Penclawdd Primary School

Maths Calculation Strategies

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

White Rose MATHS

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

White Rose MATHS

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

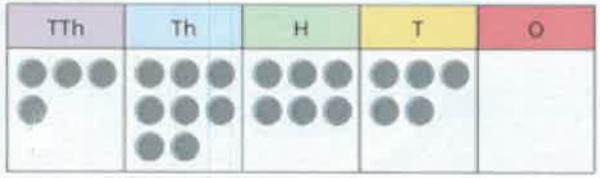
Addition

White Rose MATHS

Year 5	• Add whole numbers with more than 4 digits, including using formal written methods. • Add numbers mentally with increasingly large numbers. • Add decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 • Add fractions with the same denominator, and denominators that are multiples of the same number.
Progression of skills	**Key representations**

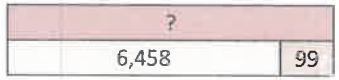
Add using mental strategies

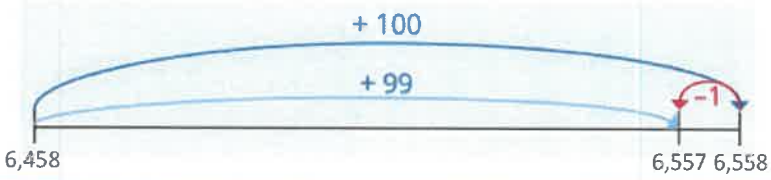
Add 1s, 10s, 100s, etc. to any number.
Use number bonds and related facts.



48,650 + 300 =
48,650 + 30,000 =
48,650 + 30 =

To add ..., I can add ... then subtract ...

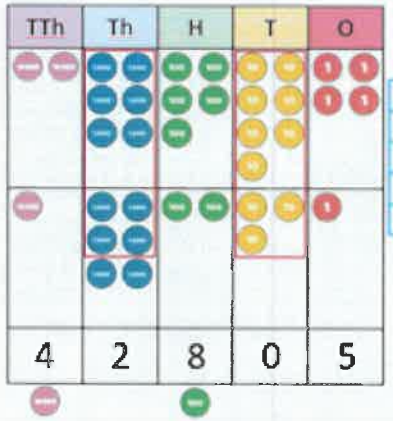


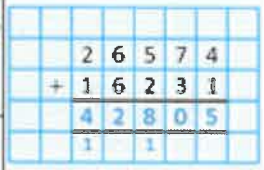


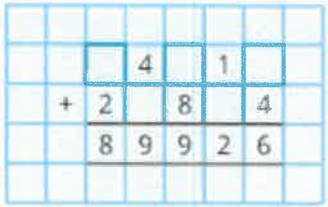
Add whole numbers with more than 4 digits

Encourage children to estimate and use inverse operations to check answers to calculations.

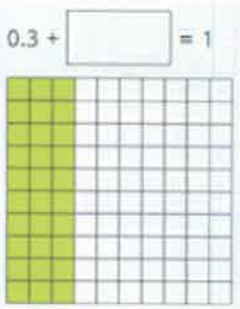
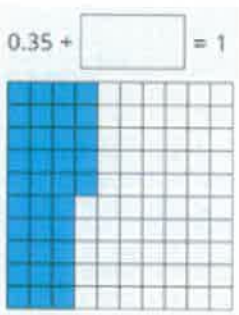
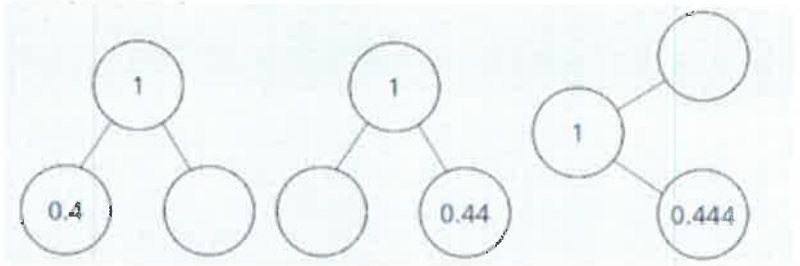
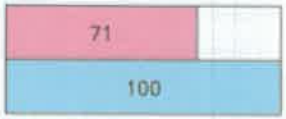
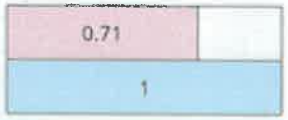
I can exchange 10 ... for 1 ...







Addition

Progression of skills	Key representations
Add decimals with up to 2 decimal places Progress from the same number of decimal places to a different number of decimal places, and from no exchange to exchange.	I do/do not need to make an exchange because ... I can exchange 10 ... for 1 ...  
Complements to 1 Pairs of numbers with up to 3 decimal places which total 1 Encourage children to make links with bonds to 10 and complements to 100 and 1,000	     $4 + 6 = 10$ $44 + 56 = 100$ $444 + 556 = 1{,}000$ $0.4 + 0.6 = 1$ $0.44 + 0.56 = 1$ $0.444 + 0.556 = 1$

Addition

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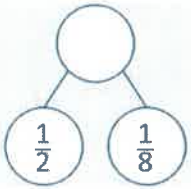
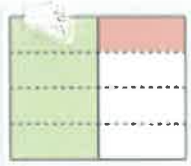
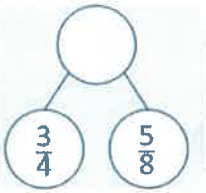
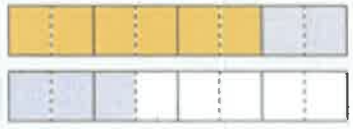
Progression of skills	Key representations
Add fractions with denominators that are a multiple of one another Encourage children to convert fractions to the same denominator before adding. Progress from adding fractions within 1 whole to adding fractions beyond 1 whole.	The denominator has been multiplied by ..., so the numerator needs to be multiplied by... for the fractions to be equivalent.   $\frac{1}{2} + \frac{1}{8} = \frac{4}{8} + \frac{1}{8} = \frac{5}{8}$  $\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$   $\frac{3}{4} + \frac{5}{8} = \frac{6}{8} + \frac{5}{8} = \frac{11}{8} = 1\frac{3}{8}$

Subtraction

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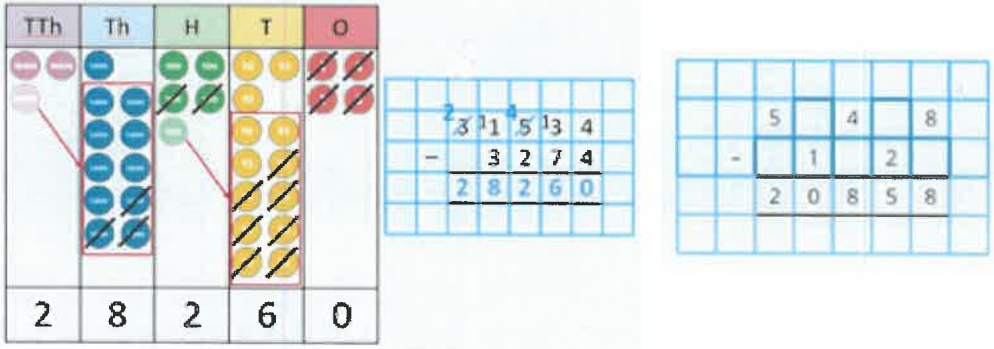
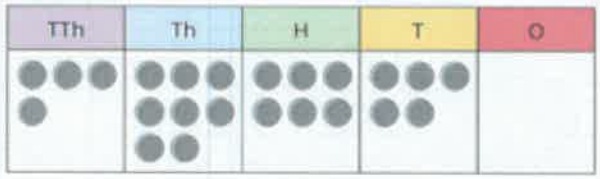
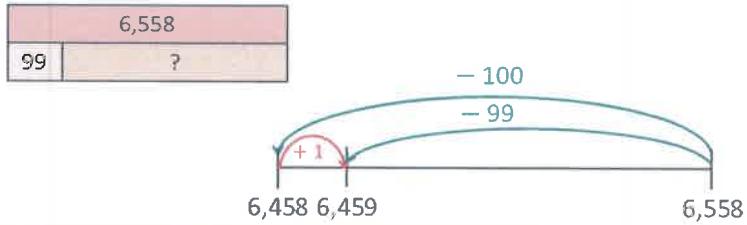
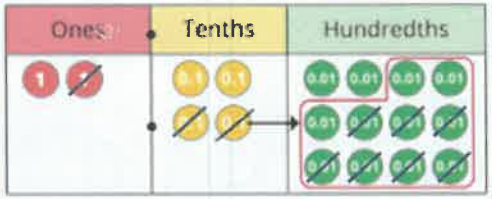
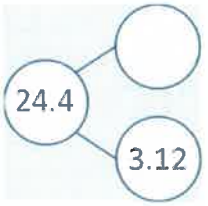
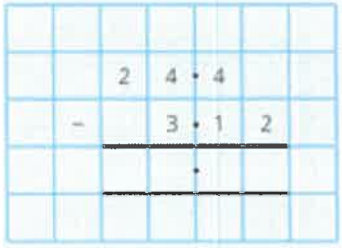
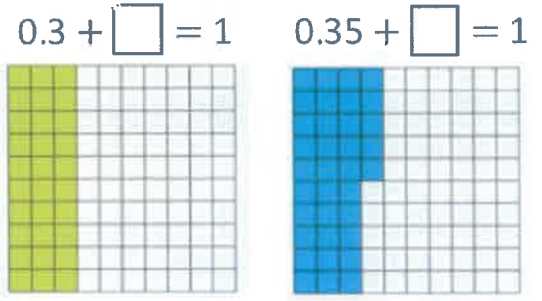
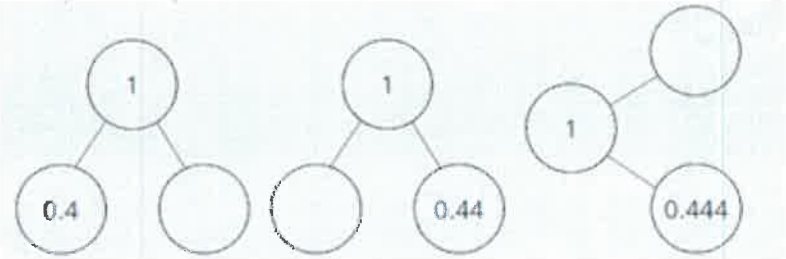
Year 5	• Subtract whole numbers with more than 4 digits. • Subtract numbers mentally with increasingly large numbers. • Subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 • Subtract fractions with the same denominator, and denominators that are multiples of the same number.

Progression of skills	Key representations
Subtract whole numbers with more than 4 digits Encourage children to estimate and use inverse operations to check answers to calculations.	I can exchange 1 ... for 10 ... 
Subtract using mental strategies Subtract 1s, 10s, 100s etc from any number. Use number bonds and related facts.	 48,650 − 300 = 48,650 − 30,000 = 48,650 − 30 =
	To subtract ..., I can subtract ... then add ... 

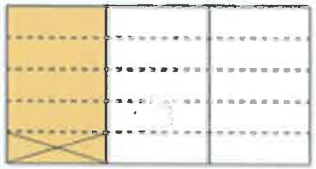
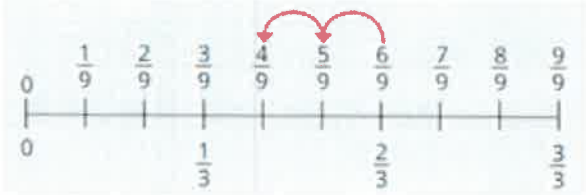
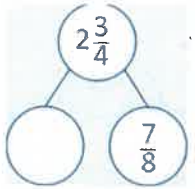
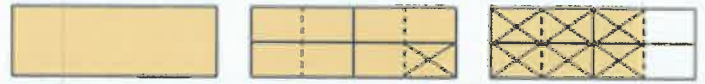
Subtraction

White Rose MATHS

Progression of skills	Key representations
Subtract decimals with up to 2 decimal places Progress from the same number of decimal places to a different number of decimal places and from no exchange to exchange.	    
Complements to 1 Encourage children to make links with bonds to 10 and complements to 100 and 1,000 when finding a missing part or subtracting from 1	  $10 - 4 = 6$ $\quad 1 - 0.4 = 0.6$ $100 - 44 = 56$ $\quad 1 - 0.44 = 0.56$ $1{,}000 - 444 = 556$ $\quad 1 - 0.444 = 0.556$

Subtraction

White Rose MATHS

Progression of skills	Key representations
Subtract fractions with denominators that are a multiple of one another Convert fractions to the same denominator before subtracting. Progress from subtracting fractions within 1 whole to subtracting from a mixed number.	The denominator has been multiplied by ..., so the numerator needs to be multiplied by... for the fractions to be equivalent.  $\frac{1}{3} - \frac{1}{15} = \frac{5}{15} - \frac{1}{15} = \frac{4}{15}$  $\frac{1}{3} - \frac{2}{9} = \frac{6}{9} - \frac{2}{9} = \frac{4}{9}$  

Multiplication

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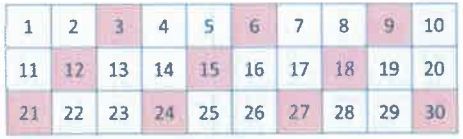
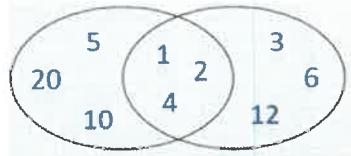
Year 5	• Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers • Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) • Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers. • Multiply numbers mentally drawing upon known facts. • Multiply whole numbers and those involving decimals by 10, 100 and 1000 • Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.

Progression of skills	Key representations		
Multiples and factors Encourage children to notice patterns and make links with known facts.	... is a multiple of ... because ... × ... = ...   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	... is a factor of ... because ... × ... = ...  1 × 8  2 × 4 1, 2, 4 and 8 are factors of 8	The common factors of ... and ... are ... Factors of 20 Factors of 12  20 5 10 1 2 4 3 6 12
Square and cube numbers	... squared means ... × ...  1 × 1 = $1^2 = 1$ 2 × 2 = $2^2 = 4$ 3 × 3 = $3^2 = 9$ 4 × 4 = $4^2 = 16$		... cubed means ... × ... × ...  1 × 1 × 1 = $1^3 = 1$ 2 × 2 × 2 = $2^3 = 8$ 3 × 3 × 3 = $3^3 = 27$

Multiplication

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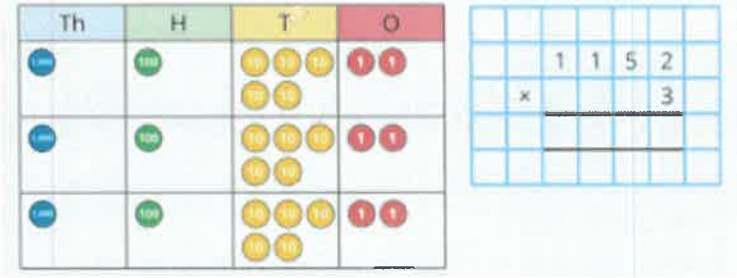
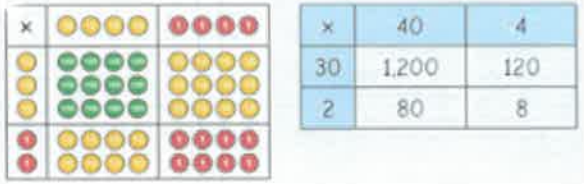
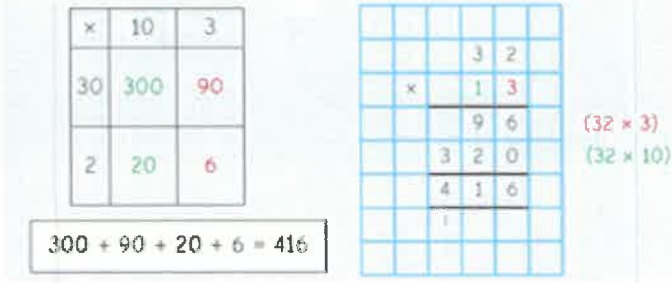
Progression of skills	Key representations
Multiply numbers up to 4 digits by a 1-digit number This builds on the short multiplication method introduced in Y4	To multiply a 4-digit number by … , I multiply the ones by … , the tens by … , the hundreds by … and the thousands by … 
Multiply numbers up to 4 digits by a 2-digit number Numbers are first partitioned using an area model then long multiplication is introduced for the first time.	I can partition … into … and …  $32 \times 44 = 1{,}200 + 80 + 120 + 8$ $32 \times 44 = 1{,}408$
	First, I multiply by the … Then I multiply by the … 

Multiplication

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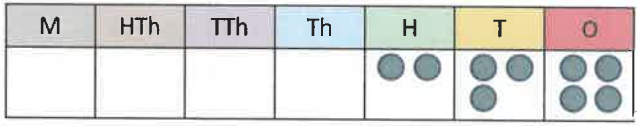
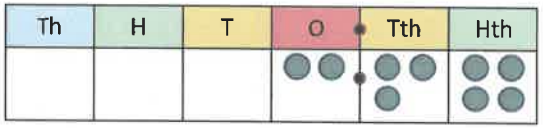
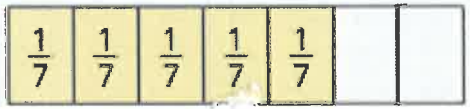
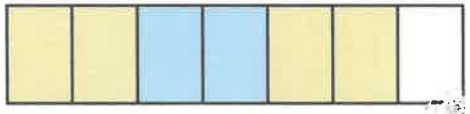
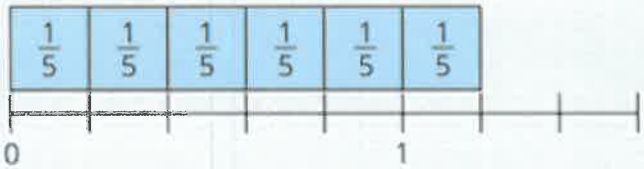
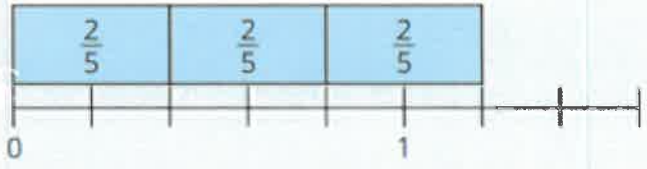
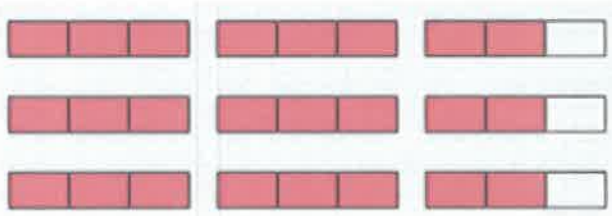
Progression of skills	Key representations
Multiply by 10, 100 and 1,000 Some children may over-generalise that multiplying by a power of 10 always results in adding zeros. This will cause issues later when multiplying decimals.	To multiply by 10/100/1,000, I move all the digits ... places to the left. ... is 10/100/1,000 times the size of ...  234 × 10 = 2,340 234 × 100 = 23,400 234 × 1,000 = 234,000  2.34 × 10 = 23.4 2.34 × 100 = 234 2.34 × 1,000 = 2,340
Mental strategies Children continue to use efficient mental strategies such as partitioning and knowledge of factor pairs and related facts to multiply.	The most efficient strategy to calculate ... × ... is ... To calculate ... × 12, I can do ... × ... × ... For example: 121 × 12 I could calculate 100 × 12 plus 20 × 12 plus 1 × 12 I could calculate 121 × 10 plus 121 × 2 I could calculate 121 × 6 × 2 I could calculate 121 × 4 × 3

Multiplication

White Rose MATHS

Progression of skills	Key representations
Multiply fractions by a whole number Make links with repeated addition. E.g. $\frac{1}{5} \times 4 = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$	To multiply a fraction by an integer, I multiply the numerator by the integer and the denominator remains the same.  $\frac{1}{7} \times 5 = \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{5}{7}$  $\frac{2}{7} \times 3 = \frac{2}{7} + \frac{2}{7} + \frac{2}{7} = \frac{6}{7}$  $\frac{1}{5} \times 6 = \frac{6}{5} = 1\frac{1}{5}$  $\frac{2}{5} \times 3 = \frac{6}{5} = 1\frac{1}{5}$
Multiply mixed numbers by a whole number	I can partition $\square\frac{\square}{\square}$ into $\square$ and $\frac{\square}{\square}$  $2\frac{2}{3} \times 3$ $2 \times 3 = 6$ $\quad \frac{2}{3} \times 3 = \frac{6}{3} = 2$ $2\frac{2}{3} \times 3 = 6 + 2 = 8$

Multiplication

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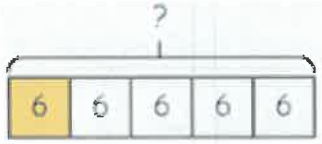
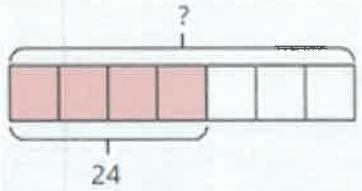
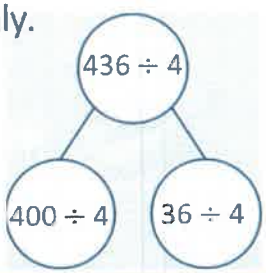
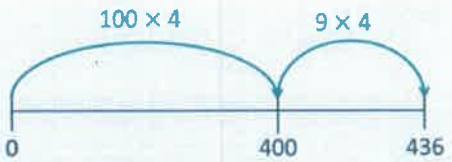
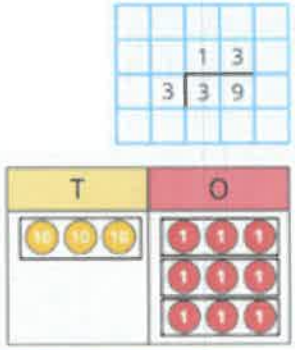
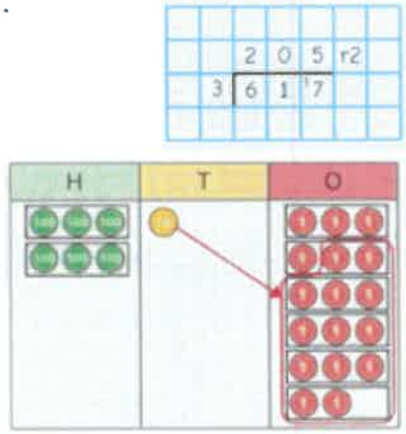
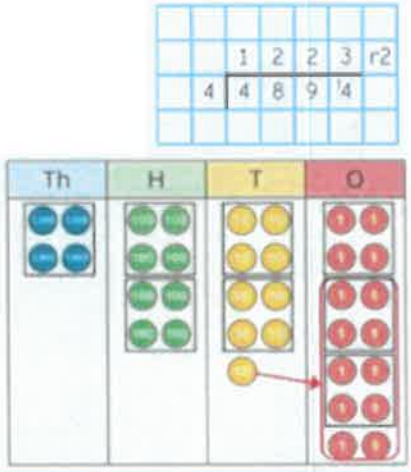
Progression of skills	Key representations	
Find the whole Children multiply to find the whole from a given part.	If $\frac{1}{\square}$ is ... , then the whole is ... × ... $\frac{1}{5}$ of ___ = 6  $5 \times 6 = 30$ $\frac{1}{5}$ of **30** = 6	If $\frac{\square}{\square}$ is ... , then $\frac{1}{\square}$ is ... and the whole is ... × ... $\frac{4}{7}$ of ___ = 24  $\frac{1}{7} = 24 \div 4 = 6$ $7 \times 6 = 42$ $\frac{4}{7}$ of **42** = 24

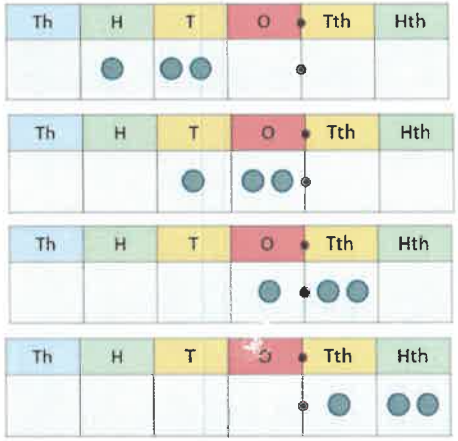
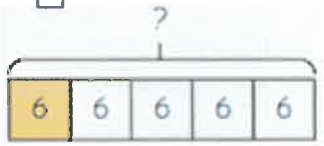
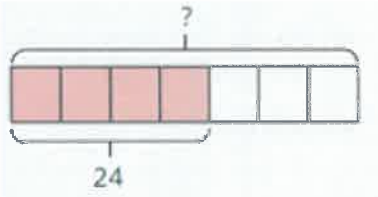
Division

White Rose MATHS

Year 5	• Divide numbers mentally drawing upon known facts. • Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context. • Divide whole numbers and those involving decimals by 10, 100 and 1,000		
Progression of skills	**Key representations**		
Mental strategies	I can partition ... into ... and ... to help me to divide more easily. 	I can show groups of ... on a number line. 	To divide by ..., I can divide by ... and then divide the result by ... 436 ÷ 4 = 436 ÷ 2 ÷ 2 436 ÷ 2 = 218 218 ÷ 2 = 109
Divide numbers up to 4 digits by a 1-digit number The short division method is introduced for the first time.	There are ... groups of ... hundreds/tens/ones/ in ... I can exchange 1 ... for 10 ...   		

Division

White Rose MATHS

Progression of skills	Key representations
Divide by 10, 100 and 1,000 Encourage children to notice that dividing by 100 is the same as dividing by 10 twice, and that dividing by 1,000 is the same as dividing by 10 three times.	To divide by 10/100/1,000, I move all the digits ... places to the right. ... is one-tenth/one-hundredth/one-thousandth the size of ... 
Fraction of an amount Bar models support children to understand that to find a fraction of an amount, we divide by the denominator and multiply by the numerator.	To find $\frac{\square}{\square}$ of ... , I need to divide by ... and multiply by ...  $\frac{1}{5}$ of 20 = $\frac{3}{5}$ of 20 = $\frac{1}{4}$ of 84 = $\frac{3}{4}$ of 84 =
	If $\frac{1}{\square}$ is ... , then the whole is ... × ...  $\frac{1}{5}$ of ___ = 6  $\frac{4}{7}$ of ___ = 24