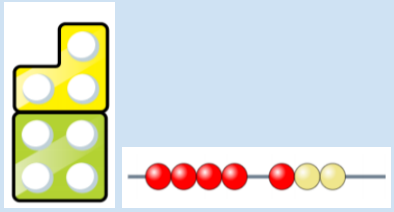
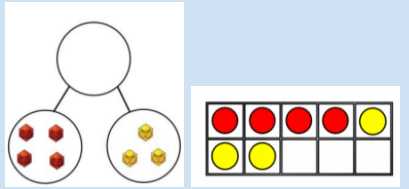
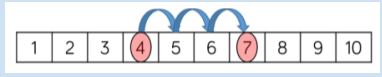
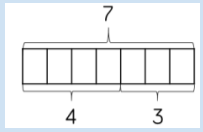
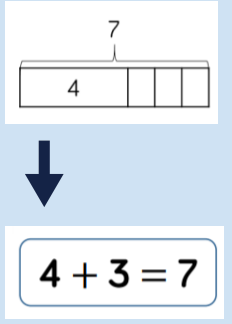
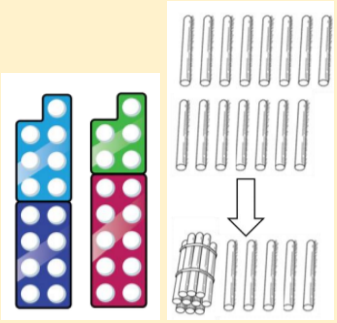
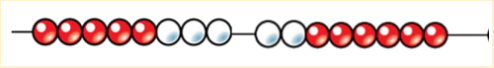
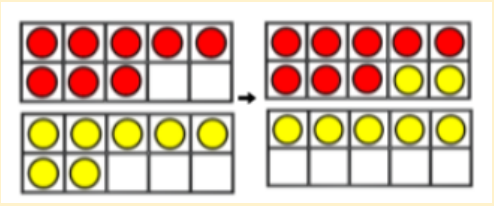
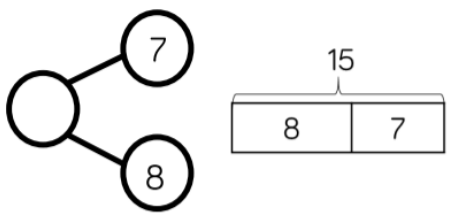
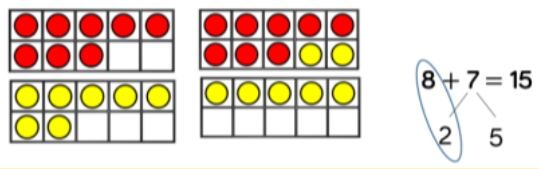
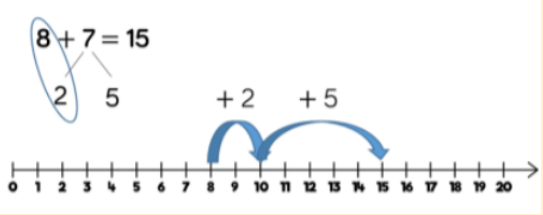
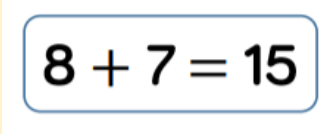
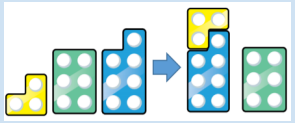
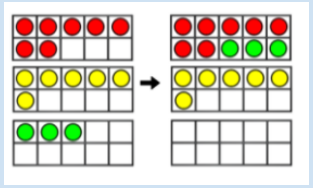
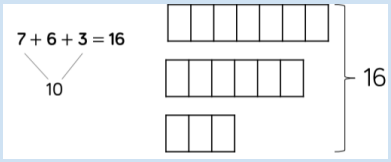
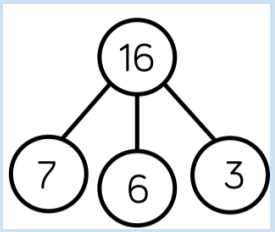
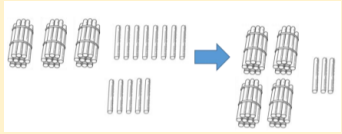
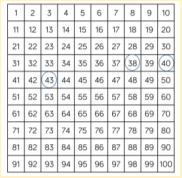
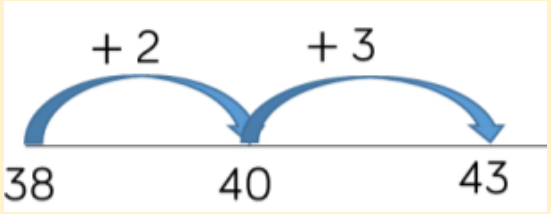
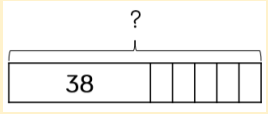
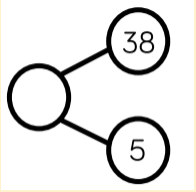
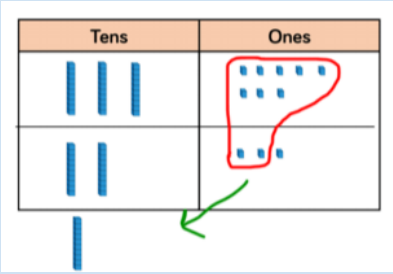
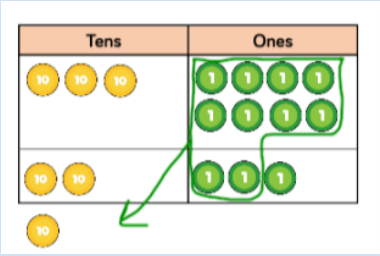
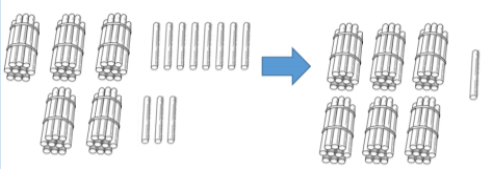
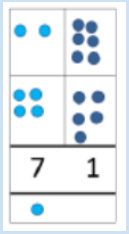
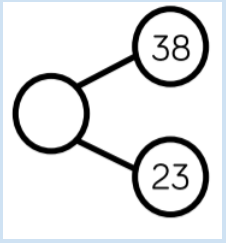
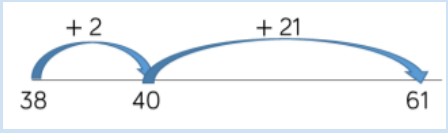
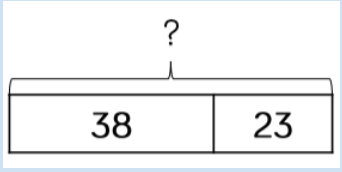
Pilgrim Primary Maths Calculation Policy 2024-25

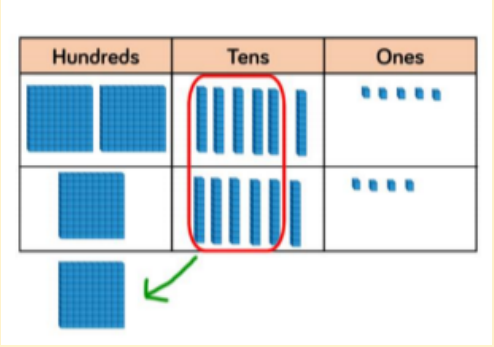
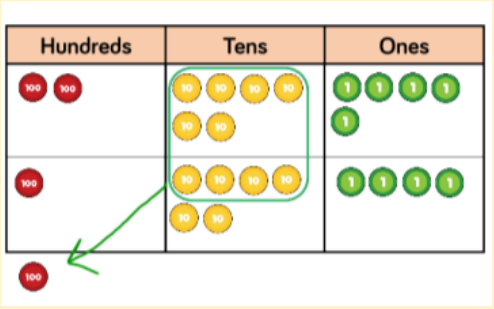
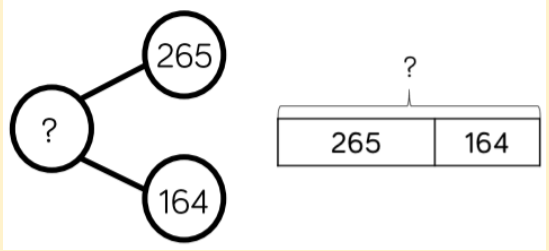
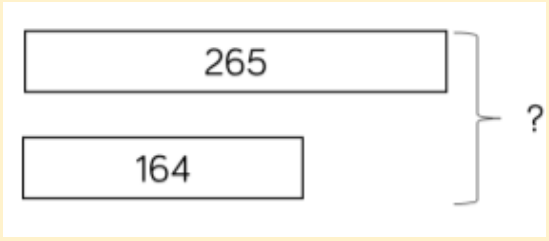
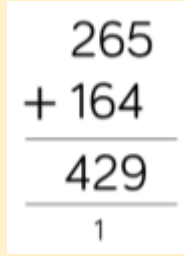
This calculation policy is a working document, created by Rachel Hardington for Pilgrim Primary Academy. This policy has been adapted in line with the guidance from the White Rose Hub calculation policy. It is highly recommended that teachers look at the WRH calculation policies separately as they have additional guidance and information specifically about the purpose and use of each type of concrete apparatus. The year group allocated is the year that the skill is first introduced, teachers should always refer to and plan opportunities to recap skills taught in prior year groups.

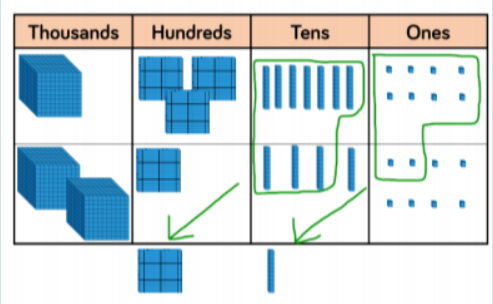
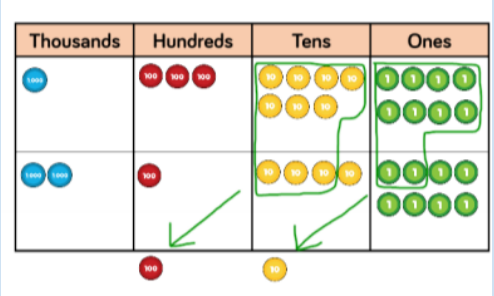
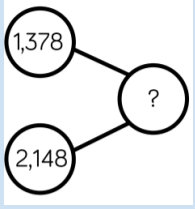
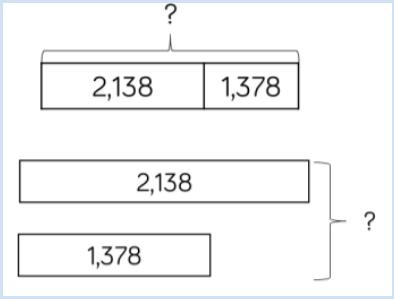
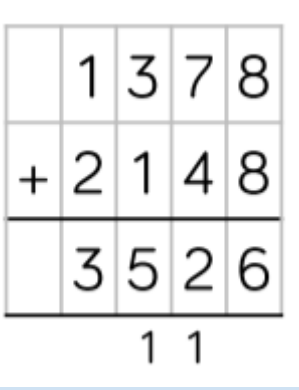
Skills for addition	Year group	Concrete	Pictorial	Abstract
Add two 1-digit numbers to 10	**1**	Children explore addition using cubes, place value counters, numicon and bead strings.  	Additions are represented using part-whole models, place value grids and number lines.    When introducing number lines children should count on in jumps of one.	Use the pictorial representations to move into abstract. Children will need to be introduced to the + symbol. e.g.  Teach children to start with the biggest number first especially for mental arithmetic.

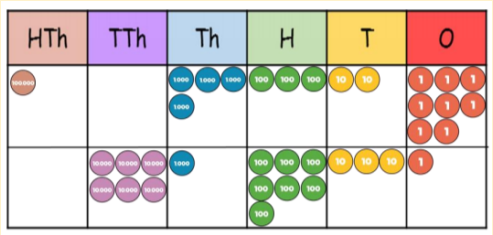
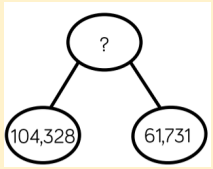
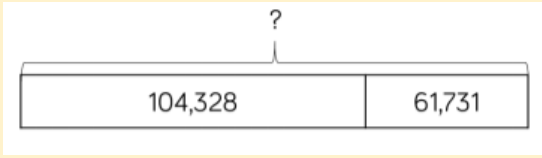
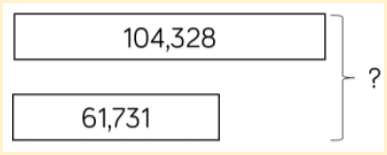
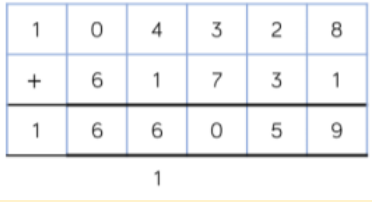
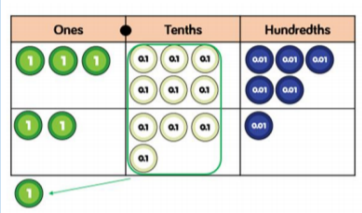
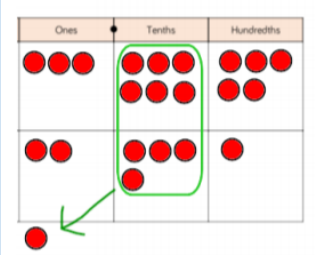
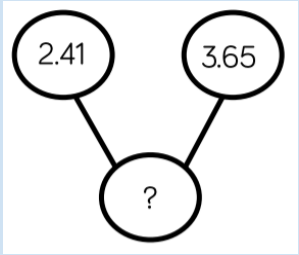
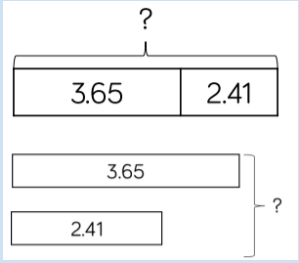
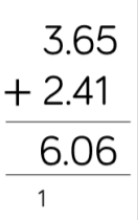
Add 1 and 2 digit numbers to 20	**1**	Children explore addition using numicon, straws, bead strings and counters. It is important to introduce the concept of grouping in 10s (as shown below with the straws and place value grid).   	Additions are represented using part-whole models, place value grids and number lines.  Children are to use their knowledge of number bonds to partition numbers, in order to make 10 (place value grid) and jump on to 10 (number line).   	Children record the addition using the + symbol.  Mental strategy: Place the larger number in your head and count on the smaller number to find your answer. As children become more confident, they should be able to partition mentally. 8 + 2 = 10. 10 + 5 = 15.

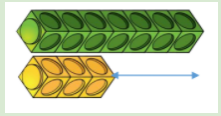
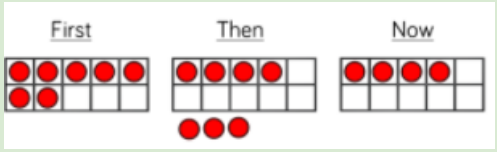
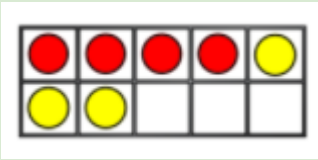
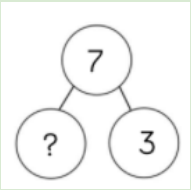
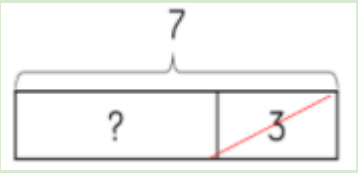
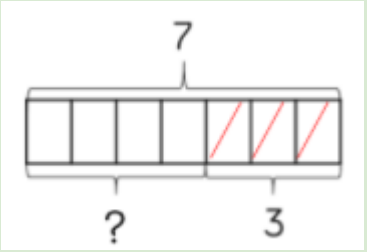
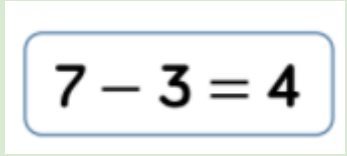
Add three 1 digit numbers	**2**	Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers. These include numicon and place value counters / grids.  	The following images represent part whole models in different ways.   	It is important to introduce the concept and vocabulary of 'commutativity' - that the order of the numbers can be changed but the answer is still the same. Children record the addition using the + symbol. $7 + 6 + 3 = 16$ Mental strategy: Look for pairs to 10 first.
Add 1 and 2 digit numbers to 100	**2**	Number lines can be used to count on.  Straws and hundred squares can support children to find the number bond to 10 to make the addition more efficient.  	Children can represent the additions on a blank number line - making links with their number bonds to 10.  Other representations include part whole models and bar models.   	Children record the addition using the + symbol. $38 + 5 = 43$ Mental strategy: If I am at 38, how many do I need to add to get to 40? How many do I add on now? (How many are left?)

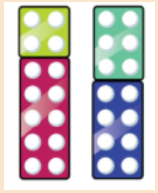
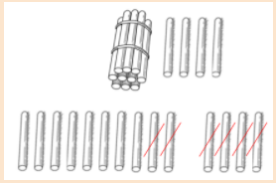
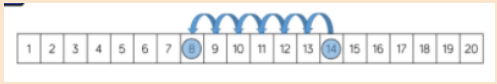
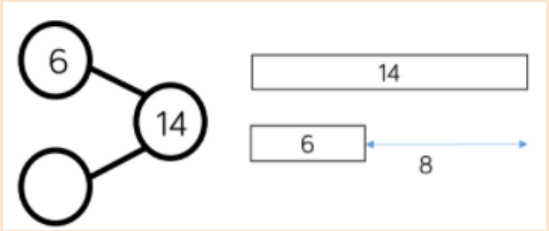
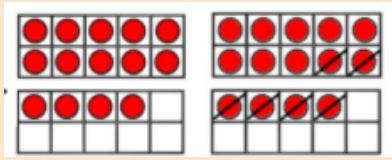
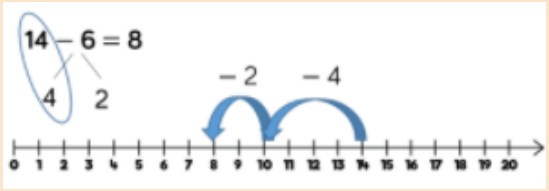
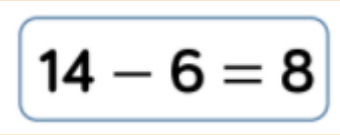
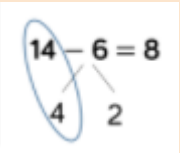
Add two 2 digit numbers (including an exchange)	**2**	At this stage children will be introduced to column addition. They will start using manipulatives alongside the written method. It is essential that children understand <u>why</u> we have to exchange and how this affects each column.   **Note**: Straws become a less efficient method as numbers get larger. 	Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding. Other representations include number lines, part whole models and bar models.     	Children should be taught to use the written method alongside the concrete and pictorial. This is essential for children to understand the concept of exchanging. $38 + 23 = 61$ $\begin{array}{r} 38 \\ +\ 23 \\ \hline 61 \\ \hline 1 \end{array}$

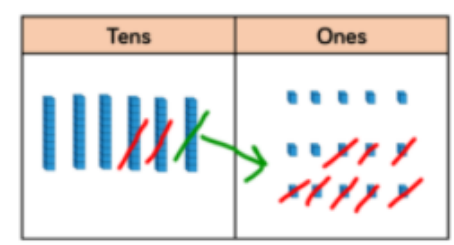
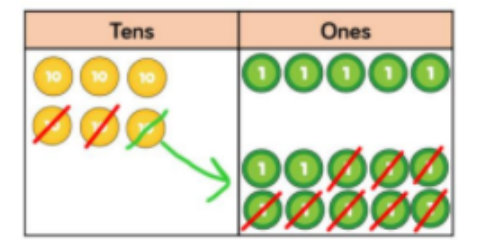
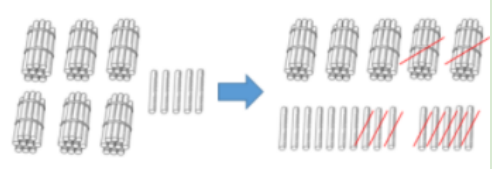
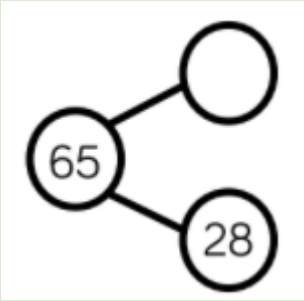
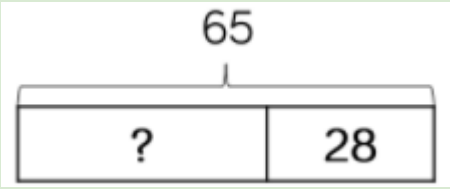
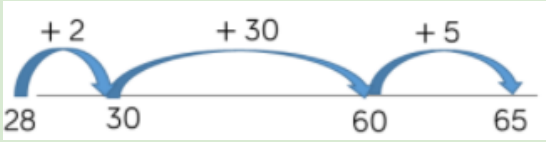
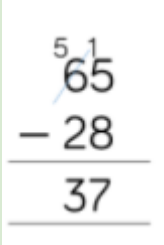
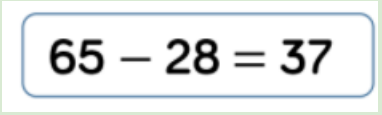
Add with up to 3 digit numbers (including an exchange)	**3**	Base 10 and place value counters are the most effective manipulatives when adding numbers up to 3 digits. **Note**: Plain counters on a place value grid can also be used. It is essential that the written method is used alongside the concrete.  	Pictorial representations include part whole models and bar models. Children can be supported by images of the dienes and counters in the different models.  	Children should be taught to use the written method alongside the concrete and pictorial. This is essential for children to understand the concept of exchanging.  

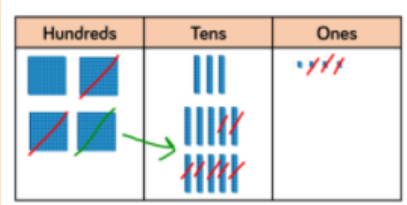
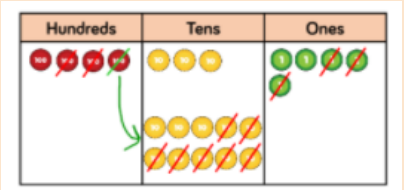
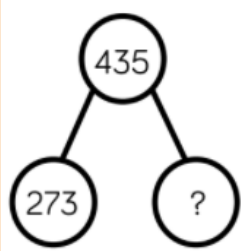
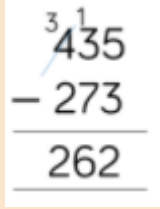
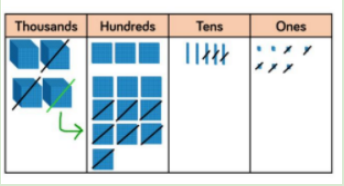
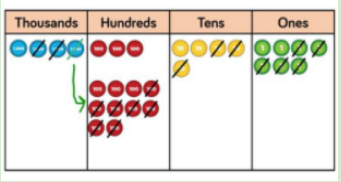
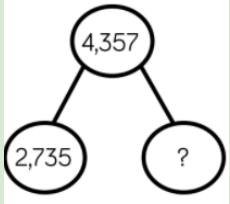
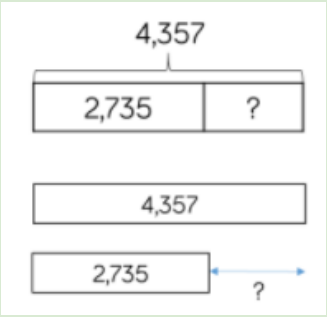
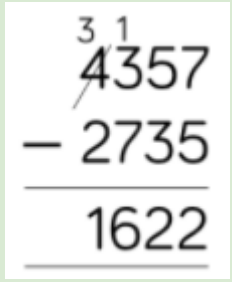
Add with up to 4 digits (including more than 1 exchange)	**4**	Base 10 and place value counters are the most effective manipulatives when adding numbers up to 4 digits. **Note**: Plain counters on a place value grid can also be used.   	Pictorial representations include part whole models and bar models. Children can be supported by images of the dienes and counters in the different models.   	Children should be taught to use the written method alongside the concrete and pictorial. This is essential for children to understand the concept of exchanging.  **1,378 + 2,148 = 3,526**

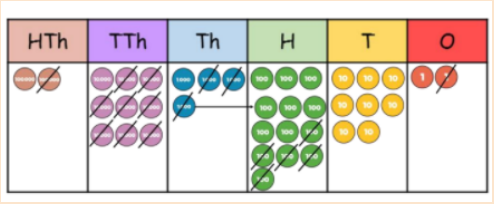
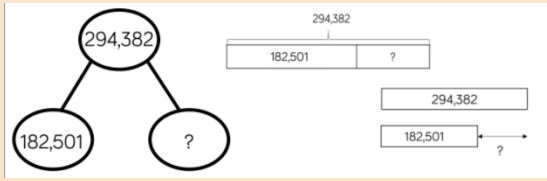
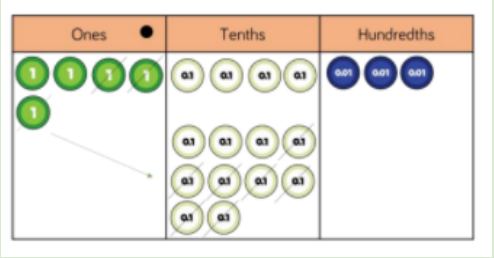
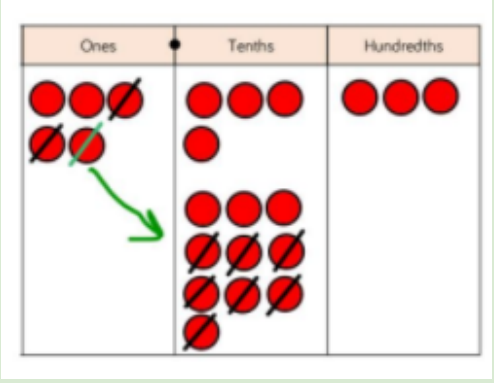
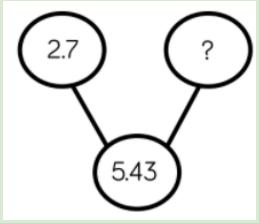
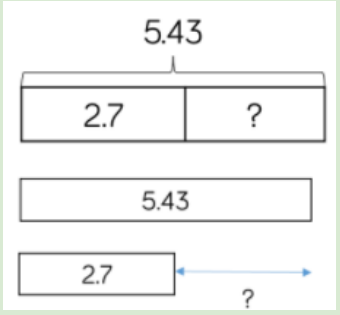
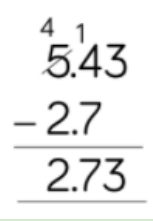
Add with more than 4 digits	**5**	Place value counters or plain counters on a place value grid are the most effective concrete resources when adding more than 4 digits. 	Pictorial representations include part whole models and bar models.   	Children should be taught to use the written method alongside the concrete and pictorial. This is essential for children to understand the concept of exchanging.  104,328 + 61,731 = 166,059
Add with up to 3 decimal places	**5**	The use of place value counters and plain counters are the most efficient method when adding decimals with 1,2 or 3 decimal places.  	Pictorial representations include part whole models and bar models.  	Children should be taught to use the written method alongside the concrete and pictorial.  3.65 + 2.41 = 6.06 **Note**: Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

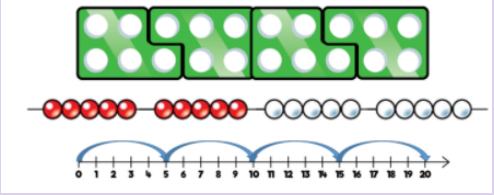
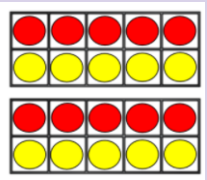
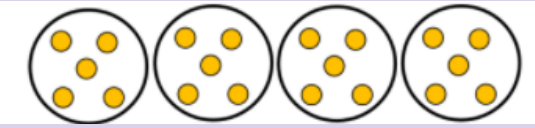
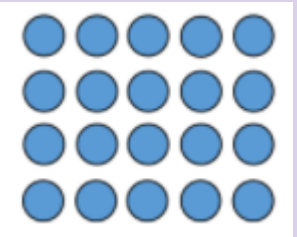
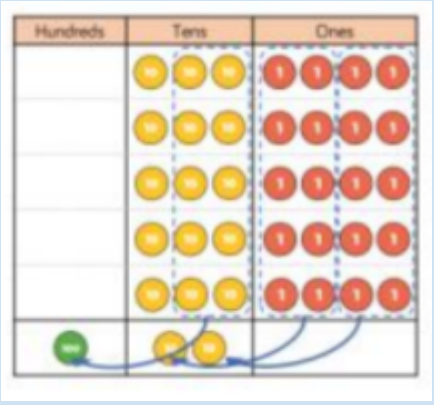
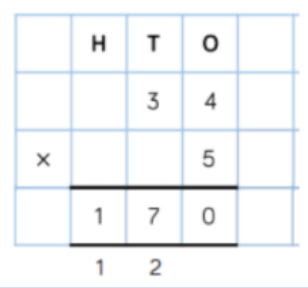
Skills for subtraction	Year group	Concrete	Pictorial	Abstract
Subtract two 1-digit numbers to 10	**1**	Children explore subtraction using cubes, place value counters, numicon, bead strings and number lines.     	Tens frames, part-whole models and bar models support partitioning.    Bar models with two bars can support finding the difference. Single bar models can support reduction as can tens frames.  	Use the pictorial representations to move into abstract. Children will need to be introduced to the - symbol. 

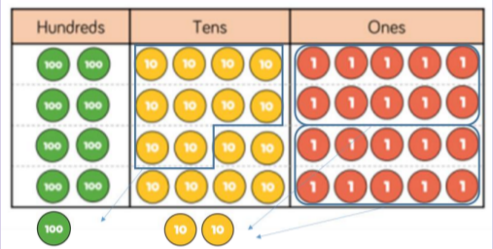
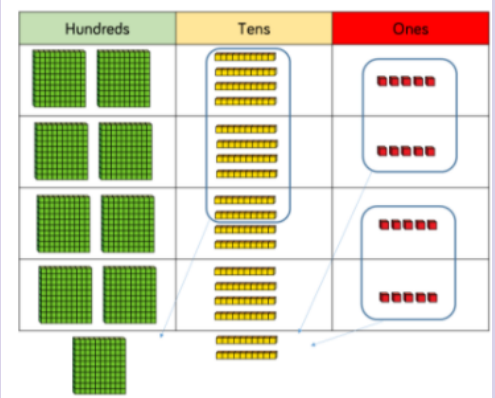
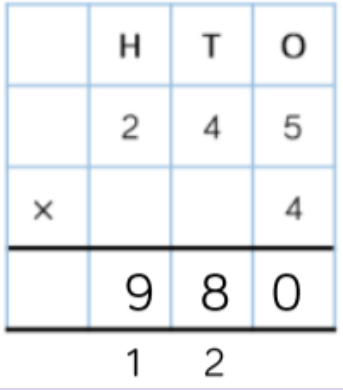
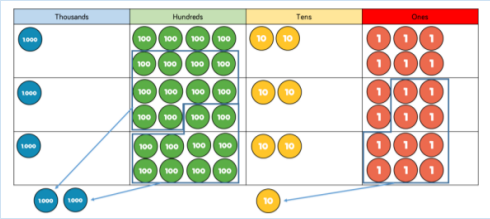
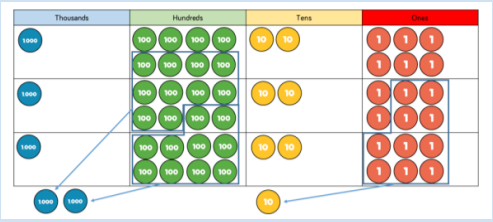
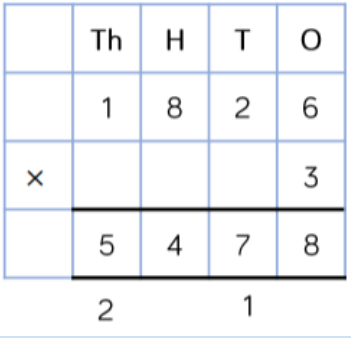
Subtract 1 and 2-digit numbers to 20	**1**	When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.   	Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Tens frames and number lines are really useful for this.   	 

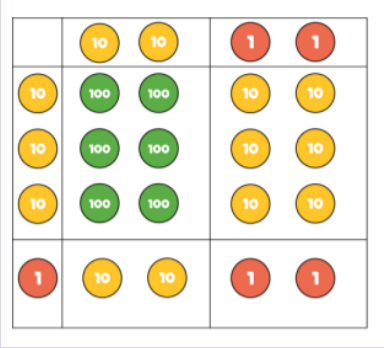
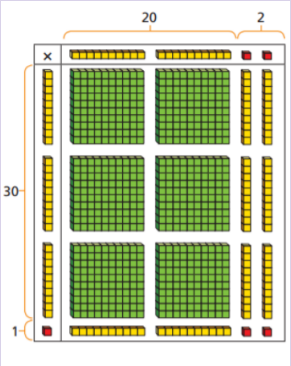
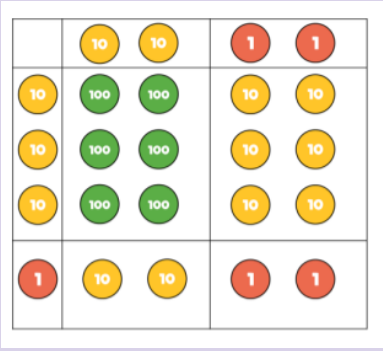
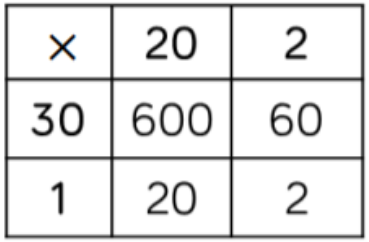
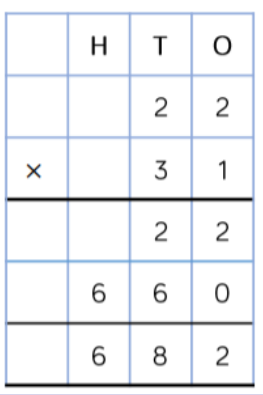
Subtract 1 and 2-digit numbers to 100 & subtract two 2-digit numbers.	**2**	At this stage children will be introduced to column subtraction. They will start using manipulatives alongside the written method.   **Note**: Straws become a less efficient method as numbers get larger. 	  Children can use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.  	Children should be taught to use the written method alongside the concrete and pictorial. This is essential for children to understand the concept of exchanging.  

Subtract up to 3-digits	**3**	Base 10 and place value counters are the most effective manipulatives when subtracting up to 3-digits.   	Pictorial representations include part whole models and bar models.   	Children should be taught to use the written method alongside the concrete and pictorial.  435 – 273 = 262
Subtract up to 4-digits	**4**	Base 10 and place value counters are the most effective manipulatives when subtracting up to 4-digits.   **Note**: Plain counters on a place value grid can also be used.	Pictorial representations include part whole models and bar models.   	Children should be taught to use the written method alongside the concrete and pictorial.  4,357 – 2,735 = 1,622

Subtract more than 4-digits	**5**		Pictorial representations include part whole models and bar models. 	At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently. **294,382 – 182,501 = 111,881** 
Subtract with up to 3 decimals places	**5**	 	Pictorial representations include part whole models and bar models.  	Children should be taught to use the written method alongside the concrete and pictorial.  **5.43 – 2.7 = 2.73** **Note**: Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

Skills for multiplication	Year group	Concrete	Pictorial	Abstract
Solve one-step problems with multiplication	1/2	Numicon, bead strings and number lines should be used to introduce repeated addition. In Y1 children use concrete and pictorial methods to introduce multiplication. 	  Arrays: 	 One bag holds 5 apples. How many apples do 4 bags hold? In Year 2 children are introduced to the x symbol. 5 x 4 = 20.
Multiply 2-digit by 1-digit numbers	3/4	Children use counters to represent each part of the multiplication. 		**Short multiplication**  $34 \times 5 = 170$

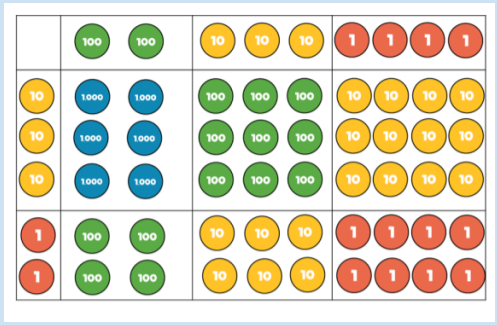
Multiply 3-digit by 1-digit numbers	**4**	Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.	 	 $245 \times 4 = 980$
Multiply 4-digit by 1-digit numbers	**5**	By this stage, place value counters are the best manipulative to support children in their understanding of the written method. 	 **Note**: If children are multiplying larger numbers and are struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.	$1{,}826 \times 3 = 5{,}478$ 

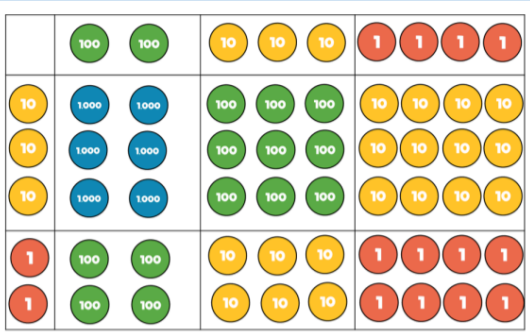
Multiply 2-digit by 2-digit numbers	**5**	When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by Base 10. 	 	The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.   $22 \times 31 = 682$

Multiply 2-digit by 3-digit numbers

5

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



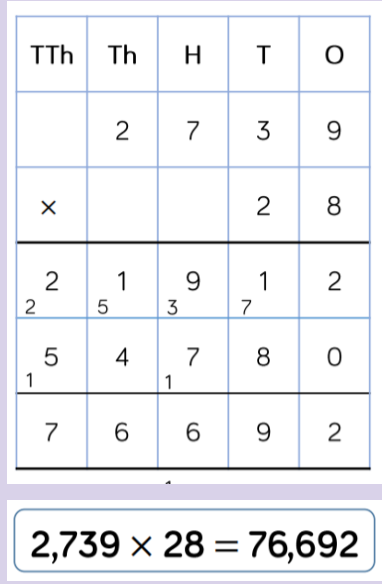


Encourage children to move towards the formal written method, seeing the links with the grid method.

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

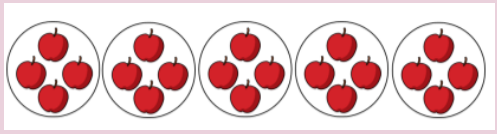
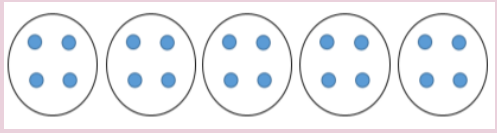
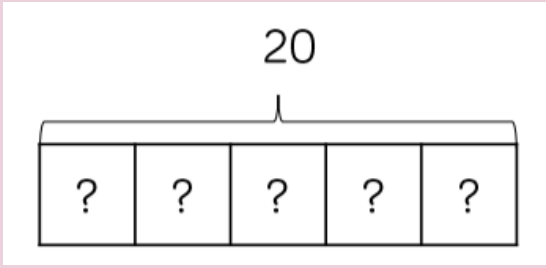
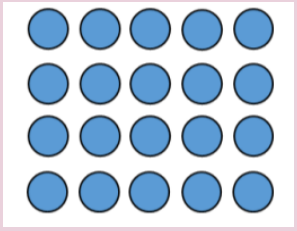
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
$^{1}7$	$^{1}0$	2	0
7	4	8	8

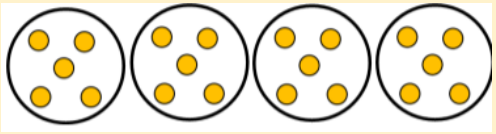
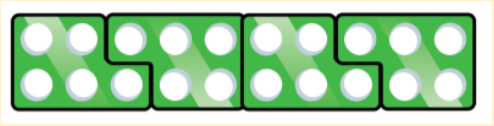
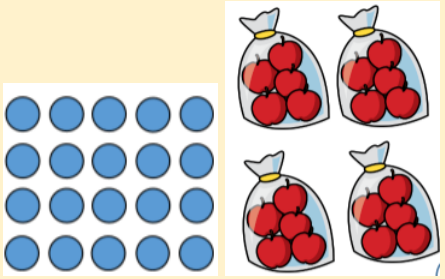
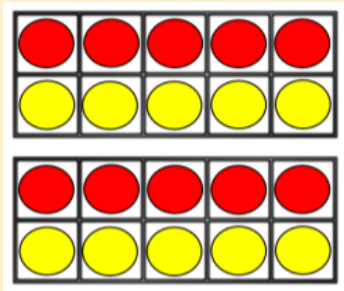
$234 \times 32 = 7{,}488$

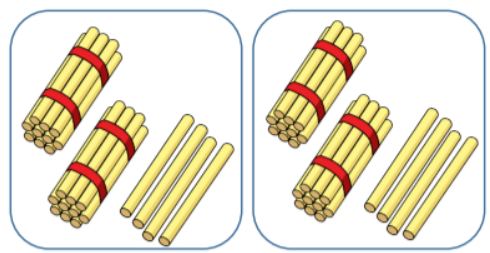
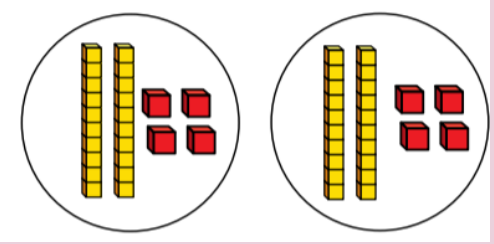
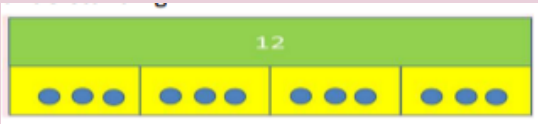
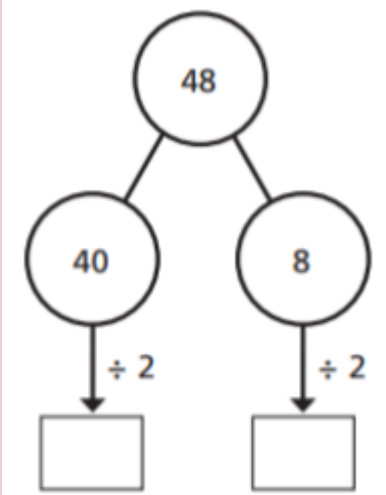
Multiply 2-digit but 4-digit numbers	**5/6**	By this stage children should be confident in the written method and not require concrete apparatus.		

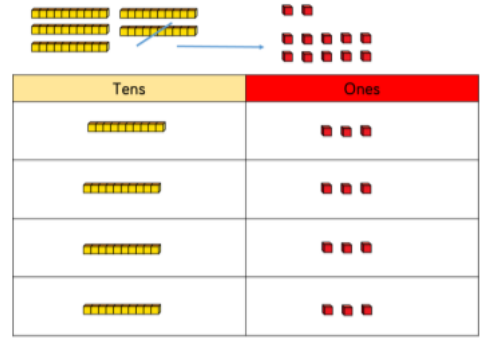
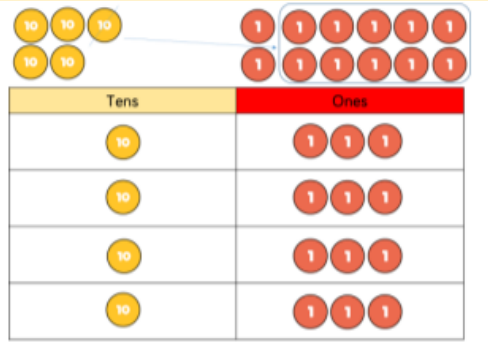
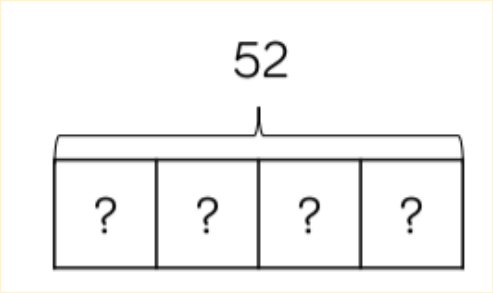
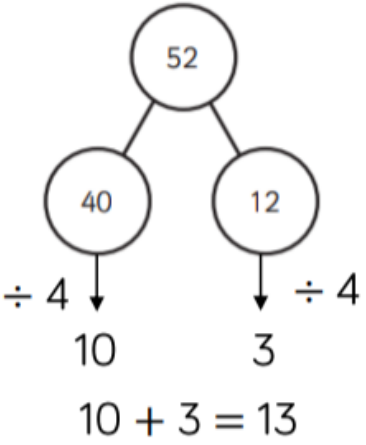
TTh	Th	H	T	O
	2	7	3	9
×			2	8
2 (2)	1 (5)	9 (3)	1 (7)	2
5 (1)	4	7 (1)	8	0
7	6	6	9	2

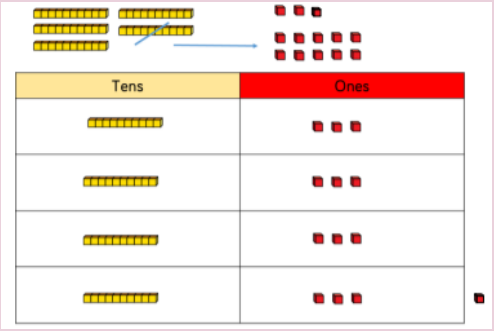
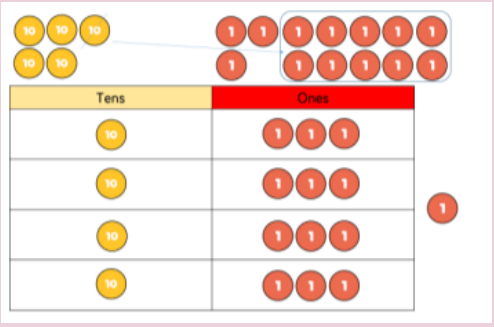
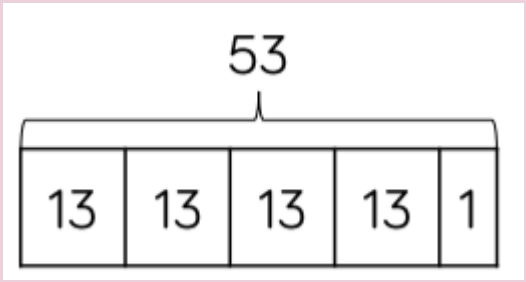
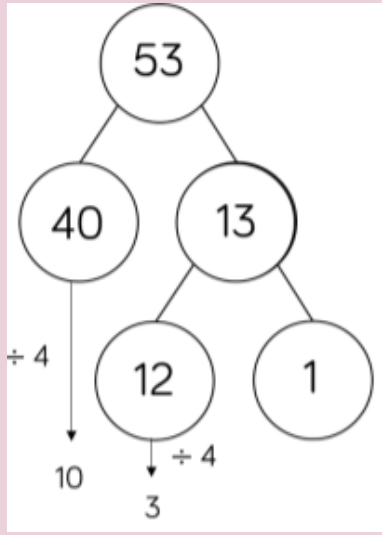
$2{,}739 \times 28 = 76{,}692$

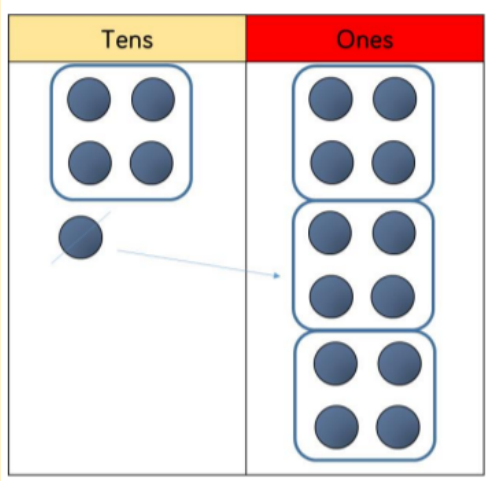
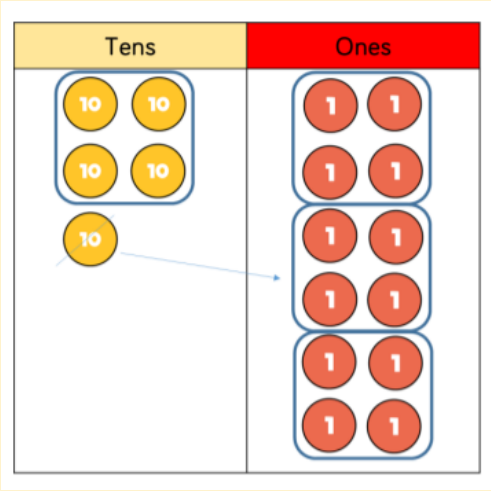
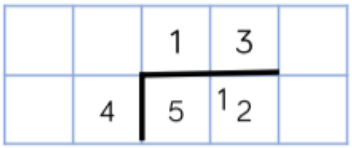
Skills for division	Year group	Concrete	Pictorial	Abstract
Solve one-step problems with division (sharing)	1/2	Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record divisions formally.  	 	In Year 2 children are introduced to the divide symbol. $20 \div 5 = 4$

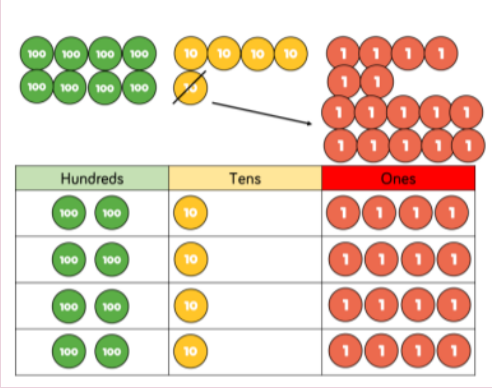
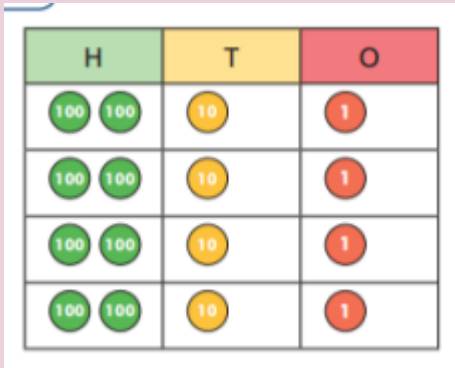
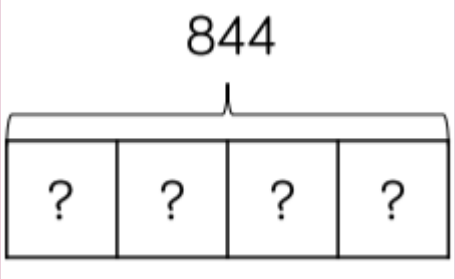
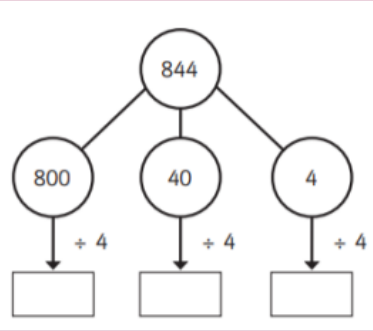
Solve one-step problems with division (grouping)	**1/2**	Children solve problems by grouping and counting the number of groups.   They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division. 	  Grouping encourages children to count in multiples and links to repeated subtraction on a number line.  	There are 20 apples altogether. They are put in bags of 5. How many bags are there? $20 \div 5 = 4$

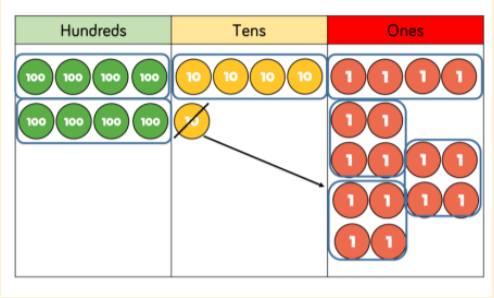
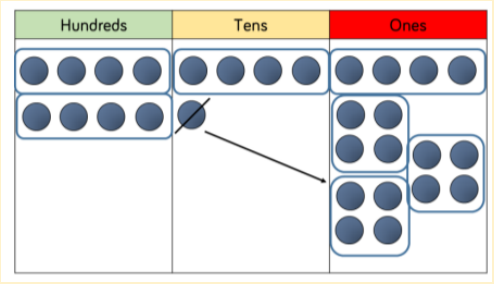
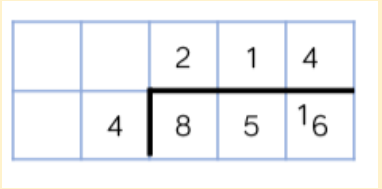
Divide 2-digits by 1-digit (no exchange sharing)	**1/2**	When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base 10 and place value counters can all be used to share numbers in equal group.    	Children use bar models to support understanding.  	Part whole model can give children a clear written method that matches the concrete representation.  $48 \div 2 = 24$

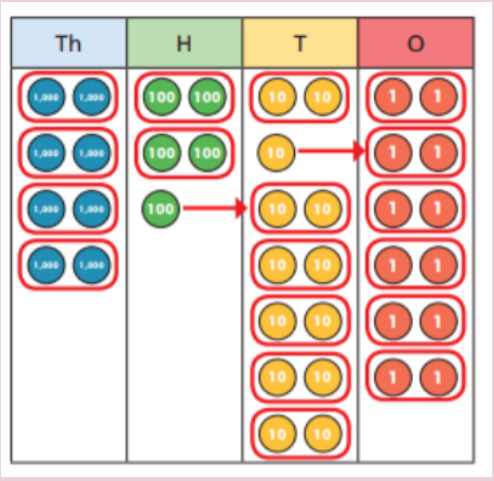
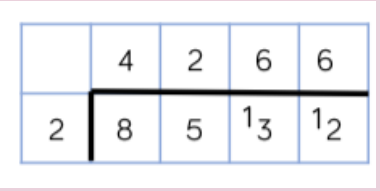
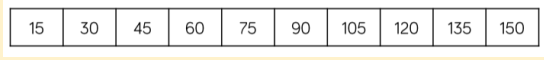
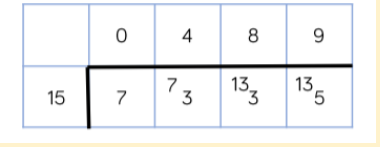
Divide 2-digits by 1-digit (sharing with exchange)	**3/4**	When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.  Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.  	 Flexible partitioning in a part-whole model supports this method.	 **52 ÷ 4 = 13**

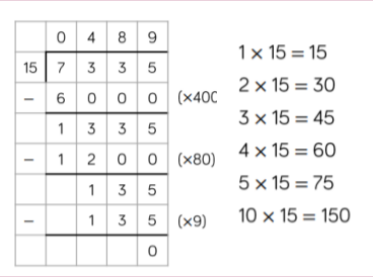
Divide 2-digits by 1-digit (sharing with remainders)	**3/4**	When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.   	 Flexible partitioning in a part-whole model supports this method.	 $53 \div 4 = 13\ r1$

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

Divide 3-digits by 1-digit (sharing with exchange)	**4**	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.	

Divide 3-digits by 1-digit (grouping)	**4/5C**	Children can continue to use grouping to support their understanding of short division when dividing by a 3-digit numbers 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 draw their own counters and group them through a more pictorial method.	

Divide 4-digits by 1-digit (grouping)	**5**	Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. 	**Note:** Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.	 $8{,}532 \div 2 = 4{,}266$
Divide multi-digits by 2-digits (short division)	**6**	When children begin to divide up to 4-digit numbers 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.  $7{,}335 \div 15 = 489$

Divide multi-digits by 2-digits (long division)	**6**	By this stage children should be confident in the written method and not require concrete apparatus.		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.  **7,335 ÷ 15 = 489**