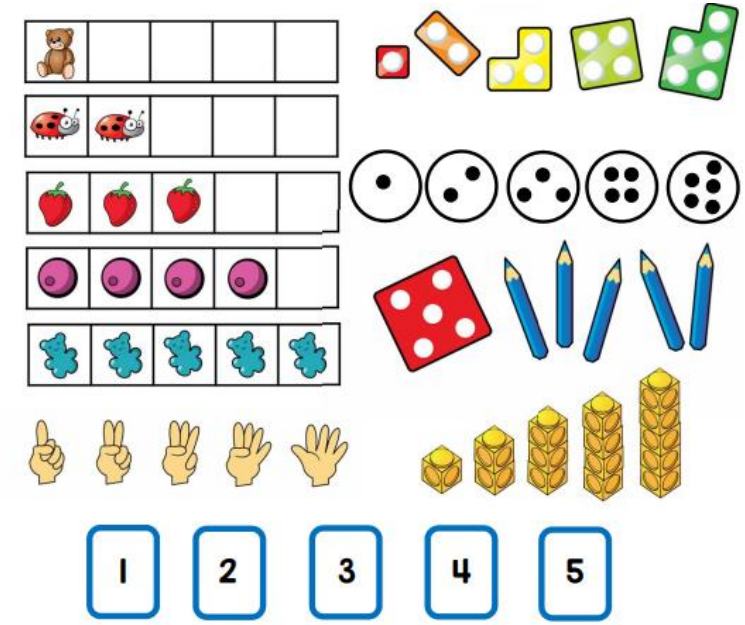
Holland Park Calculation Policy

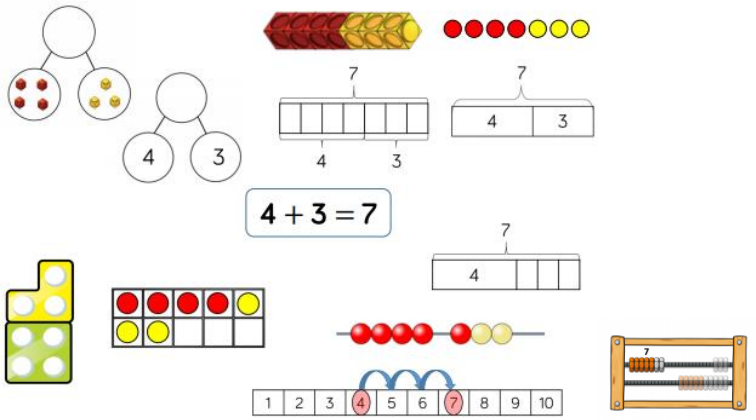
This document is broken down into five sections - early years, addition, subtraction, multiplication and division.

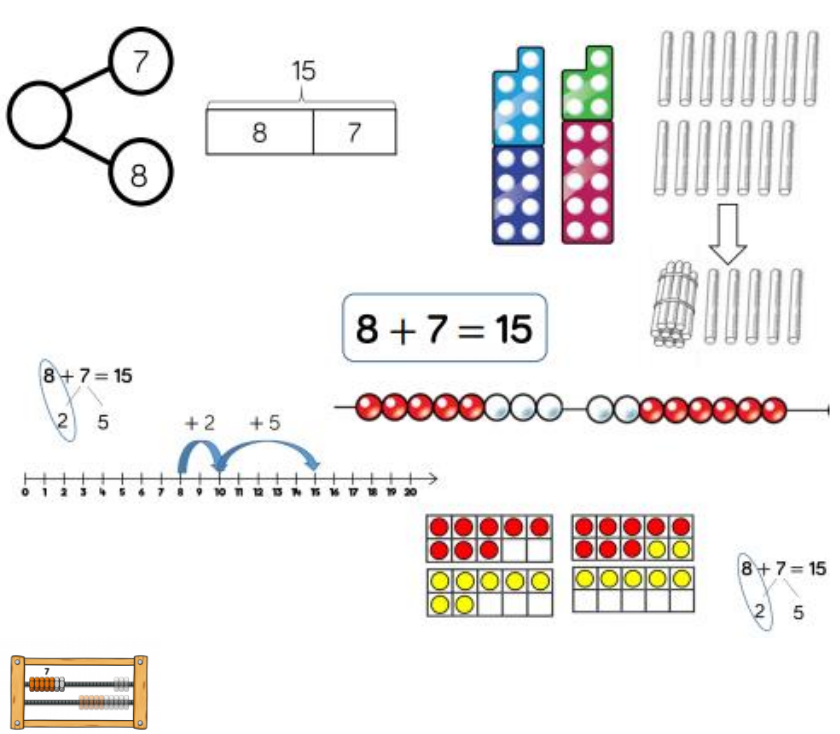
The methods used will be used across the school in the appropriate age groups but earlier methods can be revisited, especially if a child is finding a new concept difficult or is not working at the same level as the rest of the class. Resources used within lessons are carefully selected to ensure a deep understanding of the methods being taught and should be used to enhance the teaching of formal abstract methods.

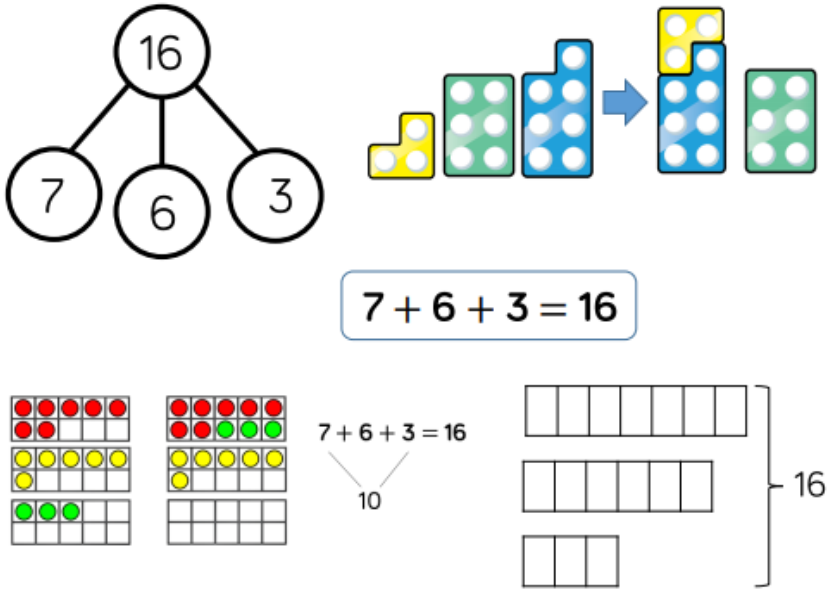
Early Years

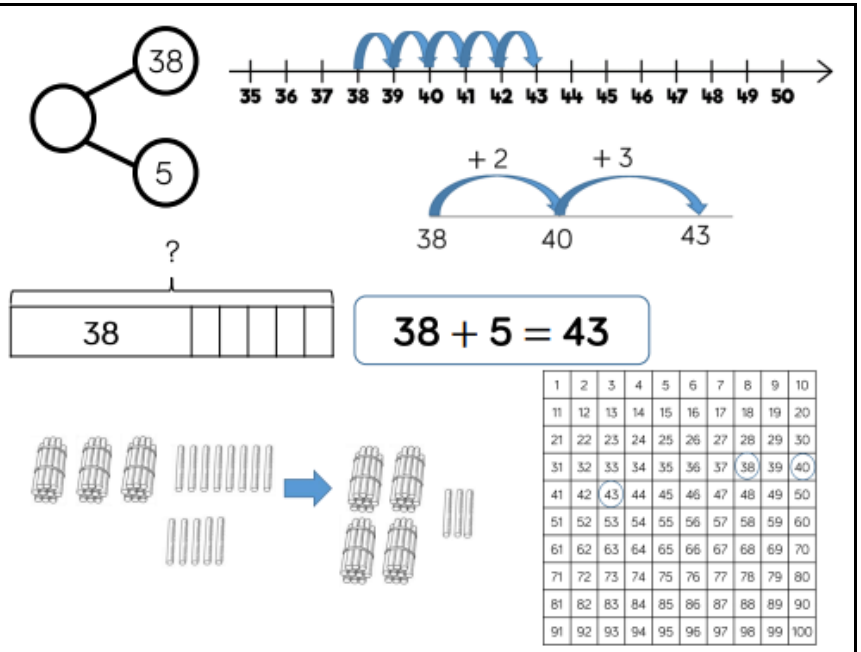
Year Group	Explanation	Models used to support learning
R	**ELG: Number Children at the expected level of development will:** - Have a deep understanding of number to 10, including the composition of each number; - Subitise (recognise quantities without counting) up to 5; - Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts. **ELG: Numerical Patterns Children at the expected level of development will:** - Verbally count beyond 20, recognising the pattern of the counting system; - Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity; - Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.	

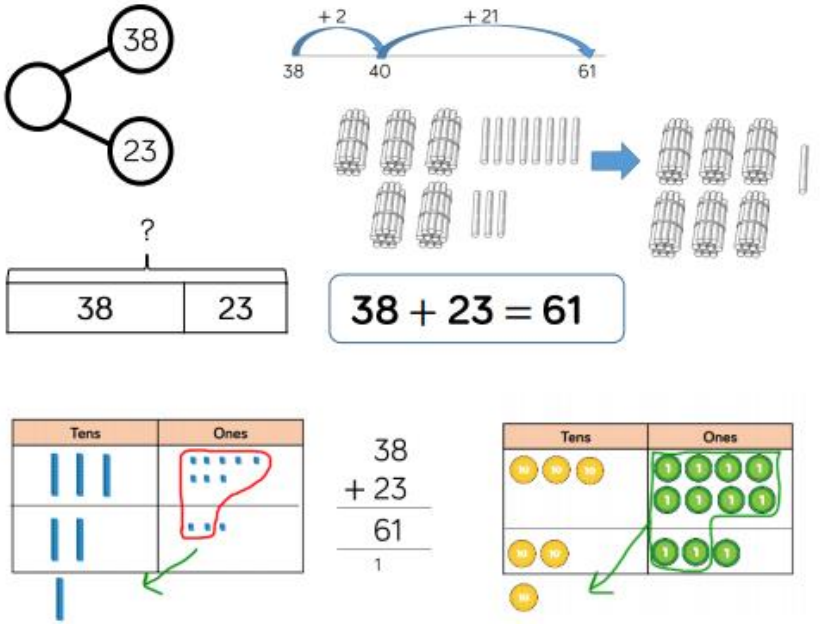
Addition

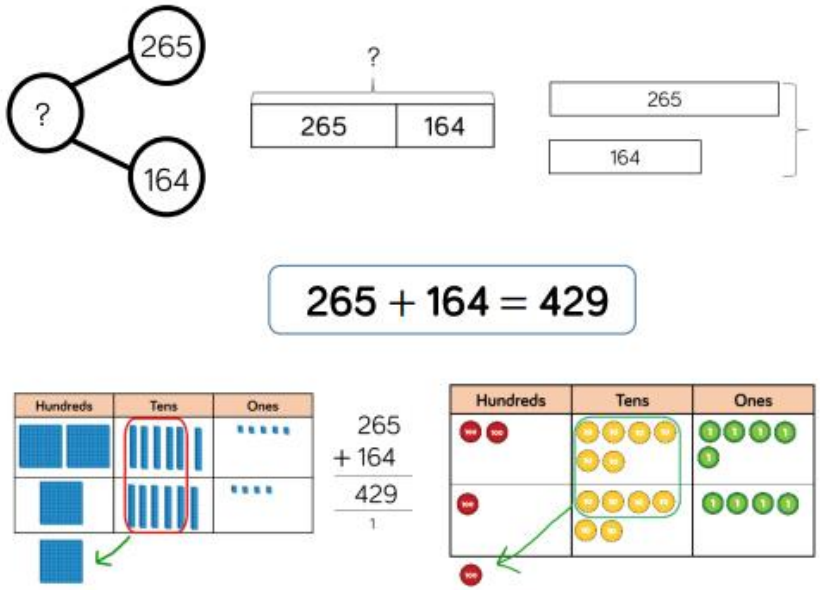
Year Group	Explanation	Models used to support learning
1	<u>Add 1 digit numbers within 10.</u> When adding numbers to 10, children can explore both aggregation (joining two or more groups together) and augmentation (adding on from a given number). The use of part-whole model, continuous bar models, numicon, tens frames and bead strings will all be used to develop understanding in a concrete and pictorial manner before moving onto abstract models.	

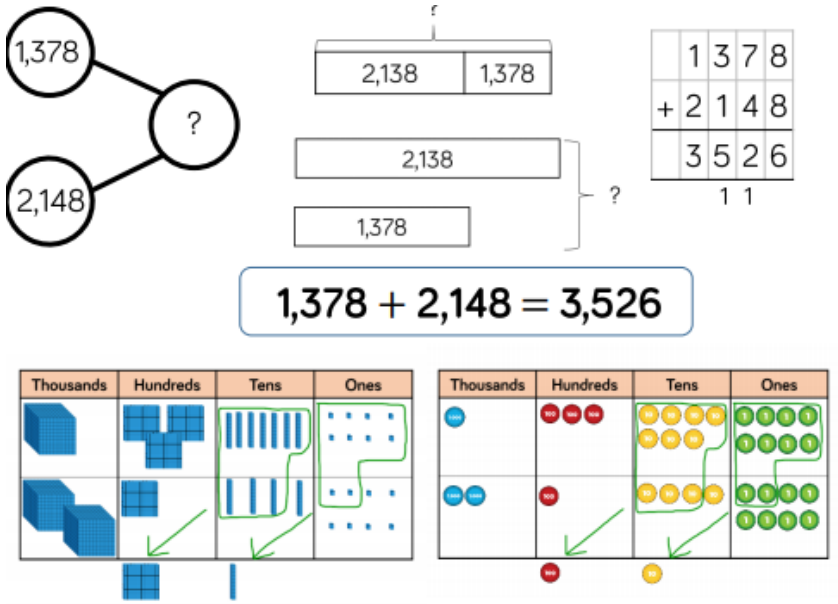
1 & 2	<u>Add 1 and 2 digit numbers to 20</u> The importance of ten ones equalling one ten will be highlighted when teaching adding to 20. Groups of straws will be used to demonstrate this in a concrete way before moving on to pictorial and finally abstract methods. A range of manipulatives will be used to represent this exchange. These concrete resources will be used alongside number lines and abstract recording methods to develop understanding about how to partition their jumps.	

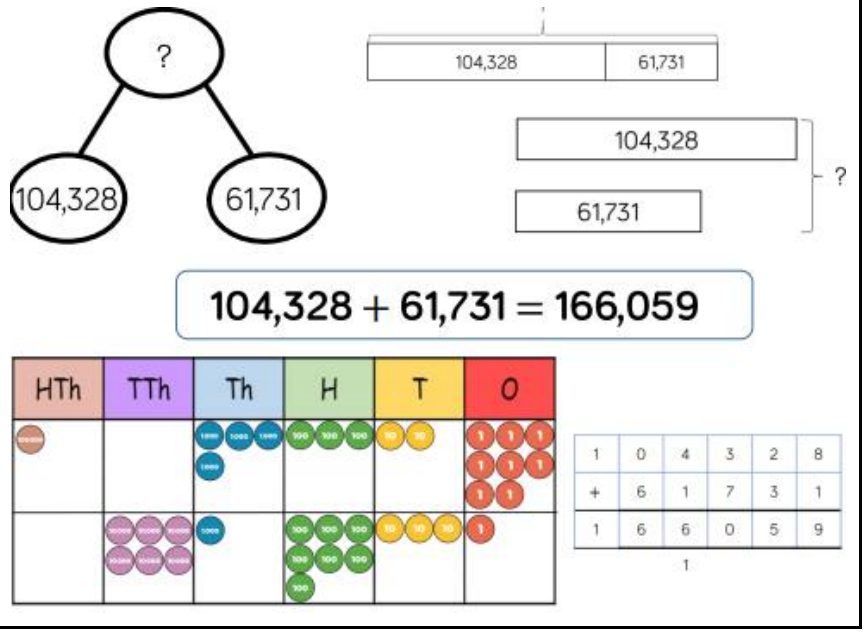
2	<u>Add three 1 digit numbers</u> WHen adding three 1-digit numbers, children will be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children with their understanding of commutativity (i.e. that 3 + 2 + 4 is the same as 2 + 4 + 3). Manipulatives that highlight bonds to 10 (such asnumicon and tens frames) will be used alongside part whole models, bar models and abstract recording methods to reinforce understanding.	

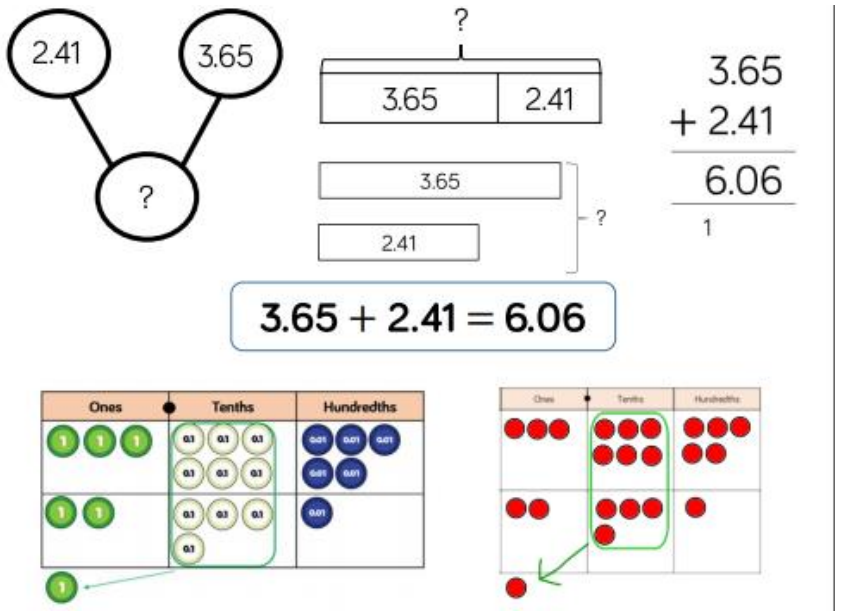
2 & 3	<u>Add 1 digit and 2 digit numbers to 100</u> When adding single digits to a two digit number, children will be encouraged to count on from the larger number. Initially this will be supported through the use of number lines and hundred squares. They will also be taught to apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43. Concrete resources such as straws will also be used to support children when exchanging ones for bonds to ten.	

2 & 3	<u>Add two 2 digit numbers to 100</u> Children will be encouraged to use abstract methods more regularly by being introduced to the formal column method alongside concrete resources such as straws, base 10 or place value counters. As numbers become larger the effectiveness of these resources is reduced so they will gradually be phased out and other pictorial methods such as bar models will be used to support understanding. When using the column method, the addition symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Numberlines will also be used to support the principle of jumping forward in multiples of 10 to aid efficiency.	

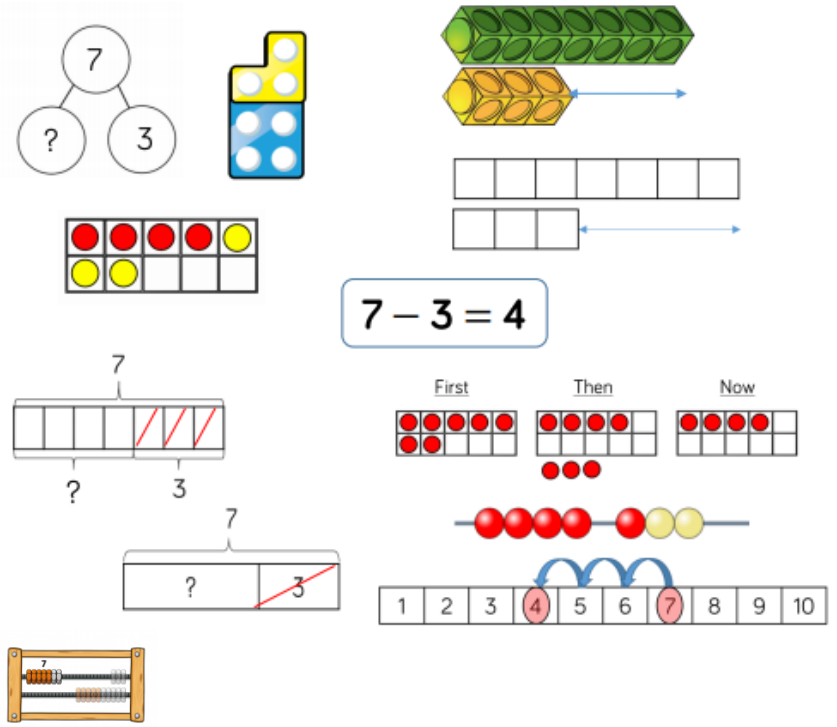
3	<u>Add numbers with up to 3 digits</u> Base 10 and place value counters will be used as manipulatives alongside formal abstract methods such as column addition. Children will be supported to ensure the correct placement of digits within a place value grid to ensure accuracy when using abstract methods. When using the column method, the addition symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line.	

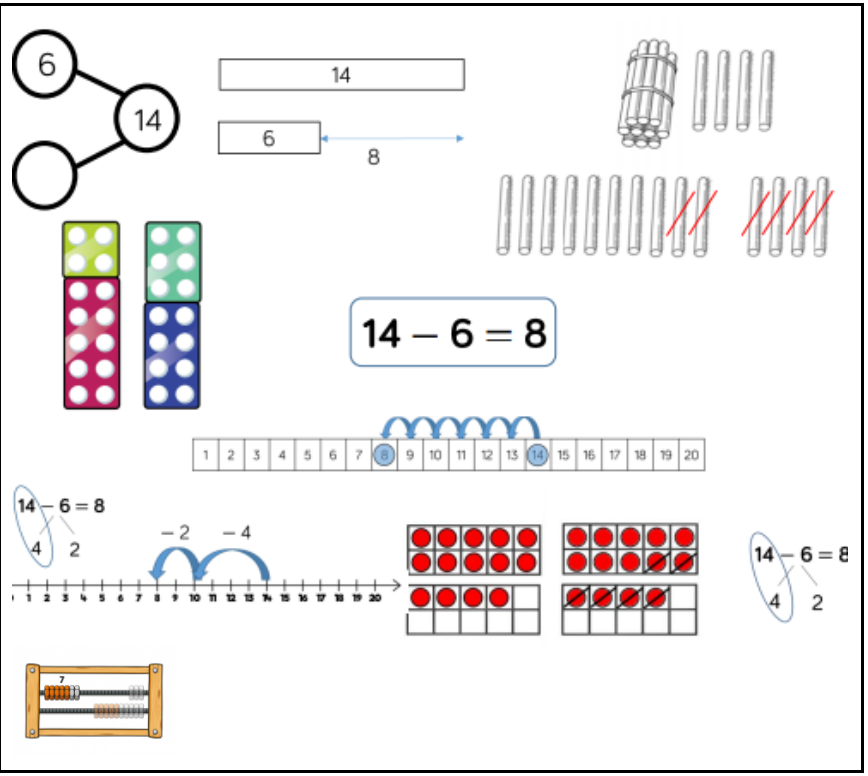
4	<u>Add numbers with up to 4 digits</u> Alongside the continued teaching of the formal abstract method of column addition, children will use base 10 and place value counters as manipulatives to support learning. When using the column method, the addition symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Pictorial methods such as bar models and part-whole models will continue to be used.	

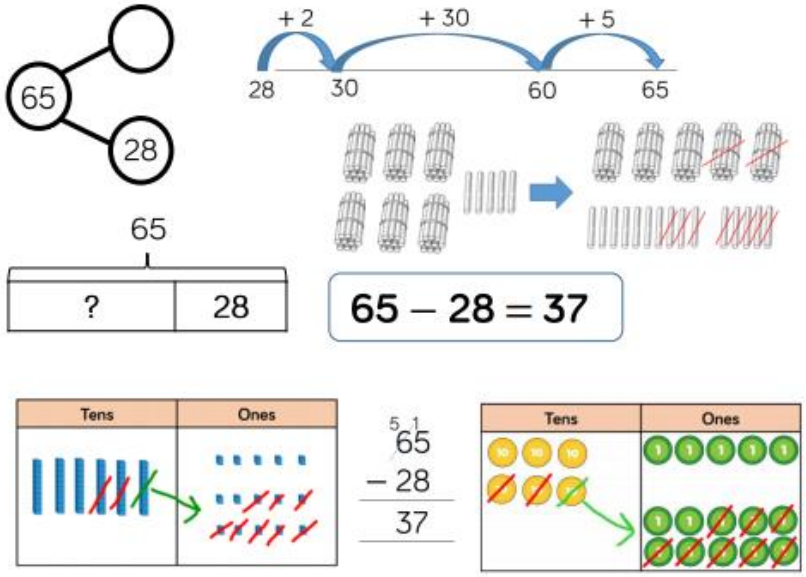
5 & 6	<u>Add numbers with more than 4 digits</u> The preferred method will now be column addition as children are now working with much larger numbers and this is now the most efficient method. However, this will still be supported with the use of place value counters, bar models and part whole models to reinforce understanding of what is happening in their calculation. When using the column method, the addition symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line.	

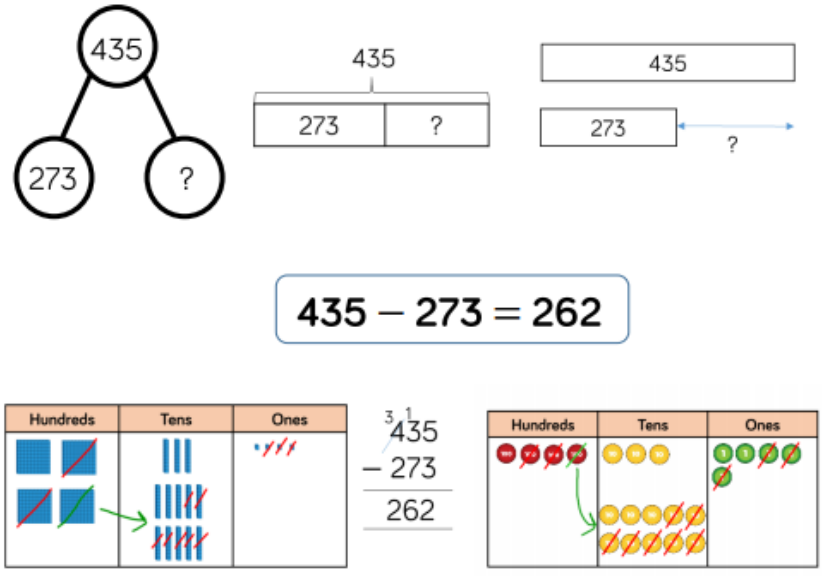
5 & 6	<u>Add with up to 3 decimal places</u> Column addition will be the main choice for these calculations. Place value counters on a place value grid will be used as the most effective manipulative for this element of the curriculum. Children will use manipulatives alongside the recording of their work in columns. They will also be supported to view these calculations in real-life contexts such as when using money. When using the column method, the addition symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line.	

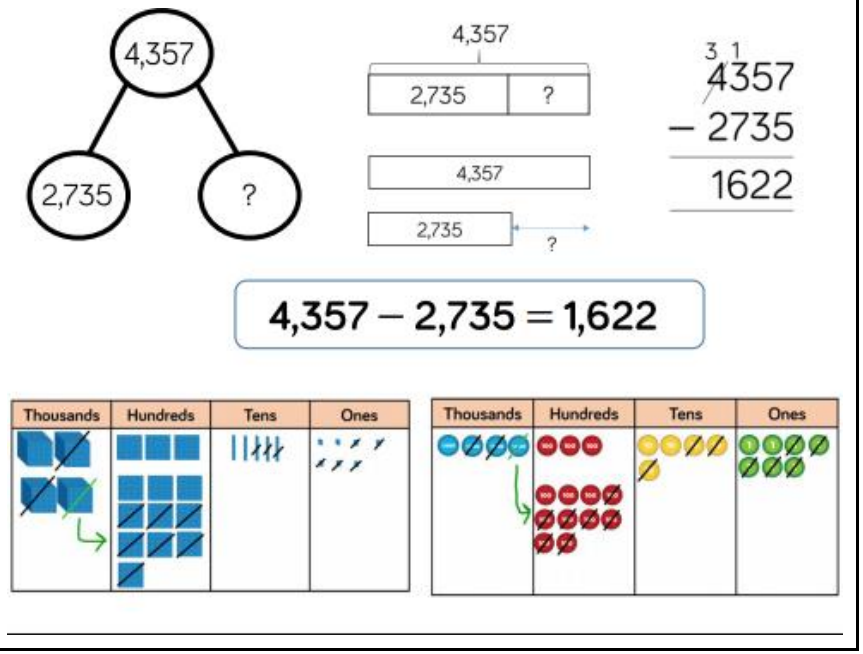
Subtraction

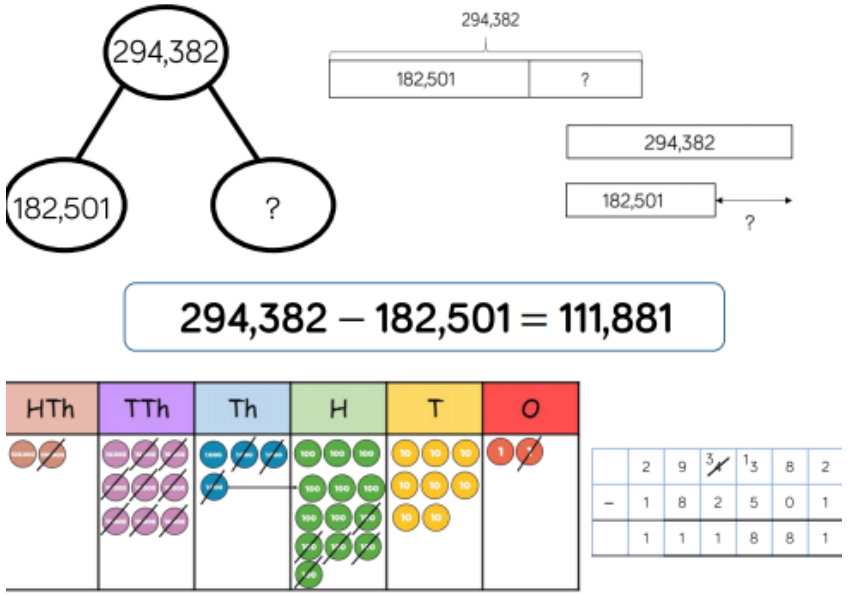
Year	Explanation	Models used to support learning
1	<u>Subtract 1 digit numbers within 10</u> Children will predominantly use concrete resources when introducing subtracting. Numicon, multilink, bead strings and tens frames will be used to support understanding of these key principles. Alongside this, number lines, bar models and part whole models will be used as pictorial representations of the calculations being completed. Children will also be shown and begin to record the abstract calculation .	

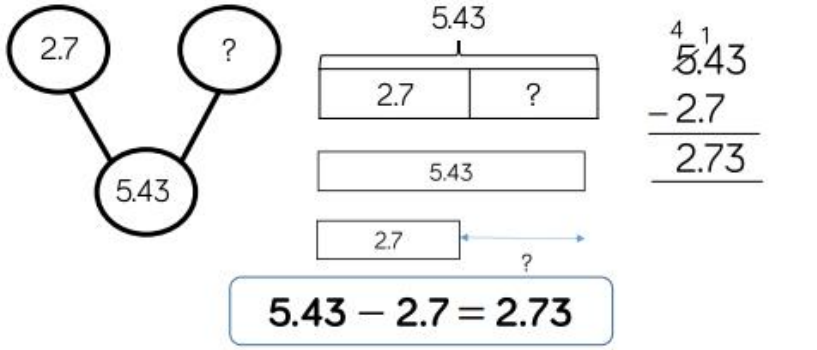
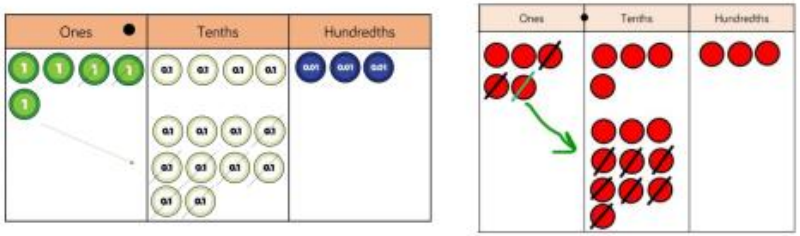
1 & 2	<u>Subtract 1 and 2 digit numbers to 20</u> It is vital ensure children understand the importance of ten ones equalling one ten. Straws will be used to reinforce this idea. Numicaon, tens frames, numberlines, bar models and part-whole models will also be used to support understanding of the concept of subtraction.	

2	<u>Subtract 1 and 2 digit numbers to 100</u> The formal column method will be introduced in Year 2 alongside concrete resources such as straws, base ten and place value counters. Straws will gradually be withdrawn as numbers being used become larger. When using the column method, the subtraction symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. The use of number lines will also be encouraged to model efficient mental methods of jumping in tens.	

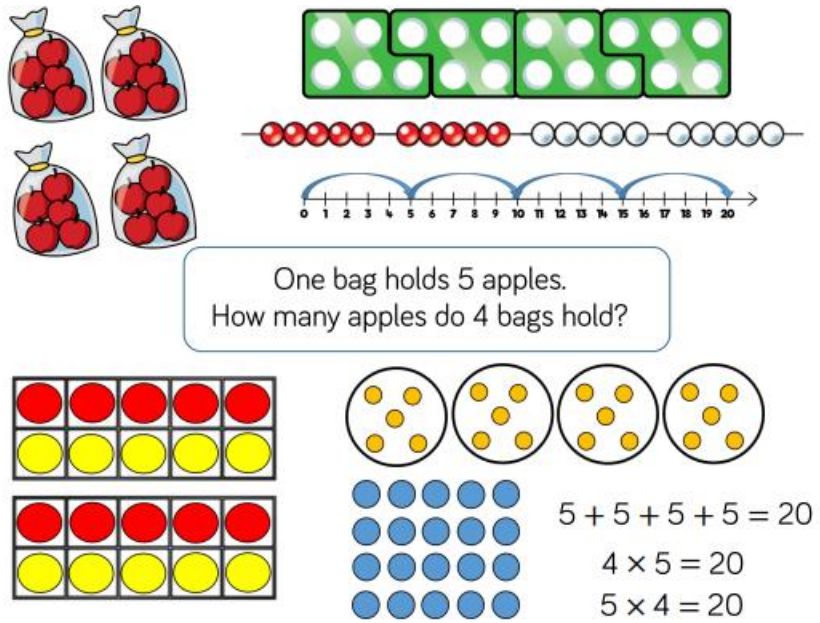
3	<u>Subtract numbers with up to 3 digits</u> As children begin to develop their understanding of the abstract column method and the use of exchange across the columns, place value counters and base ten will continue to be used to support learning. When using the column method, the subtraction symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Pictorial representations such as bar models and part-whole models will also be used to support understanding of the abstract concept.	

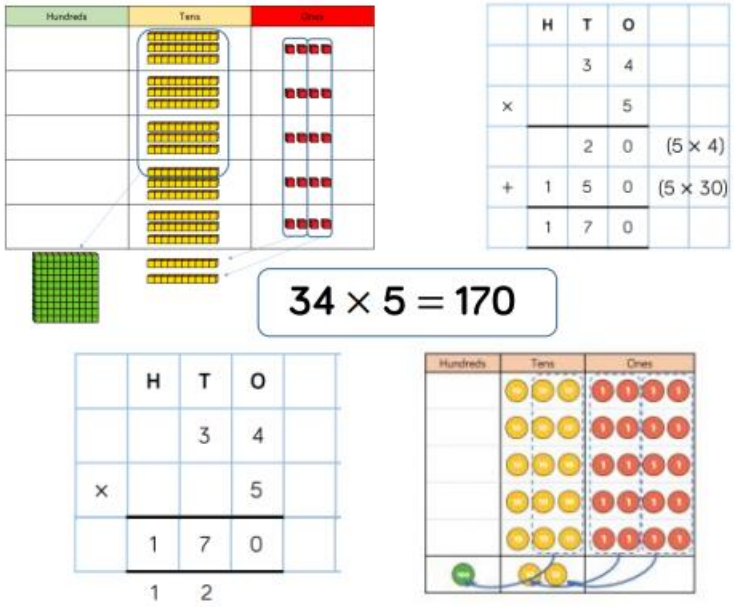
4	<u>Subtract numbers with up to 4 digits</u> Base ten and place value counters will be used to support developing understanding of subtraction with larger numbers. The formal column method will be used at all times with pictorial methods (bar models and part-whole models) and concrete resources used to support learning. When using the column method, the subtraction symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line.	

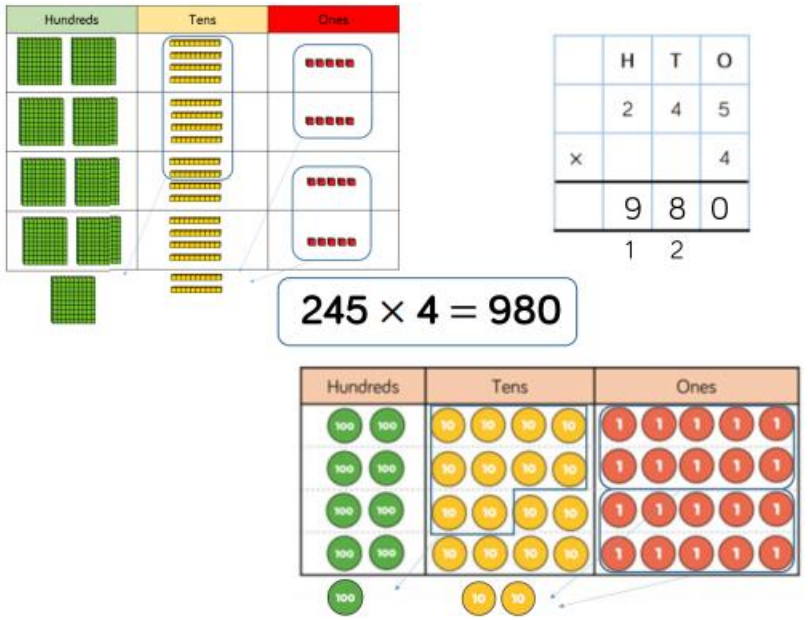
5 & 6	<u>Subtract numbers with more than 4 digits</u> At all times children will be expected to use the formal column subtraction method for calculations. When using the column method, the subtraction symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. To reinforce the methods being used, place value counters on a place value grid will be used particularly when exhancging across columns. Pictorial representations such as part whole modela and bar models will also be used within lessons.	

5 & 6	<u>Subtract with up to 3 decimal places</u> When using the formal column method, children will be taught to keep digits in the correct place value columns. This will be reinforced through the use of place value counters on a place value grid. When using the column method, the subtraction symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Part-whole models and bar models will continue to be the pictorial representations used in lessons.	 

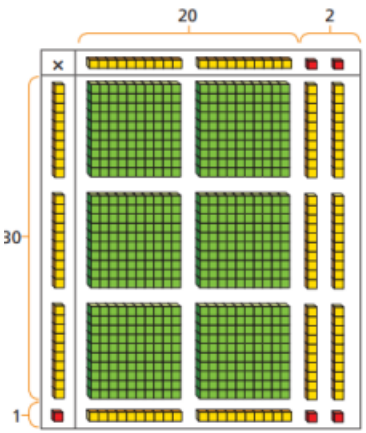
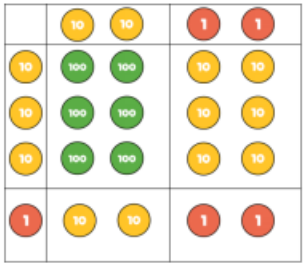
Multiplication

Year	Explanation	Models to support learning
1 & 2	<u>Solve on-step problems with multiplication</u> Multiplication will be represented as repeated addition in a range of different ways. Both concrete and pictorial representations will be used to solve problems. At this stage, children will not be expected to record multiplication formally. In Year 2 children will be introduced to the multiplication symbol.	

3 & 4	<u>Multiply 2-digit by 1 digit numbers</u> Formal recording methods will be introduced during Years 3 and 4. The expanded column method may be introduced before moving onto short multiplication method if the teacher feels that this is the appropriate first step for their class. When using the expanded or short multiplication methods, the multiplication symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. In Year 4, Place value counters and Base ten should also be used to support understanding (as opposed to supporting the method) as children should, by now, be fluent with their times tables knowledge.	

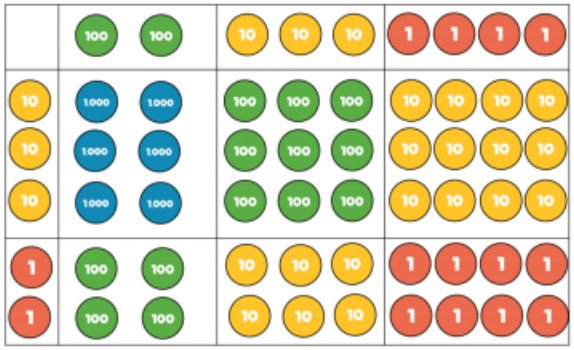
4	<u>Multiply 3 digit by 1 digit numbers</u> By the time children are moving onto 3 digit by 1 digit calculations they should have moved confidently onto the short multiplication method (as opposed to the expanded method). The short method should be used as the first choice when completing calculations. When using the short multiplication method, the multiplication symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Base ten and place value counters continue to be used to support understanding of the process. As numbers grow larger, the use of concrete resources should be reduced and eventually removed.	

5	<u>Multiply 4-digit by 1-digit numbers</u> By now the only manipulative used should be place value counters. Children should, instead, be using the short method for calculations. When using the short multiplication method, the multiplication symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Where children are finding that their times tables are holding them back with their understanding of the method, times tables grids may be used to support learning however, interventions will be put in place to support the ongoing development of times tables knowledge.	 $1{,}826 \times 3 = 5{,}478$ |	Th	H	T	O
---	---	---	---	---
	1	8	2	6
×				3
	5	4	7	8
	2		1		 2 1

5	<u>Multiply 2 digit numbers by 2 digit numbers</u> When first multiplying a 2 digit number by another 2 digit number the area model using Base ten or place value counters can be used to help understand the size of the numbers they are working with. This concrete representation can then be replicated using the grid method as an abstract model of what is happening to aid understanding. However, grid method is not one of the formally accepted methods so this should only be used to aid understanding of a process, long multiplication should be introduced to aid with speed and efficiency and children should be confident in its use by the end of Year 5. When using the long multiplication method, the multiplication symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line.	  $22 \times 31 = 682$

×	20	2
30	600	60
1	20	2

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

5	<u>Multiply 3 digit numbers by 2 digit numbers</u> The area model and associated grid method can continue to be used to aid understanding of the size of the numbers involved when multiplying a 3 digit number by a 2 digit number. Long multiplication should be introduced quickly as the accepted formal method and children should be confident in its use by the end of Year 5. When using the long multiplication method, the multiplication symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line.	 $234 \times 32 = 7{,}488$ 	Th	H	T	O
---	---	---	---
	2	3	4
×		3	2
	4	6	8
$^{1}7$	$^{1}0$	2	0
7	4	8	8 | | ×	200	30	4
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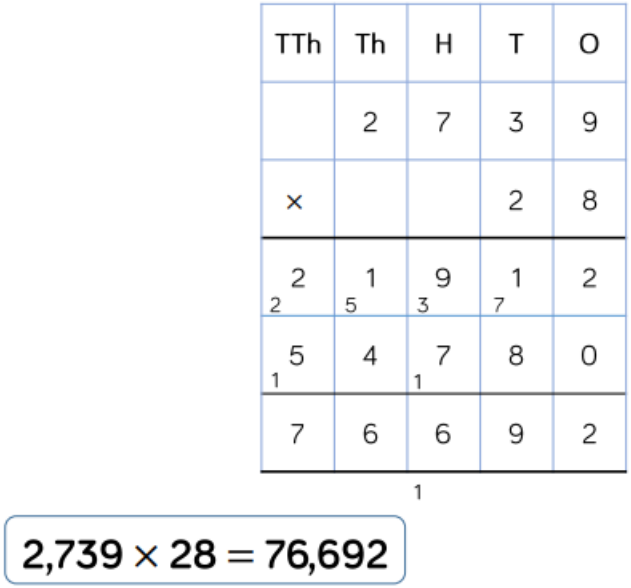
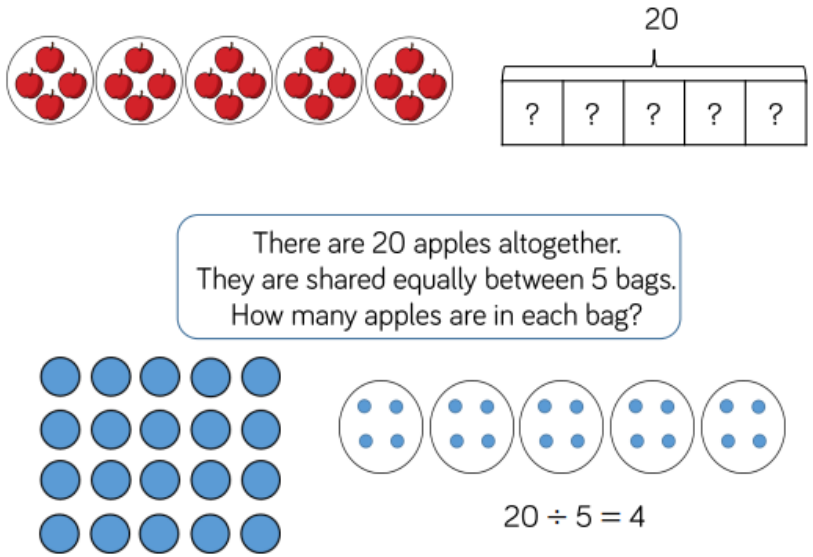
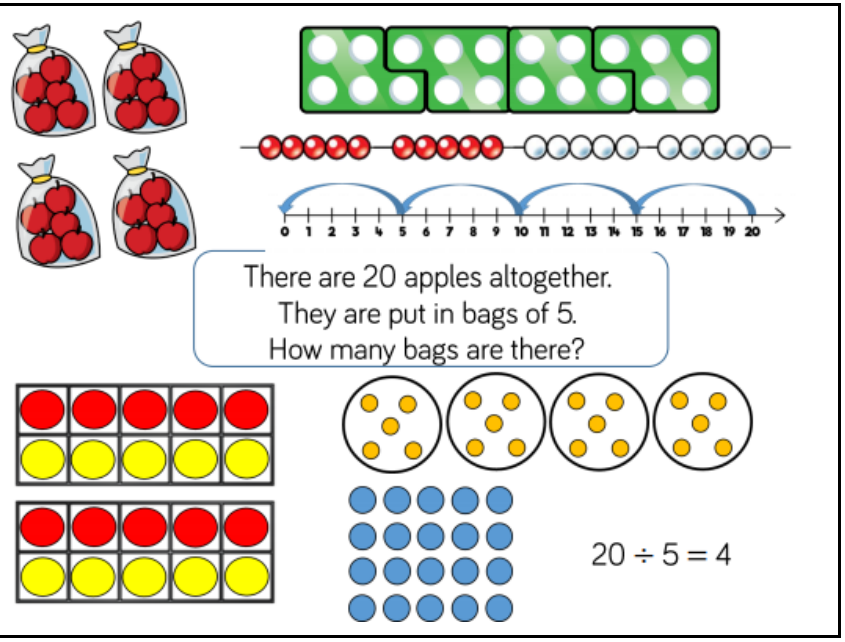
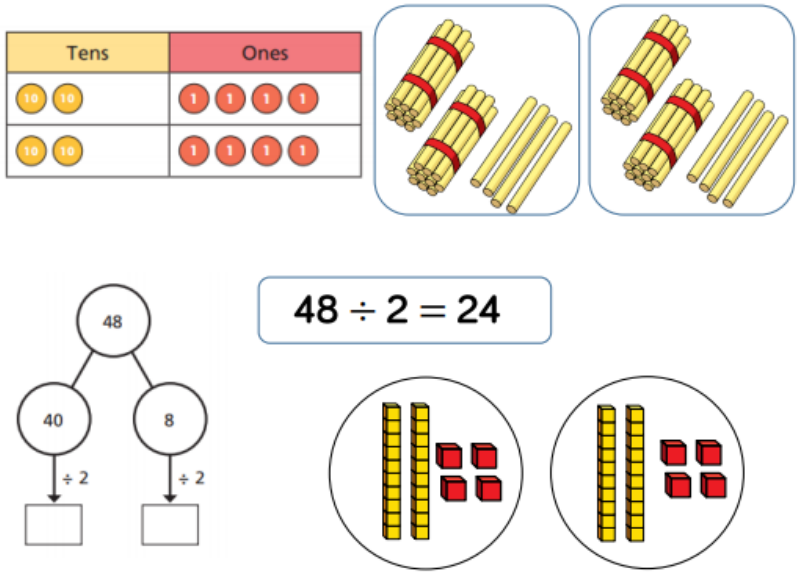
30	6,000	900	120
2	400	60	8	

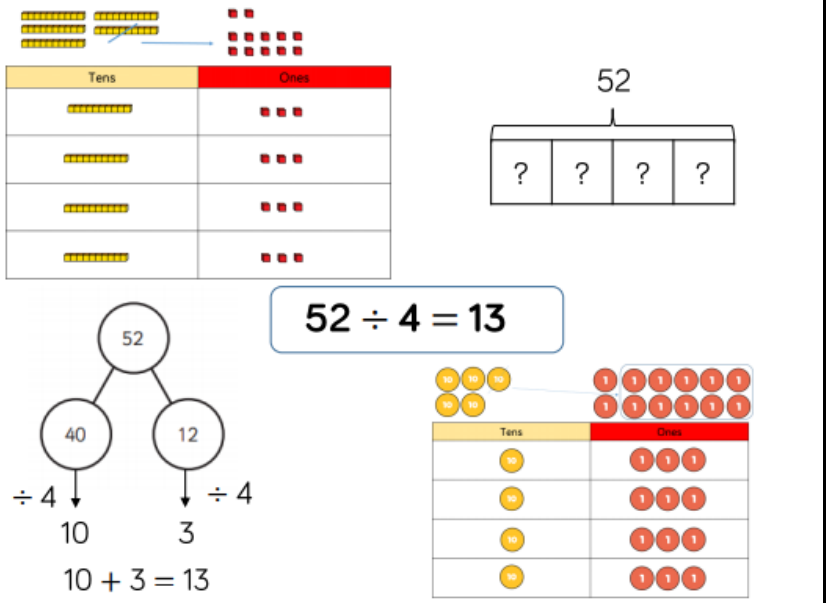
5 & 6	<u>Multiply 4 digit numbers by 3 digit numbers</u> When multiplying 4 digit numbers by 2 digits (including when multiplying decimal numbers in Year 6) children should be confident in the use of the formal long multiplication method. When using the long multiplication method, the multiplication symbol will be written on the left hand side of the calculation (as in the diagram opposite) and exchanged digits will be represented below the line. Multiplication grids may be provided if children are struggling with their times tables knowledge. Interventions must be put in place to support the developing times tables knowledge.	

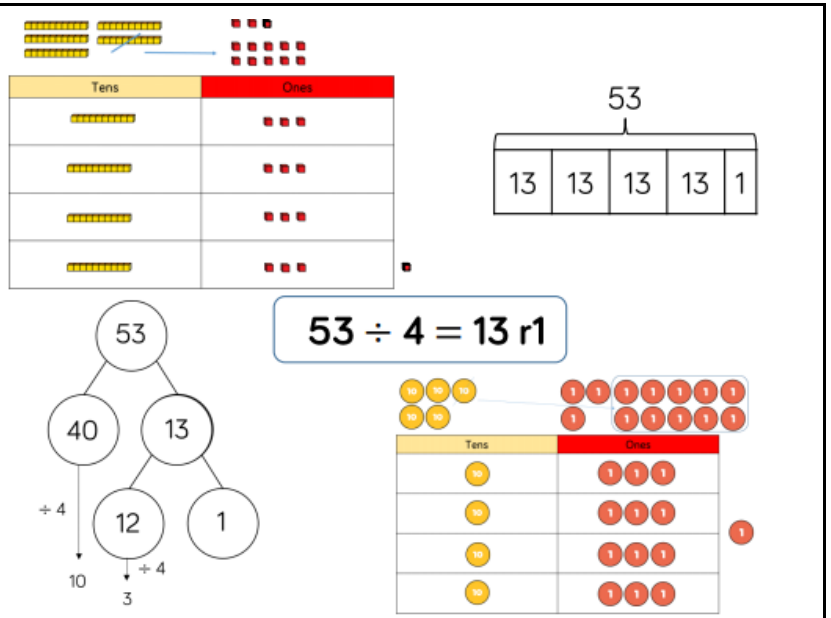
Division

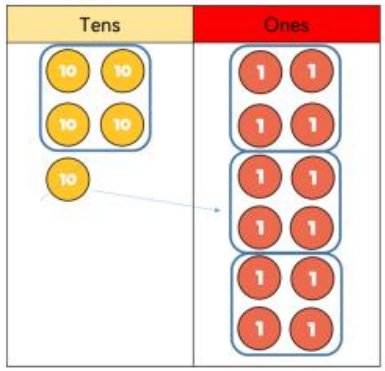
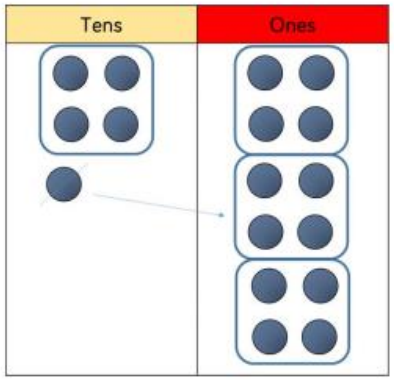
Year	Explanation	Models to support learning
1 & 2	<u>Solve one-step problems with division (sharing)</u> Problems will be solved by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems - they do not record division formally. In Year 2, children are introduced to the division symbol and will begin to record their calculations formally.	

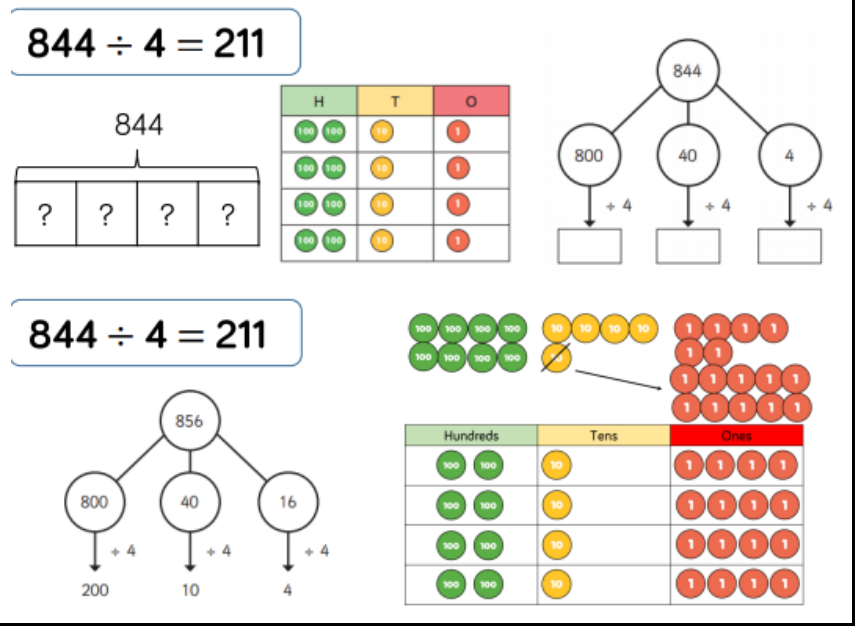
1 & 2	<u>Solve one-step problems with division (grouping)</u> Children will solve problems by grouping and counting the number of groups. This encourages counting in multiples and links with repeated subtraction on a number line. Concrete representations in fixed groups (such as numicon) shows the link between multiplication and division. In Year 2 formal recording of the calculation will take place.	

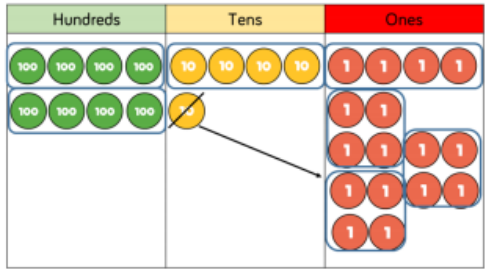
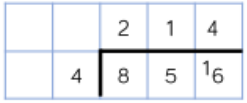
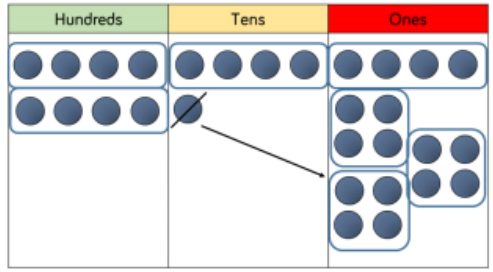
1 & 2	<u>Divide 2 digits by 1 digit (no exchange, sharing)</u> When dividing larger numbers, manipulatives may be used to enable partitioning into tens and ones. Straws, Base 10 and place value counters can all be used to share into equal groups. Part-whole models can also be used to support the principle of sharing into equal groups. In Year 2 formal recording of the calculation will take place.	

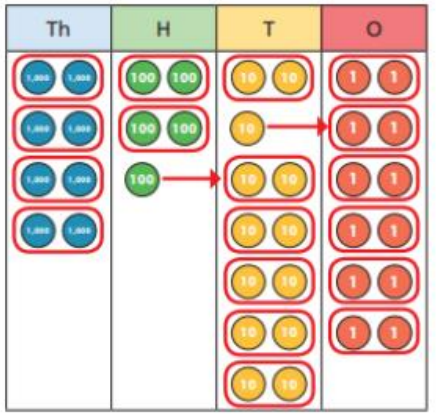
3 & 4	<u>Divide 2 digits by 1 digit (sharing with exchange)</u> While continuing to record calculations formally, concrete resources (Base 10 and place value counters) will be used to model exchange. With both resources children will start with the resource outside of the place value grid before sharing into the grid in equal rows.	

3 & 4	<u>Divide 2 digits by 1 digit (sharing with reminders)</u> While recording their calculations formally, children should still be encouraged to use concrete resources to model their calculations, representing the whole number outside of the grid before sharing the number equally within the place value grid. Remainders will be outside of the grid therefore representing the element which is left over.	

4 & 5	<u>Divide 2 digits by 1 digit (grouping)</u> The short division method is first introduced in Year 4 (the correct title of short division must be used at all times and **<u>not</u>** 'the bus stop method'). Models using concrete resources should start with the largest place value being grouped by the divisor. Teachers should use the correct terms of divisor, dividend and quotient when modelling this method to the class. Language use is key when modelling this method. Phrases such as 'How many groups of 4 tens can we make?' and How many groups of 4 ones can we make?' to ensure that children understand they are working with tens and ones. When modelling short division the division bracket should be modelled clearly as a short vertical line between the divisor and the dividend joining onto the horizontal vinculum (the line above the dividend and below the quotient). Exchanged digits should be shown clearly to the left of the digit they are joining.	   $52 \div 4 = 13$

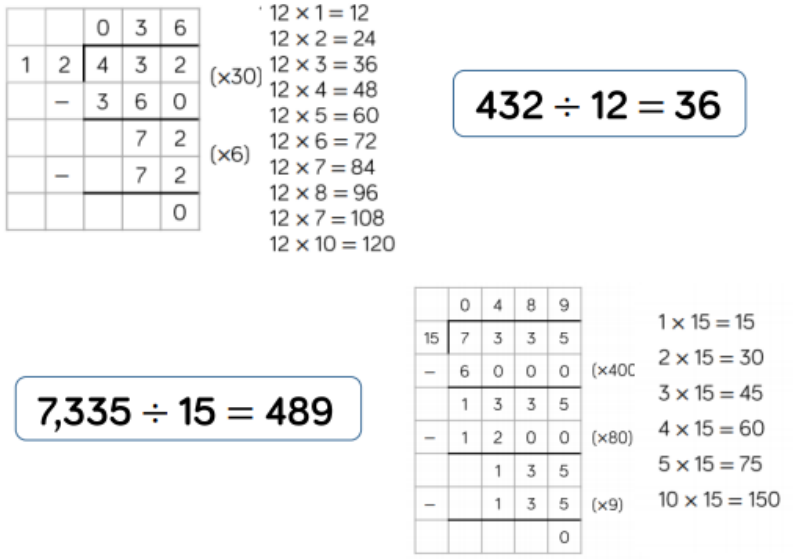
4	<u>Divide 3 digits by 1 digit (sharing with exchange)</u> Children will continue to record their calculations formally following the use of concrete resources tol find the solution. Place value counters should be used to share three digit numbers into equal groups. Resources should be placed outside the place value grid before sharing the hundreds, tens and ones equally between the rows (starting with the largest place value column).	

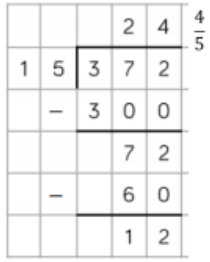
4 & 5	<u>DIvide 3 digits by 1 digit (grouping)</u> Children should, by now, be confidently using the short division method. They may continue to use concrete resources (place value counters) to support their understanding of the method. Pictorial versions of place value grids can also be useful when supporting understanding. When modelling short division the division bracket should be modelled clearly as a short vertical line between the divisor and the dividend joining onto the horizontal vinculum (the line above the dividend and below the quotient). Exchanged digits should be shown clearly to the left of the digit they are joining.	   856 ÷ 4 = 214

5	<u>Divide 4 digits by 1 digit (grouping)</u> Children should be confidently using the short method when in Year 5. Although concrete resources (place value counters) and pictorial representations may still be used to support understanding. As the year progresses all children should move away from the use of concrete resources as thei confidence grows and as the complexity of the calculations evolve (for example where multiple exchanges are required). When modelling short division the division bracket should be modelled clearly as a short vertical line between the divisor and the dividend joining onto the horizontal vinculum (the line above the dividend and below the quotient). Exchanged digits should be shown clearly to the left of the digit they are joining.	 8,532 ÷ 2 = 4,266

	4	2	6	6
2	8	5	$^{1}3$	$^{1}2$

6	<u>Divide multi-digits by 2 digits (short division)</u> Initially, in Year 6 division of up to 4 digits by a 2 digit divisor will use the short division method. Concrete and pictorial representations are less efficient as the size of the numbers increase so these should be moved away from. Children should be encouraged to write out multiples of the divisor to help them with their calculations. When modelling short division the division bracket should be modelled clearly as a short vertical line between the divisor and the dividend joining onto the horizontal vinculum (the line above the dividend and below the quotient). Exchanged digits should be shown clearly to the left of the digit they are joining.	 $432 \div 12 = 36$ $7{,}335 \div 15 = 489$  15 30 45 60 75 90 105 120 135 150

6	<u>Divide multi-digits by 2 digits (long division)</u> Once short division of 4 digit numbers by a 2 digit number has been mastered, long division will be taught. CHildren should be encouraged to use this method where exchange of large numbers occurs. Children should be encouraged to write multiple lists for the divisor to help with the efficiency of the calculation. When modelling long division the division bracket should be modelled clearly as a short vertical line between the divisor and the dividend joining onto the horizontal vinculum (the line above the dividend and below the quotient). Exchanged digits should be shown clearly to the left of the digit they are joining. Where numbers are 'brought down' within the calculation this can be modelled through a simple arrow, although the should eventually be removed as the children grow in confidence.	

6	<u>Divide multi-digits by 2 digits (long division)</u> When modelling short division the division bracket should be modelled clearly as a short vertical line between the divisor and the dividend joining onto the horizontal vinculum (the line above the dividend and below the quotient). Exchanged digits should be shown clearly to the left of the digit they are joining.	$372 \div 15 = 24\ r12$  $1 \times 15 = 15$ $2 \times 15 = 30$ $3 \times 15 = 45$ $4 \times 15 = 60$ $5 \times 15 = 75$ $10 \times 15 = 150$  $372 \div 15 = 24\frac{4}{5}$