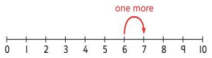
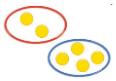
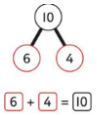
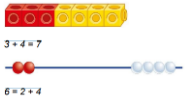
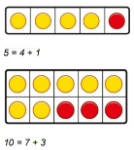
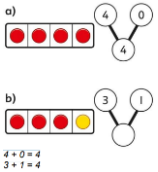
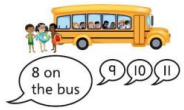
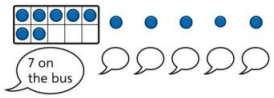
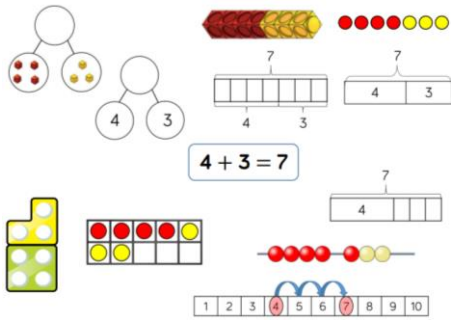
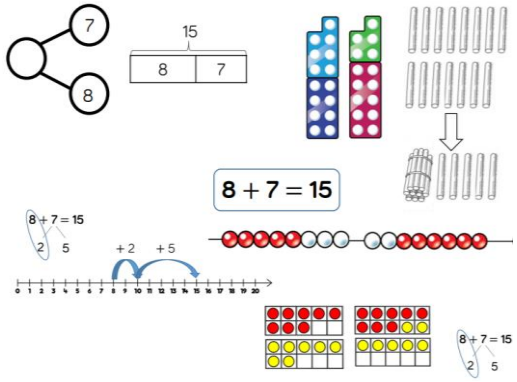
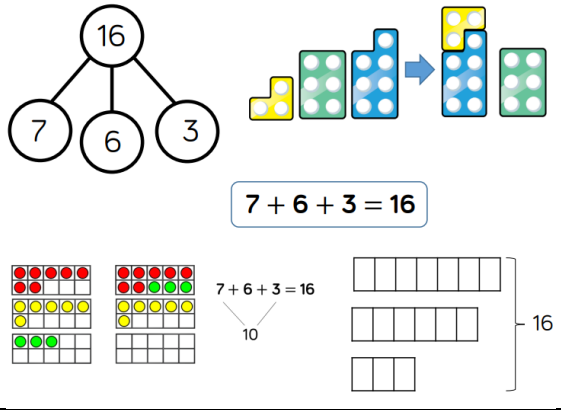
St Leonard's Primary School Mathematics Calculation Policy

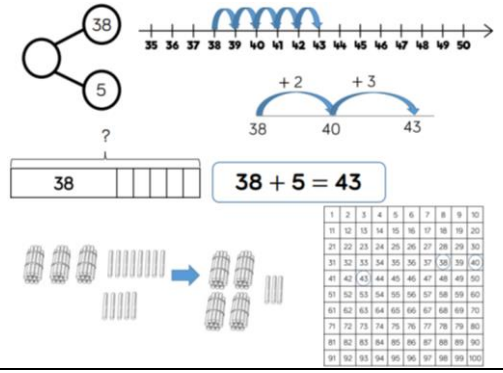
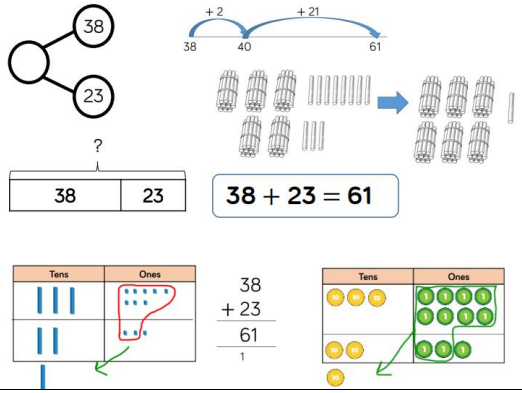
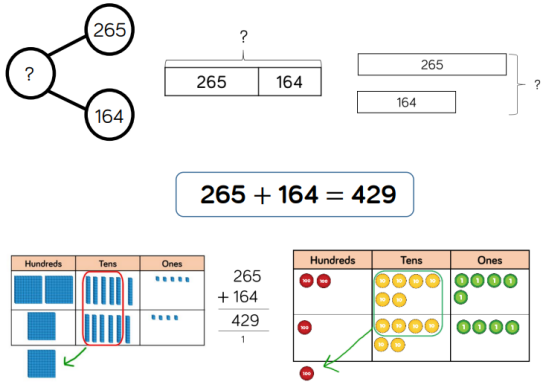
The 2014 Primary National Curriculum in England, Mathematics, sets out progression in written methods of calculation that highlights how children would move from informal methods of recording to a formal written method for each of the four operations.

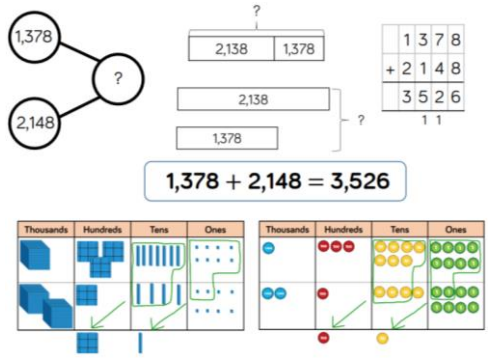
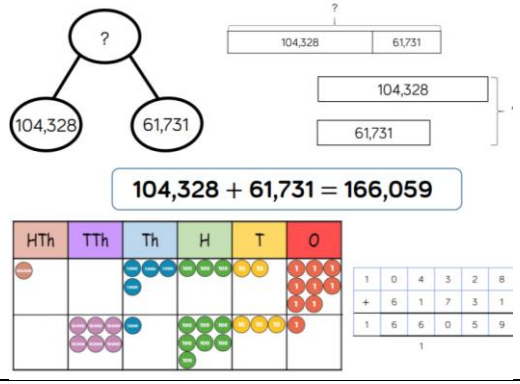
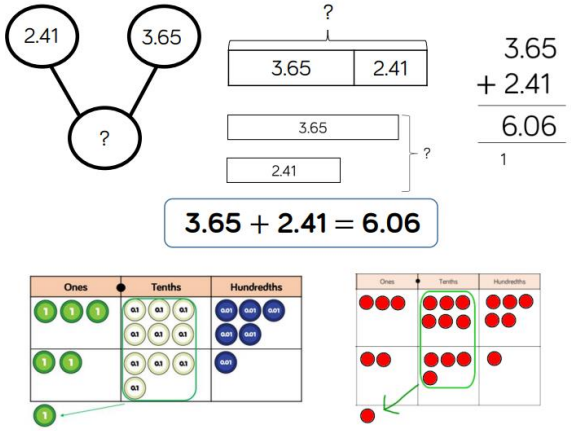
This policy lays out how we teach calculation at St Leonard's Primary School and has been created to support the teaching of a mastery approach to mathematics alongside the White Rose scheme of learning.

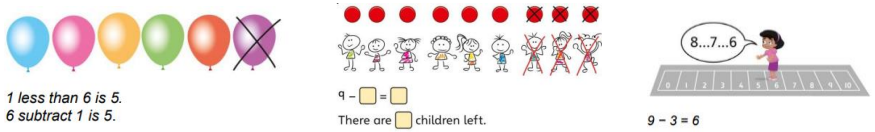
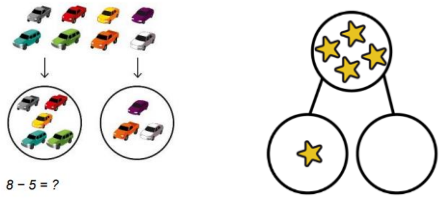
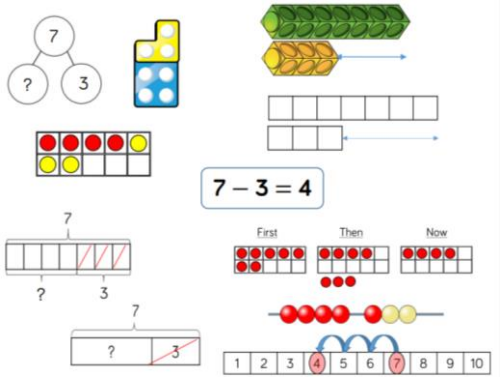
Mathematical understanding is developed through use of representations that are, first of all, concrete (e.g., Dienes apparatus and place value counters), and then pictorial (e.g., bar models) to then facilitate abstract working (e.g. standard written methods). This is underpinned by the use of models and images that support conceptual understanding and this policy promotes a range of representations to be used across year groups.

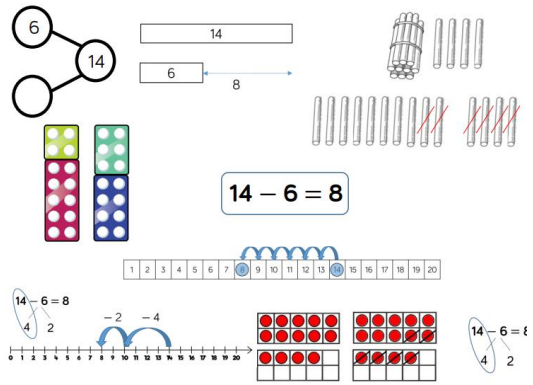
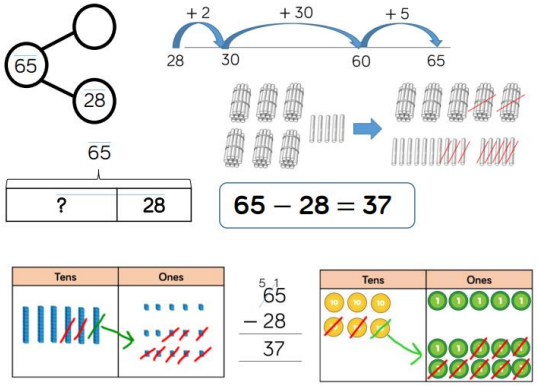
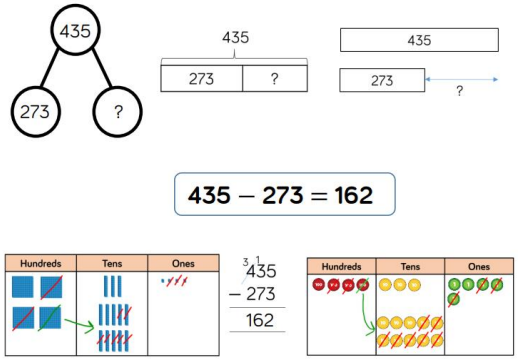
Skills - Addition	
EYFS – Counting and adding more.  *One more than 4 is 5.*  *One more than 6 is 7.* *7 is one more than 6.*	Children add one more person or object to a group to find one more. Children add one more cube or counter to a group to represent one more. Use a number line to understand how to link counting on with finding one more.
EYFS – Understanding part-part-whole relationship.  *The parts are 2 and 4. The whole is 6.*  *The parts are 1 and 5. The whole is 6.* 	Sort people and objects into parts and understand the relationship with the whole. Children draw to represent the parts and understand the relationship with the whole. Use a part-whole model to represent the numbers.
EYFS – Knowing and finding number bonds within 10   	Break apart a group and put back together to find and form number bonds. Use five and ten frames to represent key number bonds. Use a part-whole model alongside other representations to find number bonds.
EYFS – Adding by counting on  	Children use knowledge of counting to 20 to find a total by counting on using people or objects. Children use counters to support and represent their counting on strategy.

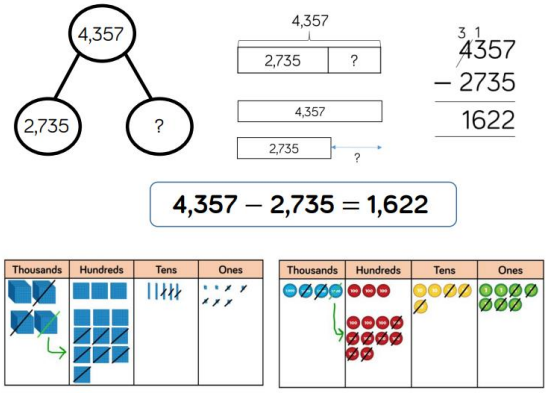
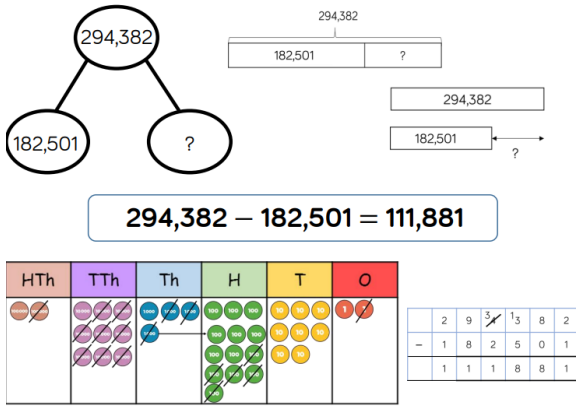
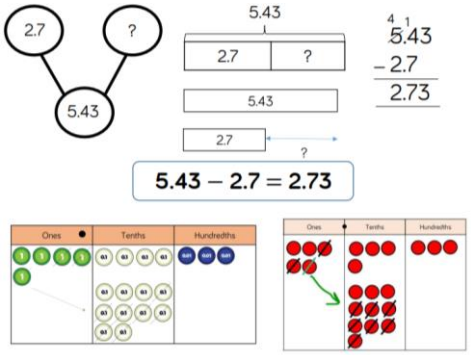
Year 1 – Adding 1-digit numbers within 10. 	When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.
Year 1/2 – Adding 1 and 2-digit numbers to 20. 	When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. In Year 1, this is only done just by counting on. From Year 2, use different manipulatives can be used to represent this exchange alongside number lines to support children in understanding how to partition their jumps.
Year 2 – Adding 3 single digit numbers. 	When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

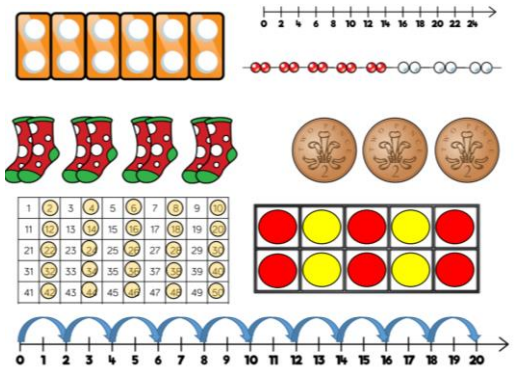
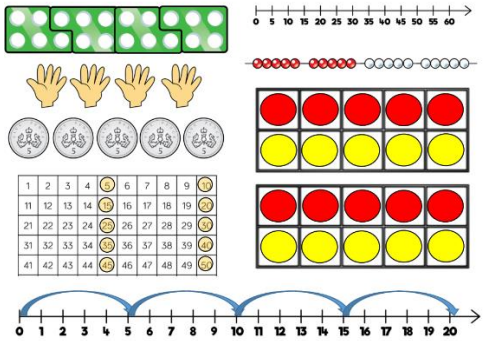
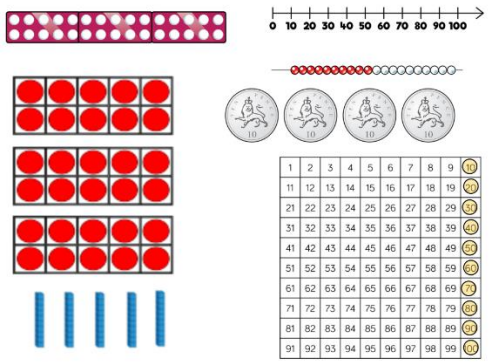
Year 2/3 – Adding 1-digit and 2-digit numbers to 100. 	When adding single digits to a two-digit number, children should be encouraged to count on from the larger number. They should also apply their knowledge of number bonds to add more efficiently e.g., 8 + 5 = 13 so 38 + 5 = 43. Hundred squares and straws can support children to find the number bond to 10.
Year 2/3 – Adding two 2-digit numbers to 100. 	Children can use a blank number line and other representations to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.
Year 3 - Adding numbers with up to 3 digits. 	Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

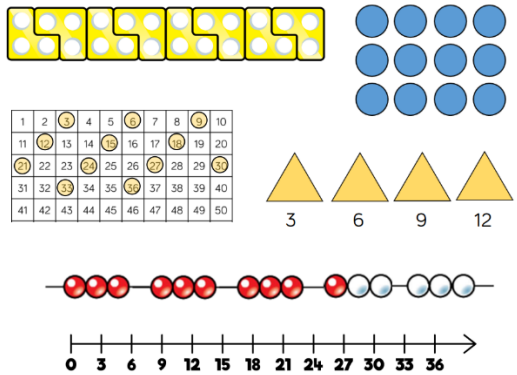
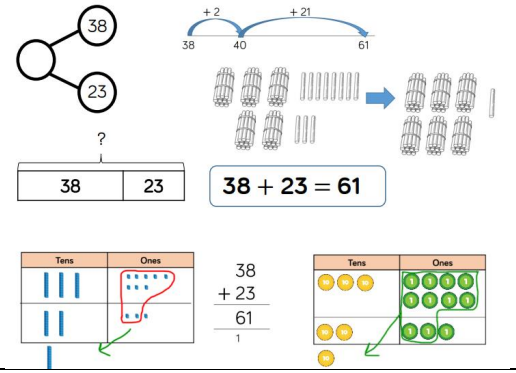
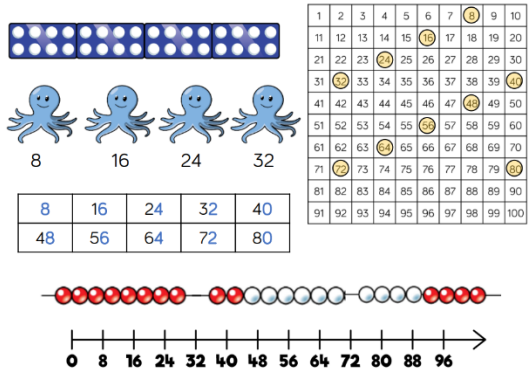
Year 4 - Adding numbers with up to 4 digits. 	Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.
Year 5/6 – Adding numbers with more than 4 digits. 	Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.
Year 5 – Adding up to 3 decimal places. 	Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places. 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.

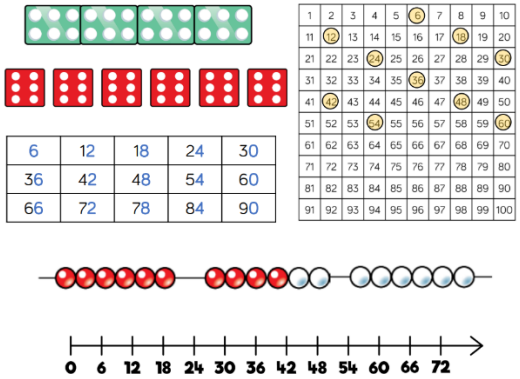
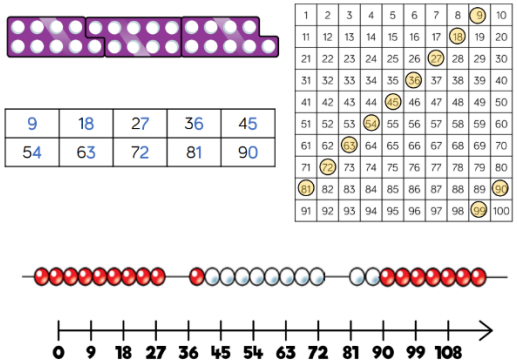
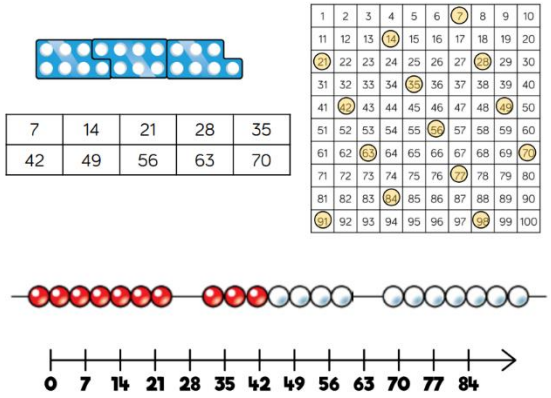
Skills – Subtraction	
EYFS – Counting back and taking away.  	Children arrange objects and remove to find how many are left. Children draw and cross out or use counters to represent objects from a problem. Children count back to take away and use a number line or number track to support the method.
EYFS – Finding a missing part, given a whole and part.  	Children separate a whole into parts and understand how one part can be found by subtraction
EYFS – Subtraction within 10  	Understand when and how to subtract 1s efficiently. Use a bead string to subtract 1s efficiently. Understand how to use knowledge of bonds within 10 to subtract.
Year 1 – Subtracting 1-digit numbers within 10.  	Part-whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference.

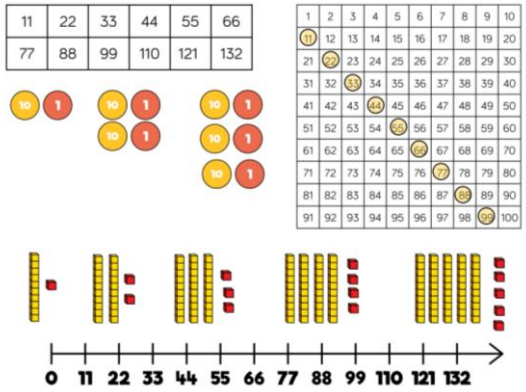
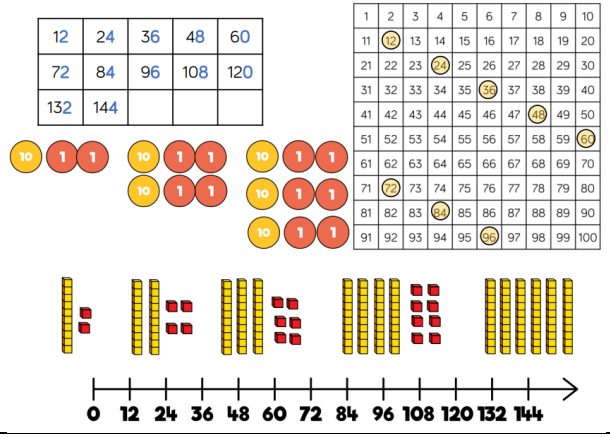
Year 1/2 – Subtracting 1 and 2-digit numbers to 20. 	In Year 1, subtracting one-digit numbers that cross 10, is done by counting back, using objects, number tracks and number lines. From Year 2, children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.
Year 2/3 - Subtracting 1 and 2-digit numbers to 100. 	Children can also use a blank number line to count back to find the difference. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.
Year 3 – Subtracting numbers with up to 3 digits 	Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

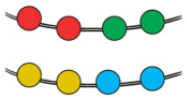
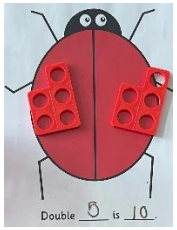
Year 4 – Subtracting numbers with up to 4 digits 	Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.
Year 5/6 – Subtracting numbers with more than 4 digits 	Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.
Year 5/6 – Subtracting numbers with up to 3 decimal places 	Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places. Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

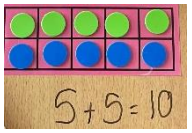
Skills – Times Tables	
Year 2 – 2 Times Table 	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the two times table, using concrete manipulatives to support. Notice how all the numbers are even and there is a pattern in the ones. Use different models to develop fluency.
Year 2 – 5 Times Table 	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the five times table, using concrete manipulatives to support. Notice the pattern in the ones as well as highlighting the odd, even, odd, even pattern.
Year 2 – 10 Times Table 	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the ten times table, using concrete manipulatives to support. Notice the pattern in the digits - the ones are always 0, and the tens increase by 1 ten each time.

Year 3 – 3 Times Table 	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the three times table, using concrete manipulatives to support. Notice the odd, even, odd, even pattern using number shapes to support. Highlight the pattern in the ones using a hundred square.
Year 3 – 4 Times Table 	Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the four times table, using manipulatives to support. Make links to the 2 times table, seeing how each multiple is double the twos. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using number shapes to support.
Year 3 – 8 Times Table 	Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the eight times table, using manipulatives to support. Make links to the 4 times table, seeing how each multiple is double the fours. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using number shapes to support.

Year 4 – 6 Times Table  	Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the six times table, using manipulatives to support. Make links to the 3 times table, seeing how each multiple is double the threes. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using number shapes to support.
Year 4 – 9 Times Table  	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the nine times table, using concrete manipulatives to support. Notice the pattern in the tens and ones using the hundred square to support as well as noting the odd, even pattern within the multiples.
Year 4 – 7 Times Table  	Encourage daily counting in multiples both forwards and backwards, supported by a number line or a hundred square. The seven times table can be trickier to learn due to the lack of obvious pattern in the numbers, however they already know several facts due to commutativity. Children can still see the odd, even pattern in the multiples using number shapes to support.

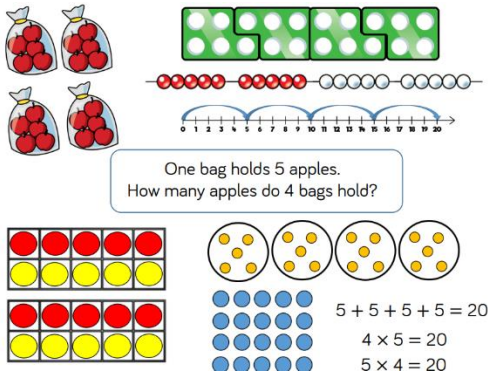
Year 4 – 11 Times Table 	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the eleven times table, using concrete manipulatives to support. Notice the pattern in the tens and ones using the hundred square to support. Also consider the pattern after crossing 100.
Year 4 – 12 Times Table 	Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the 12 times table, using manipulatives to support. Make links to the 6 times table, seeing how each multiple is double the sixes. Notice the pattern in the ones within each group of five multiples. The hundred square can support in highlighting this pattern.

<table>
<tr><th colspan="2">Skill – Multiplication</th></tr>
<tr><td>EYFS – Solve problems, including doubling, halving, and sharing.
 
 

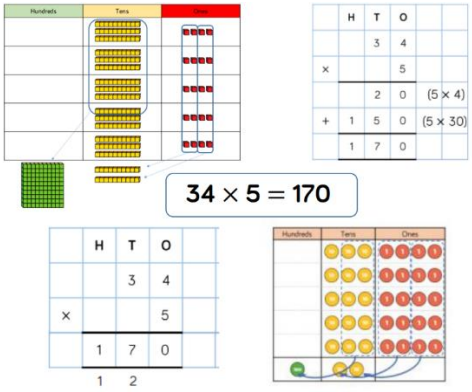
 
</td><td>Children use concrete objects to make and count equal groups of objects.

They will count on in twos using a bead string and number line.

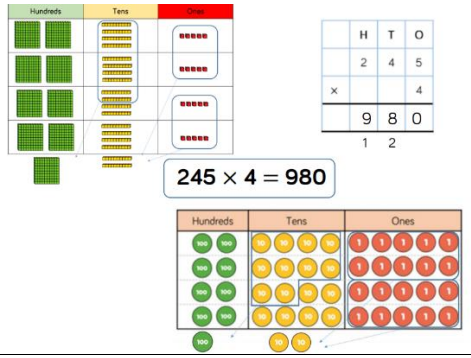
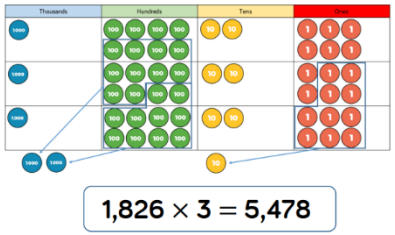
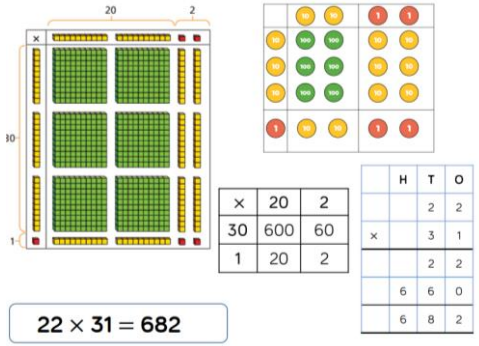
They understand doubling as repeated addition.

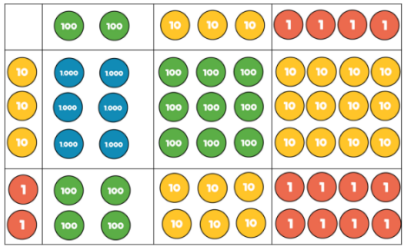
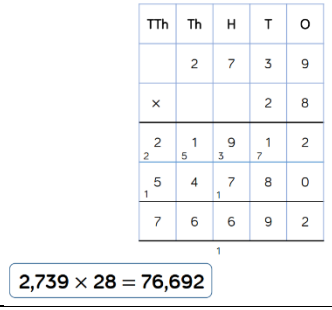
They use concrete and pictorial representation to record their calculations.</td></tr>
<tr><td>Year 1/2 – Solving 1-step problems using multiplication.
 
</td><td>Children represent multiplication as repeated addition in many different ways.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.

In Year 2, children are introduced to the multiplication symbol.</td></tr>
<tr><td>Year 3/4 – Multiplying 2-digit numbers by 1-digit numbers.
 
</td><td>Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method in Year 4.

Place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.</td></tr>
</table>

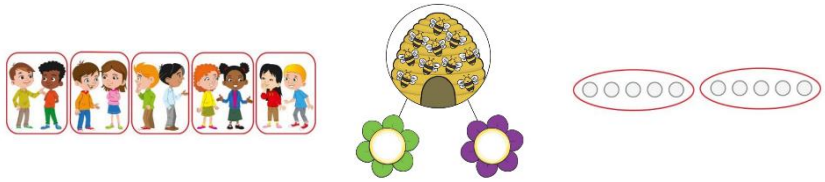
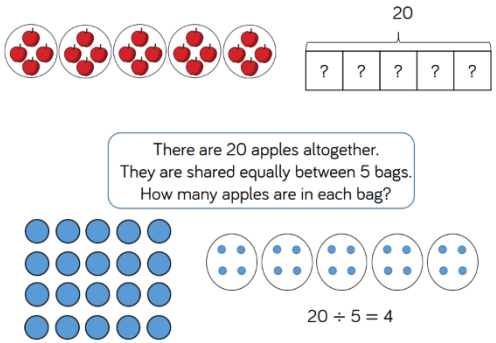
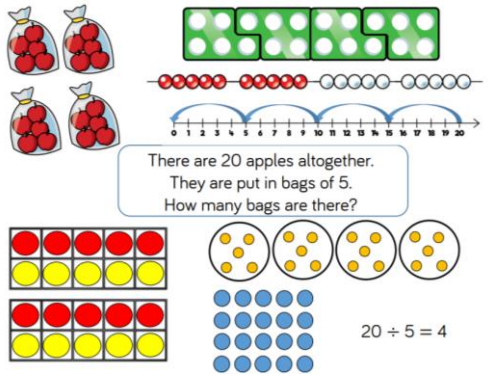
Year 4 - Multiplying 3-digit numbers by 1-digit numbers. 	When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.
Year 5 - Multiplying 4-digit numbers by 1-digit numbers. 	When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.
Year 5 – Multiplying 2-digit numbers by 2-digit numbers. 	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 the Base 10. The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

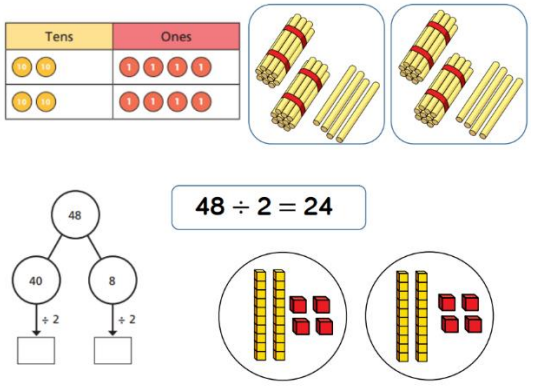
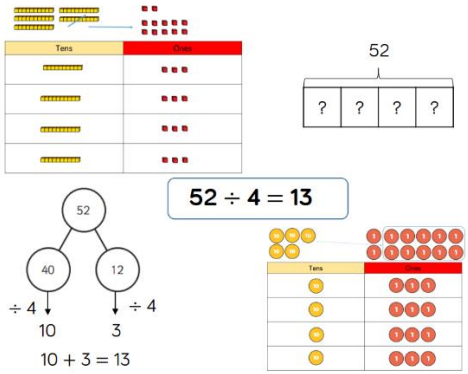
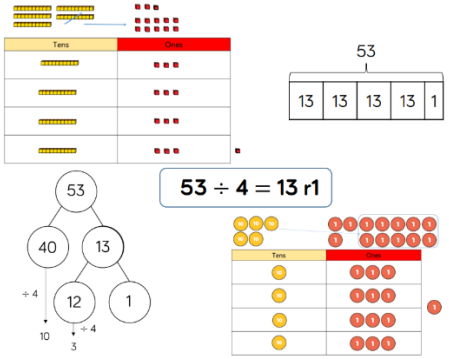
Year 5 - Multiplying 3-digit numbers by 2-digit numbers.  $234 \times 32 = 7{,}488$	Children can continue to use the area model when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers. Children should now move towards the formal written method, seeing the links with the grid. Method.
Year 5/6 – Multiply 4-digit numbers by 2-digit numbers  $2{,}739 \times 28 = 76{,}692$	When multiplying 4-digits by 2-digits, children should be confident in using the formal written method. If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method. Consider where exchanged digits are placed and make sure this is consistent.

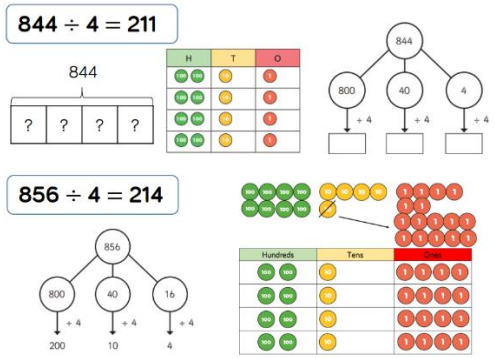
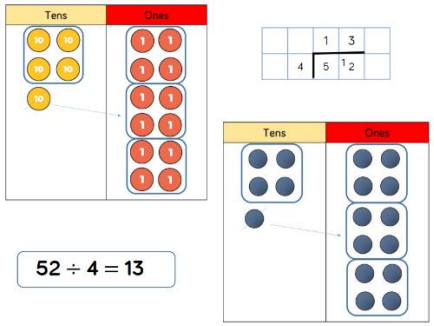
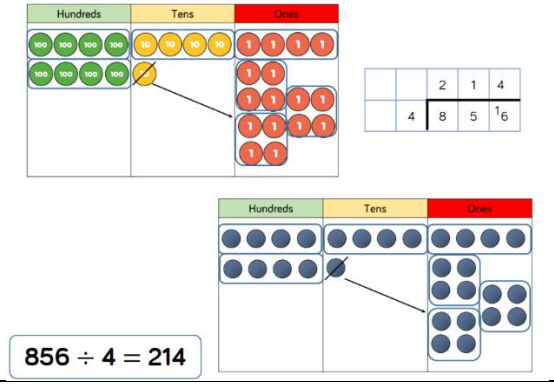
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
1 7	1 0	2	0
7	4	8	8

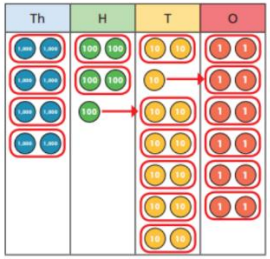
×	200	30	4
30	6,000	900	120
2	400	60	8

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
		1		

Skill – Division	
EYFS – Solve problems, including doubling, halving, and sharing. 	Children use concrete objects to count and share equally into 2 groups. They count a set of objects and halve them by making two equal groups. They understand sharing and halving as dividing by 2. They will begin to use objects to make groups of 2 from a given amount.
Year 1/2 – Solving 1-step problems using division (sharing) 	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 division formally. In Year 2, children are introduced to the division symbol.
Year 1/2 – Solving 1-step problems using division (grouping) 	Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

Year 3 - Dividing 2-digits by 1-digit (sharing with no exchange) 	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 into equal groups. Part-whole models can provide children with a clear written method that matches the concrete representation.
Year 3/4 - Dividing 2-digits by 1-digit (sharing with exchange) 	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.
Year 3/4 - Dividing 2-digits by 1-digit (sharing with remainders) 	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.

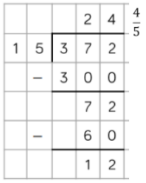
Year 4 – Dividing 3-digits by 1-digit (sharing) 	Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.
Year 5 – Dividing 2-digits by 1-digit (grouping) 	When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor. 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
Year 5 - Dividing 3-digits by 1-digit (grouping) 	Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number 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 also draw their own counters and group them through a more pictorial method.

Year 5 - Dividing 4-digits by 1-digit (grouping)  $8{,}532 \div 2 = 4{,}266$	Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method. Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.
Year 6 - Dividing multi digits by 2-digits (short division) $432 \div 12 = 36$ $7{,}335 \div 15 = 489$ 15 30 45 60 75 90 105 120 135 150	When children begin to divide up to 4-digits 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.
Year 6 - Dividing multi digits by 2-digits (long division) $432 \div 12 = 36$ $12 \times 1 = 12$ $12 \times 2 = 24$ $12 \times 3 = 36$ $12 \times 4 = 48$ $12 \times 5 = 60$ $12 \times 6 = 72$ $12 \times 7 = 84$ $12 \times 8 = 96$ $12 \times 7 = 108$ $12 \times 10 = 120$ $7{,}335 \div 15 = 489$ $1 \times 15 = 15$ $2 \times 15 = 30$ $3 \times 15 = 45$ $4 \times 15 = 60$ $5 \times 15 = 75$ $10 \times 15 = 150$	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.

Year 6 - Dividing multi digits by 2-digits with remainders (long division)	When a remainder is left at the end of a calculation, children can either leave it as a remainder or convert it to a fraction. This will depend on the context of the question. Children can also answer questions where the quotient needs to be rounded according to the context.

$372 \div 15 = 24$ r12

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150



$372 \div 15 = 24\frac{4}{5}$