

Chalfont St Peter Church of England Academy

Calculation Policy

Part 3: Multiplication and Division



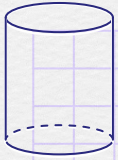


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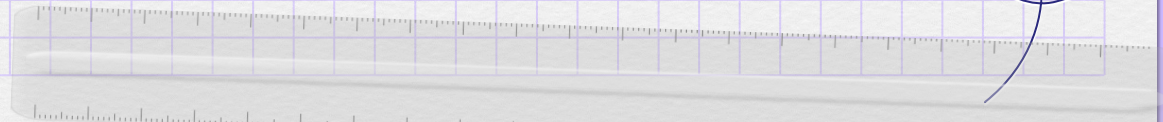
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Keywords

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

Progression of Skills in Multiplication

Solve one step problems with multiplication.

Year 2

Multiply 2-digit numbers by 1-digit numbers.
Multiply 3-digit numbers by 1-digit numbers.

Year 4

Multiply 4-digit numbers by 1-digit numbers.
Multiply 2-digit numbers by 2-digit numbers.
Multiply 2-digit numbers by 3-digit numbers.
Multiply 2-digit numbers by 4-digit numbers.

Year 6

Year 3

Multiply 2-digit numbers by 1-digit numbers.

Year 5

Multiply 4-digit numbers by 1-digit numbers.
Multiply 2-digit numbers by 2-digit numbers.
Multiply 2-digit numbers by 3-digit numbers.
Multiply 2-digit numbers by 4-digit numbers.

Progression of Skills in Division

- Solve one step problems with division (sharing)
- Solve one step problems with division (grouping)

Year 2

- Divide 2-digits by 1-digit (sharing with remainders)
- Divide 2-digits by 1-digit (grouping)
- Divide 3-digits by 1-digit (sharing with exchange)
- Divide 3-digits by 1-digit (grouping)

Year 4

- Divide multi-digits by 2-digits (short division)
- Divide multi-digits by 2-digits (long division)

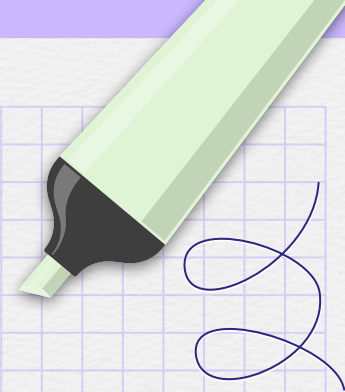
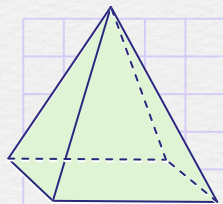
Year 6

Year 3

- Divide 2-digits by 1-digit (no exchange and with exchange)
- Divide 2-digits by 1-digit (sharing with remainders)

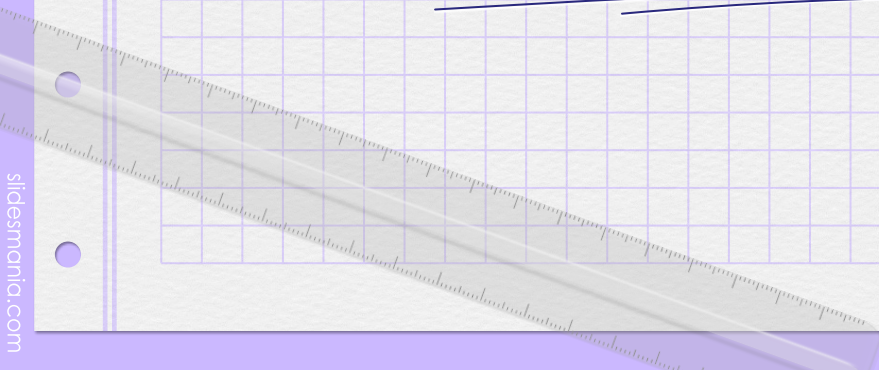
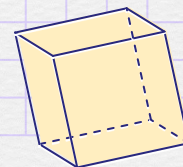
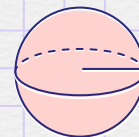
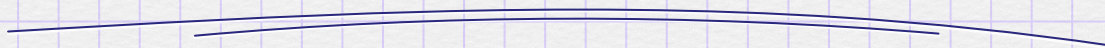
Year 5

- Divide 2-digits by 1-digit (grouping)
- Divide 3-digits by 1-digit (grouping)
- Divide 4-digits by 1-digit (grouping)



Multiplication

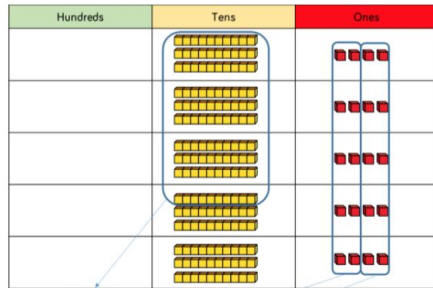
Year 3 & 4



Multiplication in Year 3

Skill: Multiply 2-digit numbers by 1-digit numbers

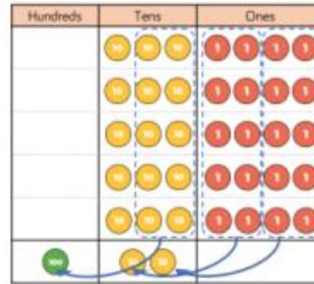
Year: 3/4



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

$$34 \times 5 = 170$$

	H	T	O
		3	4
x			5
	1	7	0
	1	2	

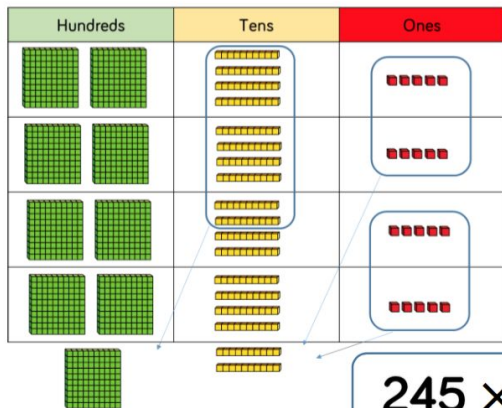


Teachers may decide to first look at the expanded column method before moving on to the short multiplication method.

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.

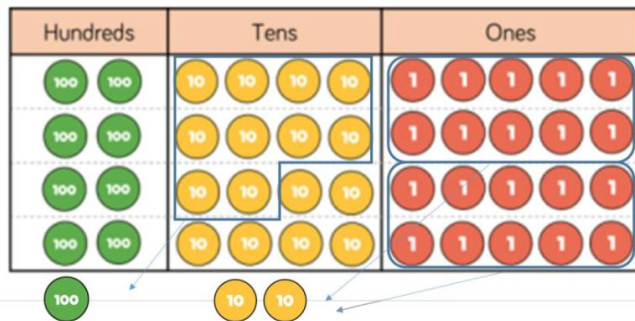
Skill: Multiply 3-digit numbers by 1-digit numbers

Year: 3/4



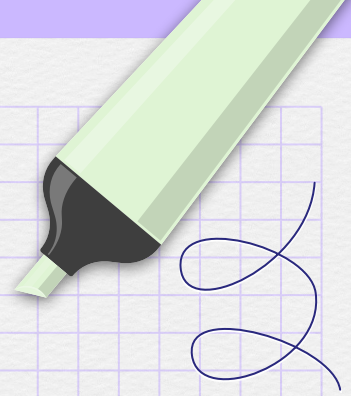
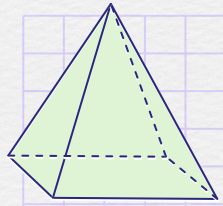
	H	T	O
	2	4	5
x			4
	9	8	0
	1	2	

$$245 \times 4 = 980$$



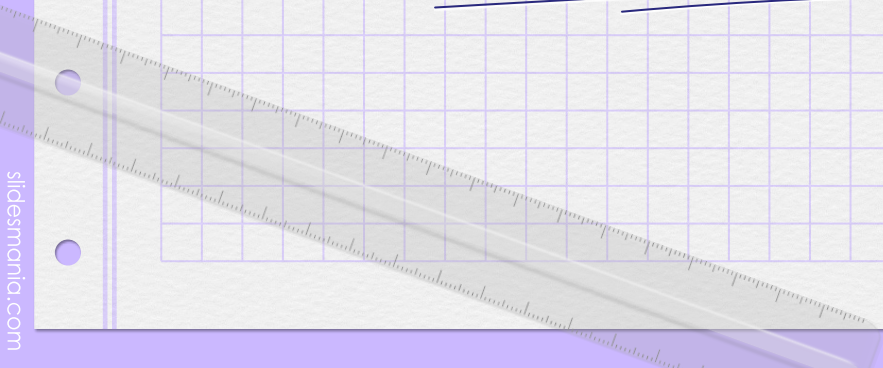
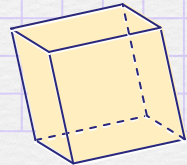
When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.

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.



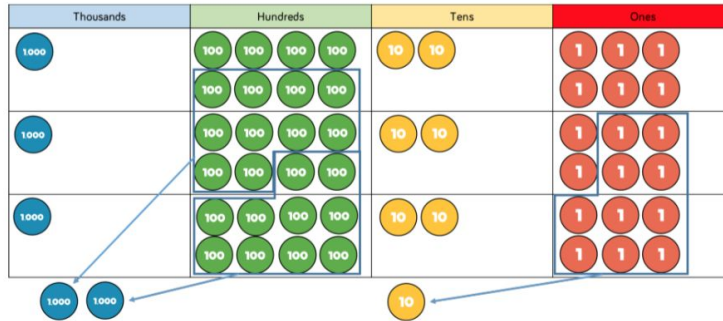
Multiplication

Year 5 & 6



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

Year: 5



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

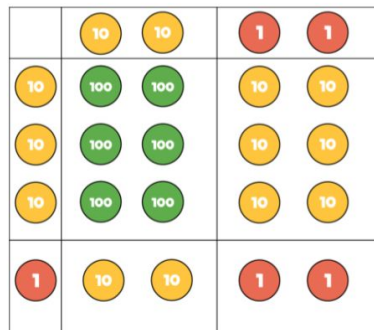
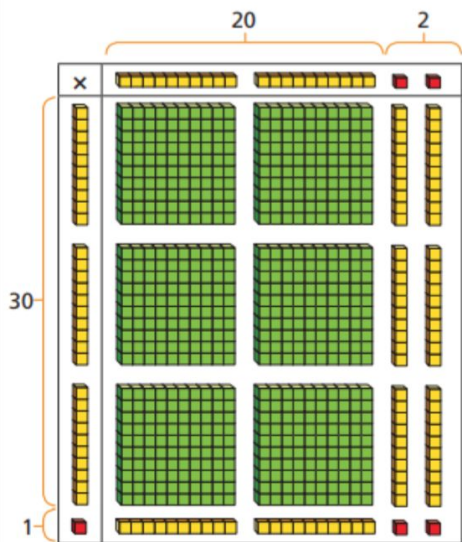
	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

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.

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

Year: 5



×	20	2
30	600	60
1	20	2

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

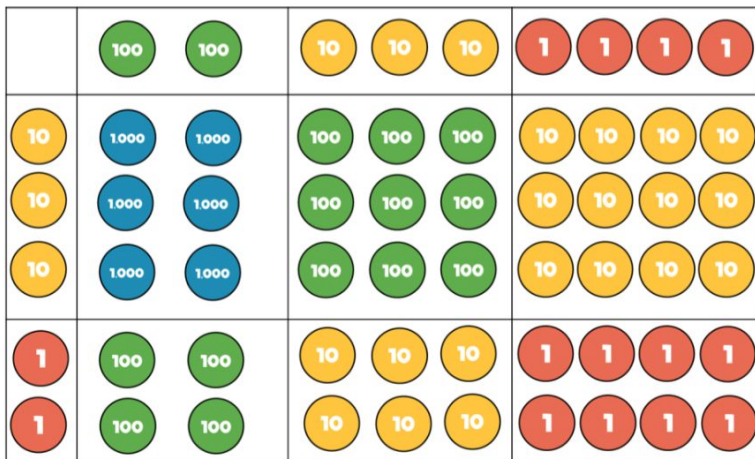
$$22 \times 31 = 682$$

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.

The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

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

Year: 5



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

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

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

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.

Encourage children to move towards the formal written method, seeing the links with 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
<hr/>					
	2	1	9	1	2
₂		₅	₃	₇	
	5	4	7	8	0
₁			₁		
	7	6	6	9	2

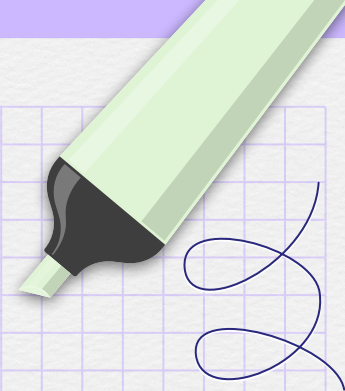
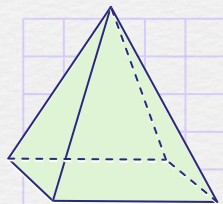
1

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

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

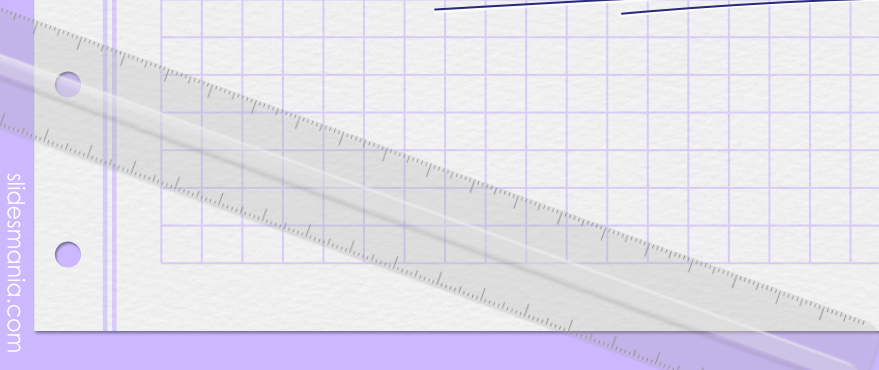
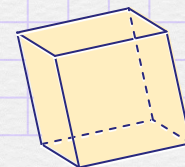
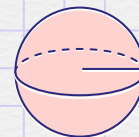
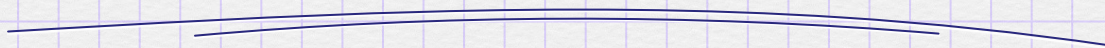
If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method.

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



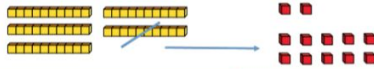
Division




Year 3 & 4



Skill: Divide 2-digits by 1-digit (sharing with exchange)

Year: 3/4

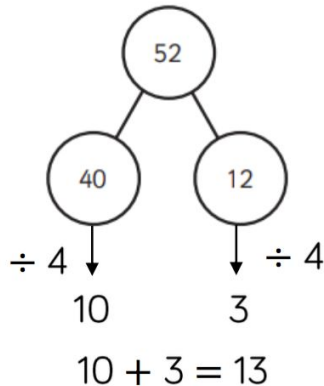










Tens	Ones
	
	
	
	

52

52			
?	?	?	?

$$52 \div 4 = 13$$



Tens	Ones
	
	
	
	

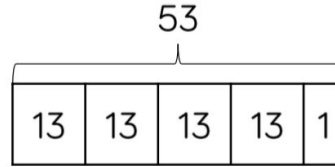
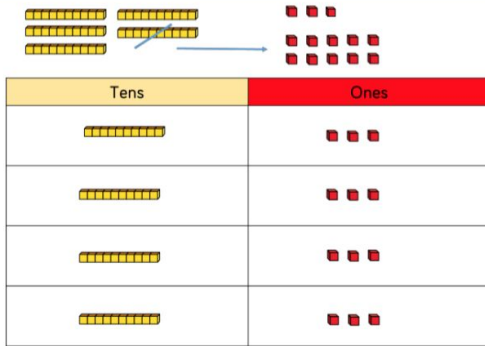
When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.

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

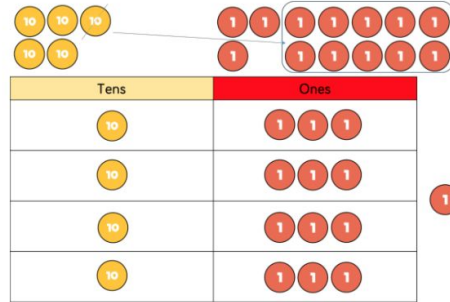
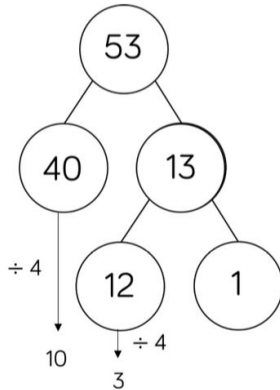
Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (sharing with remainders)

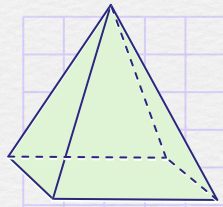
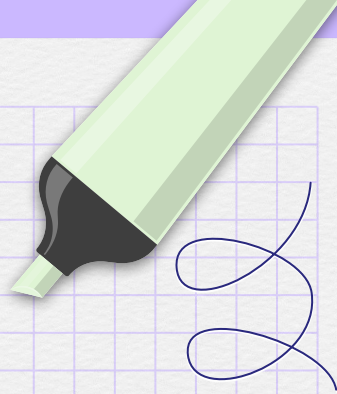
Year: 3/4



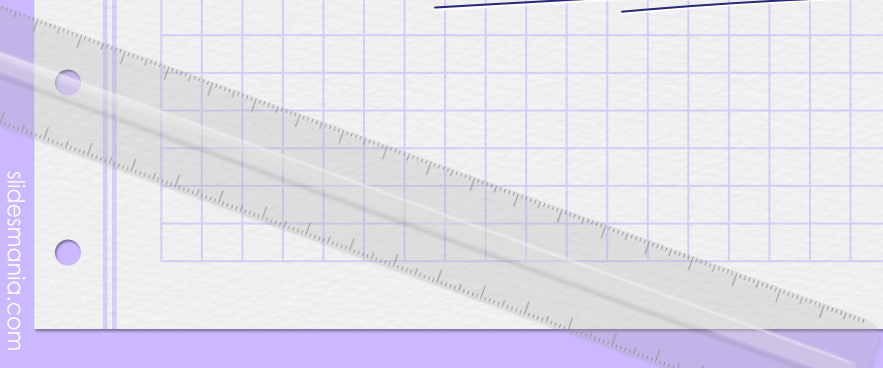
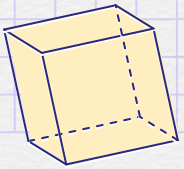
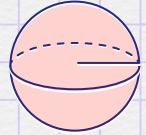
$$53 \div 4 = 13 \text{ r}1$$



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.



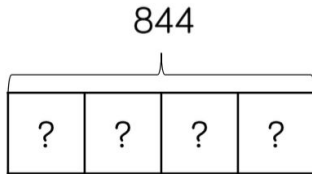
Division Year 4 Only



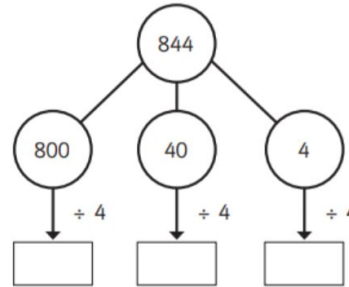
Skill: Divide 3-digits by 1-digit (sharing)

Year: 4

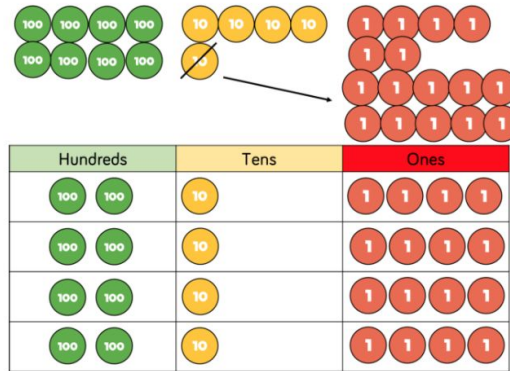
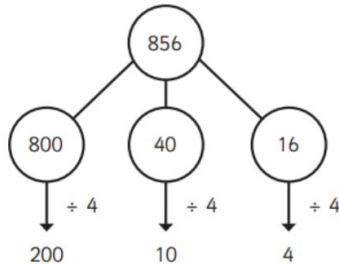
$$844 \div 4 = 122$$



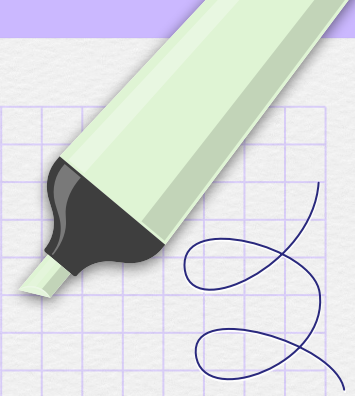
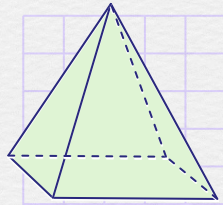
H	T	O



$$844 \div 4 = 122$$

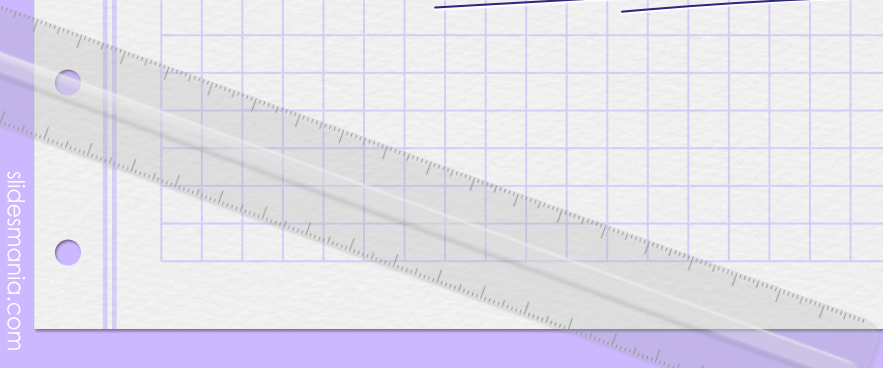
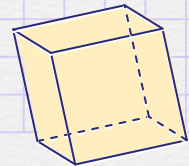


Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.



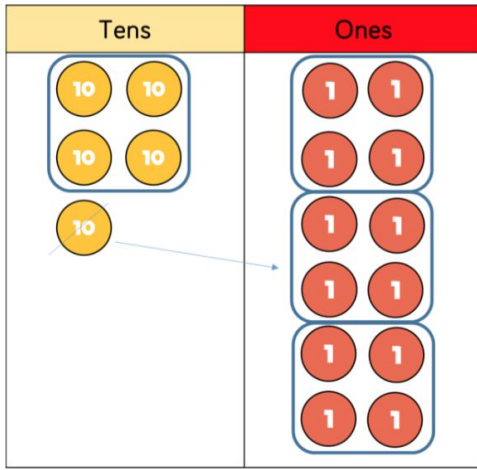
Division

Year 4 + 5

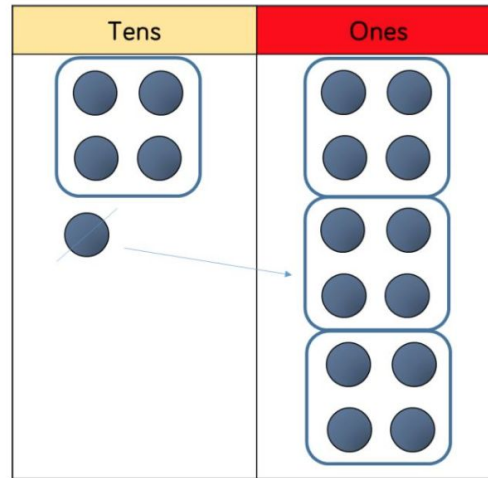


Skill: Divide 2-digits by 1-digit (grouping)

Year: 4/5



		1	3	
	4	5	12	

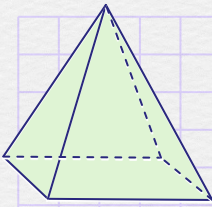
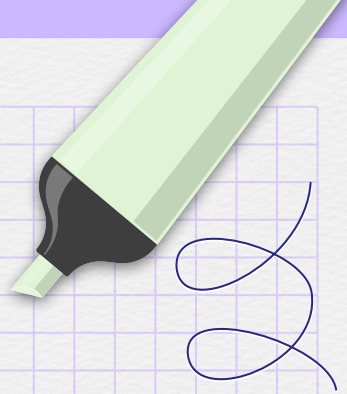


$$52 \div 4 = 13$$

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

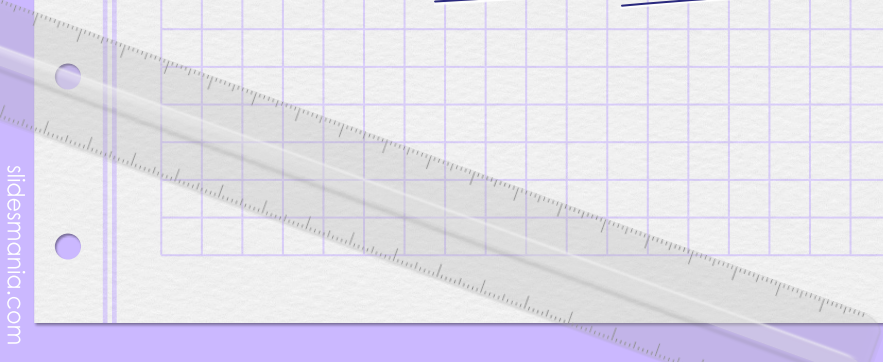
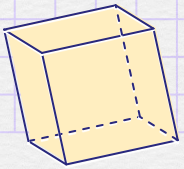
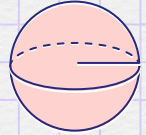
Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

Remainders can also be seen as they are left ungrouped.



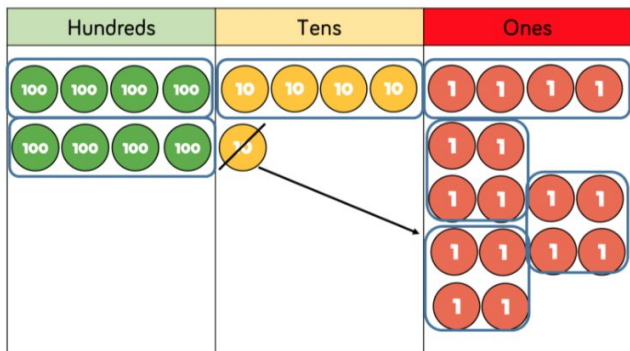
Division

Year 5

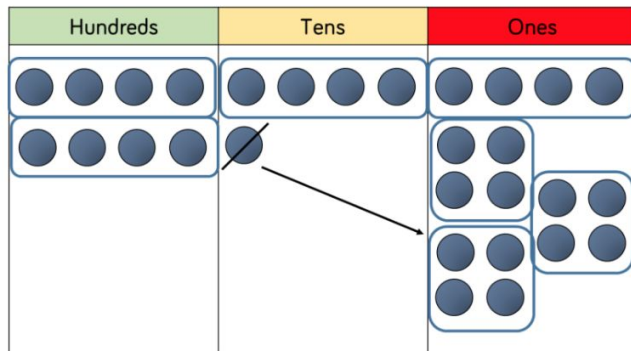


Skill: Divide 3-digits by 1-digit (grouping)

Year: 5



		2	1	4
	4	8	5	16



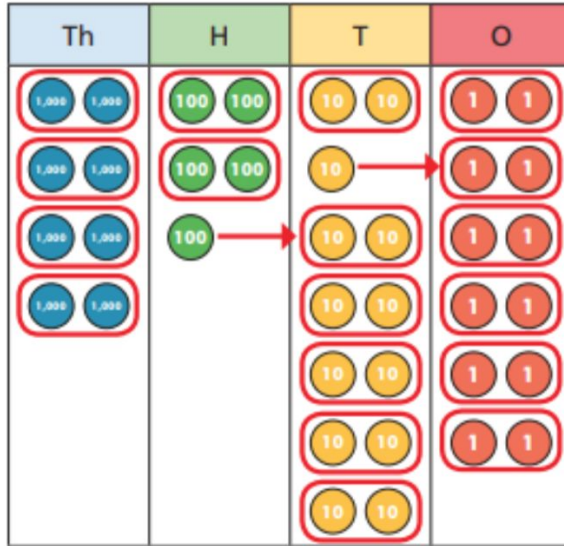
$$856 \div 4 = 214$$

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.

Skill: Divide 4-digits by 1-digit (grouping)

Year: 5

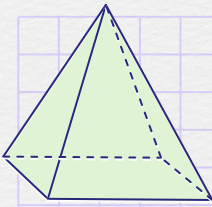
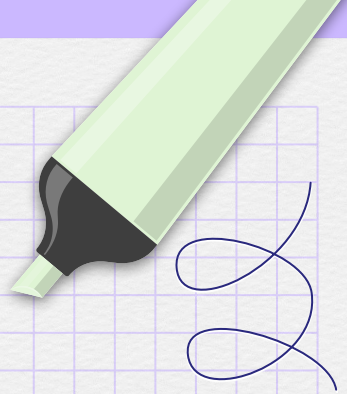


	4	2	6	6
2	8	5	13	12

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

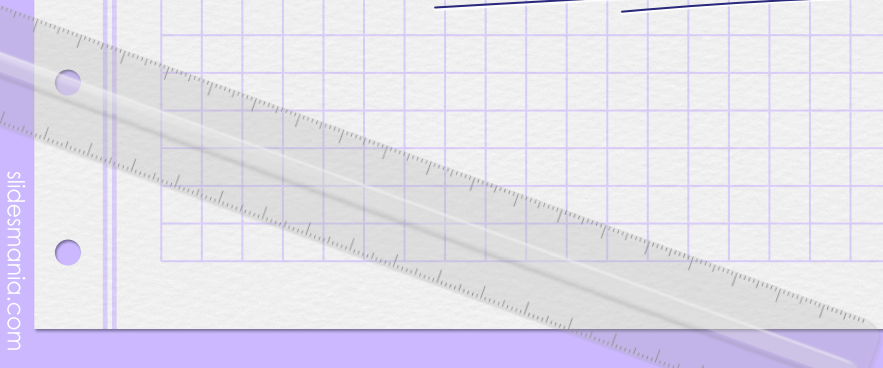
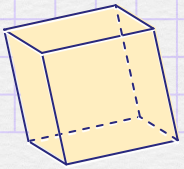
Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

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



Division

Year 6



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

Year: 6

		0	3	6
	12	4	$4\overset{4}{3}$	$7\overset{7}{2}$

$$432 \div 12 = 36$$

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

	0	4	8	9
15	7	$7\overset{7}{3}$	$13\overset{13}{3}$	$13\overset{13}{5}$

15	30	45	60	75	90	105	120	135	150
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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

		0	3	6
1	2	4	3	2
	-	3	6	0
			7	2
	-		7	2
				0

(x30)

$$\begin{aligned} 12 \times 1 &= 12 \\ 12 \times 2 &= 24 \\ 12 \times 3 &= 36 \\ 12 \times 4 &= 48 \\ 12 \times 5 &= 60 \\ 12 \times 6 &= 72 \\ 12 \times 7 &= 84 \\ 12 \times 8 &= 96 \\ 12 \times 9 &= 108 \\ 12 \times 10 &= 120 \end{aligned}$$

$$432 \div 12 = 36$$

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

	0	4	8	9
15	7	3	3	5
-	6	0	0	0
	1	3	3	5
-	1	2	0	0
		1	3	5
-		1	3	5
				0

(x400)

$$\begin{aligned} 1 \times 15 &= 15 \\ 2 \times 15 &= 30 \\ 3 \times 15 &= 45 \\ 4 \times 15 &= 60 \\ 5 \times 15 &= 75 \\ 10 \times 15 &= 150 \end{aligned}$$

(x80)

(x9)

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

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

$$372 \div 15 = 24 \text{ r}12$$

			2	4	r	1	2
1	5	3	7	2			
	-	3	0	0			
			7	2			
	-		6	0			
			1	2			

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

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.

			2	4	$\frac{4}{5}$
1	5	3	7	2	
	-	3	0	0	
			7	2	
	-		6	0	
			1	2	

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

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