Romanby Primary School - Calculation Policy

This policy has been adapted from the White Rose Maths Hub Calculation Policy with further material added. It is a working document and will be revised and amended as necessary. It is a consistent and systematic approach to the teaching of written calculations from the National Curriculum Programmes of Study for Mathematics. Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate emphasis should be placed on choosing and using the method that is most efficient for the given situation. If a child can complete a calculation mentally or with jottings, they should not be expected to complete a written algorithm. Teachers should always encourage children to ask themselves;

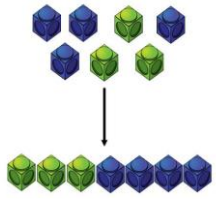
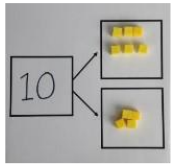
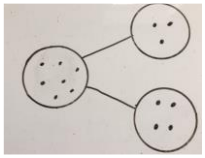
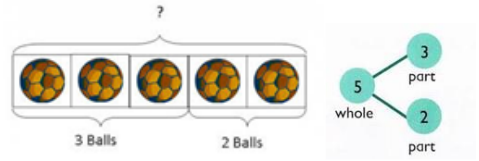
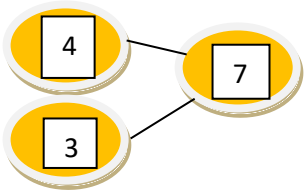
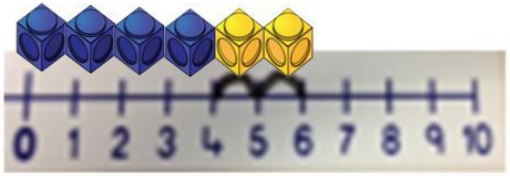
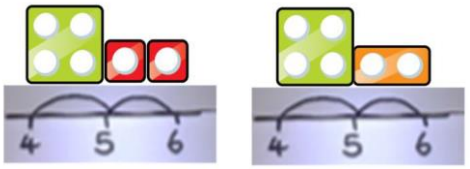
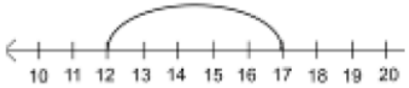
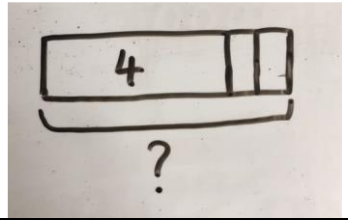
- Do I understand the question?
- Do I know what mathematics to use?
- Do I have a rough idea about the answer?
- Can I do this in my head?
- Are there resources available which would help me?
- Do I need to jot something down?
- Should I use a more formal written method?
- Does my answer look right? How do I know?
- Can I explain what I have done to someone else?

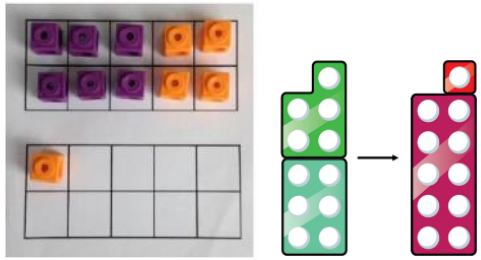
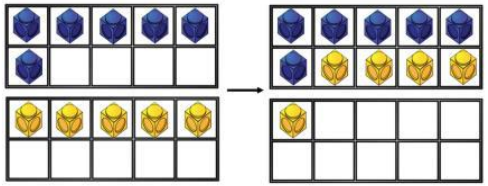
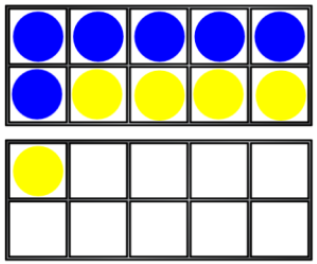
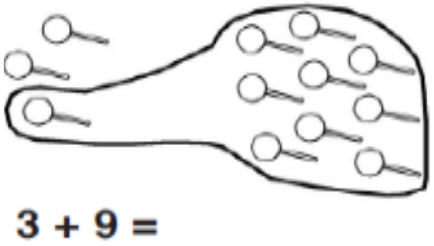
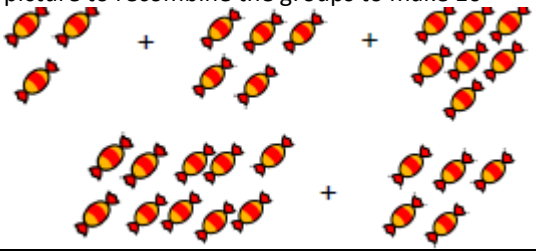
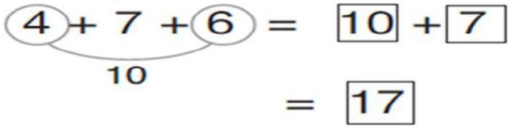
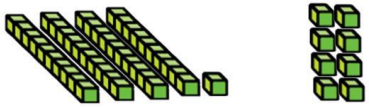
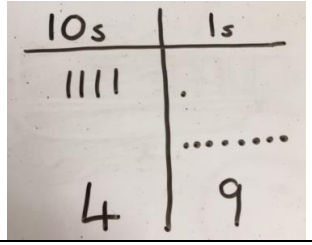
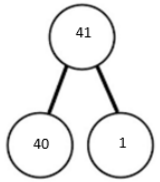
Overview

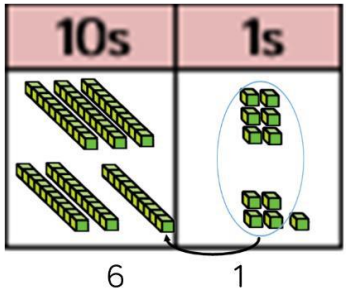
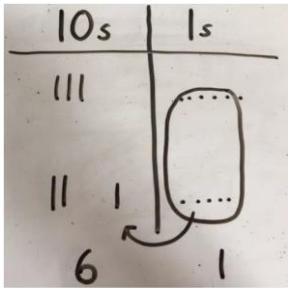
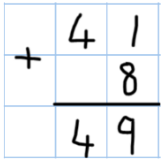
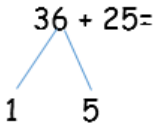
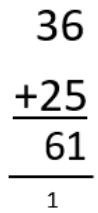
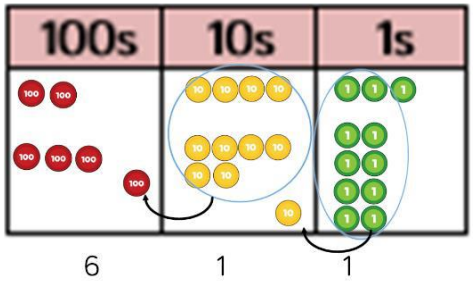
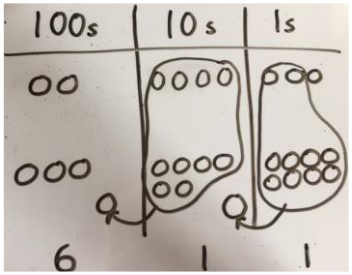
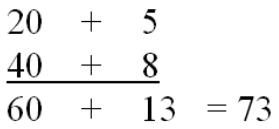
	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Regrouping to make 10 using ten frame.	Adding three single digits. Use of base 10 to combine two numbers.	Column method- regrouping. Using place value counters (up to 3 digits).	Column method- regrouping. (up to 4 digits)	Column method- regrouping. Use of place value counters for adding decimals.	Column method- regrouping. Abstract methods. Place value counters to be used for adding decimal numbers.

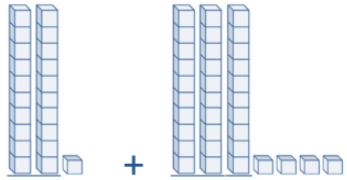
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10 using the ten frame	Counting back Find the difference Part whole model Make 10 Use of base 10	Column method with regrouping. (up to 3 digits using place value counters)	Column method with regrouping. (up to 4 digits)	Column method with regrouping. Abstract for whole numbers. Start with place value counters for decimals- with the same amount of decimal places.	Column method with regrouping. Abstract methods. Place value counters for decimals- with different amounts of decimal places.
Multiplication	Recognising and making equal groups. Doubling Counting in multiples Use cubes, Numicon and other objects in the classroom	Arrays- showing commutative multiplication	Arrays 2d × 1d using base 10	Column multiplication- introduced with place value counters. (2 and 3 digit multiplied by 1 digit)	Column multiplication Abstract only but might need a repeat of year 4 first (up to 4 digit numbers multiplied by 1 or 2 digits, whole numbers and decimals to 10, 100 and 1000)	Column multiplication, Long multiplication. Abstract methods (multi-digit up to 4 digits by a 2 digit number, whole numbers and decimals to 10, 100 and 1000)
Division	Sharing objects into groups Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time.	Division as grouping Division within arrays- linking to multiplication Repeated subtraction	Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction. 2d divided by 1d using base 10 or place value counters	Division with a remainder Short division (up to 3 digits by 1 digit- concrete and pictorial)	Short division (up to 4 digits by a 1 digit number including remainders, whole numbers and decimals to 10, 100 and 1000)	Short division Long division with place value counters (up to 4 digits by a 2 digit number with remainders, whole numbers and decimals to 10, 100 and 1000)

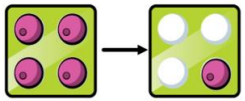
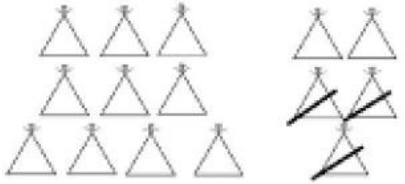
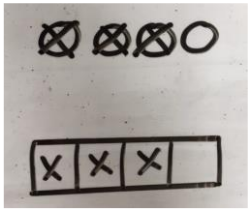
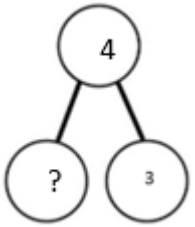
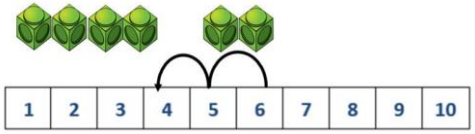
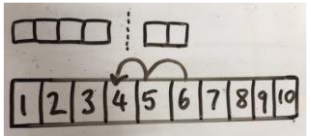
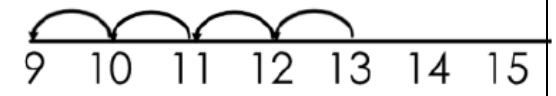
Guidance

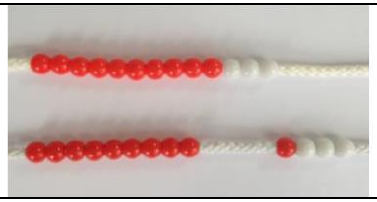
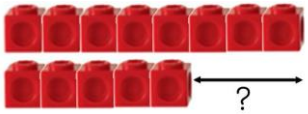
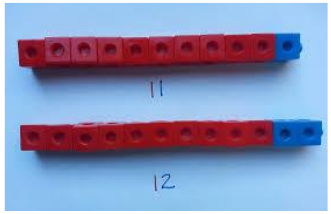
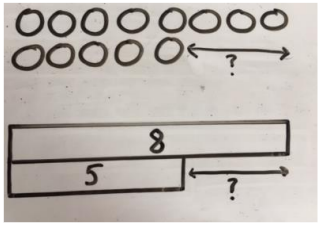
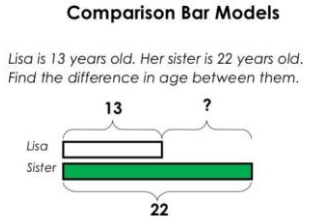
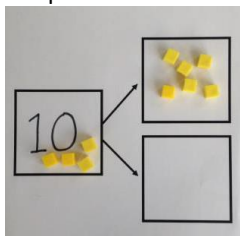
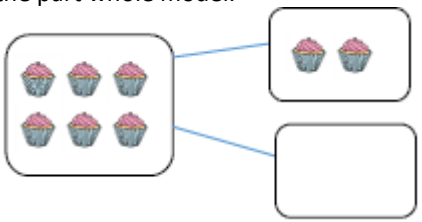
Objective and Strategy	Concrete	Pictorial	Abstract
Addition			
Combining two parts to make a whole (part - whole model)	Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars)   	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too  Use pictures to add two numbers together as a group or in a bar.  	Four is a part, three is a part and the whole is seven 4 + 3 = 7 
Starting at the bigger number and counting on	Start with the larger number and then count on to the smaller number 1 by 1 to find the answer   	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer. A bar model which encourages the children to count on, rather than count all  	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2  5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.

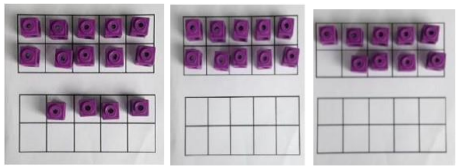
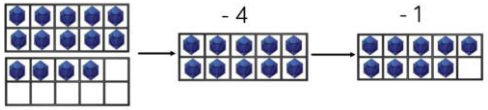
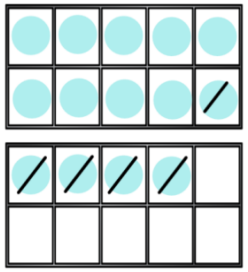
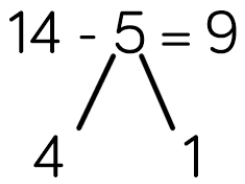
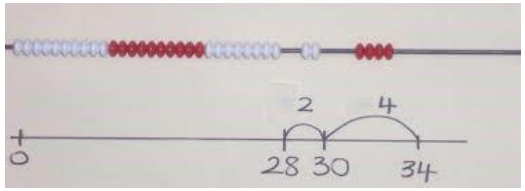
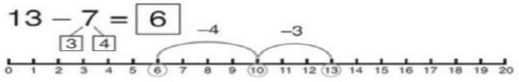
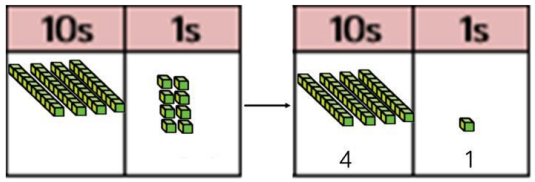
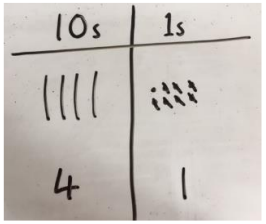
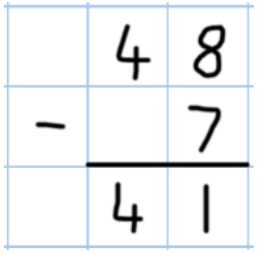
Regrouping to make 10 using ten frame.	Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5  Use ten frames. 	Children to draw the ten frame and counters/cubes   3 + 9 =	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
Adding three single digits.	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7. 	Add together three groups of objects. Draw a picture to recombine the groups to make 10 	Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.  Look for doubles as well as number bonds, ie. 6 + 2 + 6...double 6 = 12...12 + 1 = 13
Use of base 10 to combine two numbers.	Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	40 + 1  Partition a number into tens and ones, add the ones (in one jump) and then the tens (in

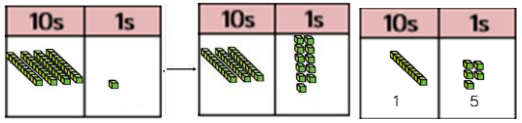
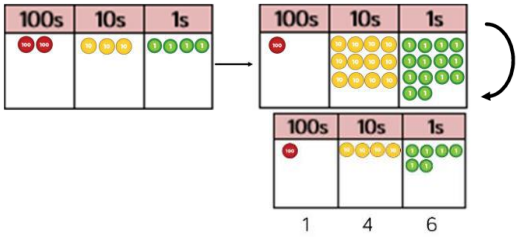
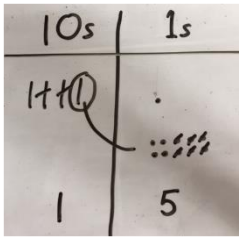
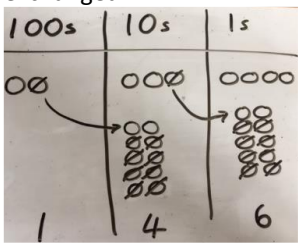
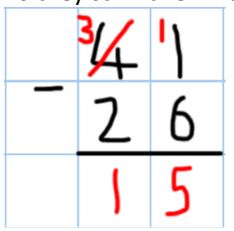
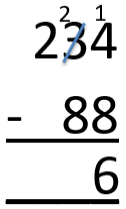
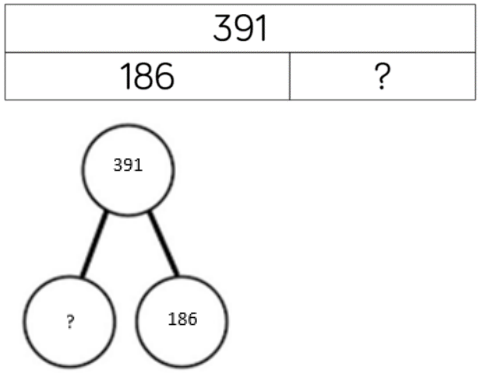
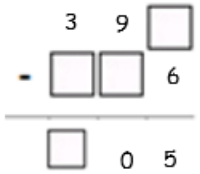
	Continue to develop understanding of partitioning and place value. 36 + 25 	Children to represent the base 10 in a place value chart. 	either one jump or jumps of ten) For example; 43 + 28 =... 3 + 8 = 11... 40 + 20 = 60... 60 + 11 = 71  1 + 8 = 9 40 + 9 = 49 Looking for ways to make 10. 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61  Formal method 
Column method- regrouping Year 3 - Using place value counters (up to 3 digits) Year 4 - (up to 4 digits) Year 5/6 - Use of	When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred. 	Children to represent the counters in a place value chart, circling when they make an exchange. 	Start by partitioning the numbers before moving on to clearly show the exchange below the addition. 

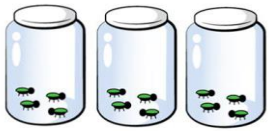
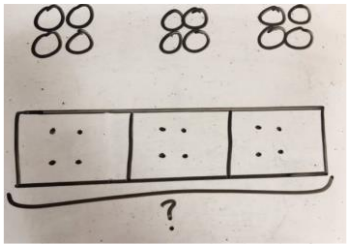
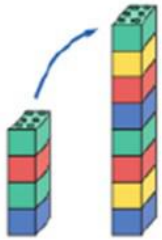
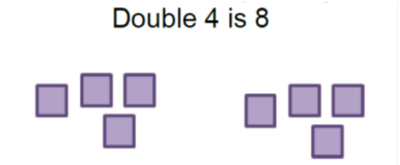
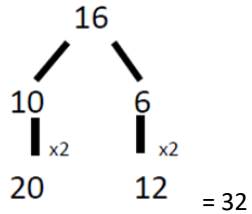
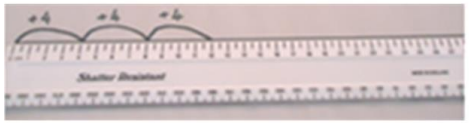
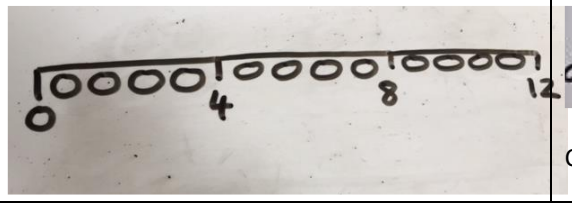
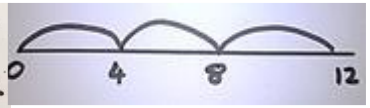
place value counters for adding decimals			243 +368 611 1 1 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here. £23.59 + £7.55 £31.14 1 1 1 23.361 9.080 59.770 + 1.300 93.511 2 1 2
Abstract Methods	<table><tr><td colspan="2">?</td></tr><tr><td>21</td><td>34</td></tr></table>	Word problems: In year 3, there are 21 children and in year 4, there are 34 children. How many children in total? 21 + 34 = 55. Prove it 21 +34 ___ 21 + 34 = = 21 + 34 Calculate the sum of twenty-one and thirty-four.	 Missing digit problems 

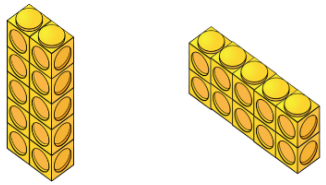
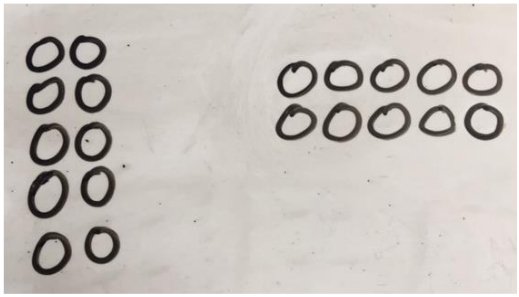
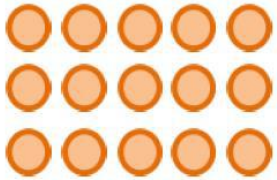
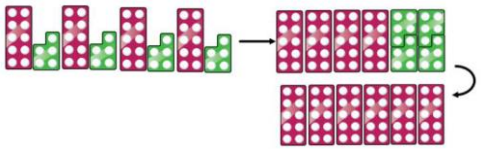
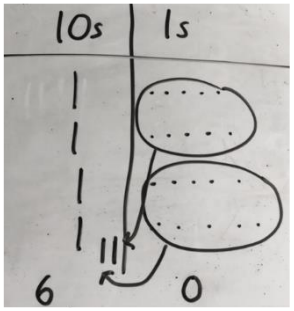
Subtraction			
Taking away ones	Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).  Use physical objects, counters, cubes etc. to show how objects can be taken away. 4-3=1 	Cross out drawn objects to show what has been taken away  15 – 3 = 12 . 	4- 3 = ? ? = 4 – 3 
Counting back	Move objects away from the group, counting backwards  6 – 2 = 4  Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4	Count back on a number line or number track   Start at the bigger number and count back the smaller number showing the jumps on the number line. This can progress all the way to counting back using two 2 digit numbers .	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line  Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

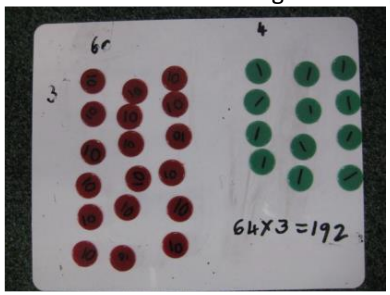
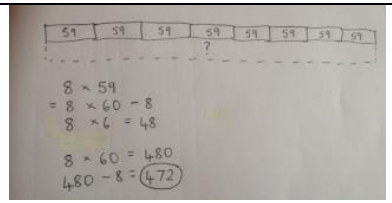
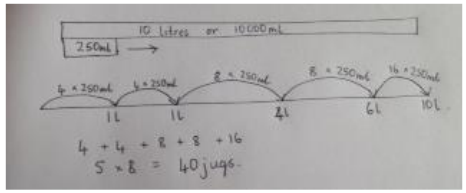
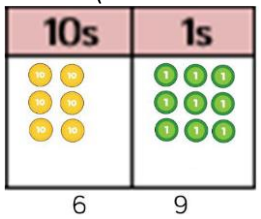
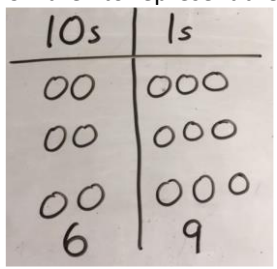
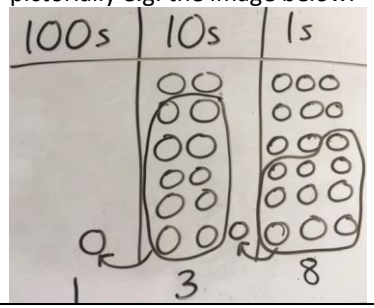
			
Find the difference	Compare amounts and objects to find the difference. Calculate the difference between 8 and 5.  Compare amounts and objects to find the difference. Use cubes to build towers or make bars to find the difference  	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.   	Find the difference between 8 and 5. Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference. Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the numbers of sandwiches.
Part-Whole model	Link to addition- use the part whole model to help explain the inverse between addition and subtraction. If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6  	Use a pictorial representation of objects to show the part whole model. 	Move to using numbers within the part whole model. 

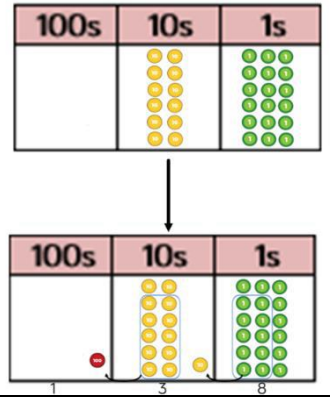
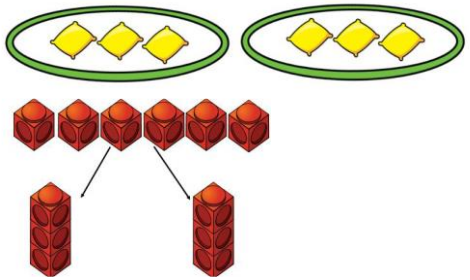
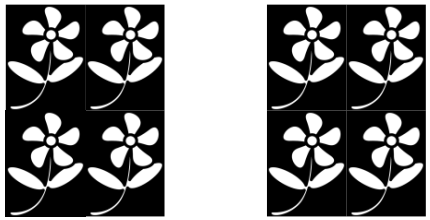
Make 10 using the ten frame	14—9  Make 14 on the ten frame. Take 4 away to make ten, then take one more away so that you have taken 5. 14-5= 	Children to present the ten frame pictorially and discuss what they did to make 10 13—7 	Children to show how they can make 10 by partitioning the subtrahend. 14 – 4 = 10 10 – 1 = 9  16—8 How many do we take off first to get to 10? How many left to take off?
Make 10	Use a bead bar or bead strings to model counting to next ten and the rest. 34—28 	Jump back 3 first, then another 4. Use ten as the stopping point. 	16—8 How many do we take off first to get to 10? How many left to take off?
Use of base 10	Column method using base 10. 48-7 	Children to represent the base 10 pictorially. 	Column method or children could count back 7. 

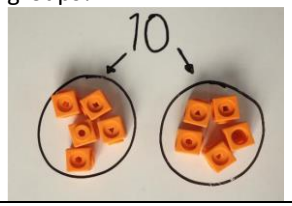
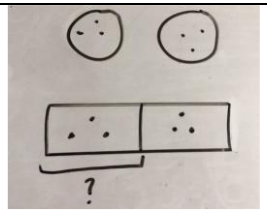
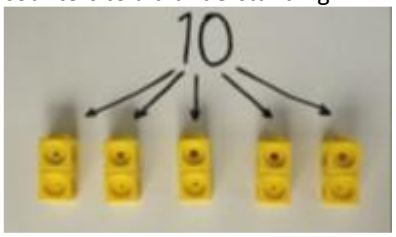
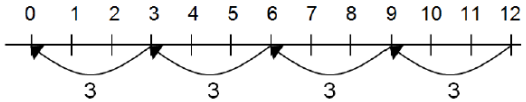
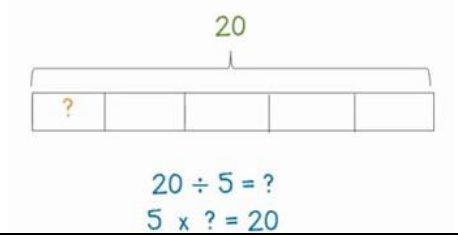
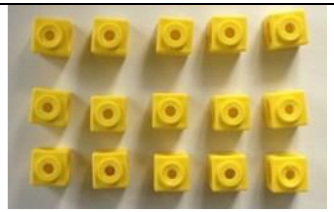
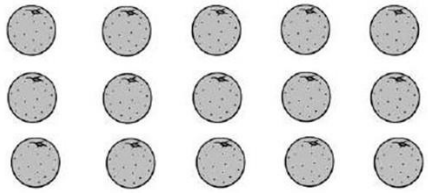
Column method with regrouping. Y3 - (up to 3 digits using place value counters) Y4 - (up to 4 digits) Y5/6 - Start with place value counters for decimals- with the same amount of decimal places.	Column method using base 10 and having to exchange. 41 – 26  Column method using place value counters. 234 – 88  	Represent the base 10 pictorially, remembering to show the exchange.  Represent the place value counters pictorially; remembering to show what has been exchanged.  	Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.  Formal column method. Children must understand what has happened when they have crossed out digits. 
Abstract Methods	 	Raj spent £391, Timmy spent £186. How much more did Raj spend? Calculate the difference between 391 and 186. What is 186 less than 391?	Missing digit calculations 

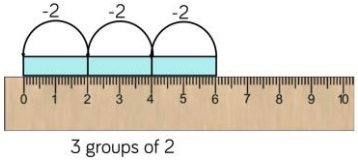
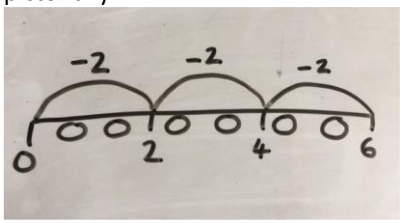
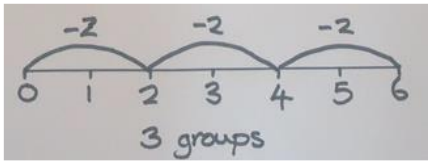
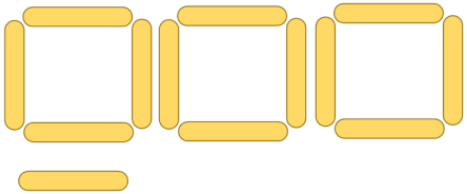
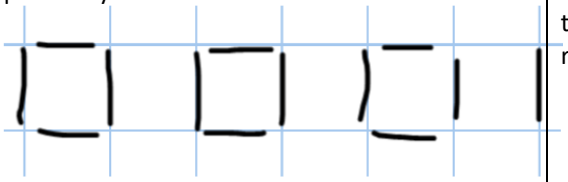
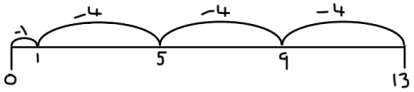
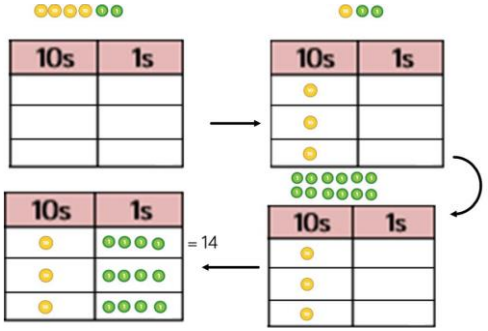
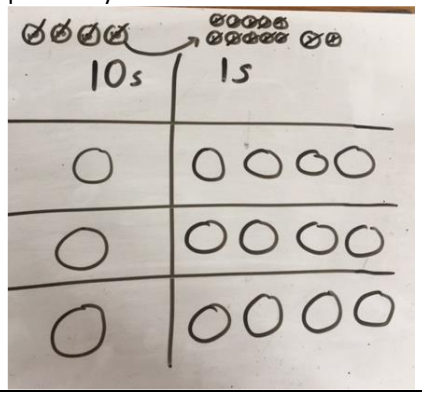
Multiplication			
Recognising and making equal groups.	Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group.  	Children to represent the practical resources in a picture and use a bar model 	3× 4 = 12 4 + 4 + 4 = 12
Doubling	Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling  double 4 is 8 4 × 2 = 8	Draw pictures to show how to double a number. 	Partition a number and then double each part before recombining it back together.  = 32
Counting in multiples Use cubes, Numicon and other objects in the classroom	Number lines to show repeated groups- 3 × 4  	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12  Count in multiples of a number aloud.

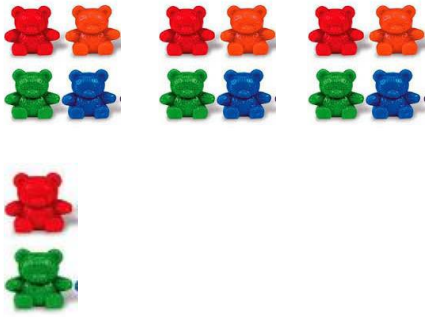
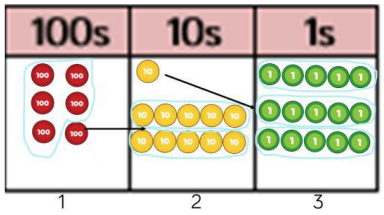
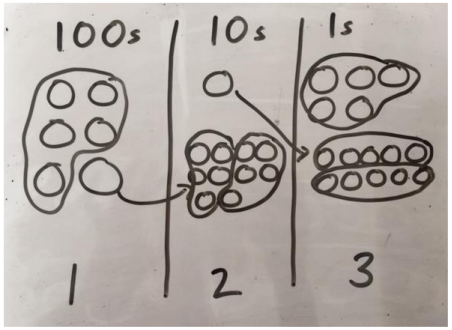
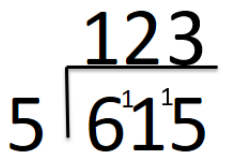
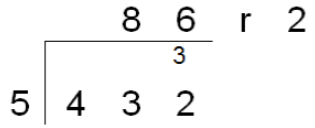
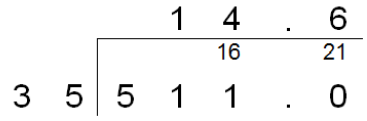
			Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Arrays- showing commutative multiplication	 Use arrays to illustrate commutativity counters and other objects can also be used. 2 × 5 = 5 × 2  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially 	Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 3x5=15
2d × 1d using base 10	Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4 × 15 	Children to represent the concrete manipulatives pictorially. 	Children to be encouraged to show the steps they have taken. 4 x 15 10 5 10 x 4 = 40 5 x 4 = 20 40 + 20 = 60

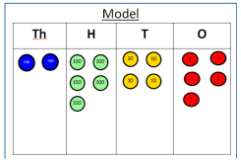
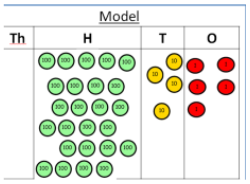
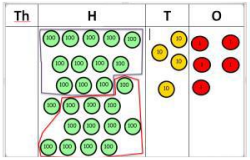
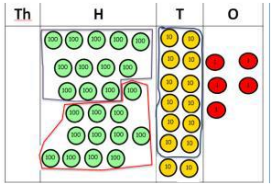
Column multiplication - Y4 - introduced with place value counters (2 and 3 digit multiplied by 1 digit)	Children can continue to be supported by place value counters at the stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	 Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.  	Formal written method 6 x 23 = 23 × 6 138 1 1
Column multiplication Y5 - Abstract only but might need a repeat of year 4 first (up to 4 digit numbers multiplied by 1 or 2 digits)	Formal column method with place value counters (Base 10 can also be used.) 3 × 23  Formal column method with place value counters. 6 x 23	Children to represent the counters pictorially.  Children to represent the counters/base 10, pictorially e.g. the image below.  	Children to record what it is they are doing to show understanding. 3 × 23 3 × 20 = 60 3 × 3 = 9 20 3 60 + 9 = 69 23 × 3 69 Formal written method 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768

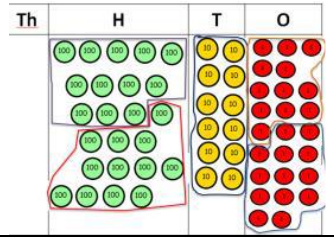
			
Column multiplication Y6 - Abstract methods (multi-digit up to 4 digits by a 2 digit number)	When children start to multiply 3d × 3d and 4d × 2d etc., they should be confident with the abstract: To get 744 children have solved 6 × 124. To get 2480 they have solved 20 × 124.		2 3 1 1 3 4 2 x 1 8 1 3 4 2 0 1 0 7 3 6 2 4 1 5 6 1
Division			
Sharing objects into groups	Sharing using a range of objects. 6 ÷ 2 	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4	Share 9 buns between three people. 9 ÷ 3 = 3 12 shared between 3 is 4 6 ÷ 2 = 3 3 | 3 Children should also be encouraged to use their 2 times table facts.

	I have 10 cubes, can you share them equally in 2 groups? 		
Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding  	 Use a number line to show jumps in groups. The number of jumps equals the number of groups. Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group. 	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?
Division within arrays - linking to multiplication	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. E.g. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	 Draw an array and use lines to split the array into groups to make multiplication and division sentences	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4

Repeated subtraction	Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  	Children to represent repeated subtraction pictorially.  	Abstract number line to represent the equal groups that have been subtracted. 
Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction.	2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over.	Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	13 ÷ 4 – 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.  '3 groups of 4, with 1 left over'
2d divided by 1d using base 10 or place value counters	Sharing using place value counters. 42 ÷ 3 = 14  	Children to represent the place value counters pictorially.  	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14
Division with a remainder	14 ÷ 3 = Divide objects between groups and see how much is left over	Draw dots and group them to divide an amount and clearly show a remainder.	Complete written divisions and show the remainder using r.

			
Short division Y4 - Short division (up to 3 digits by 1 digit- concrete and pictorial) Y5/6 - (up to 4 digits by a 1 digit number including remainders)	Short division using place value counters to group. 615 ÷ 5  1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones?	Represent the place value counters pictorially. 	Children to the calculation using the short division scaffold.  Move onto divisions with a remainder.  Finally move into decimal places to divide the total accurately. 

Long division with place value counters (up to 4 digits by a 2 digit number) Children should exchange into the tenths and hundredths column too	2544 ÷ 12  How many groups of 12 thousands do we have? None  $\begin{array}{r} 0 \\ 12\overline{)2544} \end{array}$ Exchange 2 thousand for 20 hundreds. How many groups of 12 are in 25 hundreds? 2 groups. Circle them. We have grouped 24 hundreds so can take them off and we are left with one.  $\begin{array}{r} 02 \\ 12\overline{)2544} \\ \underline{24} \\ 1 \end{array}$ Exchange the one hundred for ten tens so now we have 14 tens. How many groups of 12 are in 14? 1 remainder 2  $\begin{array}{r} 021 \\ 12\overline{)2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 2 \end{array}$ Exchange the two tens for twenty ones so now we have 24 ones. How many groups of 12 are in 24?	Instead of using physical counters, children can draw the counters and circle the groups on a whiteboard or in their books. Use this method to explain what is happening and as soon as they have understood what move on to the abstract method as this can be a time consuming process.	$\begin{array}{r} 0318\ r5 \\ 20\overline{)6365} \\ \underline{-60\downarrow\ \ \downarrow} \\ \ \ 36\ \ \downarrow \\ \underline{-20\ \ \downarrow} \\ \ \ 165 \\ \underline{-160} \\ \ \ \ \ 5 \end{array}$

	 0 2 1 2 12 ⟌ 2544 24 14 12 24 24 0		