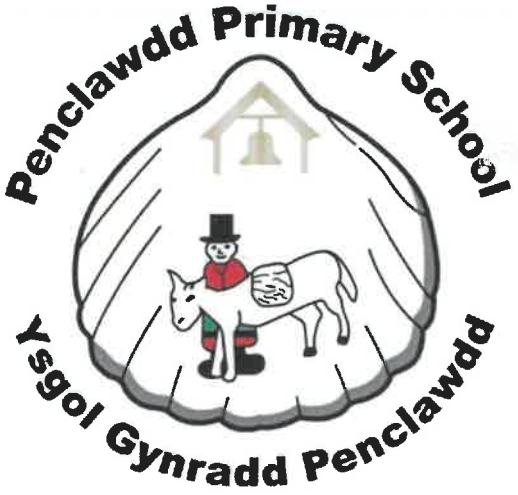
Penclawdd Primary School

Maths Calculation Strategies



White Rose Maths

Mathematics and Numeracy

At Penclawdd Primary School, we use the White Rose Maths scheme for the teaching of Maths from Reception to Year 6, which follows the mastery approach to learning. At the heart of White Rose Maths is the belief that all children can achieve.

White Rose Maths focuses on helping all children to build a deep understanding of maths concepts and confidence in maths.

For each year group the curriculum strands are broken down into small steps that build on prior knowledge to help children develop a deep and robust understanding of the concept before moving on.

Within this booklet, you will find the calculation strategies taught and used by your child in school.

Further information can be found at www.whiteroseeducation.com

Progression of skills - Addition

Year group	Skill
Nursery	• Subitise to 3 • Count how many • Make numbers to 5 • Add 1 more (through songs and rhymes)
Reception	• Conceptually subitise to 5 • 1 more • Notice the composition of numbers within 10 • Combine 2 groups • Add more
Year 1	• Add together • Add more • Bonds within 10 • Related facts within 20 • Missing numbers

Progression of skills - Addition

Year group	Skill
Year 2	• Add 1s to any number (related facts) • Add three 1-digit numbers • Add across a 10 • Add multiples of 10 • Add 10s to any number • Add two 2-digit numbers (not across a ten) • Add two 2-digit numbers (across a ten) • Missing numbers
Year 3	• Add 1s, 10s and 100s to a 3-digit number • Add two numbers (no exchange) • Add two numbers across a 10 or 100 • Complements to 100 • Add fractions with the same denominator within 1 whole • Calculate the duration of events

Progression of skills - Addition

Year group	Skill
Year 4	• Add 1s, 10s and 100s to a 4-digit number • Add up to two 4-digit numbers • Add decimal numbers in the context of money • Add fractions and mixed numbers with the same denominator beyond 1 whole
Year 5	• Add using mental strategies • Add whole numbers with more than 4 digits • Add decimals with up to 2 decimal places • Complements to 1 • Add fractions with denominators that are a multiple of one another
Year 6	• Add integers up to 10 million • Add decimals with up to 3 decimal places • Order of operations • Negative numbers • Add fractions

Addition

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Year 4	• Add numbers with up to 4 digits using a formal written method. • Solve simple measure and money problems involving fractions and decimals to 2 decimal places. • Add fractions with the same denominator.
Progression of skills	**Key representations**

Add 1s, 10s and 100s to a 4-digit number

Emphasis on mental strategies including number bonds and related facts. Prompt children to notice which digit changes.

The ones/tens/hundreds/thousands column will increase by ...

3,425 + 3 =
3,425 + 30 =
3,425 + 300 =
3,425 + 3,000 =

What patterns do you notice?

2,350 + 3 =
2,350 + 30 =
2,350 + 300 =
2,350 + 3,000 =

6,040 + 200 =
6,040 + 500 =
6,040 + 900 =

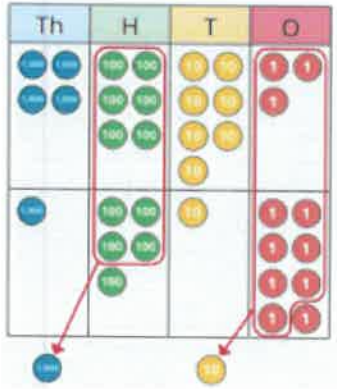
2,211 + ☐ = 2,251
2,211 + ☐ = 2,215
2,211 + ☐ = 2,511

Add up to two 4-digit numbers

Formal written method with up to 3 exchanges. Encourage children to estimate and use inverse operations to check answers to calculations.

There are ... ones/tens/hundreds so I do/do not need to make an exchange.

I can exchange 10 ... for 1 ...



	Th	H	T	O
	4	6	7	3
+	1	5	1	8
	6	1	9	1

Addition

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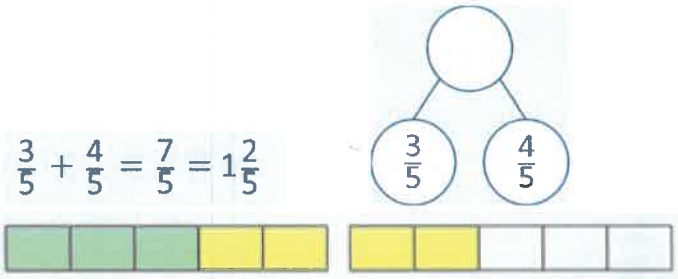
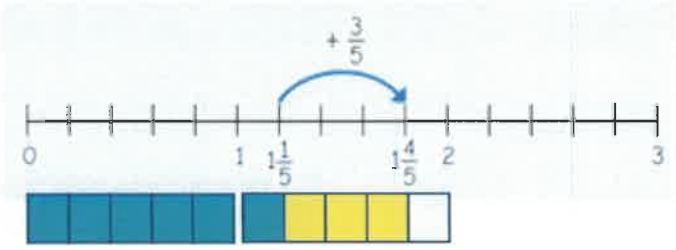
Progression of skills.	Key representations	
Add decimal numbers in the context of money Emphasis on partitioning and use of number lines rather than formal written calculations.	... pence + ... pence = ... pence ... pounds + ... pounds = ... pounds  45p + 25p = 70p £2 + £3 = £5 £5 + 70p = £5.70	£3.25 can be partitioned into £3 + 20p + 5p 
Add fractions and mixed numbers with the same denominator beyond 1 whole	When adding fractions with the same denominator, I only add the numerator. ... fifths + ... fifths = ... fifths $\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = 1\frac{2}{5}$  	

Subtraction

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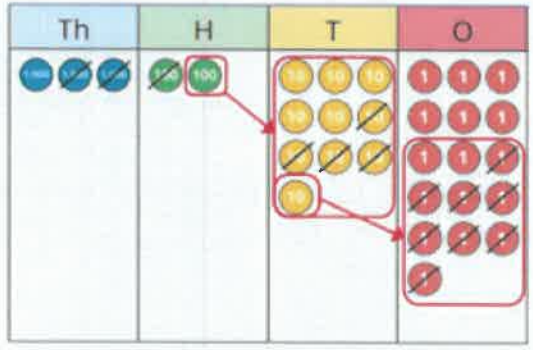
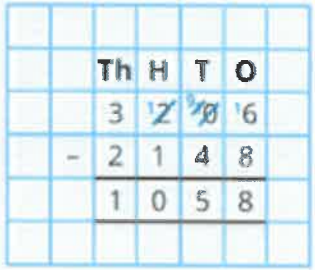
Year 4	• Subtract numbers with up to 4 digits using a formal written method. • Solve simple measure and money problems involving fractions and decimals to 2 decimal places. • Subtract fractions with the same denominator.

Progression of skills	Key representations
Subtract 1s, 10s, 100s and 1,000s from a 4-digit number Emphasis on mental strategies including number bonds and related facts. Prompt children to notice which digit changes.	The ones/tens/hundreds/thousands column will decrease by ...  3,425 − 2 = 3,425 − 20 = 3,425 − 200 = 3,425 − 2,000 = What patterns do you notice? 4,356 − 3 = 4,356 − 30 = 4,356 − 300 = 4,356 − 3,000 = 6,940 − 200 = 6,940 − 300 = 6,940 − 400 = 4,433 − ☐ = 4,430 4,433 − ☐ = 4,033 4,433 − ☐ = 4,403
Subtract up to two 4-digit numbers Formal written method with up to 3 exchanges. Encourage children to estimate and use inverse operations to check answers to calculations.	I need to subtract... ones/tens/hundreds. I do/do not need to make an exchange. I can exchange 1... for 10...  

Subtraction

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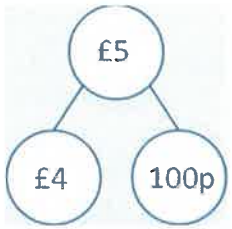
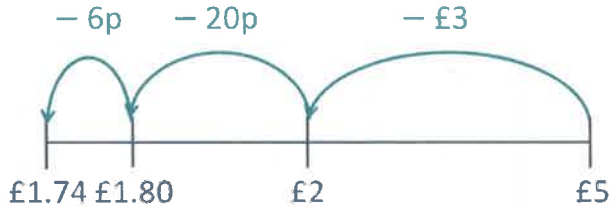
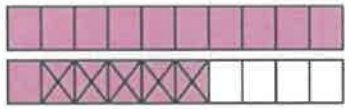
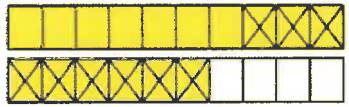
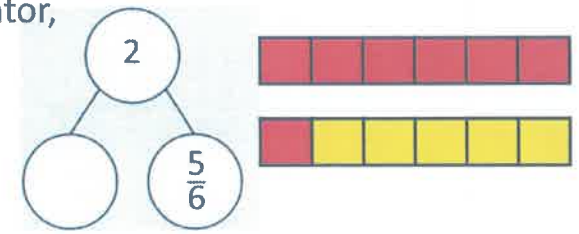
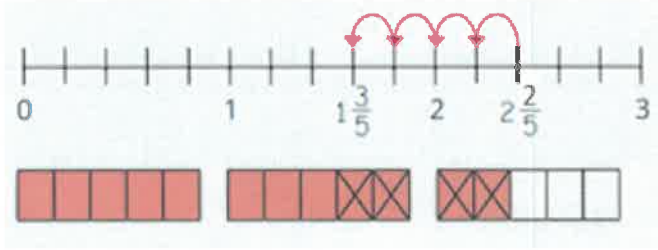
Progression of skills	Key representations	
Subtract decimal numbers in the context of money Emphasis here is on partitioning and use of number lines rather than formal written calculations.	I can partition £... into £... and 100p £... − £... = £... 100p − ...p = ...p **£5 − £3.26** £4 − £3 = £1 100p − 26p = 74p £5 - £3.26 = £1.74 	£3.26 can be partitioned into £3 + 20p + 6p 
Subtract fractions and mixed numbers with the same denominator Include subtracting fractions from wholes.	When subtracting fractions with the same denominator, I only subtract the numerator. ... tenths − ... tenths = ... tenths  $\frac{16}{10} - \frac{5}{10}$  $\frac{16}{10} - \frac{9}{10}$	 

Multiplication

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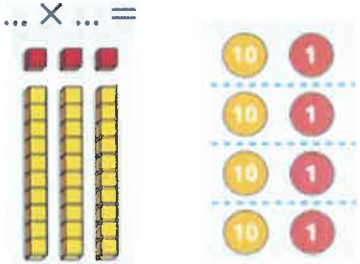
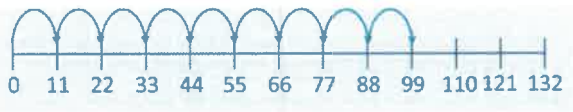
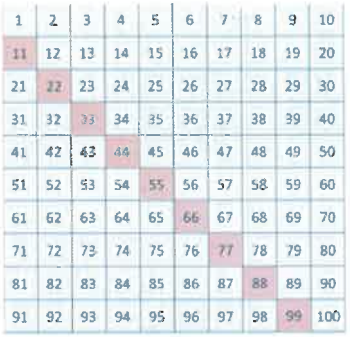
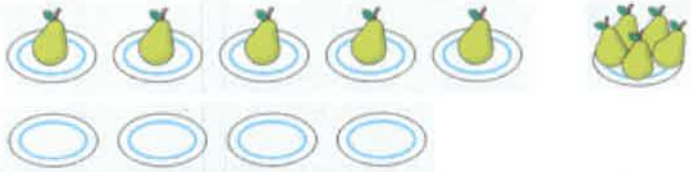
Year 4	• Recall multiplication facts for multiplication tables up to 12 × 12 • Use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; multiplying together three numbers. • Recognise and use factor pairs and commutativity in mental calculations. • Multiply two-digit and three-digit numbers by a one-digit number using formal written layout. • Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.
Progression of skills	**Key representations**
Times-table facts to 12 × 12 Encourage daily counting in multiples both forwards and back. Encourage children to notice links between related times-tables.	... groups of ... = ... times ... is equal to ... ... × ... =    
Multiply by 1 and 0	Any number multiplied by 1 is equal to ... Any number multiplied by 0 is equal to ...  ... × ... = ... 1 × 1 = 1 1 × 0 = 0 2 × 1 = 2 2 × 0 = 0 3 × 1 = 3 3 × 0 = 0 4 × 1 = 4 4 × 0 = 0

Multiplication

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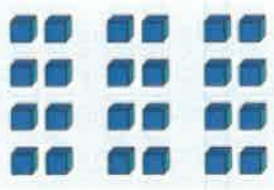
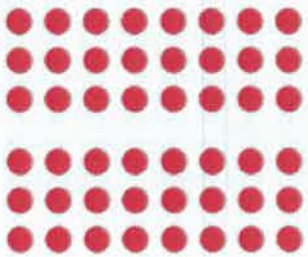
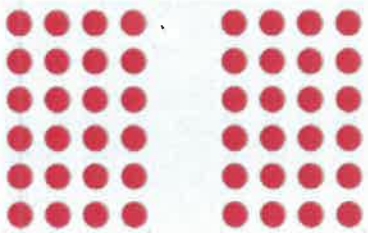
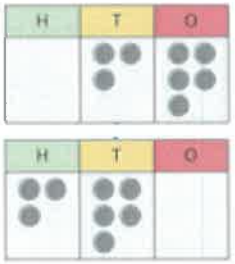
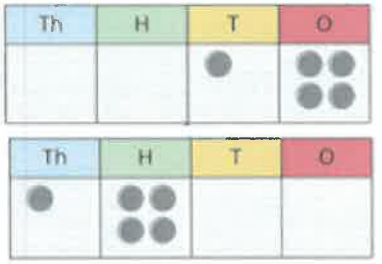
Progression of skills	Key representations
Multiply 3 numbers Children use their understanding of commutativity to multiply more efficiently.	To work out ... × ... × ..., I can first calculate ... × ... and then multiply the answer by ...  $4 \times 2 \times 3 = 8 \times 3 = 24$ $2 \times 3 \times 4 = 6 \times 4 = 24$ $3 \times 4 \times 2 = 12 \times 2 = 24$
Factor pairs Children explore equivalent calculations using different factors pairs.	$12 =$ ... × ..., so ... × 12 = ... × ... × ...  $8 \times 6 = 8 \times 3 \times 2$ $8 \times 6 = 24 \times 2$  $6 \times 8 = 6 \times 4 \times 2$ $6 \times 8 = 24 \times 2$
Multiply by 10 and 100 Some children may over-generalise that multiplying by 10 or 100 always results in adding zeros. This will cause issues later when multiplying decimals.	When I multiply by 10, the digits move ... place value column to the left. ... is 10 times the size of ...  $35 \times 10 = 350$
	When I multiply by 100, the digits move ... place value columns to the left. ... is 100 times the size of ...  $14 \times 100 = 1{,}400$

Multiplication

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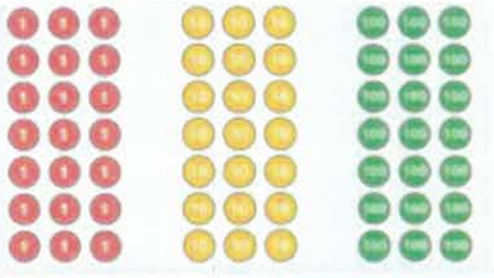
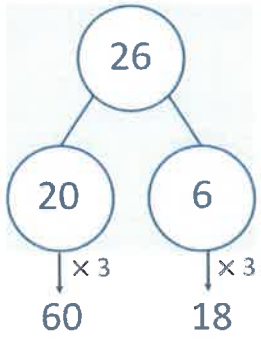
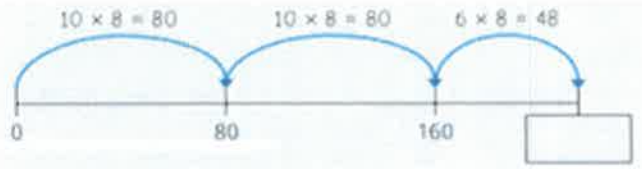
Progression of skills	Key representations
Related facts Use knowledge of multiplying by 10 and 100 to scale times-table facts.	... × ... ones is equal to ... ones so ... × ... tens is equal to ... tens and ... × ... hundreds is equal to ... hundreds.  $3 \times 7 = 21$ $\quad$ $7 \times 3 = 21$ $3 \times 70 = 210$ $\quad$ $7 \times 30 = 210$ $3 \times 700 = 2{,}100$ $\quad$ $7 \times 300 = 2{,}100$
Mental strategies Partition 2 or 3-digit numbers to multiply using informal methods.	... tens multiplied by ... is equal to ... tens. ...ones multiplied by ... is equal to ... ones.  $3 \times 26 = 60 + 18 = 78$   $26 \times 8 = 80 + 80 + 48 = 208$

Multiplication

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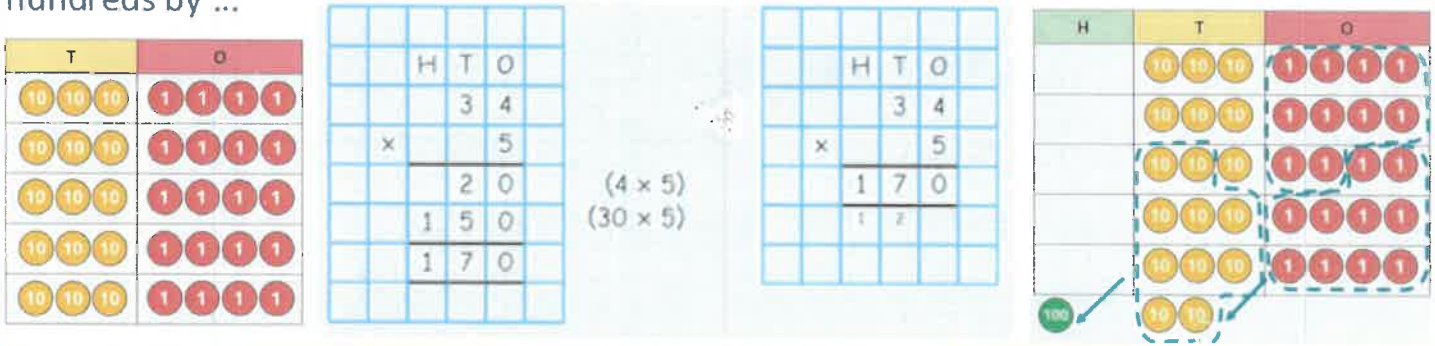
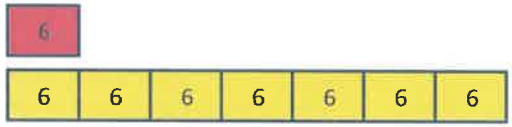
Progression of skills	Key representations
Multiply a 2 or 3-digit number by a 1-digit number The short multiplication method is introduced for the first time, initially in an expanded form.	To multiply a 2-digit number by … , I multiply the ones by … and the tens by … To multiply a 3-digit number by … , I multiply the ones by … , the tens by … and the hundreds by … 
Scaling Children focus on multiplication as scaling (… times the size).	… is … times the size of …  A computer mouse costs £7 A keyboard costs 6 times as much.  A red ribbon is 6 cm. A yellow ribbon is 7 times as long.
Correspondence problems Encourage children to use tables to show all the different possible combinations.	For every … , there are … possibilities. There are … × … possibilities altogether. A pizza company offers a choice of 5 toppings and 3 bases. 5 × 3 = 15

	Deep pan	Italian	Thin
Cheese	C DP	C I	C Th
Mushroom	M DP	M I	M Th
Vegetable	V DP	V I	V Th
Chicken	C DP	C I	C Th
Tuna	T DP	T I	T Th

Division

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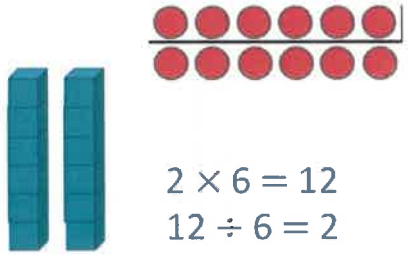
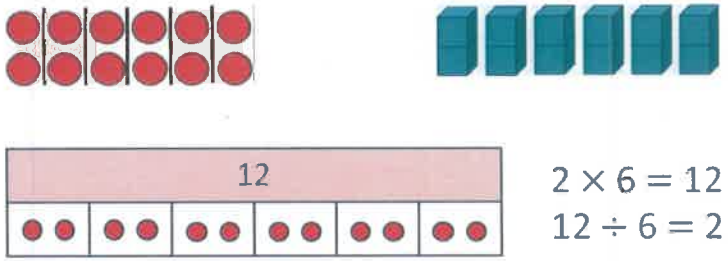
Year 4	• Recall division facts for multiplication tables up to 12 × 12 • Use place value, known and derived facts to divide mentally, including: dividing by 1 • Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.	
Progression of skills	**Key representations**	
Division facts to 12 × 12 Encourage children to compare the grouping and sharing structures of division and to make links with times-table facts.	There are ... groups of ... in ... ... ÷ ... =  2 × 6 = 12 12 ÷ 6 = 2	... has been shared equally into ... equal groups. ... ÷ ... =  2 × 6 = 12 12 ÷ 6 = 2
Divide a number by 1 and itself Children may try to divide a number by zero and it should be highlighted that this is not possible.	When I divide a number by 1, the number remains the same. 5 shared between 1 is 5  There are **5** groups of 1 in 5 	When I divide a number by itself, the answer is 1 5 shared between 5 is 1  There is **1** group of 5 in 5 

Division

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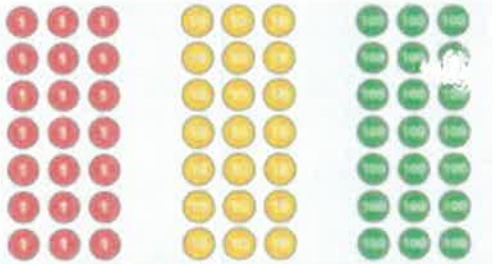
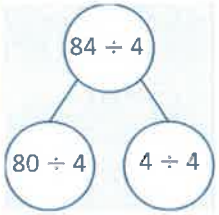
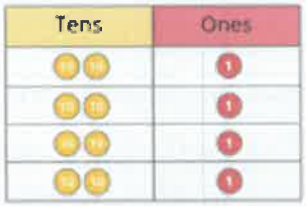
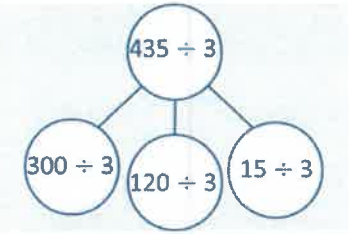
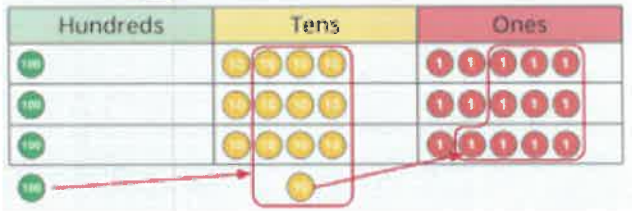
Progression of skills	Key representations	
Related facts Link to known times-table facts.	... ÷ ... is equal to ... so ... tens ÷ ... is equal to ... tens and ... hundreds ÷ ... is equal to ... hundreds. 	$21 \div 7 = 3$ $210 \div 7 = 30$ $2{,}100 \div 7 = 300$ $21 \div 3 = 7$ $210 \div 3 = 70$ $2{,}100 \div 3 = 700$
Divide a 2 or 3-digit number by a 1-digit number Progress from divisions with no exchange, to divisions with exchange and then divisions with remainders.	I can partition ... into ... tens and ... ones.   	$80 \div 4 = 20$ $4 \div 4 = 1$ $84 \div 4 = 21$
	I cannot share the hundreds/tens equally, so I need to exchange 1 ... for 10 ...   	$300 \div 3 = 100$ $120 \div 3 = 40$ $15 \div 3 = 5$ $435 \div 3 = 145$

Division

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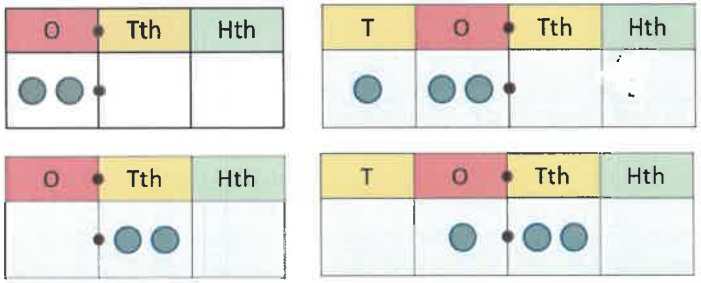
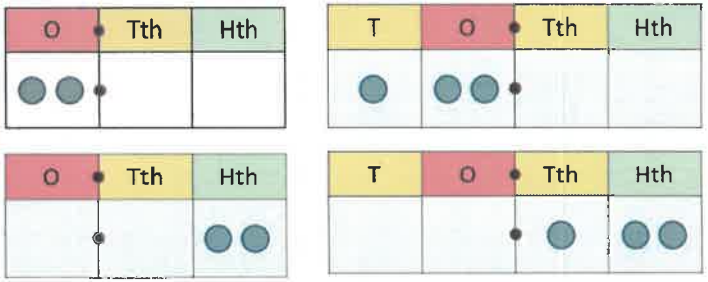
Progression of skills	Key representations	
Divide by 10 and 100 Encourage children to notice that dividing by 100 is the same as dividing by 10 twice.	When I divide by 10, the digits move 1 place value column to the right. ... is one-tenth the size of ...	When I divide by 100, the digits move 2 place value columns to the right. ... is one-hundredth the size of ...
	 $2 \div 10 = 0.2$ $12 \div 10 = 1.2$	 $2 \div 100 = 0.02$ $12 \div 100 = 0.12$