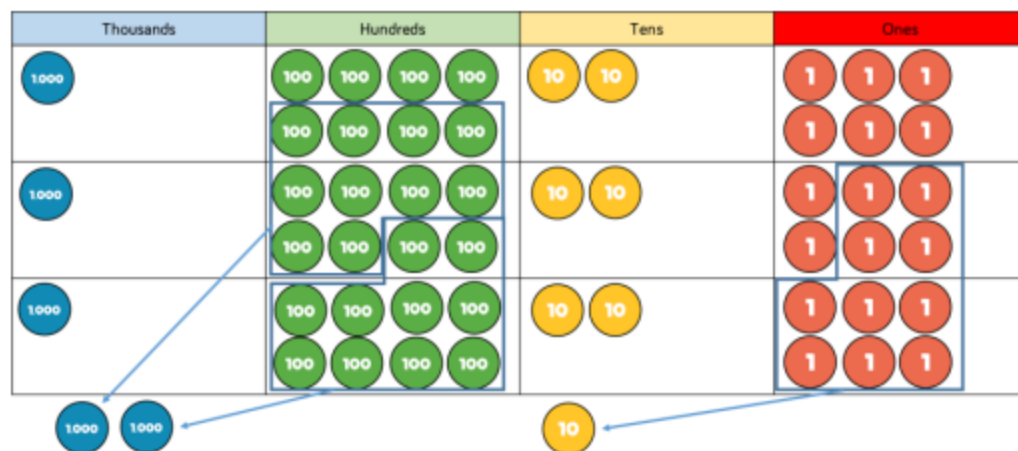
$$1,826 \times 3 = 5,478$$

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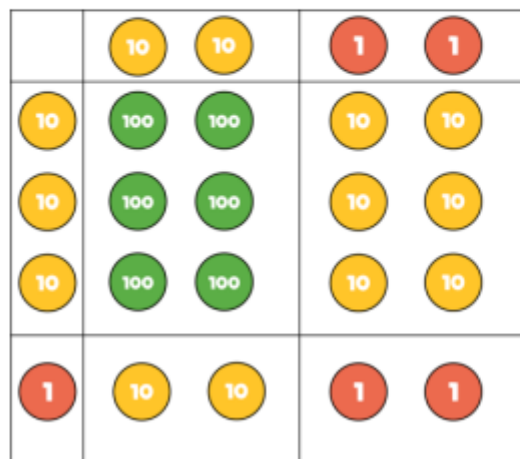If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Skill: Multiply 2-digit numbers by 2-digit numbers	Year: 5

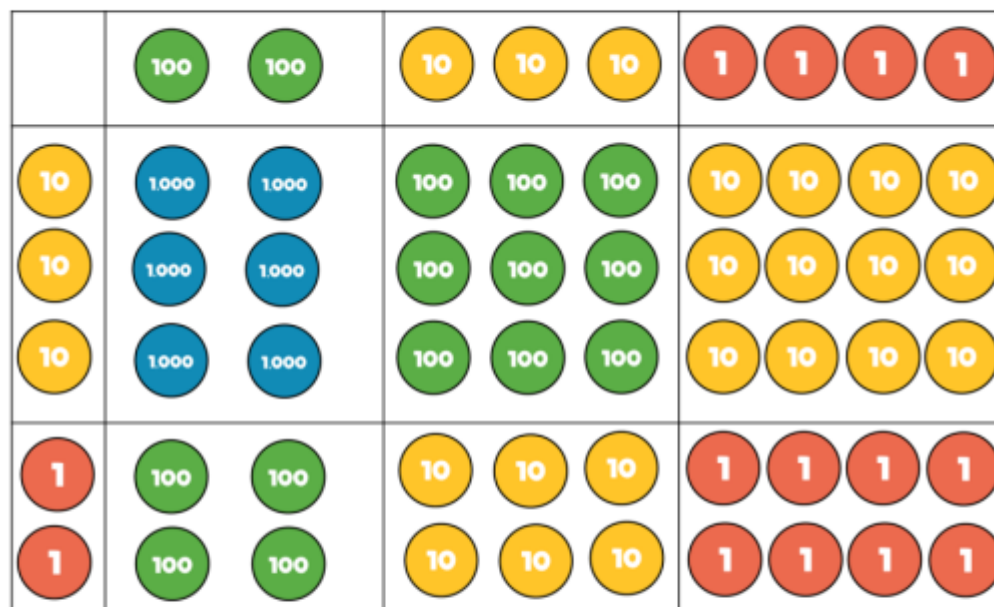When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10.

20   2

30
1

22 × 31 = 682

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

Skill: Multiply 3-digit numbers by 2-digit numbers	Year: 5

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

$234 \times 32 = 7,488$

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

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

$$\begin{array}{ccccc}
 & & \cancel{1} & & \\
 & \cancel{1} & \cancel{2} & \cancel{4} & \\
3 & 1 & 2 & 6 & \\
\times & & & 2 & 8 \\
\hline
2 & 5 & 0 & 0 & 8 \\
6 & 2 & 5 & 2 & 0 \\
\hline
8 & 7 & 5 & 2 & 8 \\
\hline
\end{array}$$

3126 x 28 = 87,528

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 focusing on the use of the method.

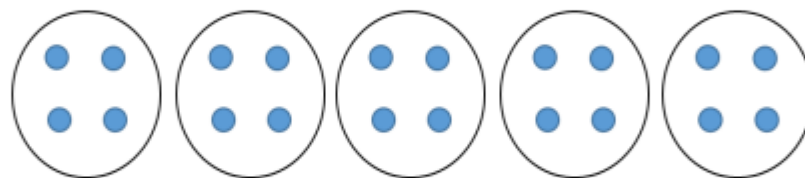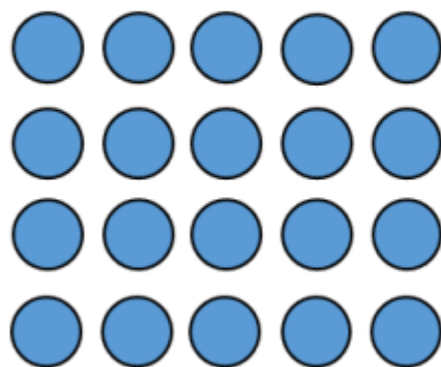Consider where exchanged digits are placed and make sure this is consistent.

Division

Skill: Solve 1-step problems using multiplication (sharing)	Year: 1/2

20

? ? ? ? ?
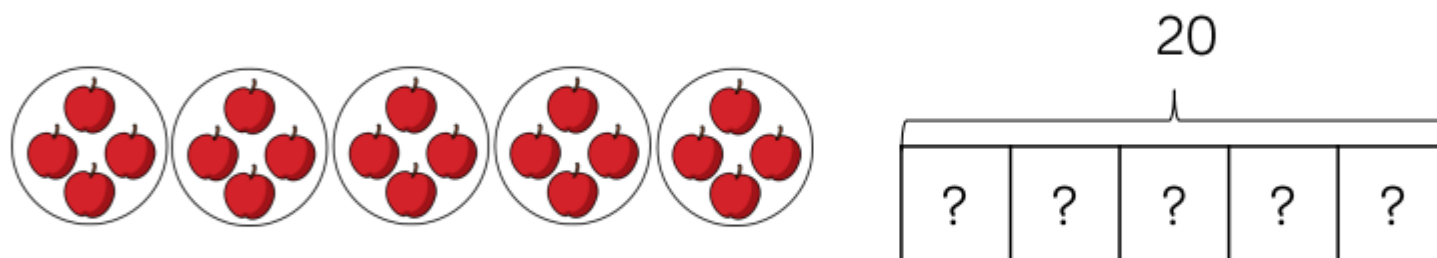
There are 20 apples altogether.
They are shared equally between 5 bags.
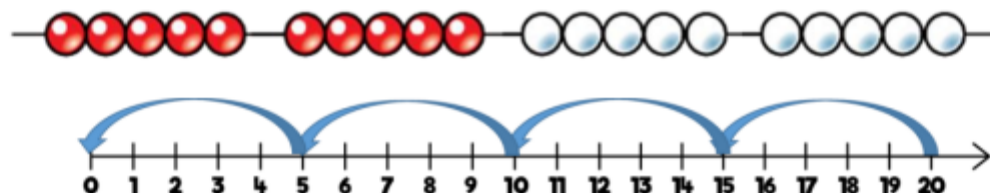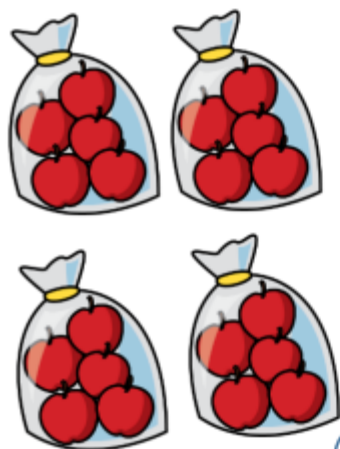How many apples are in each bag?

$20 \div 5 = 4$

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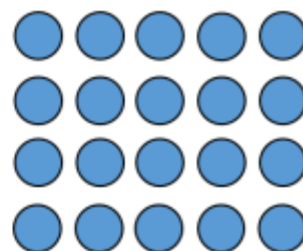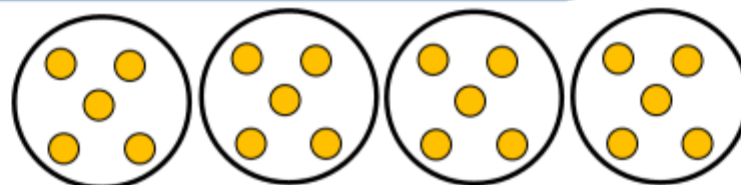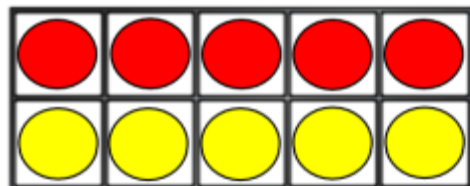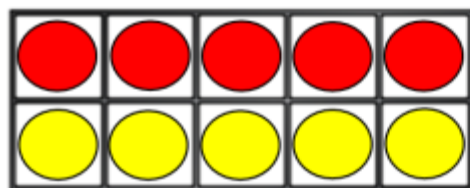
In Year 2, children are introduced to the division symbol.

Skill: Solve 1-step problems using division (grouping)	Year: 1/2

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.
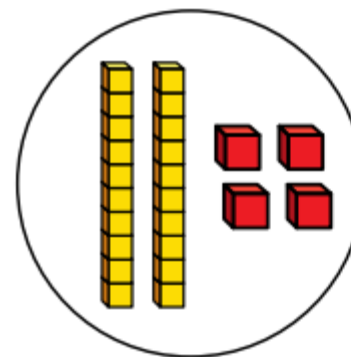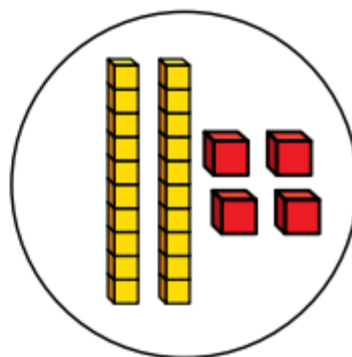
Skill: Divide 2-digits by 1-digit (sharing with no exchange)	Year: 1/2

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

$$48 \div 2 = 24$$

48

40   8

÷ 2   ÷ 2
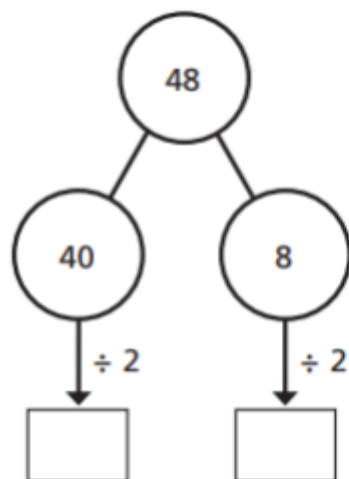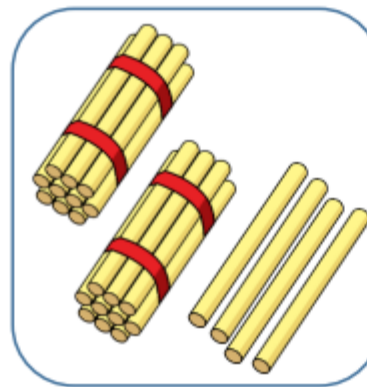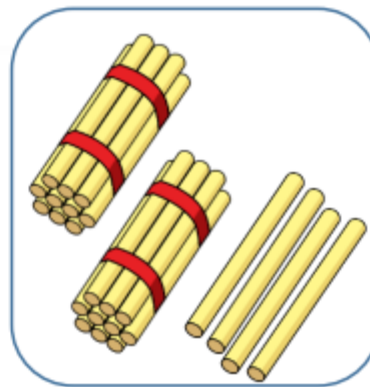
When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

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.

Skill: Divide 2-digits by 1-digit (sharing with exchange)	Year: 3/4
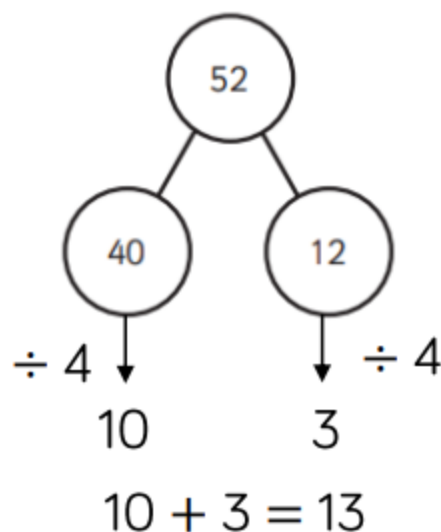
When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

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

Tens	Ones

52

?	?	?	?

$$52 \div 4 = 13$$

52

40   12

$\div 4$ $\div 4$

10   3

$10 + 3 = 13$

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

| Skill: Divide 2-digits by 1-digit (sharing with remainders) | Year: 3/4 |
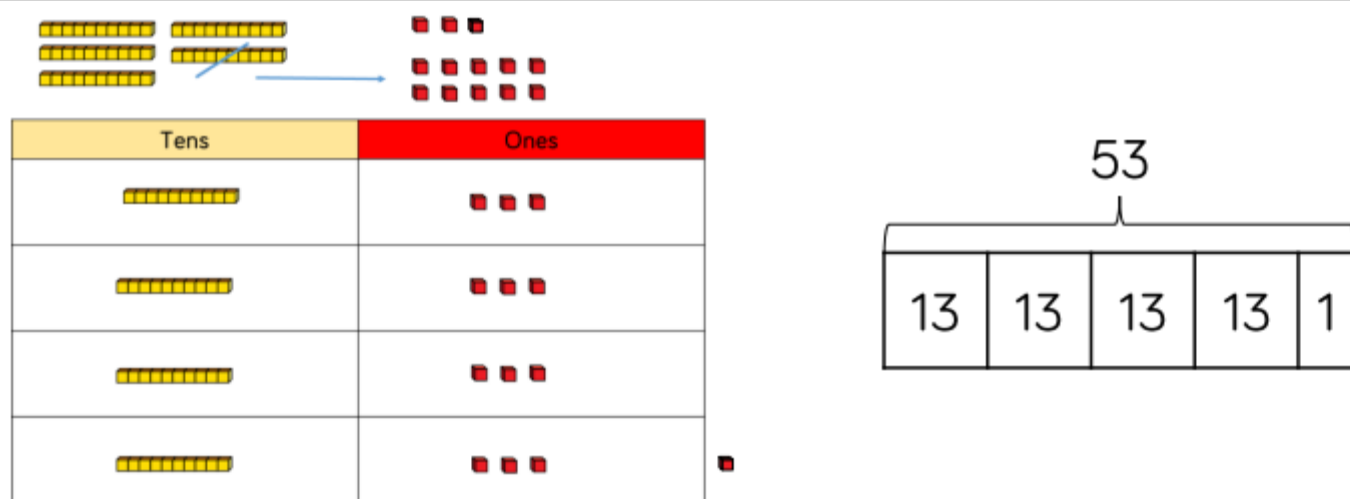
53 ÷ 4 = 13 r1
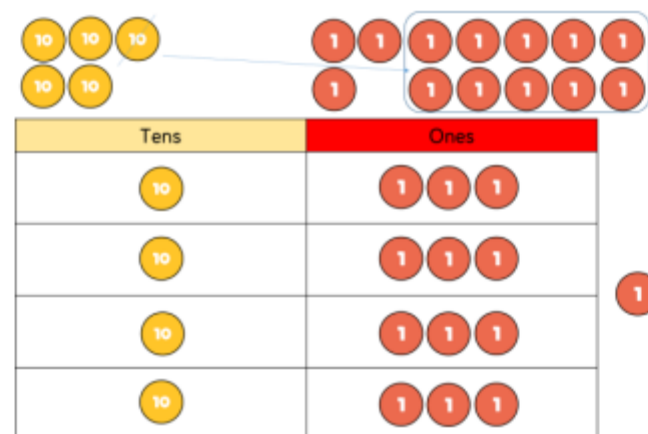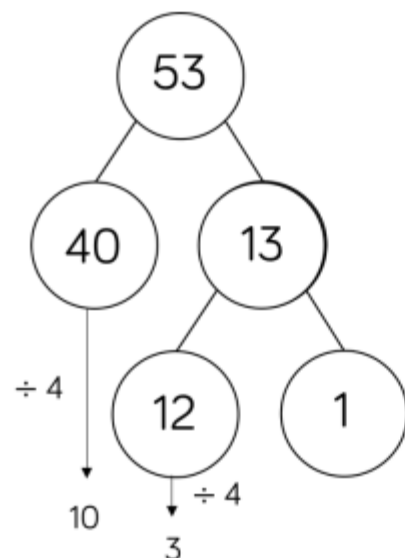
When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.

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

Skill: Divide 2-digits by 1-digit (grouping)	Year: 4/5
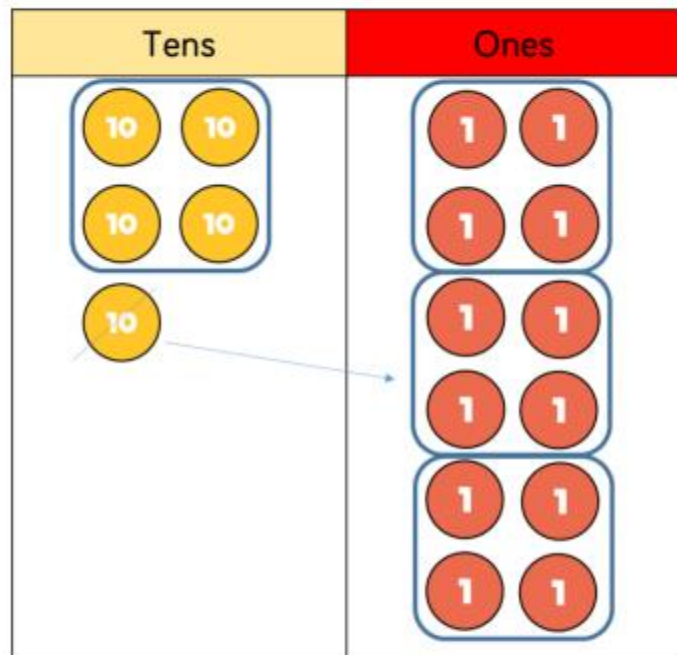
$$52 \div 4 = 13$$
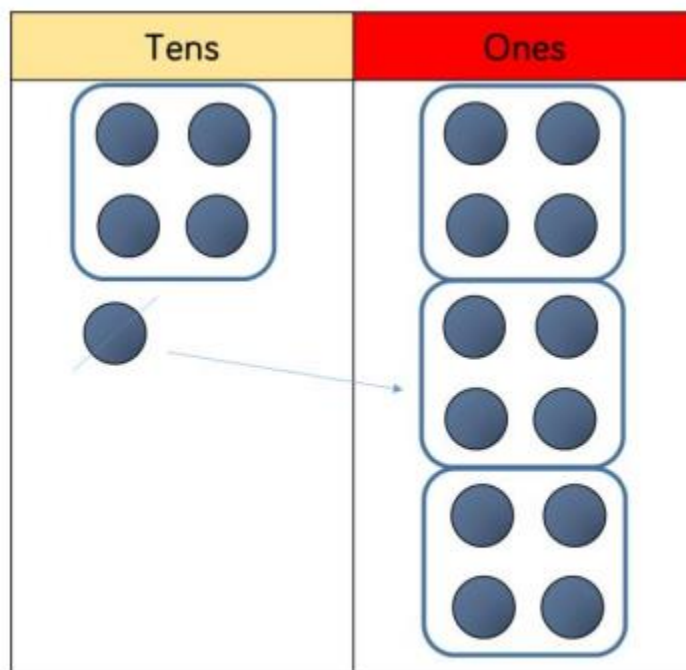
When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

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 ÷ 4 = 211

844

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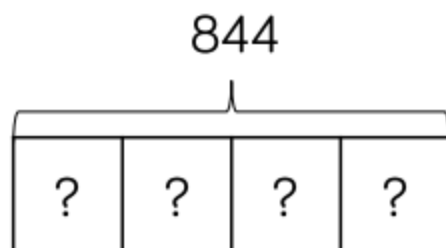
H	T	O
100 100	10	1
100 100	10	1
100 100	10	1
100 100	10	1

844

800　　40　　4

÷ 4　　÷ 4　　÷ 4

844 ÷ 4 = 211

856

800　　40　　16

÷ 4　　÷ 4　　÷ 4

200　　10　　4
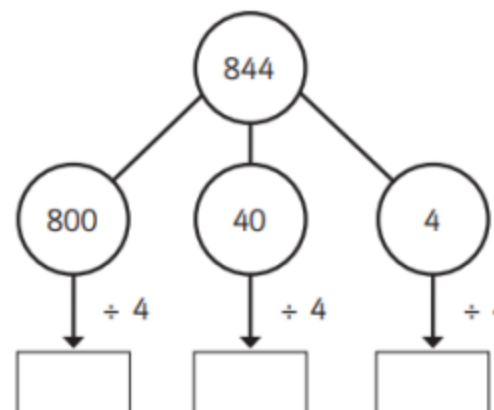
100 100 100 100　　10 10 10 10　　1 1 1 1
100 100 100 100　　10　　1 1
　　　　　　　　　　　1 1 1 1 1
　　　　　　　　　　　1 1 1 1 1
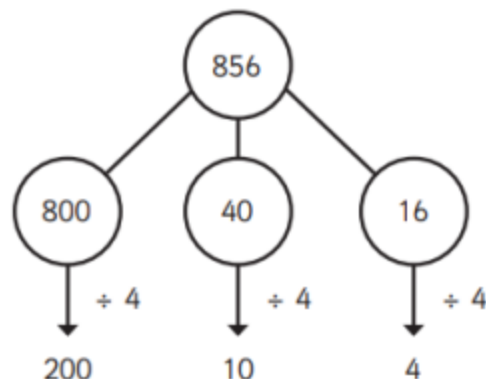
Hundreds	Tens	Ones
100 100	10	1 1 1 1
100 100	10	1 1 1 1
100 100	10	1 1 1 1
100 100	10	1 1 1 1

Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the 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

Hundreds	Tens	Ones
100 100 100 100	10 10 10 10	1 1 1 1
100 100 100 100	10	1 1
		1 1 1 1
		1 1 1 1
		1 1

		2	1	4
	4	8	5	^{1}6
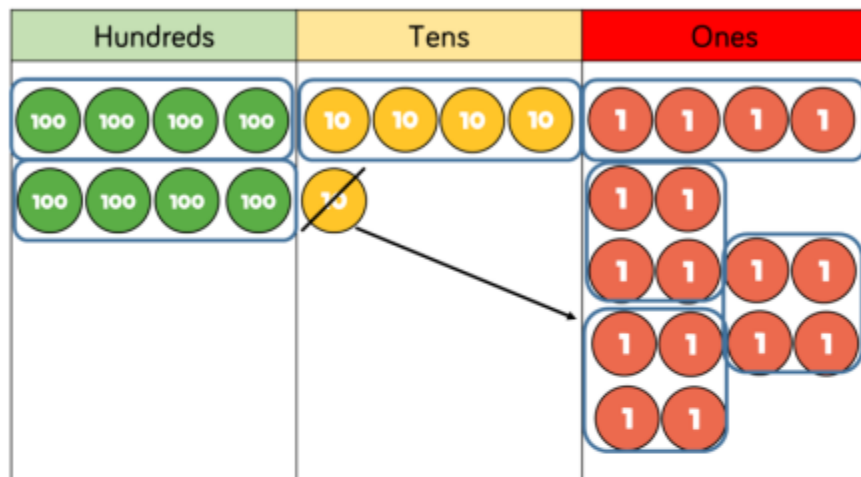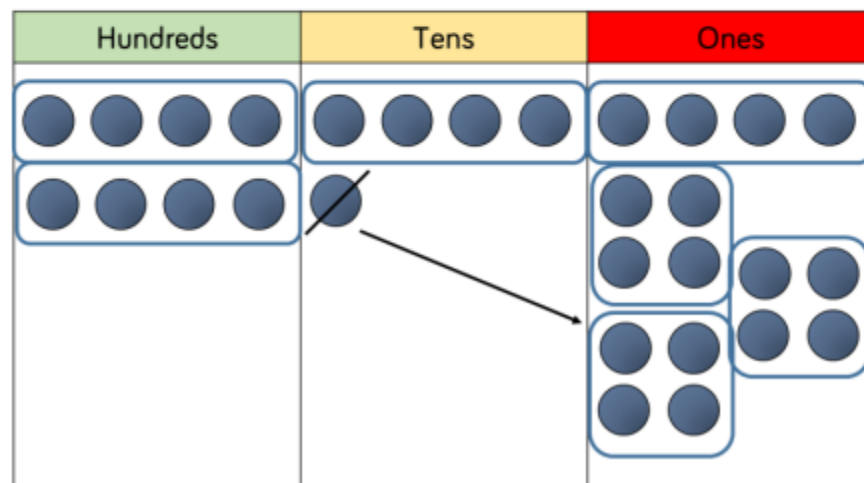
Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

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.

$856 \div 4 = 214$

Hundreds	Tens	Ones
● ● ● ●	● ● ● ●	● ● ● ●
● ● ● ●	●	● ●
		● ● ● ●
		● ● ● ●
		● ●

	Skill: Divide 4-digits by 1-digit (grouping)	Year: 5
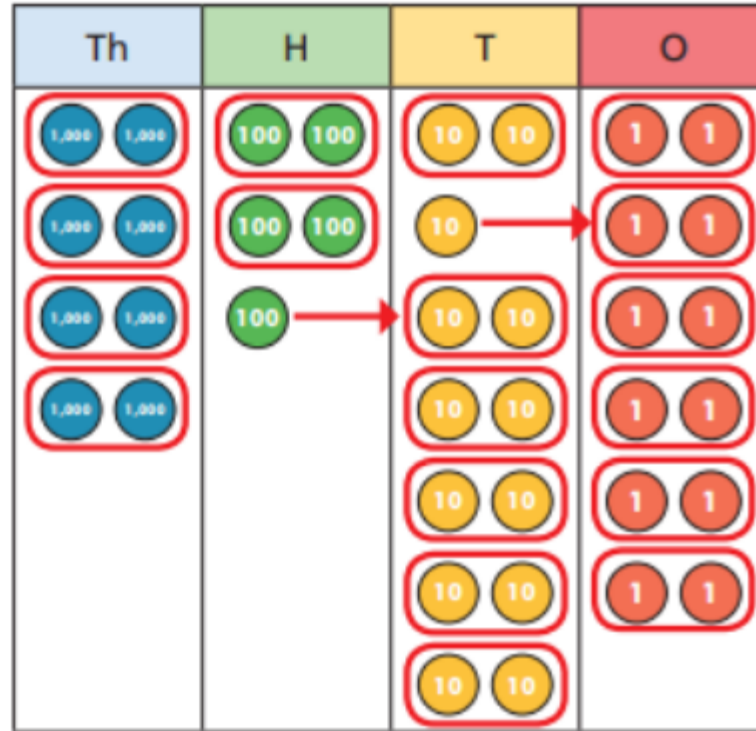
Th	H	T	O

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

		4	2	6	6
2	8	5	$^1 3$	$^1 2$	

Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

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

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

		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-digits 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 larger 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

```
        2  1  r25
   33)7  1  8
      6  6
         5  8
         3  3
         2  5
```

× 33	
1	33
2	66
3	
4	132

718 ÷ 33 = 21 r 25

When a remainder is left at the 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 questions where the quotient needs to be rounded according to the context.

```
        2  1  5
   23)4  9  4  5
      4  6
         3  4
         2  3
         1  1  5
         1  1  5
               0
```

```
        2  6  0  r3
   28)7  2  8  3
      5  6
         1  6  8
         1  6  8
               0  3
```