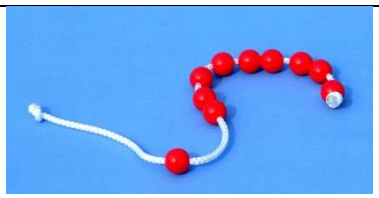
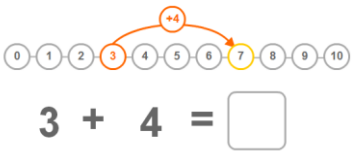
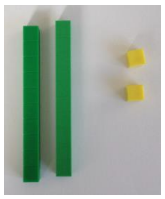
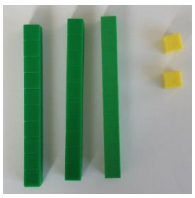
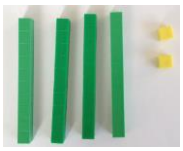
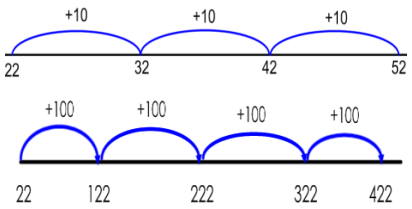
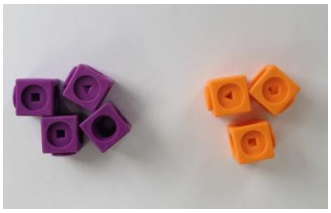
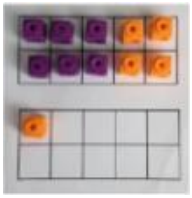
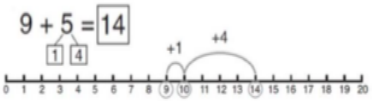
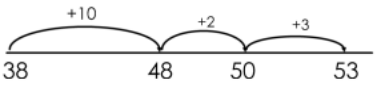
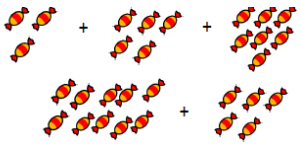
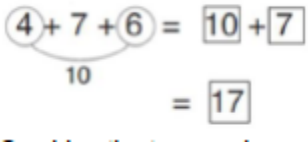
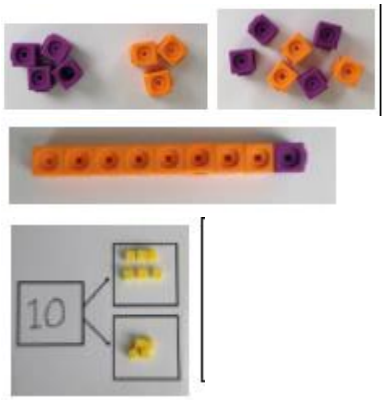
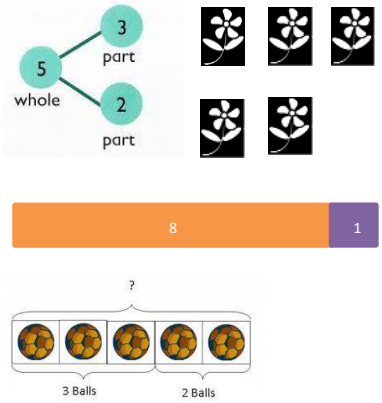
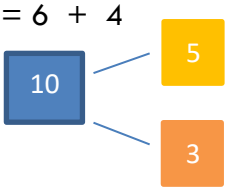
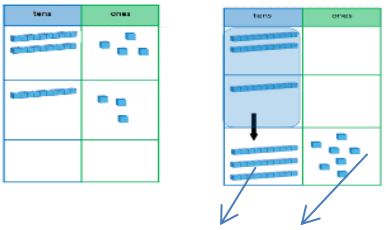
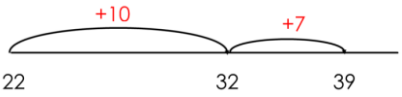
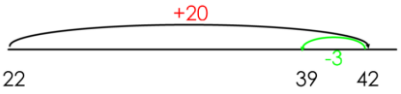
Dobcroft Infant &Junior School | Calculation Policy

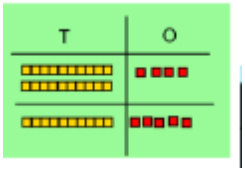
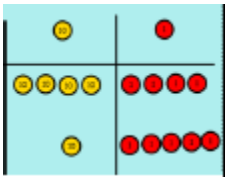
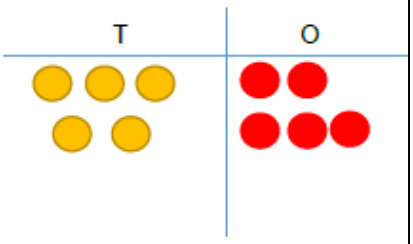
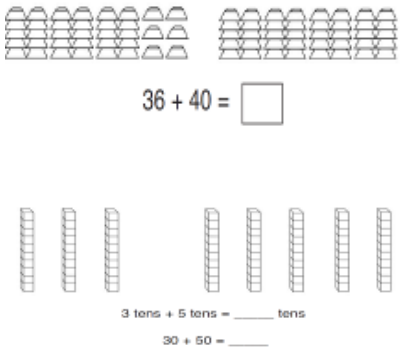
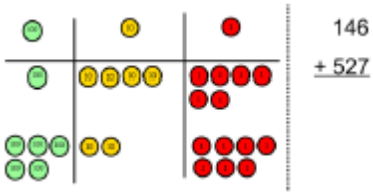
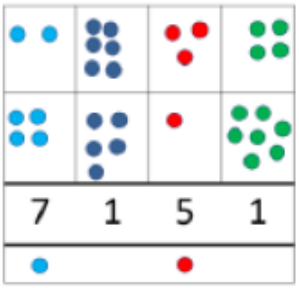
Number: Addition and Subtraction – written calculation From 2014 Curriculum			
Reception	Year 1		Year 2
	Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs. ***Represent and use number bonds and related subtraction facts within 20.*** Add and subtract one–digit and two–digit numbers to 20, including zero.		Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100.
Year 3	Year 4	Year 5	Year 6
Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.	**Add and subtract whole numbers with more than 4 digits** including using formal written methods (columnar addition and subtraction).	Use their knowledge of the order of operations to carry out calculations involving the four operations.

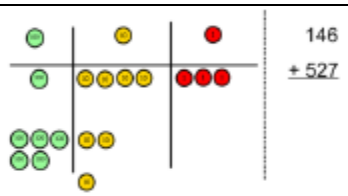
	Strategy	Concrete	Pictorial	Abstract
ADDITION	Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on the smaller number 1 by 1 to find the answer.	 3 + 4 = ☐ Start at the larger number on the number line and count on in ones or in one jump to find the answer	4 + 3 = 7 Place the larger number in your head and count on the smaller number to find your answer.
ADDITION	Counting on in tens and hundreds.	  		

ADDITION	Joining two groups and then recounting all objects using one to one correspondence.	 	  5 + 3 = 8	3 + 4 = 7

ADDITION	Regrouping to make 10.	  Start with the bigger number and use the smaller number to make 10.	 3 + 9 =  Use pictures or a number line. Regroup or partition the smaller number to make 10.	7 + 4 = 11 If I am seven, how many more do I need to make 10? How many more do I add on now?
ADDITION	Using known fact	 How pupils choose to apply this strategy is up to them; however, the focus should always be on efficency.	 	38 + 15 = 2 13 10 3
ADDITION	Adding 3 single digits	4 + 7 + 6 = 17 Put 4 and 6 together to make 10. Add on 7.  Following on from make 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	 Combine the two numbers that make 10 and then add on the remainder.

ADDITION	Combining two parts to make a whole: part-whole model	 Use cubes to add two numbers together as a group in a bar	 Use pictures to add two numbers together as a group or in a bar.	4 + 3 = 7 10 = 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.
ADDITION	Partitioning to add (no regrouping)		 24 + 13 = 37 	When not regrouping, partitioning is a mental strategy and does not need formal recording in columns. This representation prepares them for using column addition with formal recording.
ADDITION	Rounding one number, then adding the tens and taking away extra ones		 22 + 17 = 39	

ADDITION	Column method – no regrouping	24 + 15 =   Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.	 After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve addition.	21 + 42 = 20 + 4 40 + 2 20 + 40 = 60 4 + 5 = 9 60 + 9 = 69 47 + 76 13 110 123
ADDITION	Adding multiples of ten	 Using the vocabulary of 1 ten, 2 tens, 3 tens etc. alongside 10, 20, 30 is important, as pupils need to understand that it is a **ten** and not a one that is being added.	 	It also emphasises the link to known number facts. E.g. '2 + 3 is equal to 5. So 2 tens + 3 tens is equal to 5 tens.
ADDITION	Column method - regrouping	Make both numbers o a place value grid.  Add up the units and exchange 10 ones for one 10.	 Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.	20 + 5 40 + 8 60 + 13 = 73 789 + 642 becomes 7 8 9 + 6 4 2 1 4 3 1 1 1 Answer: 1431

		 Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added. This can be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. As children move on to decimals, money and decimal place value counters can be used to support learning.		72.8 + 54.6 127.4 1 1 £ 2 3 . 5 9 + £ 7 . 5 5 £ 3 1 . 1 4 1 1 1 2 3 . 3 6 1 9 . 0 8 0 5 9 . 7 7 0 + 1 . 3 0 0 9 3 . 5 1 1 2 1 2

Number: Addition and Subtraction – written calculation From 2014 Curriculum			
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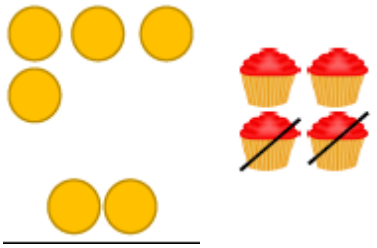
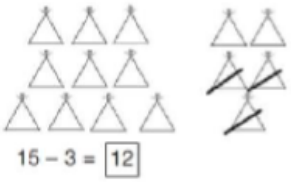
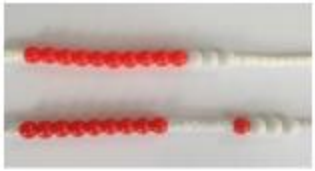
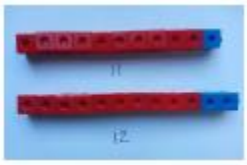
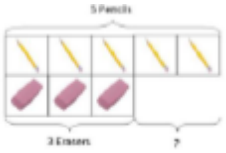
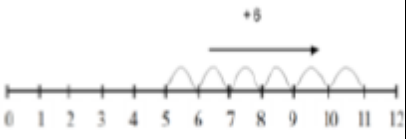
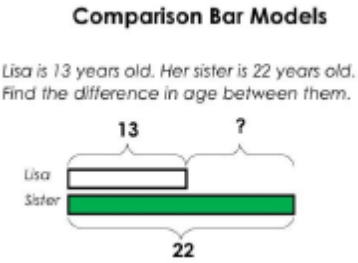
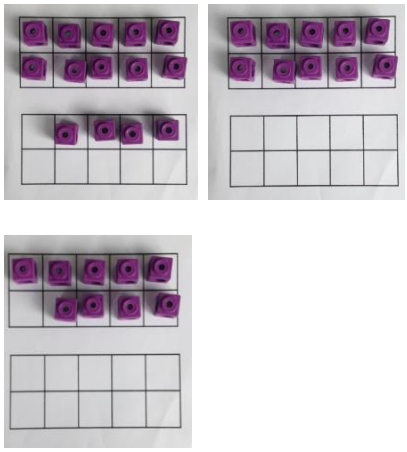
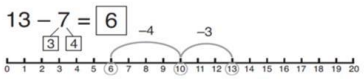
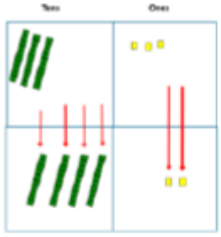
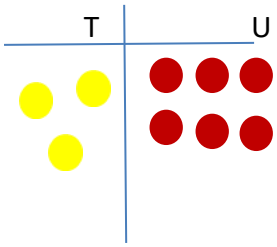
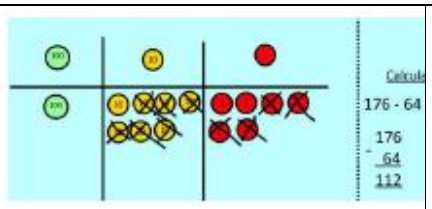
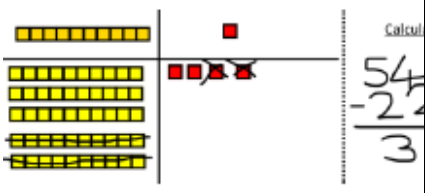
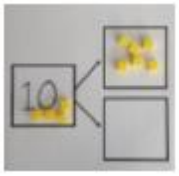
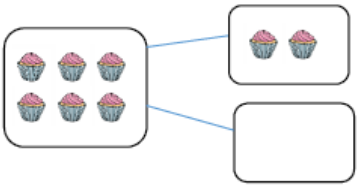
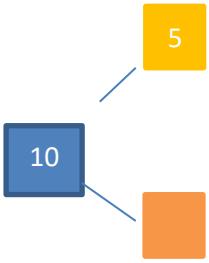
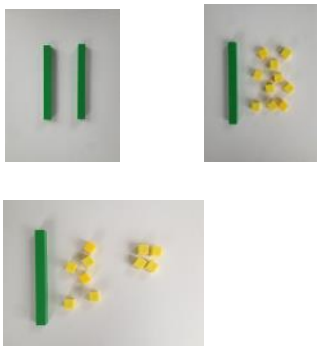
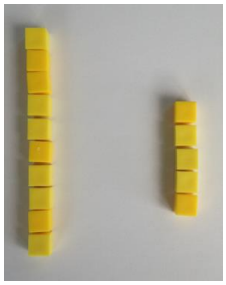
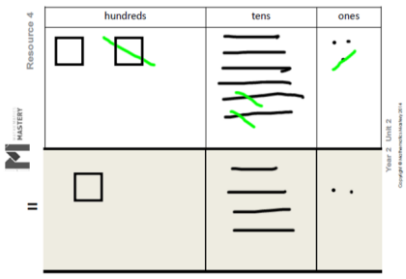
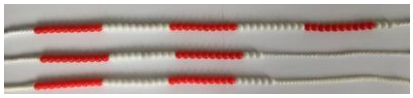
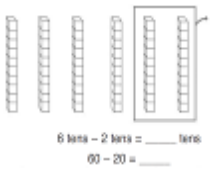
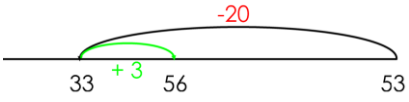
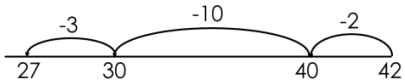
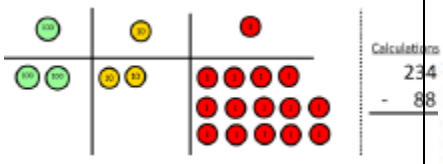
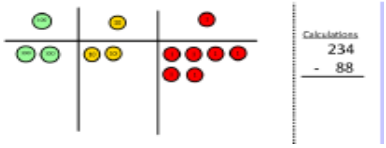
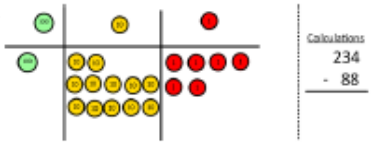
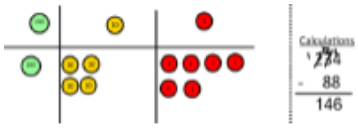
	Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs. ***Represent and use number bonds and related subtraction facts within 20.*** Add and subtract one–digit and two–digit numbers to 20, including zero.		Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100.
Year 3	Year 4	Year 5	Year 6
Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.	**Add and subtract whole numbers with more than 4 digits** including using formal written methods (columnar addition and	Use their knowledge of the order of operations to carry out calculations involving the four operations.

	Strategy	Concrete	Pictorial	Abstract
SUBRACTION	Taking one away	Use physical objects, counters, cubes etc, to show how objects can be taken away. 6 – 2 = 4 	Cross out drawn objects to show what has been taken away.  15 – 3 = 12	18 – 3 = 15 8 – 2 = 6
SUBRACTION	Counting back	Make the larger number in your subtraction. Move the beads along you bead string as you count backwards in ones. 13 – 4  Use counters and move them away from the group as you take them away counting backwards as you go. 	Count back on a number line or number tract.  9 10 11 12 13 14 Start at the bigger number and count back the smaller number showing the jumps on the number line.  -10 -10 -1 -1 -1 34 35 36 37 47 57 This can progress all the way to counting back using two 2 digit numbers.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

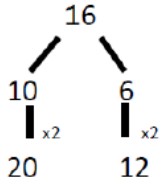
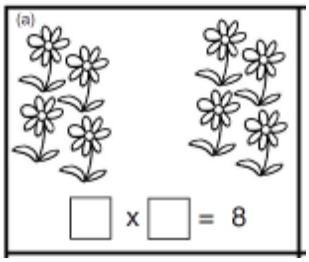
SUBRACTION	Find the difference	Compare amounts and objects to find the difference.  Use cubes to build towers or make bars to find the difference Use basic bar models with items to find the difference. 	Count on to find the difference.  Draw bars to find the difference between 2 numbers  	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
SUBRACTION	Make ten strategy	 Pupils identify how many need to be taken away to make ten first. Then they take away the rest to reach the answer.	 	Pupils identify how many need to be taken away to make ten first. Then they take away the rest to reach the answer.
SUBRACTION	Column method without regrouping	Use Base 10 to make the bigger number then take 	Draw the Base 10 or place value counters alongside the written calculation to help to show working.	874 – 523 becomes 8 7 4 – 5 2 3 3 5 1 Answer: 351

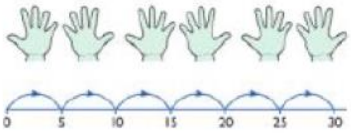
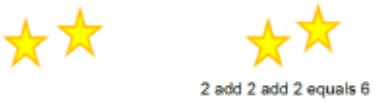
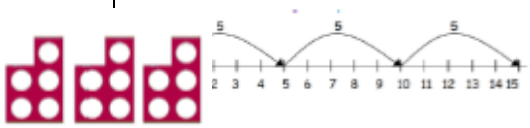
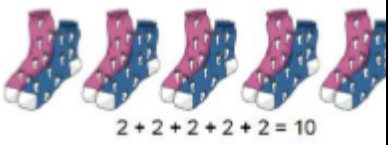
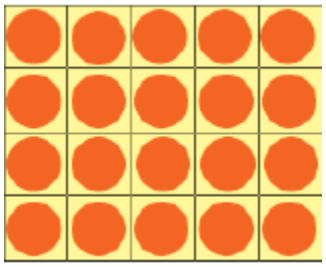
		the smaller number away.  Show how you partition numbers to subtract. Again make the larger number first.	  	
SUBRACTION	Part part whole model	Link to addition – use the part whole model to help explain the inverse between addition and subtraction.  If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6 =	Use pictorial representation of objects to show the part part whole model. 	Move to using numbers within the part whole model. 
SUBRACTION	Regroup a ten into 10 ones		 20 – 4 =	

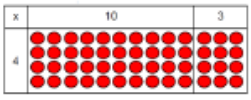
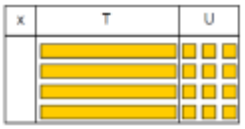
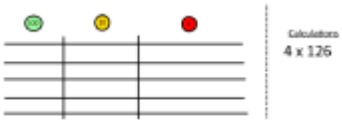
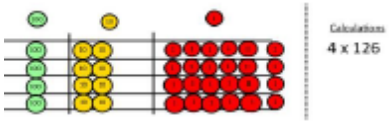
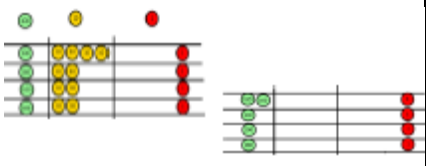
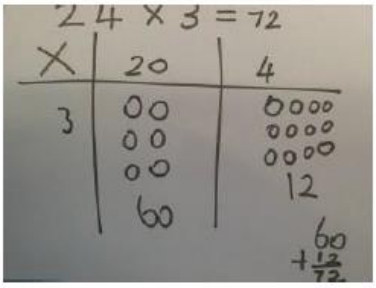
SUBRACTION	Taking away from the tens	9 = 15– 6 	 16 – 8 = 8	
SUBRACTION	Partitioning to subtract without regrouping			34 – 13 = 21
SUBRACTION	Subtracting multiples of ten	40 = 60 – 20   	 	53 – 17 = 36
SUBRACTION	Bridging through tens			42 - 15 = 2 13 10 3

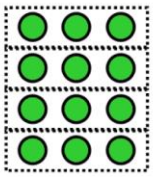
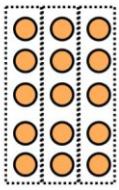
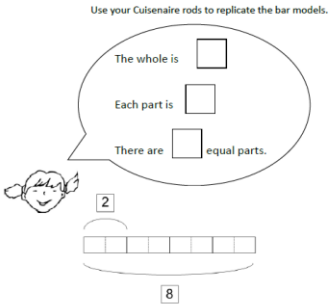
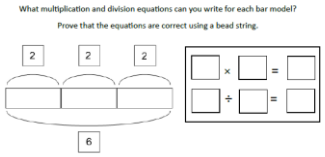
SUBRACTION	Column method with regrouping	Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractiosn with 2 exchanges. Make the larger number with the palce value counters.  Start with the ones, can I take 8 from 4 easily? I need to exchange one of my tens for ten ones.  Now I can subtract my ones.  Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten  Now I can take away eight tens and complete my subtraction.  Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.  When confident, children can find their own way to record the exchange/regrouping. Just writing numbers as shown here shows that the childn understands the method and knows when to exchange/regroup.	 Children can start their formal written method by partitioning the number into clear place value columns. Moving forward the children use a more compact method. 932 – 457 becomes 8 12 1 9 3 2 – 4 5 7 4 7 5 Answer: 475 This will lead to an understanding of subtracting any number including decimals.

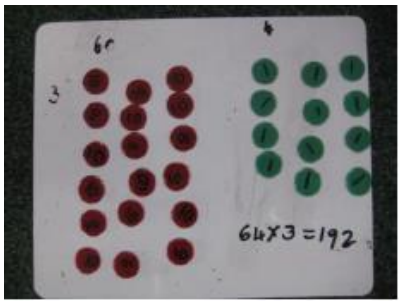
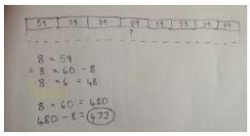
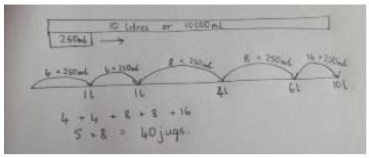
Number: Multiplication and Division – written calculation From 2014 Curriculum			
Reception	Year 1		Year 2
			Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.
Year 3	Year 4	Year 5	Year 6
Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two–digit numbers times one–digit numbers, using mental and progressing to written methods.	Multiply two–digit and three–digit numbers by a one–digit number using formal written layout.	Multiply numbers up to 4 digits by a one– or two–digit number using a formal written method, including long multiplication for two–digit numbers. Divide numbers up to 4 digits by a one–digit number using the formal written method of short division and interpret remainders appropriately for the context. Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.	***Multiply multi–digit numbers up to 4 digits by a two–digit whole number*** using the formal written method of long multiplication. ***Divide numbers up to 4 digits by a two–digit whole number*** using the formal written method of long division, ***and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.*** Use their knowledge of the order of operations to carry out calculations involving the four operations.

	Strategy	Concrete	Pictorial	Abstract
MULTIPLICATION	Doubling	Use practical activities to show how to  double 4 is 8 4 × 2 = 8	Draw pictures to show how to double a number. Double 4 is 8 	Partition a number and then double each part before recombining it back together.  16 10 ×2 → 20 6 ×2 → 12
MULTIPLICATION	Making equal groups and counting the total		 (a) □ x □ = 8	Draw  to show 2 x 3 = 6

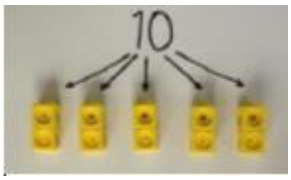
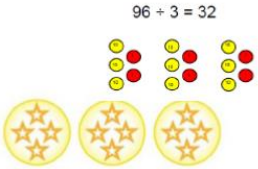
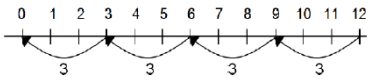
MULTIPLICATION	Counting in multiples	Count in multiples supported by concrete objects in equal groups.  	Use a number line or pictures to continue support in counting in multiples.  	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
MULTIPLICATION	Repeated Addition	Use different objects to add equal groups.  	   	Write addition sentences to describe objects and pictures. 
MULTIPLICATION	Arrays – showing commutative multiplication	Create arrays using counters/cubes to show multiplication sentences.  	Draw arrays in different rotations to find commutative multiplication sentences.    Link arrays to rectangles.	Use array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

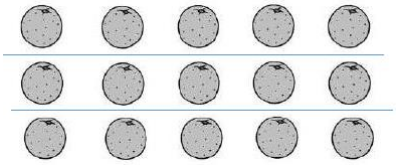
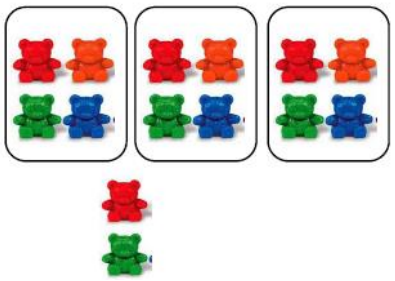
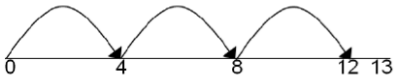
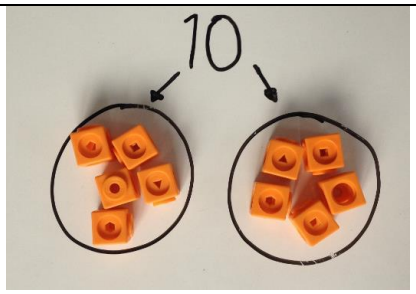
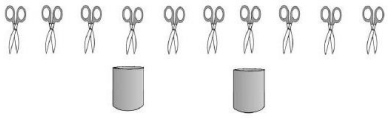
MULTIPLICATION	Grid Method	Show the link with arrays to first introduce the grid method.  4 rows of 10 4 rows of 3 Move on to using Base 10 to move towards a more compact method.  4 rows of 13 Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.  Fill each row with 126.  Add up each column, starting with the ones making any exchanges needed.  Then you have your answer.	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.  	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. | ×	30	5
---	---	---
7	210	35 | 210 + 35 = 245 Moving forward, multiply by a 2 digit number showing the different rows within the grid method. |	10	8
---	---	---
10	100	80
3	30	24 | | x	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16 |

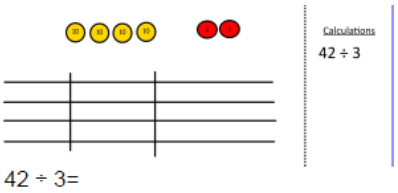
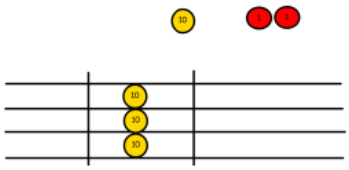
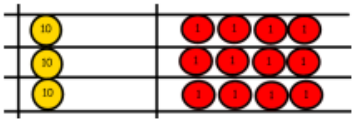
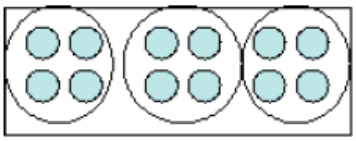
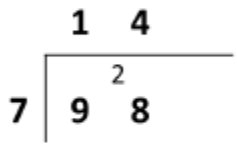
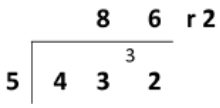
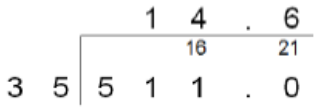
MULTIPLICATION	Bar modelling to represent the parts, the whole and the number of parts in multiplication word		There are 4 bags of sweets with 3 sweets in each bag. How many sweets are there altogether?  There are 3 school bags with 5 books in each one. How many books are there altogether? 	
MULTIPLICATION	Use of part-part-whole model to establish the inverse relationship between multiplication and division	Use Cuisenaire rods should be used to identify the whole, the size of the parts and the number of parts. 		
MULTIPLICATION	Doubling to derive new multiplication facts		 3 x 2 = 6	

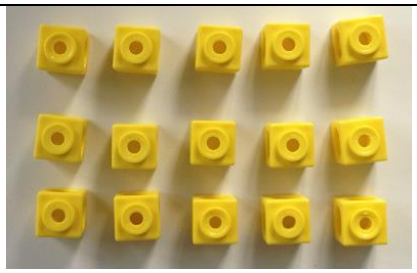
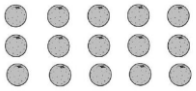
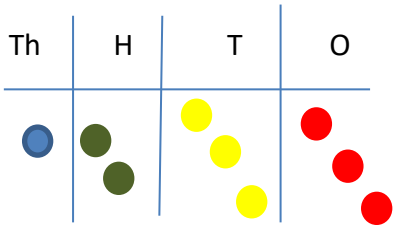
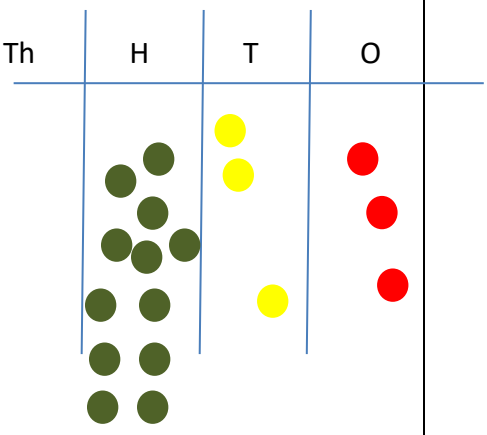
MULTIPLICATION	Column Multiplication	Children can continue to be supported by place value counters at the stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.  	**Short multiplication** 2741 × 6 becomes 2 7 4 1 × 6 1 6 4 4 6 4 2 Answer: 16 446 **Long multiplication** Reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer. 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768 7 4 × 6 3 1 2 2 1 0 2 4 0 + 4 2 0 0 4 6 6 2 This moves to the more compact method. 124 × 26 becomes 1 2 1 2 4 × 2 6 7 4 4 2 4 8 0 3 2 2 4 1 1 Answer: 3224

Number: Multiplication and Division – written calculation			
Reception	Year 1		Year 2
			Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.
Year 3	Year 4	Year 5	Year 6
Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two–digit numbers times one–digit numbers, using mental and progressing to written methods.	Multiply two–digit and three–digit numbers by a one–digit number using formal written layout.	Multiply numbers up to 4 digits by a one– or two–digit number using a formal written method, including long multiplication for two–digit numbers. Divide numbers up to 4 digits by a one–digit number using the formal written method of short division and interpret remainders appropriately for the context. Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.	***Multiply multi–digit numbers up to 4 digits by a two–digit whole number*** using the formal written method of long multiplication. ***Divide numbers up to 4 digits by a two–digit whole number*** using the formal written method of long division, ***and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.*** Use their knowledge of the order of operations to carry out calculations involving the four operations.

	Strategy	Concrete	Pictorial	Abstract
DIVISION	Division as grouping	Divide quantitites into equal groups. Use cubes, counters, objects or place value 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 with in each group.	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

DIVISION	Division within arrays	Link division to mulitplication by creating an array and thinking about the number sentences that can be created. Eg 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 four linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 4 = 7 28 ÷ 7 = 4
DIVISION	Division with a remainder	14 ÷ 3 = Divide objects between group s and see how much is left over. 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 
DIVISION	Division as sharing			10 ÷ 2 = 5

DIVISION	Short division	 Use place value counters to divide using the bus stop method alongside.  42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We exchange this ten for ten ones and then share the ones equally among the groups.  We look how much in 1 group so the answer is 14.	Children can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficently.	Begin with divisions that divide equally with no remainders. 98 ÷ 7 becomes  Answer: 14 Move onto divisions with a remainder. 432 ÷ 5 becomes  Answer: 86 remainder 2 Finally move onto decimal places to divide the total accurately. 

DIVISION	Use of part-part-whole model to represent division equations and to emphasise the relationship between division and		15 ÷ 5 = 3 15 ÷ 3 = 5 	Write the division equations that the array represents.  20 ÷ 4 = ☐ 20 ÷ 5 = ☐
DIVISION	Long division	Use a place value board to move counters from one place value column to another when exchanging is necessary.  1233 ÷ 5 =  5 | 1233 12 0	Instead of using physical counters, students can draw the counters and circle the groups on a whiteboard or in their books. Using this method to explain what is happening. As soon as they have understood, move on to the abstract method as this can be a time consuming process.	432 ÷ 15 becomes 2 8 r 12 1 5 | 4 3 2 3 0 0 1 3 2 1 2 0 1 2 Answer: 28 remainder 12 432 ÷ 15 becomes 2 8 1 5 | 4 3 2 3 0 0 15×20 1 3 2 1 2 0 15×8 1 2 $\frac{12}{15} = \frac{4}{5}$ Answer: $28\frac{4}{5}$ 432 ÷ 15 becomes 2 8 · 8 1 5 | 4 3 2 · 0 3 0 ↓ 1 3 2 1 2 0 ↓ 1 2 0 1 2 0 0 Answer: 28·8
