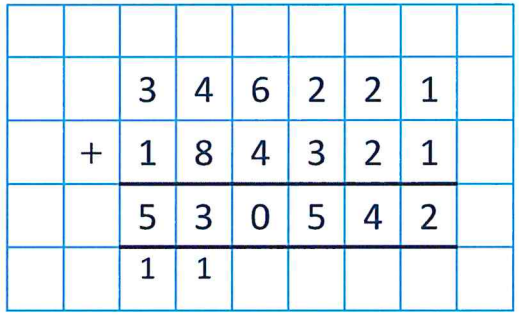
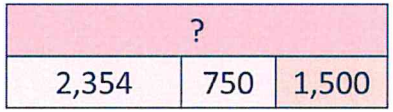
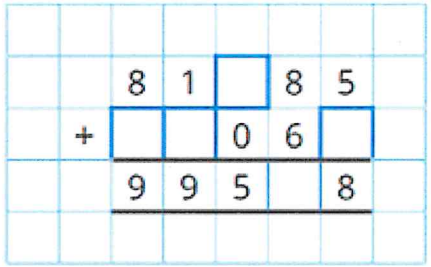
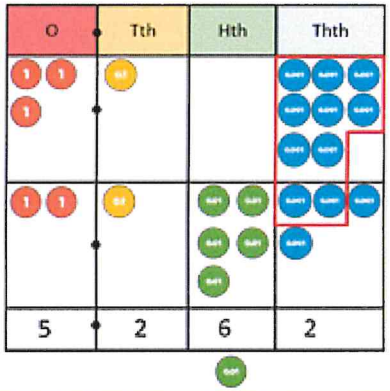
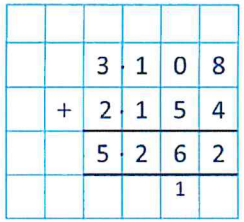
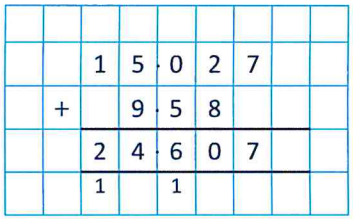
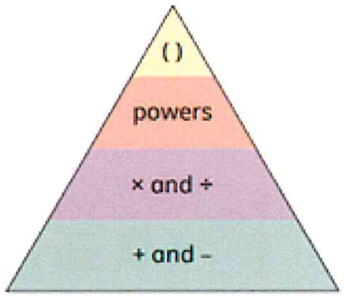
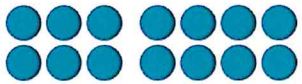
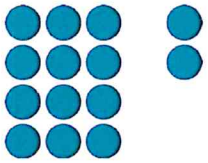
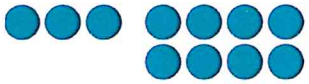
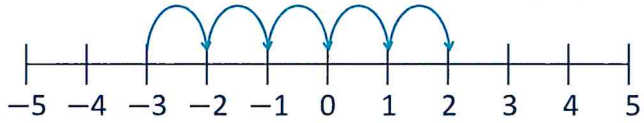
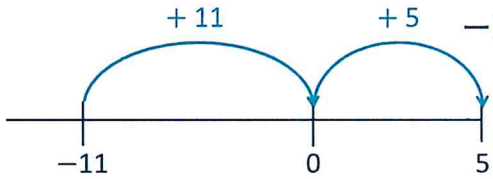
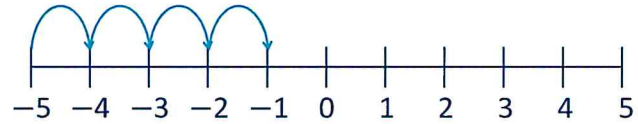
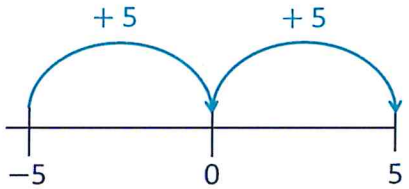
Addition

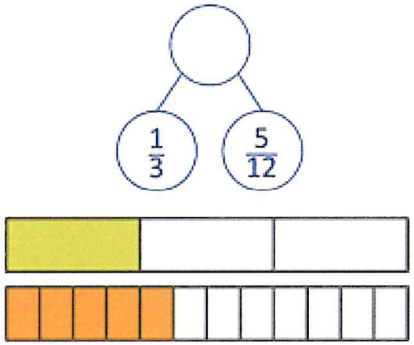
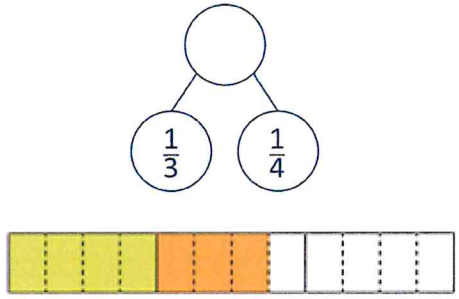
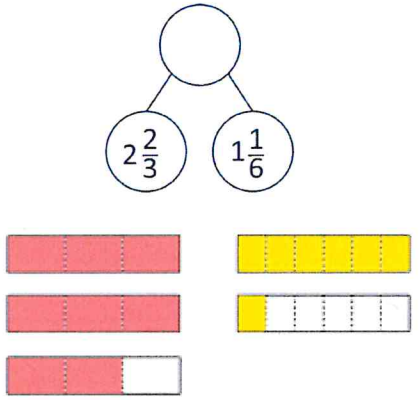
Year 6	• Add larger numbers, using the formal written method of columnar addition. • Use their knowledge of the order of operations to carry out calculations involving the 4 operations. • Calculate intervals across zero. • Add fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
Progression of skills	**Key representations**
Add integers up to 10 million Encourage children to estimate and use inverse operations to check answers to calculations.	  
Add decimals with up to 3 decimal places Progress to numbers with digits in different place value columns. Encourage children to check that they have lined up the columns correctly.	I do/do not need to make an exchange because ...   

Addition

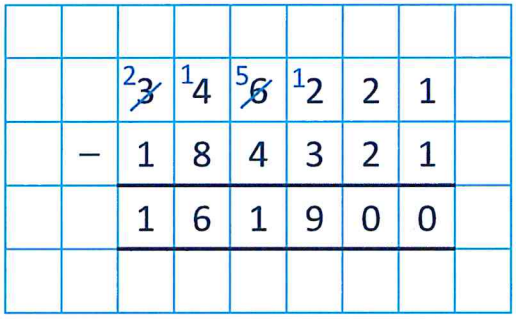
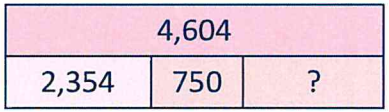
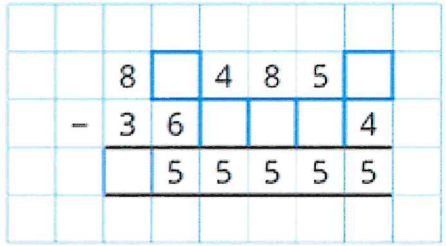
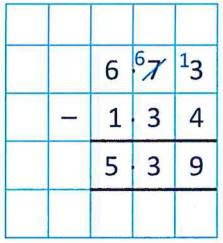
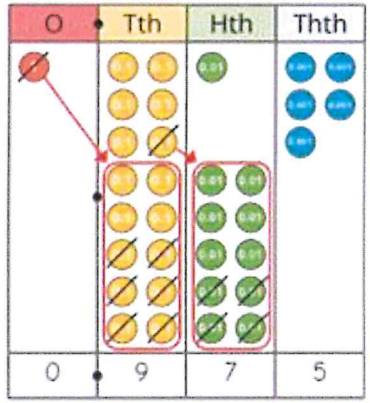
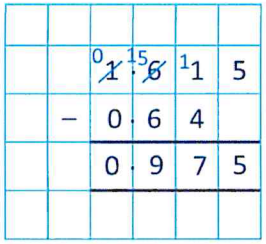
White Rose MATHS

Progression of skills	Key representations
Order of operations Calculations in brackets should be done first. Multiplication and division should be performed before addition and subtraction. *When no brackets are shown and the operations have the same priority, work left to right.	… has greater priority than …, so the first part of the calculation I need to do is …   $(3+4)\times 2=14$  $3\times 4+2=14$  $3+4\times 2=11$
Negative numbers Children add to negative numbers and carry out calculations which cross 0	… plus … is equal to … $-3+5=2$   $-11+16=5$	 The difference between – 5 and −1 is 4  The difference between – 5 and 5 is 10

Addition

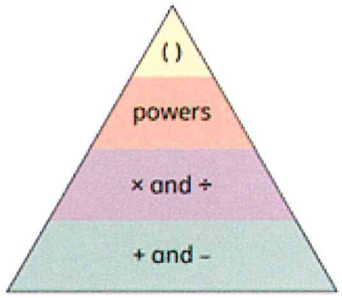
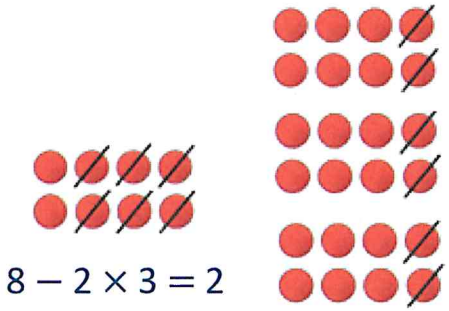
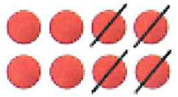
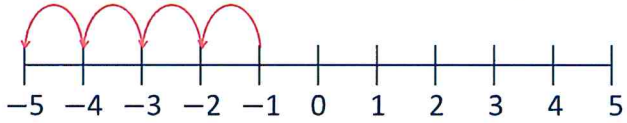
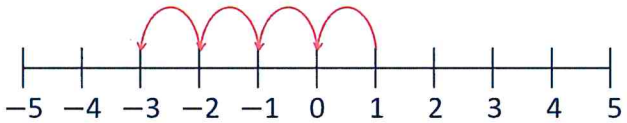
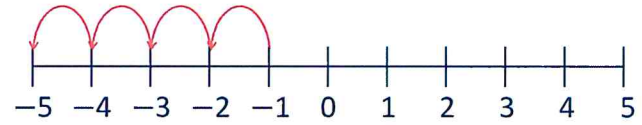
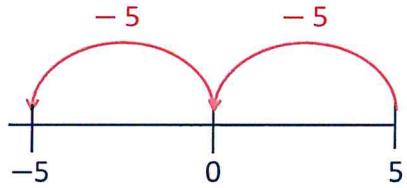
Progression of skills	Key representations		
Add fractions Convert fractions to the same denominator before adding. Progress from fractions where one denominator is a multiple of the other, to any fractions and then to mixed numbers.	The denominator has been multiplied by …, so the numerator needs to be multiplied by … 	The lowest common multiple of … and … is …  $\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$	…is made up of … wholes and … 

Subtraction

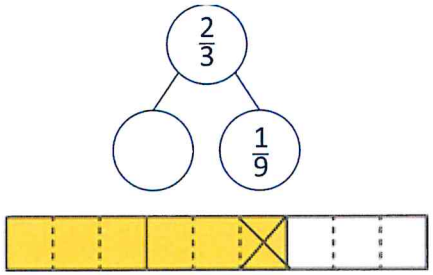
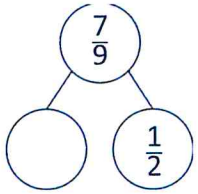
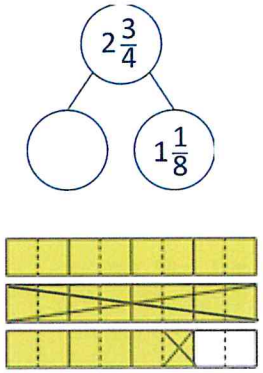
Year 6	• Subtract larger numbers, using the formal written methods of columnar subtraction. • Use their knowledge of the order of operations to carry out calculations involving the 4 operations. • Calculate intervals across zero. • Subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
Progression of skills	**Key representations**
Subtract integers up to 10 million Encourage children to estimate and use inverse operations to check answers to calculations.	  
Subtract decimals with up to 3 decimal places Progress from the same number of decimal and whole number places to a different number of decimal and whole number places.	I do/do not need to make an exchange because ...   

Subtraction

White Rose MATHS

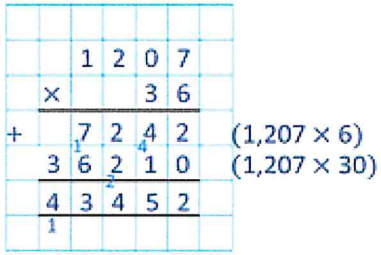
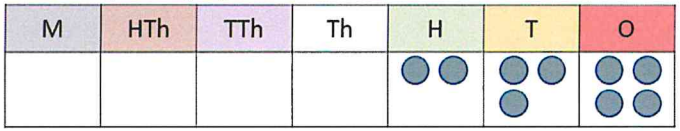
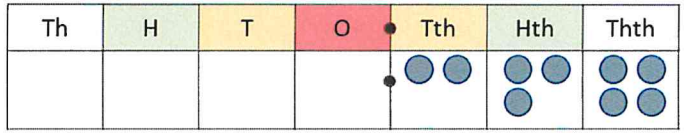
Progression of skills	Key representations
Order of operations Children learn the order of priority for operations in a calculation. Calculations in brackets should be done first. Multiplication and division should be performed before addition and subtraction.	… has greater priority than … , so the first part of the calculation I need to do is …   $8 - 2 \times 3 = 2$ $(8 - 2) \times 3 = 18$  $8 - 2^2 = 4$
Negative numbers Children subtract from positive and negative numbers and calculate intervals across 0	… minus … is equal to … $-1 - 4 = -5$  $1 - 4 = -3$   The difference between −5 and −1 is 4  The difference between 5 and −5 is 10

Subtraction

Progression of skills	Key representations		
Subtract fractions Convert fractions to the same denominator before subtracting. Progress from fractions where one denominator is a multiple of the other, to any fractions and then subtracting from a mixed number.	The denominator has been multiplied by … , so the numerator needs to be multiplied by…  $\frac{2}{3} - \frac{1}{9} = \frac{6}{9} - \frac{1}{9} = \frac{5}{9}$	The lowest common multiple of … and … is …  $\frac{7}{9} - \frac{1}{2} = \frac{14}{18} - \frac{9}{18} = \frac{5}{18}$	… is made up of … wholes and …  $2\frac{3}{4} - 1\frac{1}{8} = 1\frac{5}{8}$

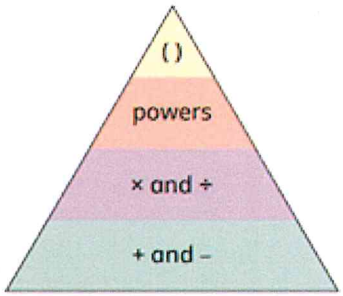
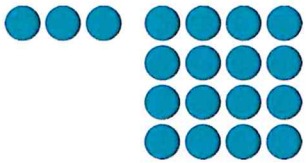
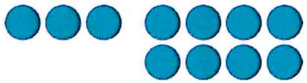
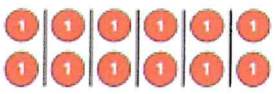
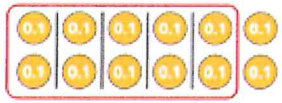
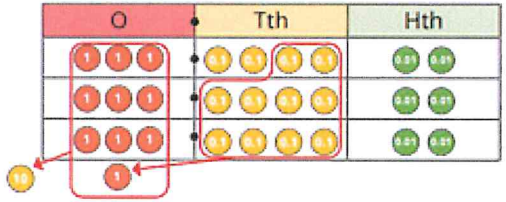
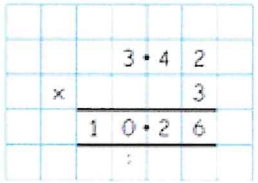
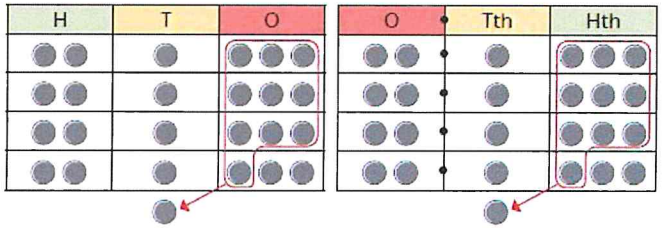
Multiplication

White Rose MATHS

Year 6	• Identify common factors and common multiples. • Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. • Multiply numbers by 10, 100 and 1,000 • Multiply one-digit numbers with up to two decimal places by whole numbers. • Use their knowledge of the order of operations to carry out calculations involving the 4 operations. • Multiply simple pairs of proper fractions, writing the answer in its simplest form. • Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. • Solve problems involving the calculation of percentages.
Progression of skills	**Key representations**
Multiply numbers up to 4 digits by a 2-digit number	To multiply by a 2-digit number, first multiply by the ones, then multiply by the tens and then find the total.  1 2 0 7 × 3 6 + 7 2 4 2 (1,207 × 6) 3 6 2 1 0 (1,207 × 30) 4 3 4 5 2
Multiply by 10, 100 and 1,000 Some children may over-generalise that multiplying by a power of 10 always results in adding zeros.	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 ...  M HTh TTh Th H T O 234 × 10 = 2,340 234 × 100 = 23,400 234 × 1,000 = 234,000  Th H T O Tth Hth Thth 0.234 × 10 = 2.34 0.234 × 100 = 23.4 0.234 × 1,000 = 234

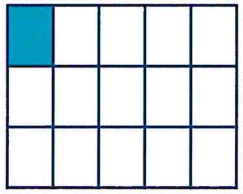
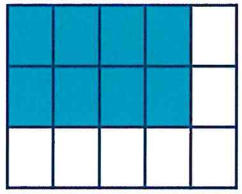
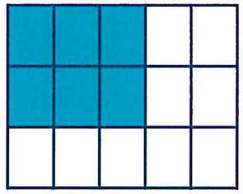
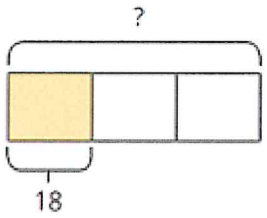
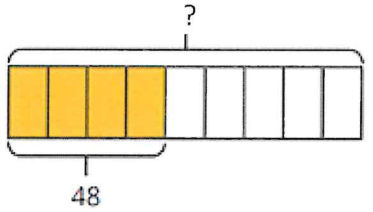
Multiplication

White Rose MATHS

Progression of skills	Key representations
Order of operations Calculations in brackets should be done first. Multiplication and division should be performed before addition and subtraction.	… has greater priority than …, so the first part of the calculation I need to do is …   $(3 + 4) \times 2 = 14$  $3 + 4^2 = 19$  $3 + 4 \times 2 = 11$
Multiply decimals by integers This is the first time children multiply decimals by numbers other than 10, 100 or 1,000 Encourage them to make links with known facts and whole number multiplication.	I know that … × … = …, so I also know that … × … = …  $6 \times 2 = 12$  $6 \times 0.2 = 1.2$
	I need to exchange 10 … for 1 …    $213 \times 4 = 852$ $2.13 \times 4 = 8.52$

Multiplication

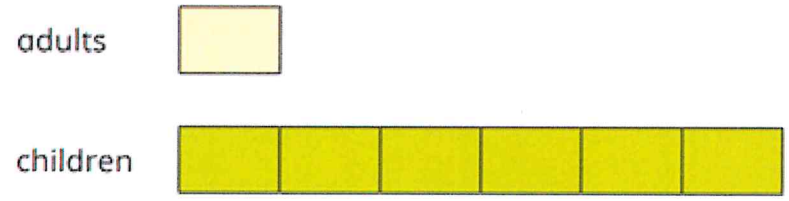
White Rose MATHS

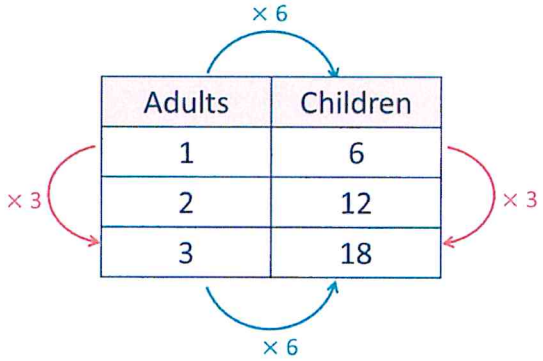
Progression of skills	Key representations
Multiply fractions by fractions Encourage children to give answers in their simplest form.	When multiplying a pair of fractions, I need to multiply the numerator and multiply the denominator.    $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$ $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$ $\frac{2}{3} \times \frac{3}{5} = \frac{6}{15} = \frac{2}{5}$
Find the whole Children multiply to find the whole from a given part.	If $\frac{1}{\square}$ is … , then the whole is … × … $\frac{1}{3}$ of $\_\_ = 18$  $18 \times 3 = 54$ $\frac{1}{3}$ of **54** $= 18$
	If $\frac{\square}{\square}$ is … , then $\frac{1}{\square}$ is … and the whole is … × … $\frac{4}{9}$ of $\_\_ = 48$  $\frac{1}{9} = 48 \div 4 = 12$ $9 \times 12 = 108$ $\frac{4}{9}$ of **108** $= 48$

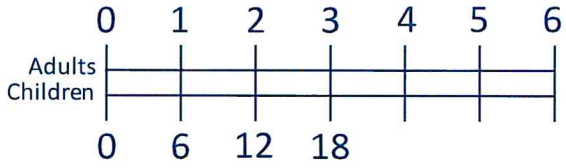
Multiplication

White Rose MATHS

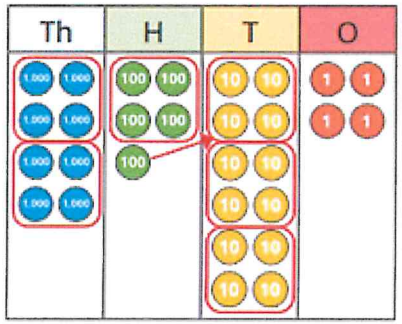
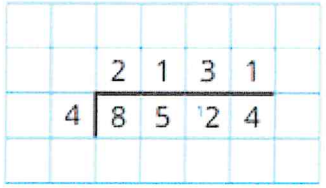
Progression of skills	Key representations
Calculate percentages Children first learn how to find 1%, 10%, 20%, 25% and 50% before using multiples of these amounts to find any percentage.	There are … lots of … % in 100% To find … %, I need to divide by … 50% of … = …÷ 2 25% of … = …÷ 4
	… % is made up of … %, and … % To find 30%, I can find 10% and then multiply it by 3 To find 23%, I can use 10% × 2 and 1% × 3 To find 99%, I can find 1%, then subtract from 100%
Calculations involving ratio Encourage children to see the multiplicative relationship between ratios. They will need to multiply or divide each value by the same number to keep the ratio equivalent. Double number lines and ratio tables help children to see both horizontal and vertical multiplicative relationships.	For every … , there are … For every 1 adult on a school trip, there are 6 children. The ratio of adults to children is 1 : 6





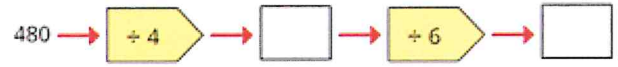
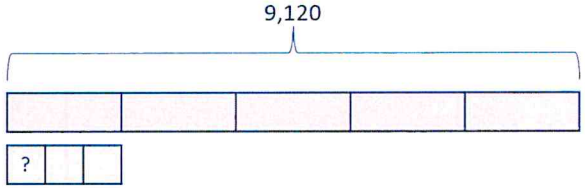
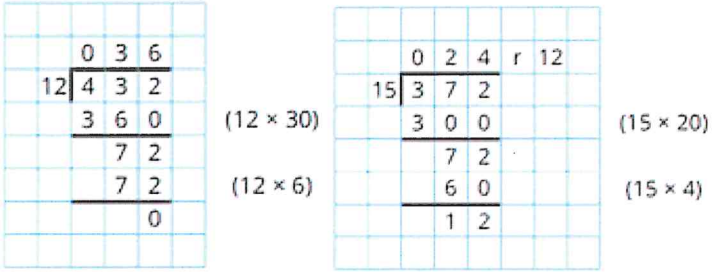
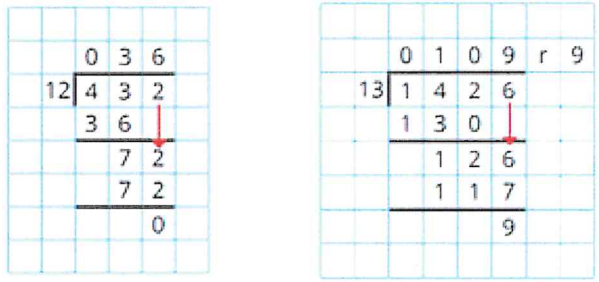
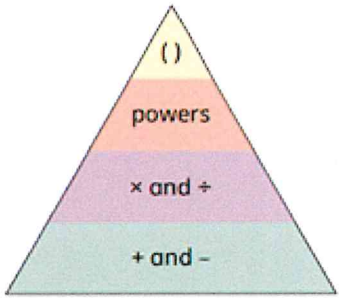
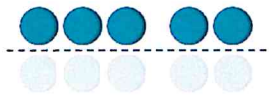
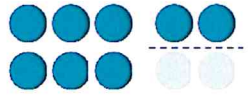


Division

Year 6	• Perform mental calculations, including with mixed operations and large numbers. • Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. • Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. • Divide numbers by 10, 100 and 1,000 giving answers up to three decimal places. • Use written division methods in cases where the answer has up to two decimal places. • Associate a fraction with division and calculate decimal fraction equivalents. • Divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$] • Solve problems involving the calculation of percentages.
Progression of skills	**Key representations**
Short division Encourage children to interpret remainders in context, for example knowing that "4 remainder 1" could mean 4 complete boxes with 1 left over so 5 boxes will be needed.	There are ... groups of ... hundreds/tens/ones/ in ... I can exchange 1 ... for 10 ...  

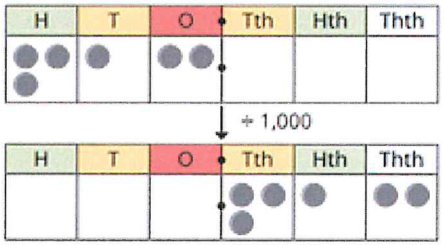
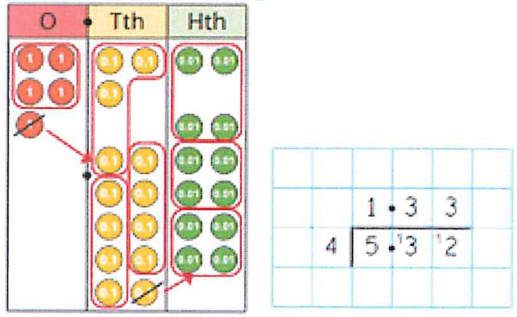
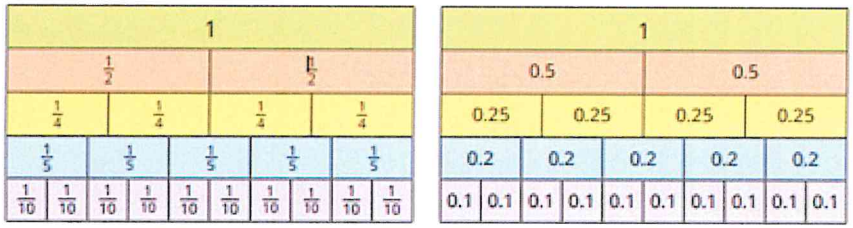
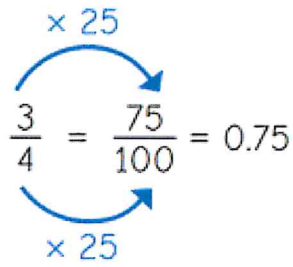
Division

White Rose MATHS

Progression of skills	Key representations
Mental strategies Include partitioning and number line strategies outlined in Y5 as well as division using factors.	To divide by … , I can first divide by … and then divide the answer by … $240 \div 60 = 240 \div 10 \div 6$  $480 \div 24 = 480 \div 4 \div 6$  $9{,}120 \div 15 = 9{,}120 \div 5 \div 3$ 
Long division The long division method is introduced for the first time. Two alternative methods are shown.	Method 1  Method 2 
Order of operations Calculations in brackets should be done first, then powers. Multiplication and division should be performed before addition and subtraction.	… has greater priority than …, so the first part of the calculation I need to do is …   $(6 + 4) \div 2 = 5$  $6 + 4 \div 2 = 8$

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 ... , I move the digits ... places to the right.  312 ÷ 10 = 31.2 312 ÷ 100 = 3.12 312 ÷ 1,000 = 0.312 906 ÷ 10 = 90.6 906 ÷ 100 = 9.06 906 ÷ 1,000 = 0.906	
Divide decimals by integers This is the first time children divide decimals by numbers other than 10, 100 or 1,000	I know that ... ÷ ... = ..., so I also know that ... ÷ ... = ...  39 ÷ 3 = 13 3.9 ÷ 3 = 1.3 0.39 ÷ 3 = 0.13	I need to exchange 1 ... for 10 ... 
Decimal and fraction equivalents	The fraction ... is equivalent to the decimal ...  $\frac{1}{5} = 0.2$ $\frac{2}{5} = 0.4$ $\frac{3}{5} = 0.6$	$\frac{\square}{\square}$ is equal to $\frac{\square}{100}$ 

Division

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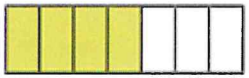
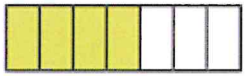
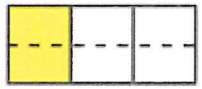
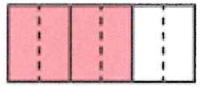
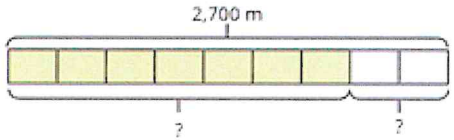
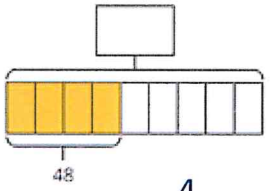
Progression of skills	Key representations		
Divide a fraction by an integer This is the first time children divide fractions by an integer.	... ones divided by 2 is ... ones so ... sevenths divided by 2 is ... sevenths.  $\frac{4}{7} \div 4 = \frac{1}{7}$  $\frac{4}{7} \div 2 = \frac{2}{7}$	I am dividing by ... , so I can split each part into ... equal parts.  $\frac{1}{3} \div 2 = \frac{1}{6}$	... is equivalent to ... so ... ÷ ... = ... ÷ ...  $\frac{2}{3} = \frac{4}{6}$ so $\frac{2}{3} \div 4 = \frac{4}{6} \div 4 = \frac{1}{6}$
Fraction of an amount Children divide and multiply to find fractions of an amount. Bar models can still be used to support understanding where needed.	To find $\frac{1}{\square}$ I divide by ... $\frac{1}{2}$ of $36 = 36 \div 2$ $\frac{1}{12}$ of $36 = 36 \div 12$	If $\frac{1}{\square}$ is equal to ..., then $\frac{\square}{\square}$ are equal to ...  $\frac{7}{9}$ of $2{,}700 = \frac{1}{9}$ of $2{,}700 \times 7$	If $\frac{\square}{\square}$ is equal to ..., then the whole is equal to ...  $\frac{4}{9}$ of $\_\_ = 48$

Division

White Rose MATHS

Progression of skills	Key representations
Calculate percentages Children first learn how to find 1%, 10%, 20%, 25% and 50% before using multiples of these amounts to find any percentage.	There are … lots of … % in 100% To find … %, I need to divide by … 50% of … = …÷ 2 25% of … = …÷ 4
	… % is made up of … %, and … % To find 30%, I can find 10% and then multiply it by 3 To find 23%, I can use 10% × 2 and 1% × 3 To find 99%, I can find 1%, then subtract from 100%
Calculations involving ratio Encourage children to see the multiplicative relationship between ratios. They will need to multiply or divide each value by the same number to keep the ratio equivalent. Double number lines and ratio tables help children to see both horizontal and vertical multiplicative relationships.	For every … , there are … For every 6 children on a school trip, there is 1 adult. The ratio of children to adults is 6 : 1