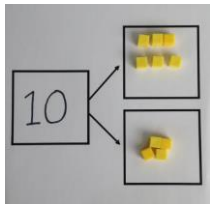
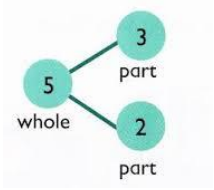
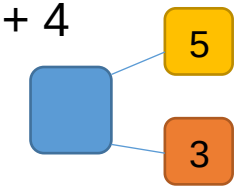
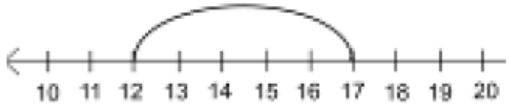
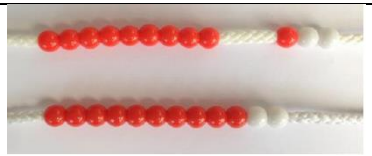
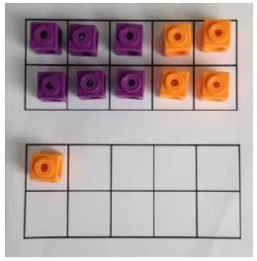
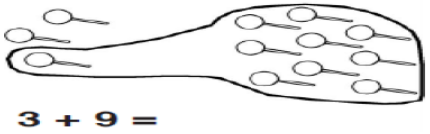
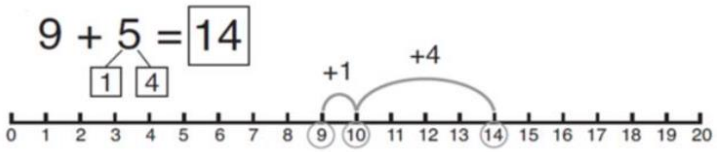
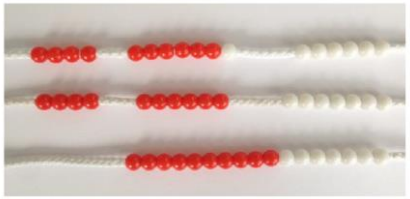
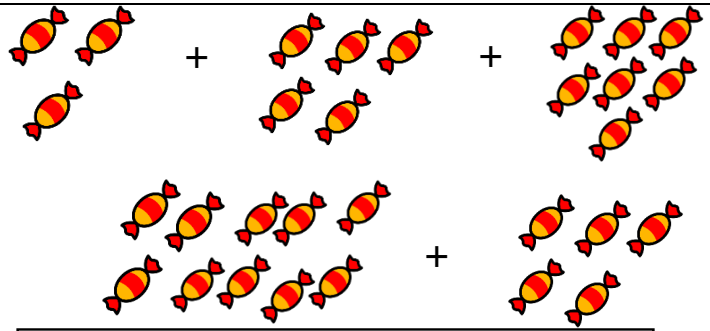
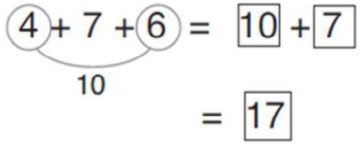
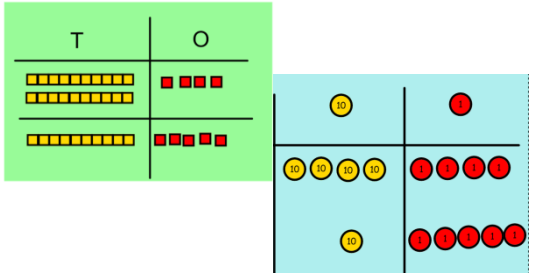
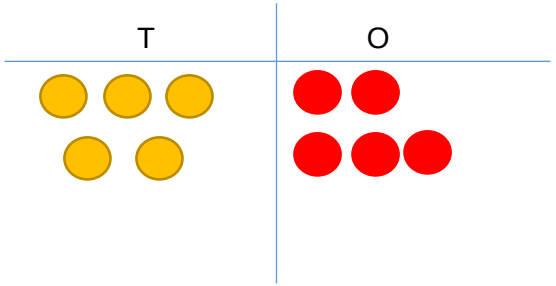
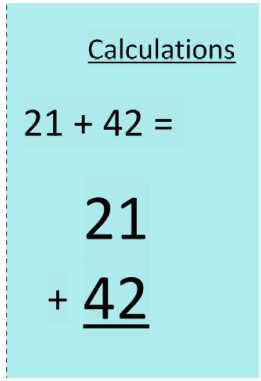
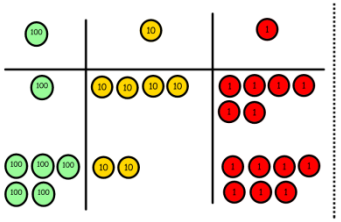
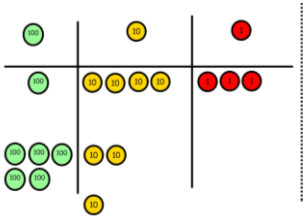
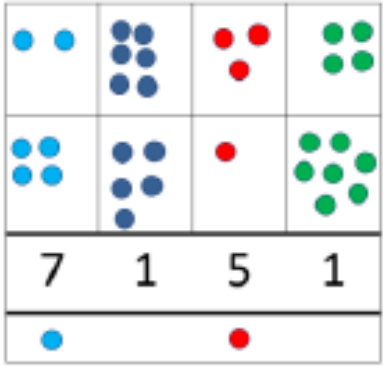
Sandon JMI School' Calculation Guide

At Sandon JMI School, we follow the White Rose and H.F.L Essential Maths Planning

Addition

Objective and Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	   Using cubes to add two numbers together as a group or in a bar. 	   Using pictures to add two numbers together as a group or in a bar 	4 + 3 = 7 10= 6 + 4  Using the part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	 Starting with the larger number on the bead string and then counting on to the smaller number, 1 by 1 to find the answer.	12 + 5 = 17  Starting at the larger number on the number line and counting on in ones or in one jump to find the answer.	5 + 12 = 17 Placing the larger number in mind and counting on the smaller number to find the answer.

Regrouping to make 10.	 6 + 5 = 11  Starting with the bigger number and using the smaller number to make 10.	 3 + 9 = Using pictures or a number line. Regrouping or partitioning the smaller number to make 10. 	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?
Adding three single digits	4 + 7 + 6= 17 Putting 4 and 6 together to make 10. Adding on 7.  Following on from making 10, making 10 with 2 of the digits (if possible) then adding on the third digit.	 Adding together three groups of objects. Drawing a picture to recombine the groups to make 10.	 Combining the two numbers that make 10 and then adding on the remainder.
Column method- no regrouping	24 + 15= ? Adding together the ones first then adding the tens. Using 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 additions. 	

Column method- regrouping	Creating both numbers on a place value grid.  146 + 527 Adding the units and exchanging 10 ones for one 10.  146 + 527 Adding 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 also 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.	Drawing a pictoral representation of the columns and place value counters to further support learning and understanding.  	Partitioning the numbers before moving on to clearly show the exchange below the addition. 20 + 5 40 + 8 60 + 13 = 73 536 + 85 621 1 1 Progression to include decimal calculations. 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

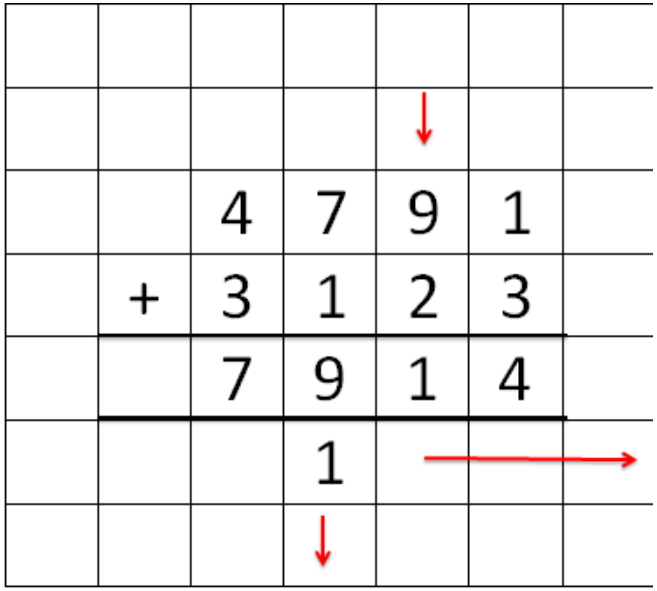
Year 5/6 Formal Written Calculation Methods.

Column Addition

In year 5, children need to be able to add two 4-digit numbers.

For Example:

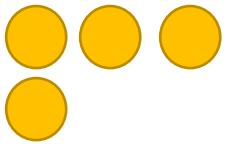
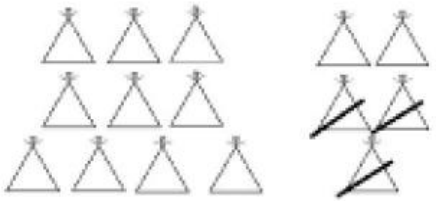
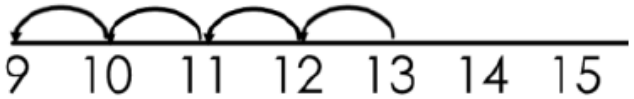
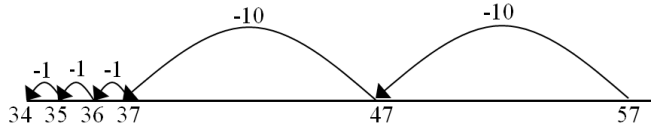
4791 + 3123 =

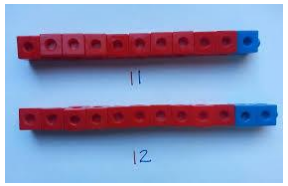
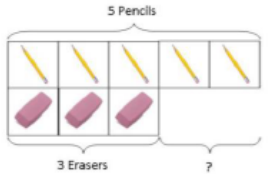
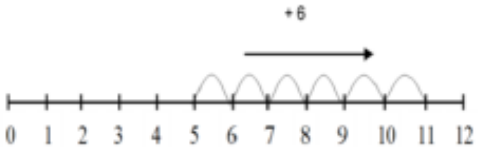
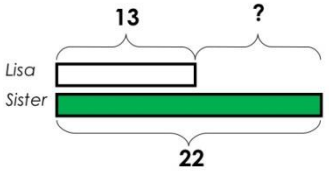
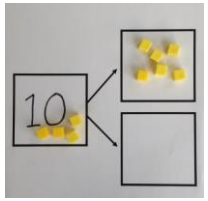
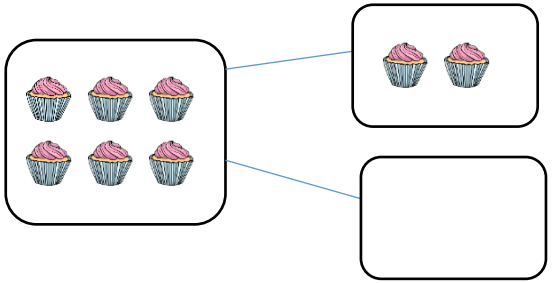
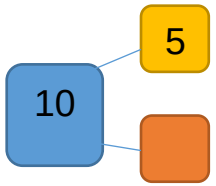
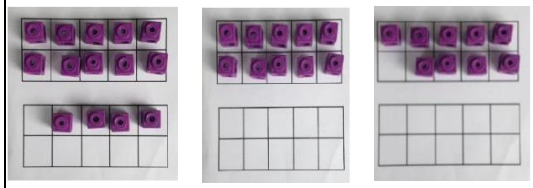
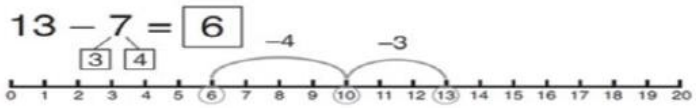


7 + 1 + 1 = 9

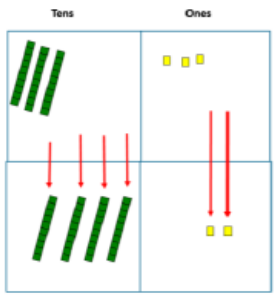
9 + 2 in the 10's column equals 11, so the one ten (1) from 11 is carried to the next column along. It is then added with the next column.

Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Using 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
Counting back	Making the larger number in your subtraction. Using beads and moving the beads along the bead string counting backwards in ones. 13 – 4  Using counters and moving them away from the group counting backwards. 	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.	Mentally starting with 13 then counting back 4.

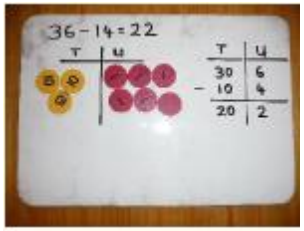
Find the difference	Comparing amounts and objects to find the difference.  Using cubes to build towers or make bars to find the difference  Using basic bar models with items to find the difference	 Counting on to find the difference. Drawing bars to find the difference between 2 numbers. **Comparison Bar Models** *Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*  	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
Part Whole Model	 Link to addition- using 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 =	Using a pictorial representation of objects to show the part whole model. 	 Moving to using numbers within the part whole model.
Make 10	14 – 9 =  Eg: Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 Starting at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?

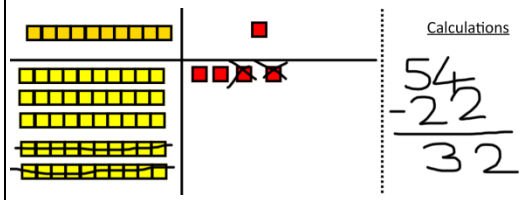
Column method without regrouping

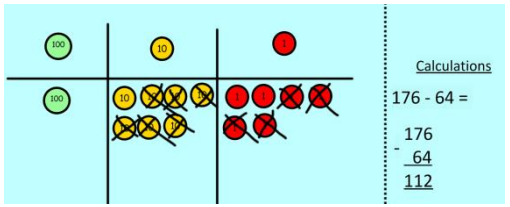


Using Base 10 to make the bigger number then take the smaller number away.

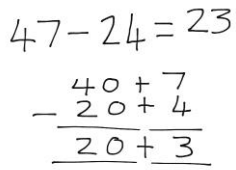
Partitioning numbers to subtract.



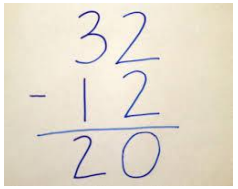




Drawing the Base 10 or place value counters alongside the written calculation to help to show working.

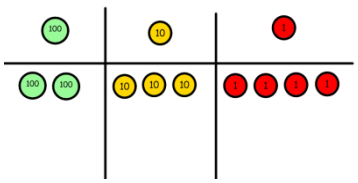


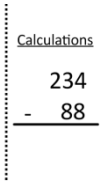
This will lead to a clear written column subtraction.

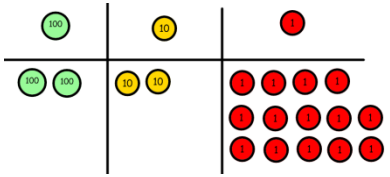


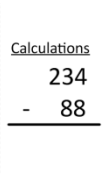
Column method with regrouping

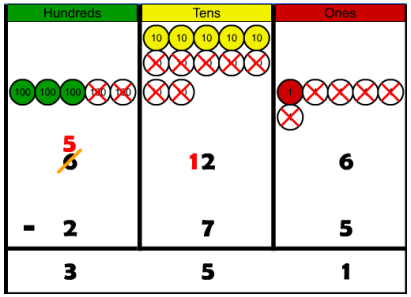
Using Base 10 to start with before moving on to place value counters. Starting with one exchange before moving onto subtractions with 2 exchanges.



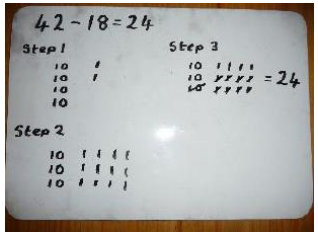






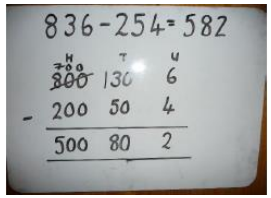


Drawing the counters onto a place value grid and show the amount taken away by crossing the counters out as well as clearly showing the exchanges made.

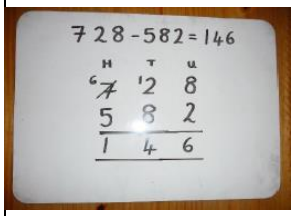


When confident, children can find their own way to record the exchange/regrouping.

Just writing the numbers as shown here shows that the child 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.

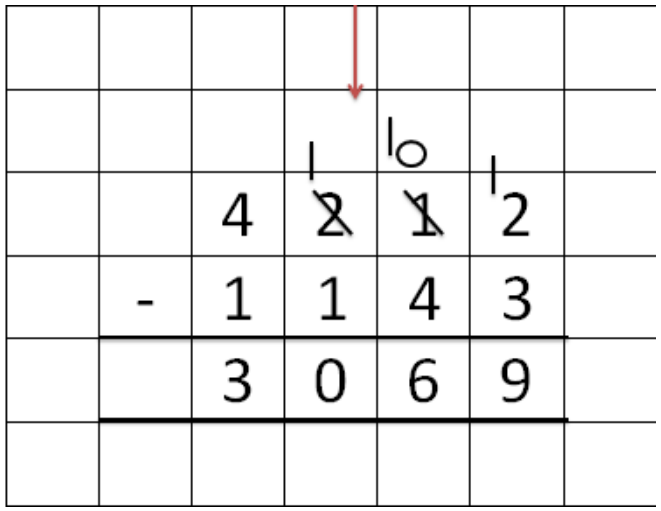
Year 5/6 Formal Written Calculation Methods.

Column Subtraction

In year 5, children need to be able to subtract a 4 digit number from another 4 digit number.

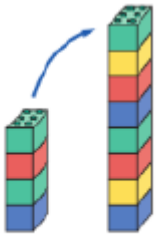
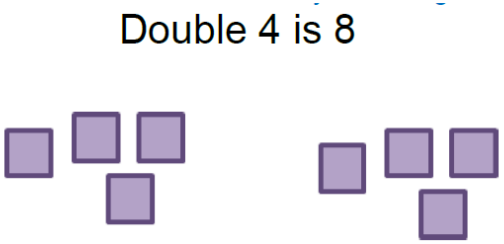
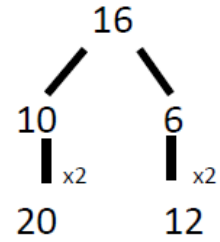
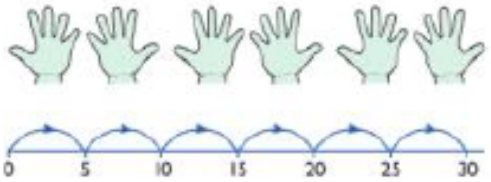
For Example:

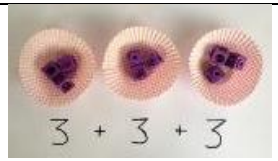
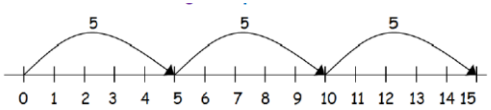
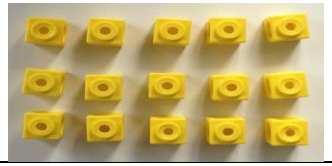
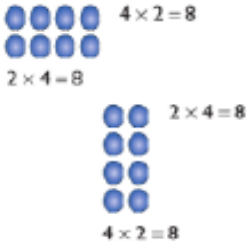
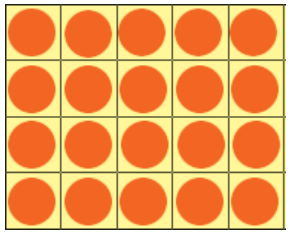
4212 - 1143 =



This example demonstrates how to exchange. 3 could not be subtracted from 2, so a 10 was exchanged from the tens column, allowing 3 to be taken from 12. The same process was used when 4 could not be taken from 0.

Multiplication

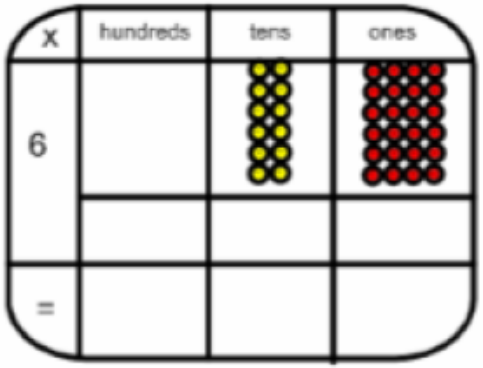
Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Using practical activities to show how to double a number.  double 4 is 8 4 × 2 = 8	Drawing pictures to show how to double a number.  	 Partition a number and then double each part before recombining it back together.
Counting in multiples	  Counting in multiples supported by concrete objects in equal groups.	 Using a number line or pictures to continue support counting in multiples.	Counting in multiples of a number aloud. Writing sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30

Repeated addition	   Using different objects to add equal groups.	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?  2 add 2 add 2 equals 6  5 + 5 + 5 = 15	Write sentences to describe objects and pictures.  2 + 2 + 2 + 2 + 2 = 10
Arrays- showing commutative multiplication	Creating arrays using counters/ cubes to show multiplication sentences.  	Drawing arrays in different rotations to find **commutative** multiplication sentences.   Linking arrays to area of ectangles.	Using an 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

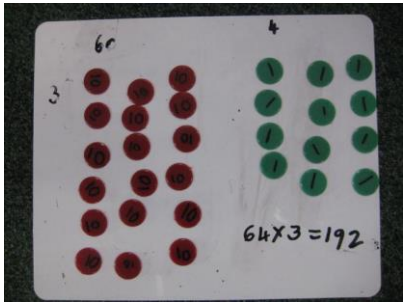
Column multiplication

Children can continue to be supported using place value counters.

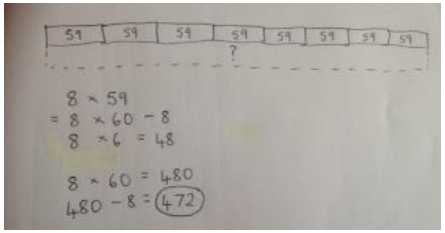
24 x 6 =

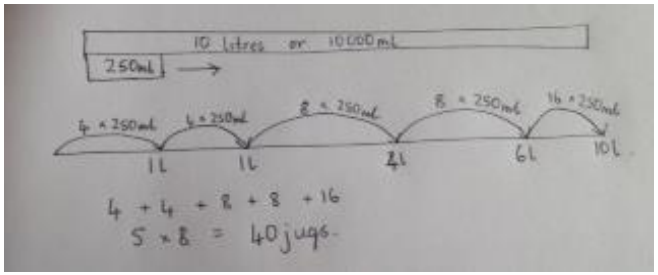


It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.



Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.





Leading to Short Multiplication and compact method.

	H	T	Ones
		6	4
x			3
	1	9	2
		1	

Year 5/6 Formal Written Calculation Methods.

Column Multiplication

In year 5, children need to be able to multiply a 4 digit number by 1 or 2 digit number.

For example: **3479 x 4 =**

		3	4	7	9	
x					4	
	1	3	9	1	6	
		1	3	3		

9 x 4 = 36. The 3 is carried underneath.
7 x 4 = 28 + the carried 3 = 31. The 30 of 31 is carried.
4 x 4 = 16, + the carried 3 = 19. The 10 from 19 is carried.
3 x 4 = 12, + the carried 1 = 13.

In Year 6, children need to be able to multiply a 4 digit number by a 2 digit number using l**ong multiplication.**

For example: **3472 x 42 =**

		1	2			
		3	4	7	2	
x				4	2	
		6	9	4	4	
1	3	8	8	8	0	
1	4	5	8	2	4	
	1	1	1			

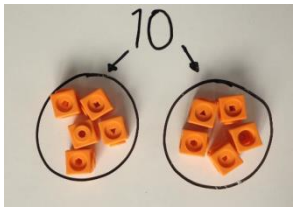
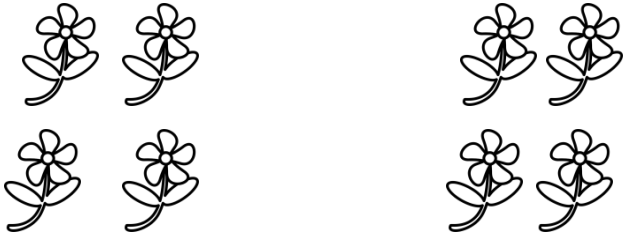
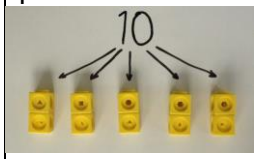
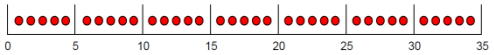
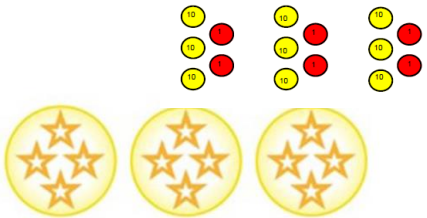
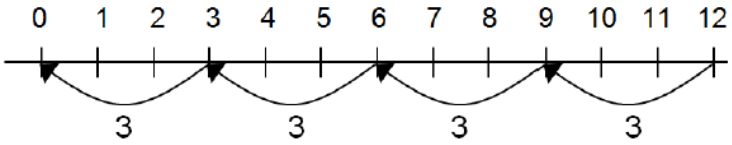
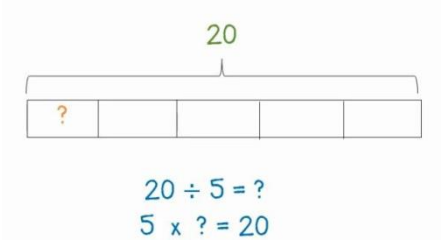
The digits are first multiplied by the unit as per short multiplication – carrying is done above the column.

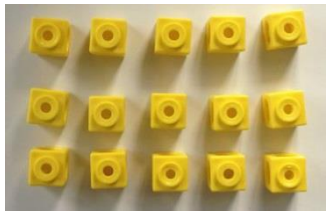
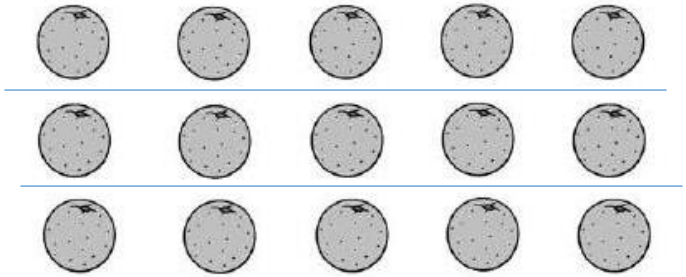
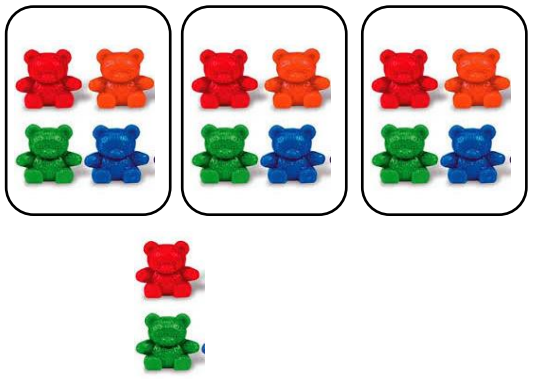
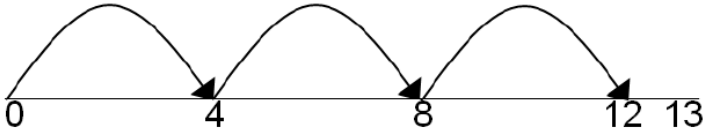
A place holding 0 is written in to signify multiplying by the 10s column.

Multiplying by the second number as before.

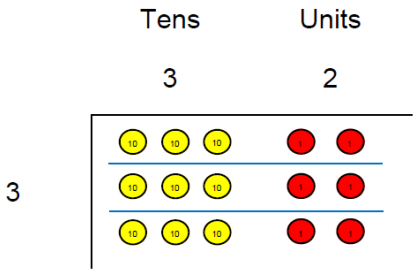
Use column addition to add answers together.

Division

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4	Sharing 9 buns between three people. 9 ÷ 3 = 3
Division as grouping	Dividing quantities into equal groups. Use cubes, counters, objects or place value counters to aid   96 ÷ 3 = 32 	Using a number line to show jumps in groups. The number of jumps equals the number of groups.  Think of the bar as a whole. Splitting into the number of groups you are dividing by and then working out how many would be within each group. 	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

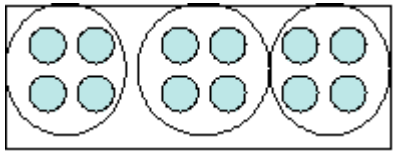
Division within arrays	 Linking division with multiplication by creating an array and thinking about the number sentences. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	 Drawing an array and using lines to split the array into groups to make multiplication and division sentences.	Finding the inverse of multiplication and division sentences by creating four linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7
Division with a remainder	14 ÷ 3 = Dividing objects between groups to see how much is left over 	Jumping forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Drawing dots and grouping them to divide an amount and clearly show a remainder.  	Completing written divisions and showing the remainder using r. 

Short division



Using place value counters to divide as well as using the bus stop method alongside .

Children can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.



Children should progress to moving towards counting in multiples to divide more efficiently.

Beginning with divisions that divide equally with no remainder.

$$\begin{array}{r} 2\ 1\ 8 \\ 4\overline{)\,8\ 7\ 2} \\ \quad\ 3 \end{array}$$

Moving onto divisions with a remainder.

$$\begin{array}{r} 8\ 6\ \text{r}\ 2 \\ 5\overline{)\,4\ 3\ 2} \\ \quad\ 3 \end{array}$$

The children will learn to represent their answers as decimals and fractions.

$$\begin{array}{r} 86.4 \\ 5\overline{)\,432.^{3\ 2}0} \end{array}$$

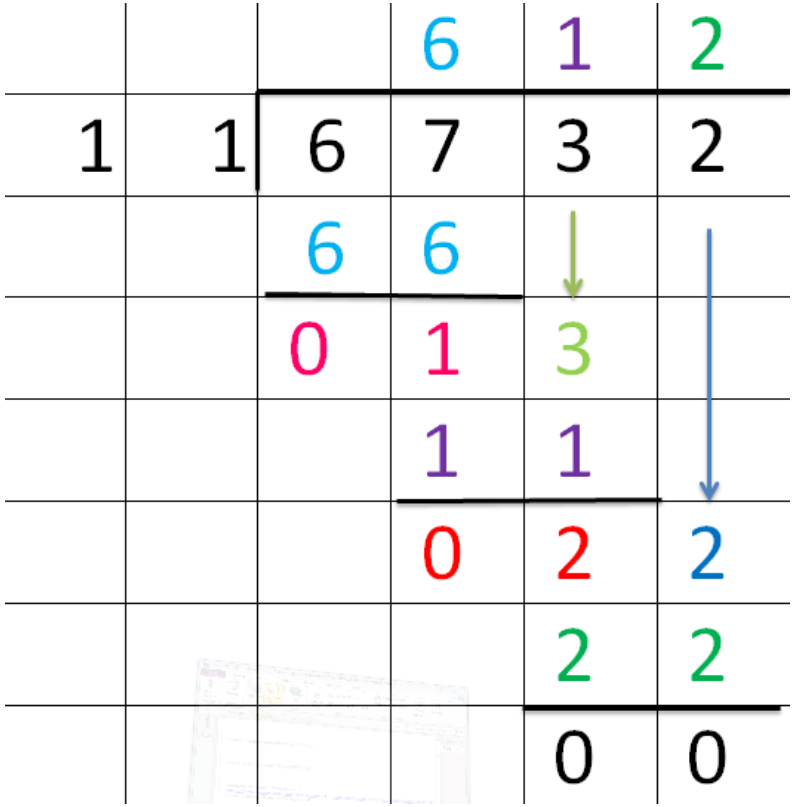
$$86\ \frac{2}{5}$$

Year 5/6 Formal Written Calculation Methods.

Short Division and Long Division

In year 5, children use **short division** to divide a 4 digit number by a 1 digit number.

In year 6, children use **long division** to divide a 4 digit number by a 2 digit number.



11 goes into 67, 6 times. 11 x 6 = 66
Subtract 66 from 67
Drop the next digit down
11 goes into 13 once. 11 x 1 = 11
Subtract 11 from 13
Drop the next digit down
11 goes into 22 twice. 11 x 2 = 22
Subtract 22 from 22 = 0. Complete!