East Bergholt CEVC Primary School

Policy for Mathematical Calculations

July 2023

The following calculation policy has been written to reflect the methods used to teach calculations to children at East Bergholt CEVC Primary school. These methods support the development of number calculation from Reception through to Year 6 and are in line with the age related expectations set out in the National Curriculum and Early Years Foundation Stage curriculums.

At East Bergholt, we believe that children should be introduced the processes of calculation through practical, oral and mental activities. As children begin to understand the underlying concepts, they develop ways of recording their working to support their thinking and calculation methods, use particular methods that apply to special cases and learn to interpret and use the signs and symbols involved.

Context and Strategies

We feel that it is important that any type of calculation is given a real life context or problem solving approach, to help build children's understanding of the purpose of calculation. This will help them to recognise when to use certain operations and methods when faced with a range of mathematical problems.

Choosing the appropriate strategy and recording jottings in Mathematics is an important tool both for furthering the understanding of ideas and communicating these ideas to others. The aim is that children use mental methods when appropriate, but for calculations they cannot do in their head, they use an efficient written method, accurately and with confidence. A useful written method is one that helps children carry out a calculation and can be understood by others. Written methods are complementary to mental methods and should not be seen as separate from them. It is important children acquire secure mental methods of calculation and an efficient written method for calculation of addition, subtraction, multiplication and division, which they know they can rely on when mental methods are not appropriate.

Progression

The majority of children will move through the policy at broadly the same pace. However, decisions about when to progress should always be based on the security of children's understanding and their readiness to progress to the next stage (stage before age). Children who grasp concepts rapidly should be challenged through being offered deepening problems that are thought stimulating and applicable to real life.

This document is organised according to age related expectation, however it may be necessary for teachers to consult with lower year groups for children in order to meet their needs at the stage they are working at. By the end of Year 6, children are expected to use the formal methods for the four operations.

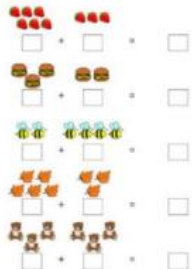
Reception

Addition

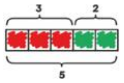
Use toys and classroom resources for the children to physically manipulate, group and regroup.

Use specific maths resources such as counters, snap cubes, Numicon etc.

Use visual supports such as tens frames, part whole models and addition mats where physical resources can be manipulated.

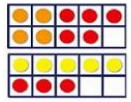


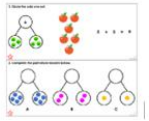
Use two groups of pictures so children are able to count the total.



Use bar modelling with visual pictures, icons or colours.

Use tens frames and part whole models with pictures.

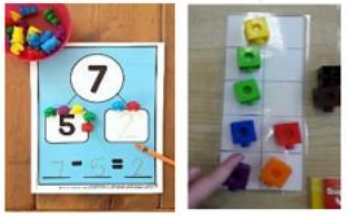




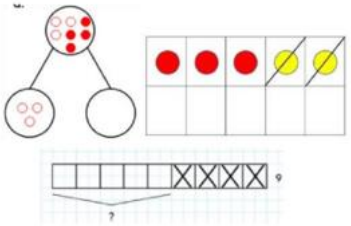
Subtraction

Use toys and classroom resources for the children to physically manipulate, group and regroup.

Use specific maths resources such as counters, snap cubes, Numicon etc.



Use visual supports such as tens frames, part whole models and addition mats where physical resources can be manipulated.

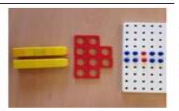


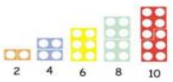
Use visual supports such as ten frames, part whole and bar model with pictures/icons.

Multiplication

Division

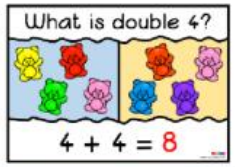
Methods and Representations in Reception

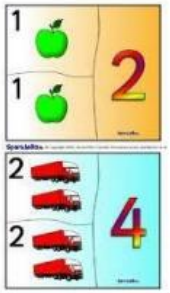




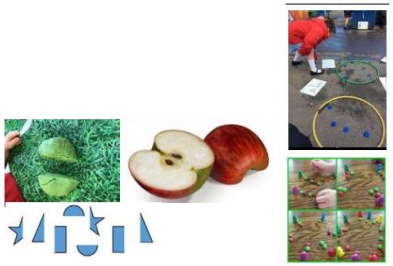
Counting and other maths resources for children to make 2 equal groups.

Physical and real life examples That encourage children to see concept of doubling as adding two equal groups.



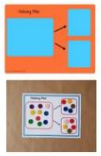


Pictures and icons that encourage children to see concept of doubling as adding two equal groups.

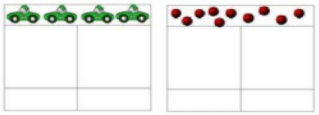


Children have the opportunity to physically cut objects, food or shapes in half.

Counting and other maths resources for children to share into two equal groups.



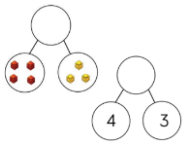
Use visual supports such as halving mats and part whole with the physical objects and resources that can be manipulated.

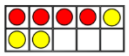


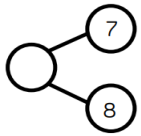
Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.

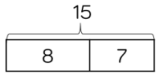
Year 1

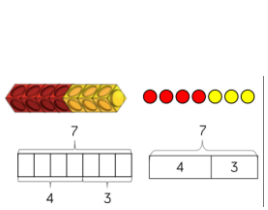
Addition

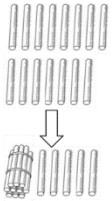


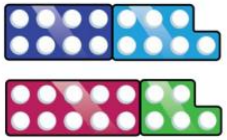




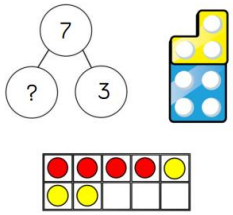


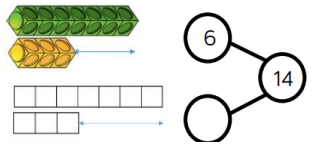


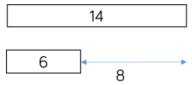


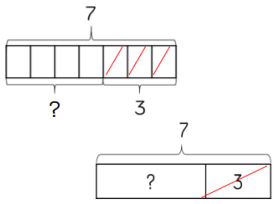


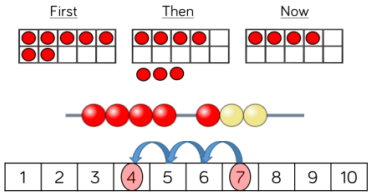
Subtraction

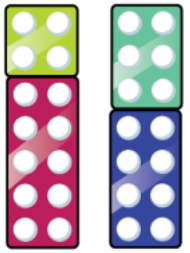




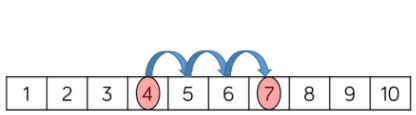


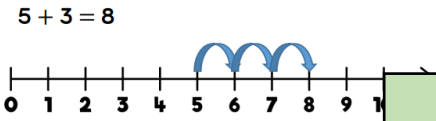






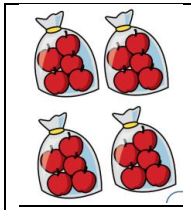
Multiplication

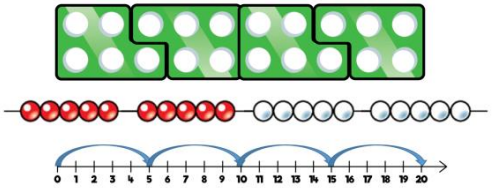


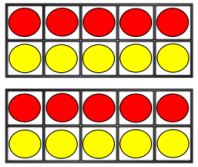


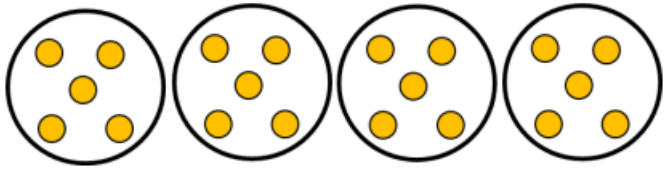
Methods and representations in year 1

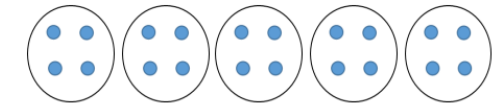
Division



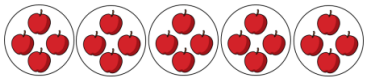


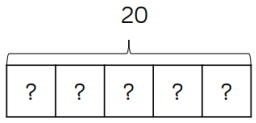




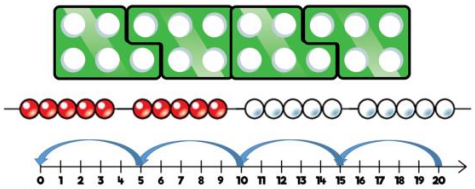


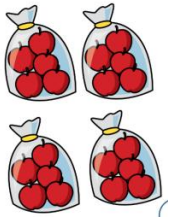
Sharing

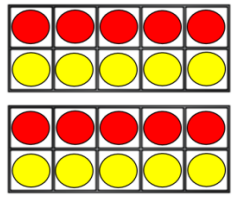




Grouping





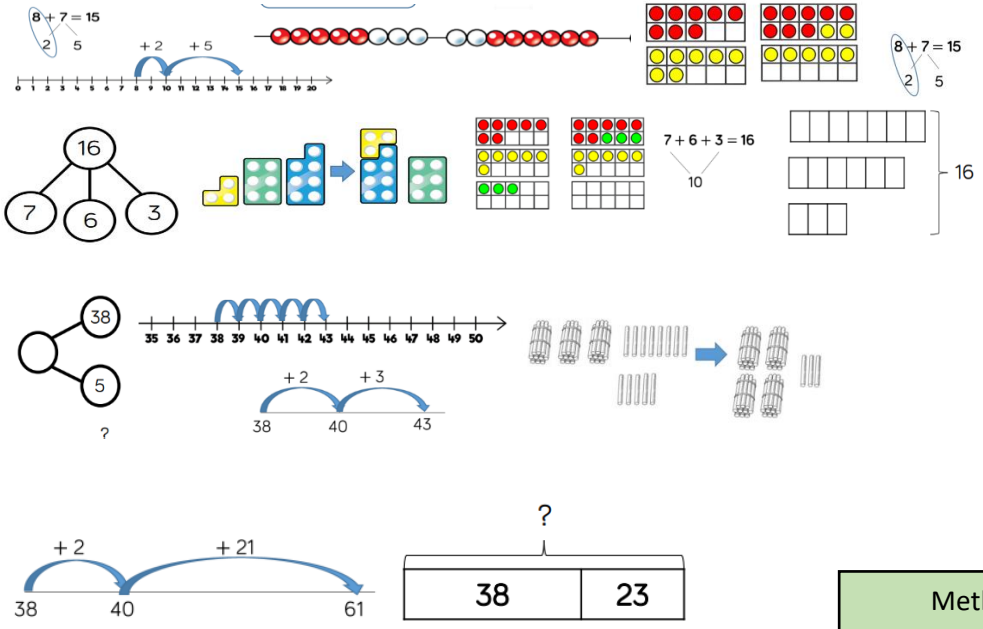


Addition	Subtraction	Multiplication	Division

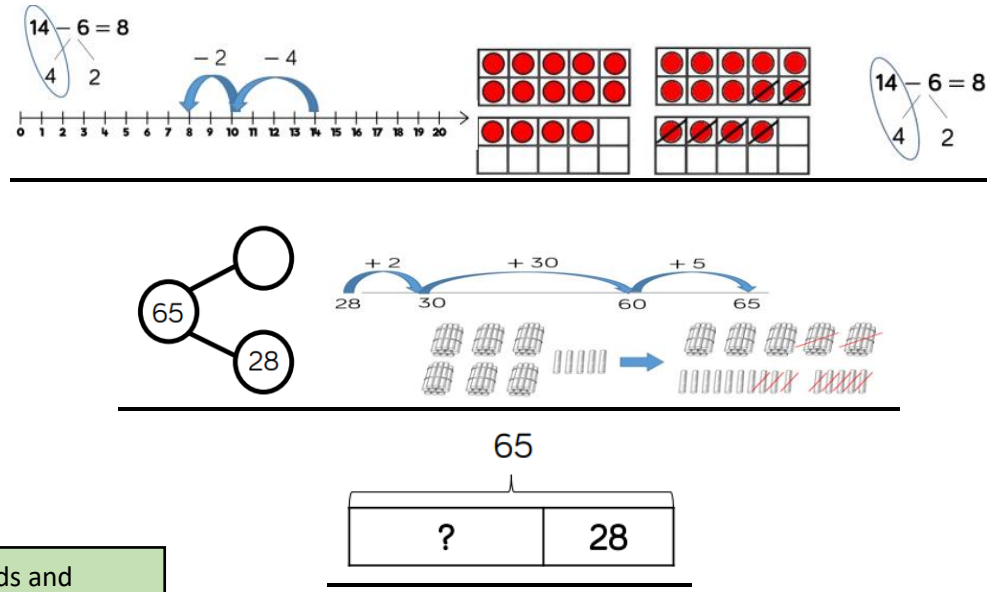
Add 1 digit numbers within 10 When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation. **Add 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.	**Subtract 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. **Subtract 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.	**Solve 1-step problems using multiplication** 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.	**Solve 1-step problems using multiplication (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 **Solve 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 2

Addition

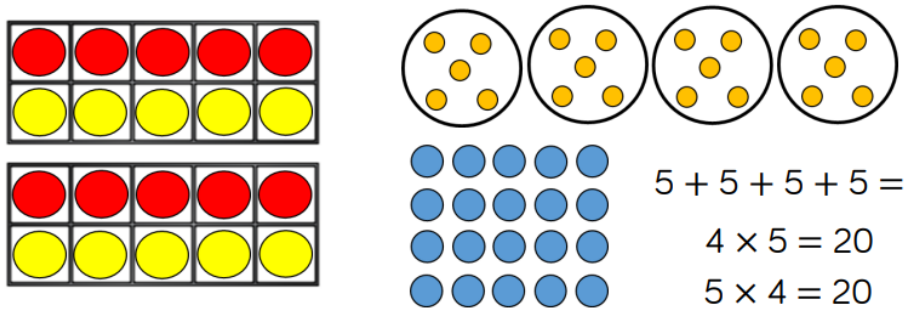


Subtraction

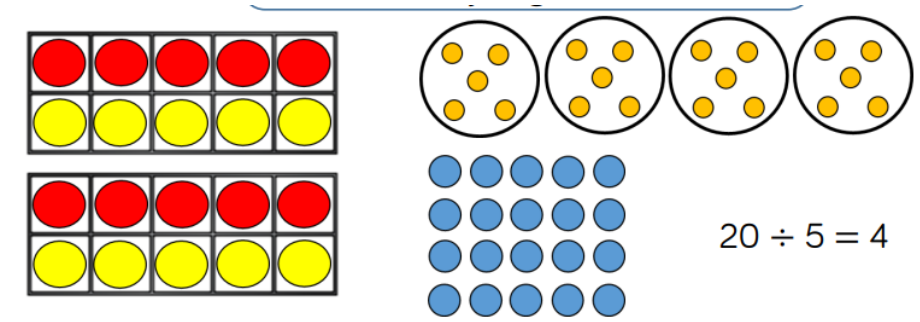


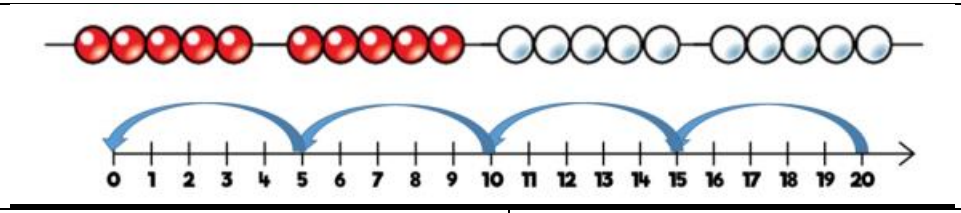
Methods and representations in Year 2

Multiplication



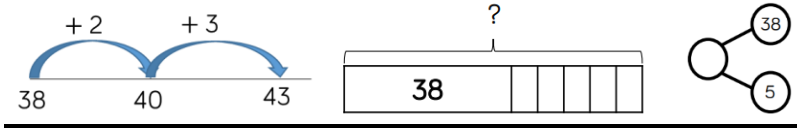
Division



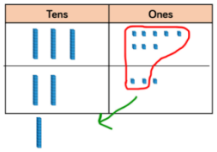
			
Addition	Subtraction	Multiplication	Division
Add 1 and 2 -digit numbers to 20 When adding one - digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. From Year 2, different manipulatives can be used to represent this exchange alongside number lines to support children in understanding how to partition their jumps. **Add three 1 -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. **Add 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. **Add two 2-digit numbers to 100**	**Subtract 1 and 2-digit numbers to 20** 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. **Subtract 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	**Solve 1-step problems using multiplication** Children represent multiplication as repeated addition in many different ways. In Year 2, children are introduced to the multiplication symbol.	**Solve 1-step problems using multiplication (sharing)** Children solve problems by sharing amounts into equal groups. In Year 2, children are introduced to the division symbol. **Solve 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.

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.			

Year 3

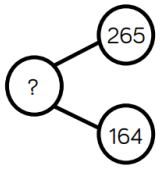
Addition	**Subtraction**
	

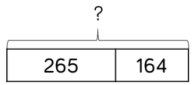
Methods and representations in Year 3

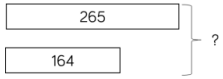


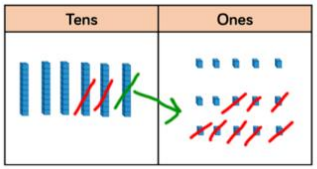
$$\begin{array}{r} 38 \\ +\ 23 \\ \hline 61 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 265 \\ +\ 164 \\ \hline 429 \\ \hline 1 \end{array}$$

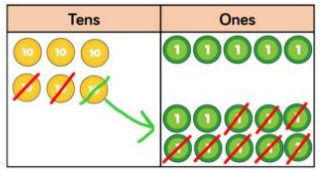


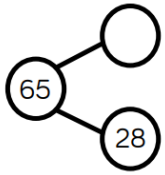


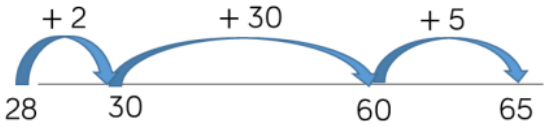


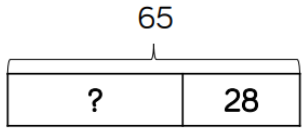


$$\begin{array}{r} {}^{5}\cancel{6}\,{}^{1}5 \\ -\ 28 \\ \hline 37 \end{array}$$

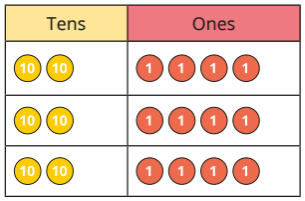


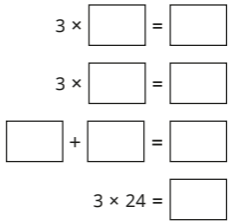


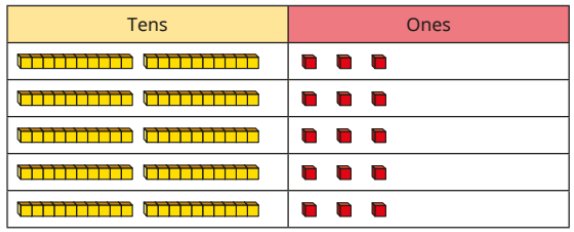




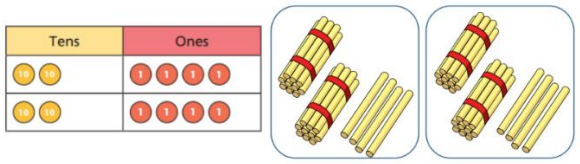
Multiplication

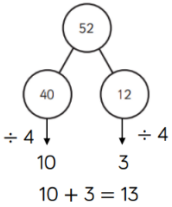


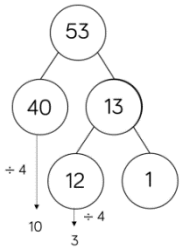


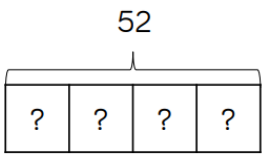


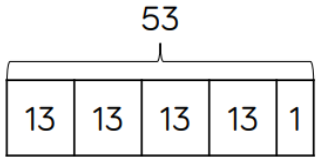
Division

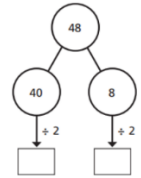










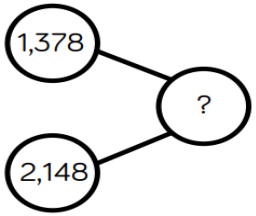


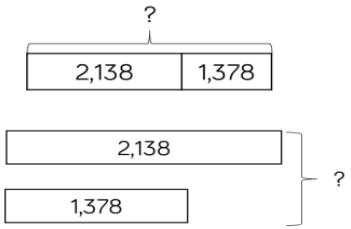
Addition	Subtraction	Multiplication	Division
Add 1-digit and 2-digit numbers to 100	**Subtract 1 and 2-digit numbers to 100**	**Multiply 2-digit numbers by 1-digit numbers**	**Divide 2-digits by 1-digit (sharing with no exchange)**

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. **Add 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. **Add 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.	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. **Subtract 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.	Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method	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. **Divide 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. **Divide 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

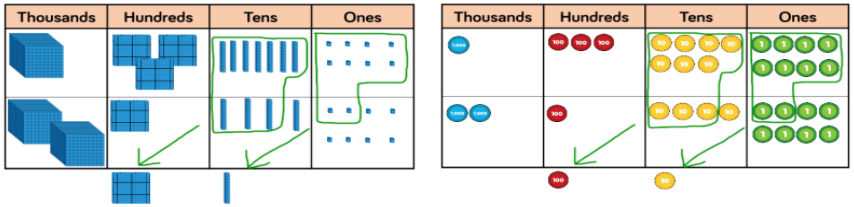
Addition



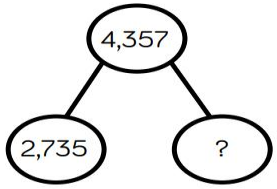


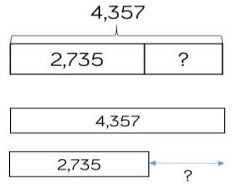
	1	3	7	8
+	2	1	4	8
	3	5	2	6
	1	1		

1,378 + 2,148 = 3,526



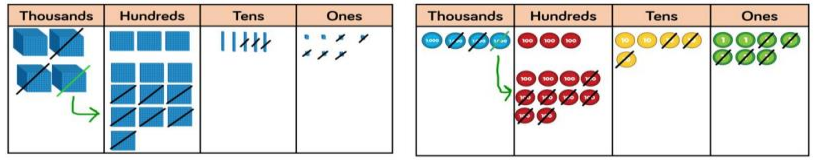
Subtraction





3 1
4357
− 2735
1622

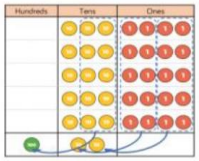
4,357 − 2,735 = 1,622



Methods and representations for Year 4

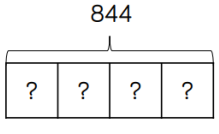
Multiplication

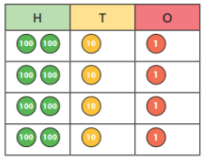
	H	T	O
		3	4
×			5
	1	7	0
	1	2	

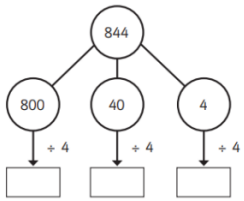


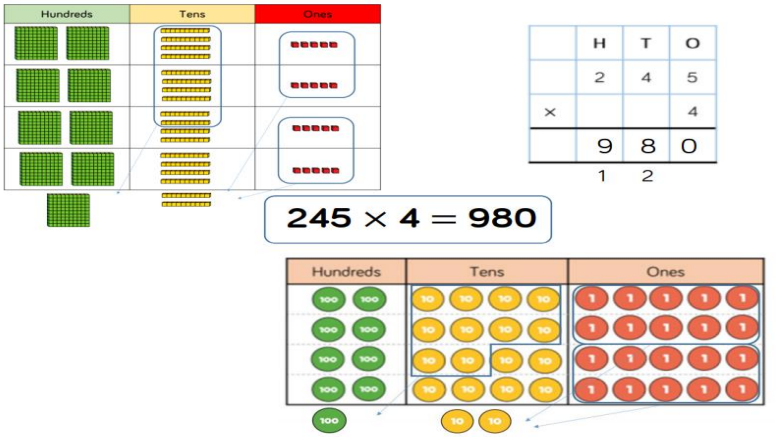
Division

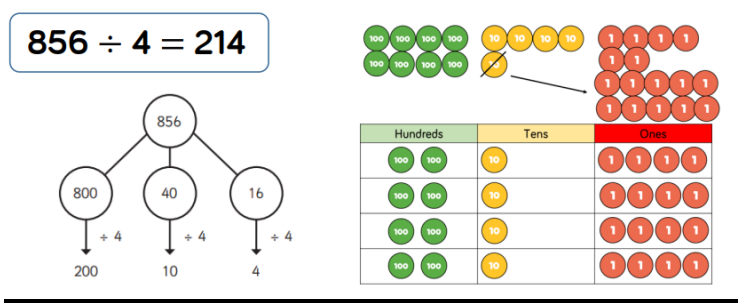
844 ÷ 4 = 211









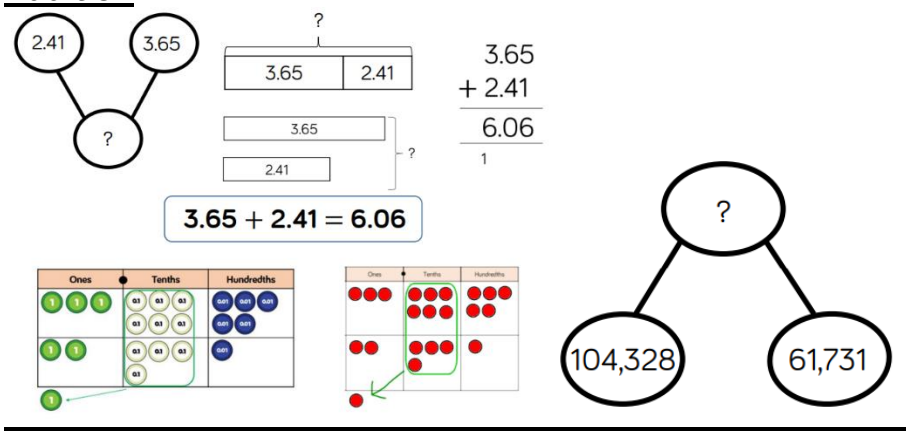


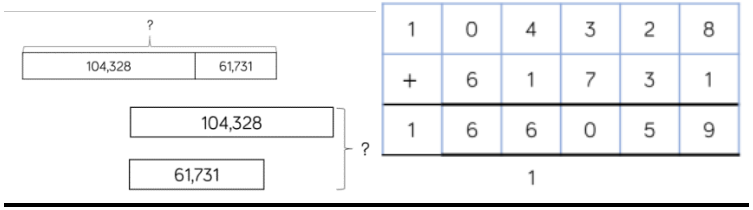
Addition	Subtraction	Multiplication	Division
Add numbers with up to 4 digits Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.	**Subtract 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.	**Multiply 2-digit numbers by 1-digit numbers** The short multiplication method is taught 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. **Multiply 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.	**Divide 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. **Divide 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. **Divide 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.

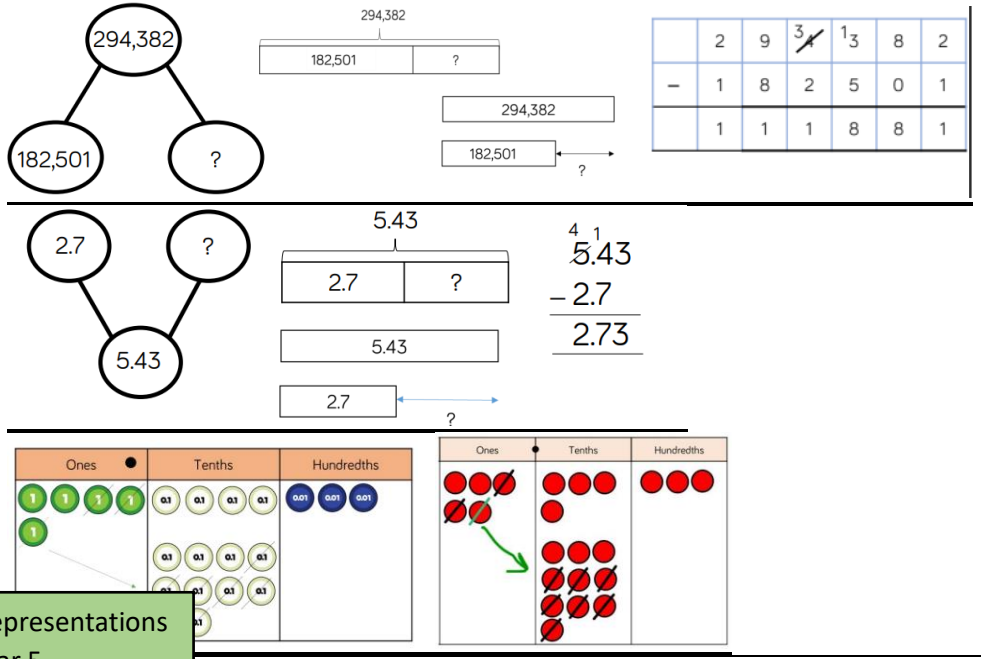
Year 5

Addition



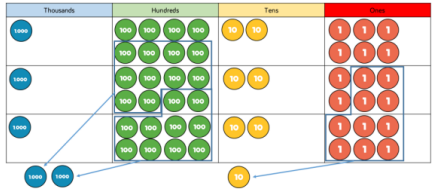


Subtraction



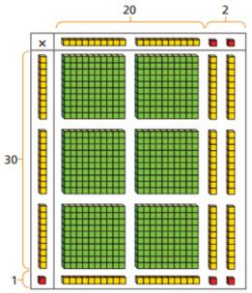
Methods and representations in Year 5

Multiplication



	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
		2		1

×	20	2
30	600	60
1	20	2

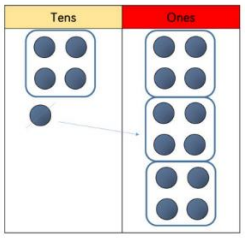


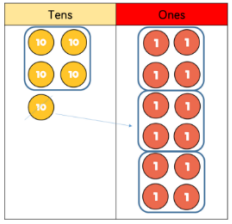
	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

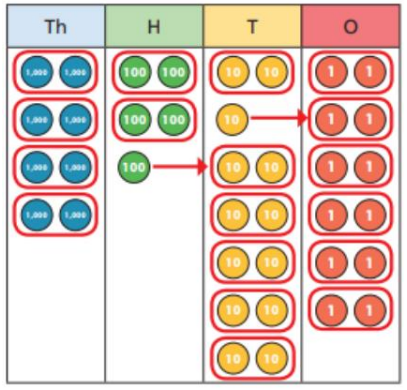
TTh	Th	H	T	O
	2	7	3	9
×			2	8
	2 (2)	1 (5)	9 (3)	1 (7) 2
	5 (1)	4	7 (1)	8 0
	7	6	6	9 2
			1	

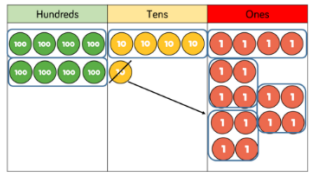
Division

		1	3
	4	5	12









		2	1	4
	4	8	5	16

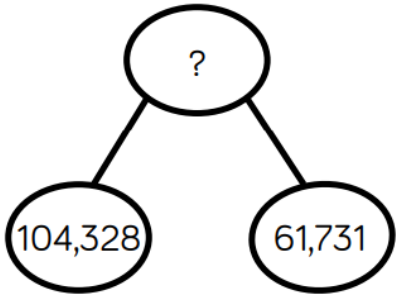
	4	2	6	6
2	8	5	13	12

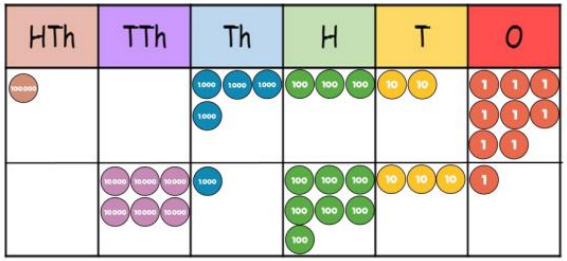
Addition	Subtraction	Multiplication	Division
Add with up to 3 decimal places Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places. Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures. **Add numbers with more than 4 digits** Place value counters or plain counters on a place value grid are	**Subtract 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 **Subtract 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	**Multiply 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. **Multiply 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	**Divide 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. **Divide 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

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.	subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.	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. **Multiply 3-digit numbers by 2-digit numbers** 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.	their own counters and group them through a more pictorial method. **Divide 4-digits by 1-digit (grouping)** 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.

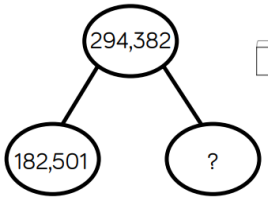
Year 6

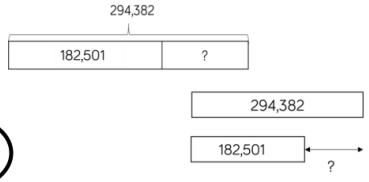
Addition

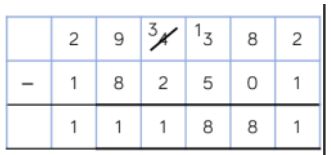


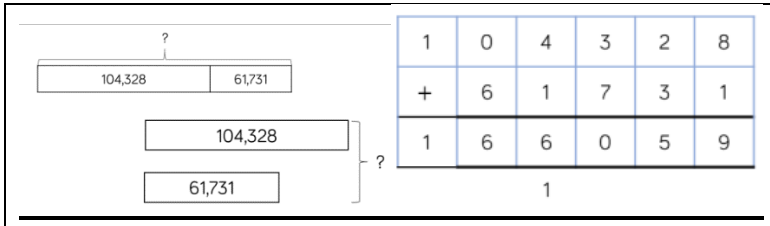


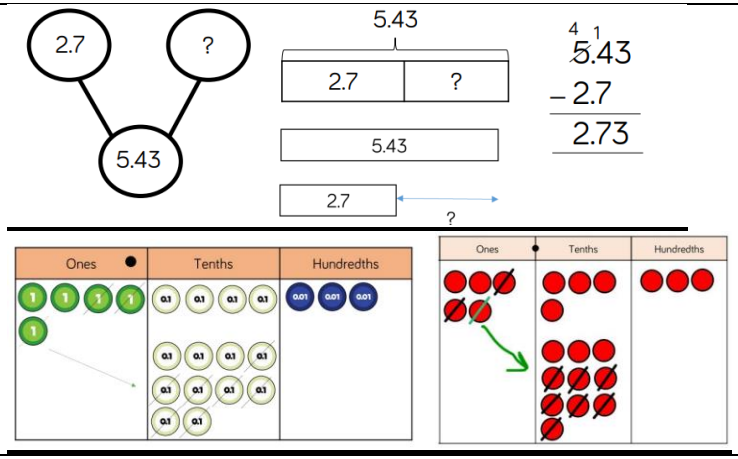
Subtraction









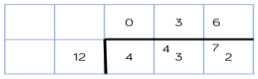


Multiplication

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

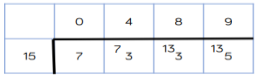
1

Division

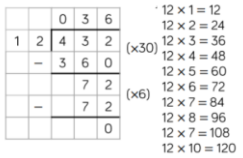


432 ÷ 12 = 36

7,335 ÷ 15 = 489



15	30	45	60	75	90	105	120	135	150



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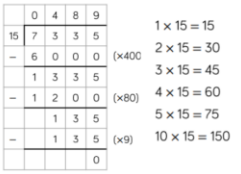

Addition	Subtraction	Multiplication	Division
Add numbers with more than 4 digits Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage,	**Subtract numbers with more than 4 digits** Place value 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	**Multiply 4-digit numbers by 2-digit numbers** When multiplying 4- digits by 2-digits, children should be confident in using the formal written method. If they are still	**Divide multi digits by 2-digits (short division)** When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become

children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.	should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently **Subtract 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.	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	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. **Divide multi-digits by 2-digits (long division)** 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.