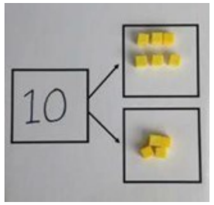
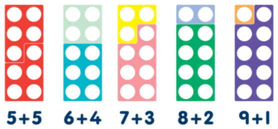
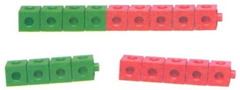
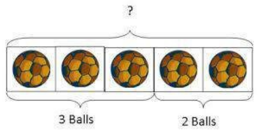
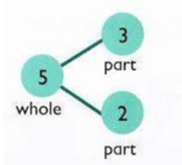
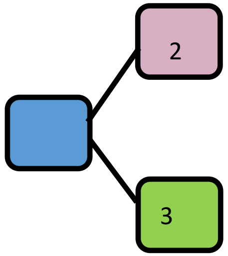
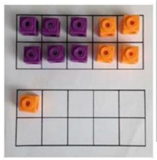
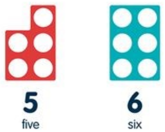
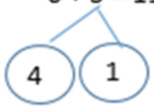
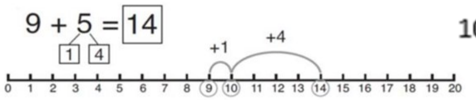
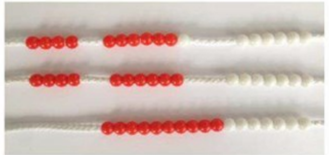
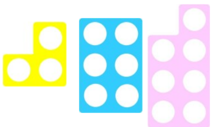
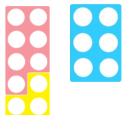
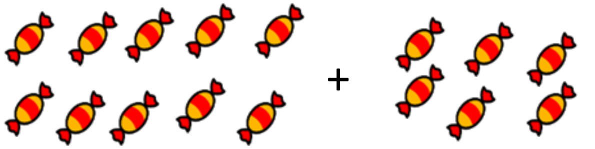
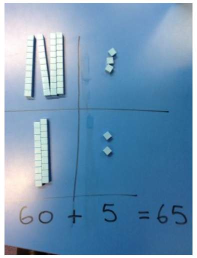
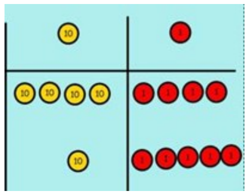
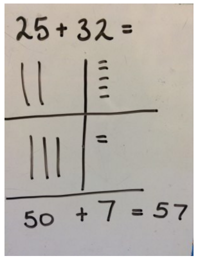
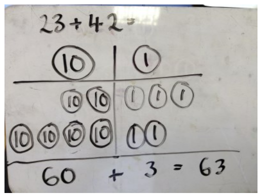
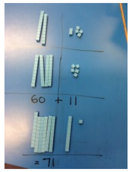
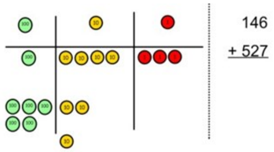
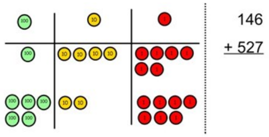
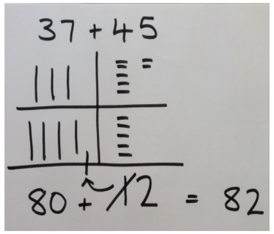
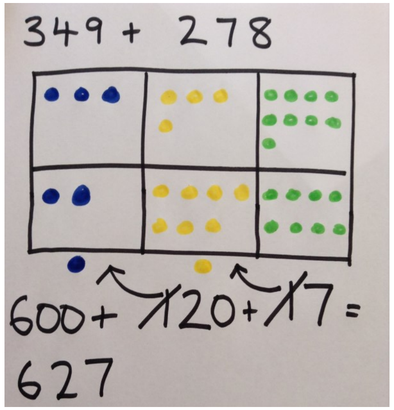
We aim to create an exceptional school that harbours confidence, respect and a love of learning and prepares children for the challenges and adventures of life.

Whole School Calculation Policy - October 2018

Calculation Policy for Addition.

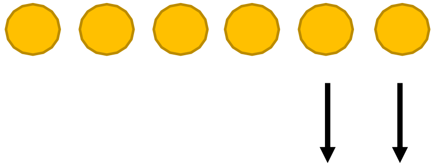
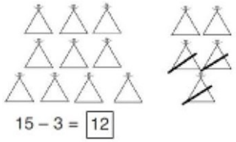
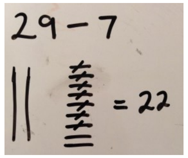
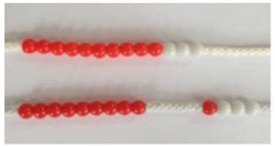
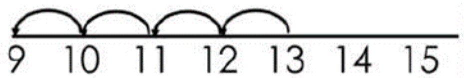
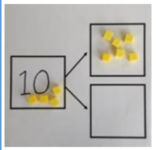
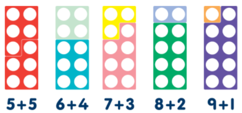
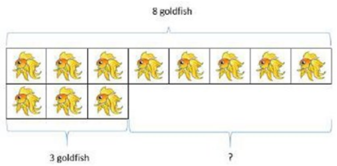
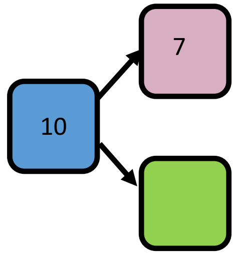
	Objective	Concrete	Pictorial	Abstract
	Number bonds of 5, 6, 7, 8, 9 and 10 Combining two parts to make a whole: part-whole model	 Use cubes, numicon and others to add two numbers together.   Use numicon and cubes to show number bonds. 	  Use pictures to add two numbers together as a group or a bar.   Introduce the bar model and the part-whole model to secure number bonds.	2 + 3 = 5 3 + 2 = 5 5 = 3 + 2 5 = 2 + 3 Use the part-whole model to move into the abstract. 
	Counting Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.  	5 + 3 = 8  Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	5 + 3 = 8 Place the larger number in your head and count on the smaller number to
	Re-grouping to make 10.	 Start with the biggest number and use the smaller number to make 10. 6 + 5 = 11   Use numicon to help with making those links to 10.	 Use pictures or a number line to regroup or partition the smaller number to make 10. 6 + 5 = 11  6 + 4 =10 10 + 1 = 11  	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?

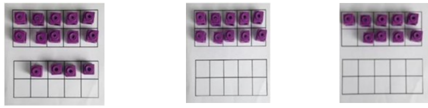
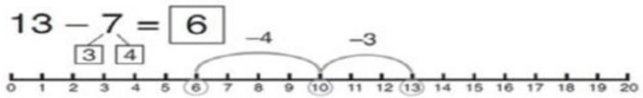
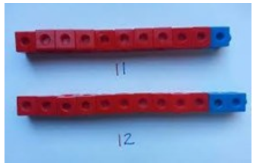
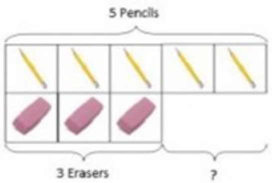
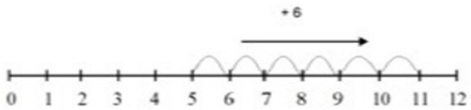
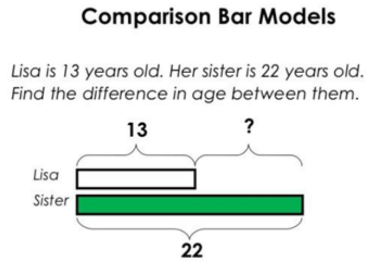
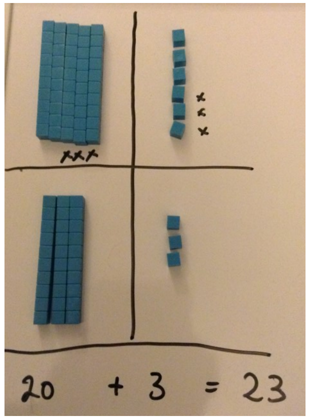
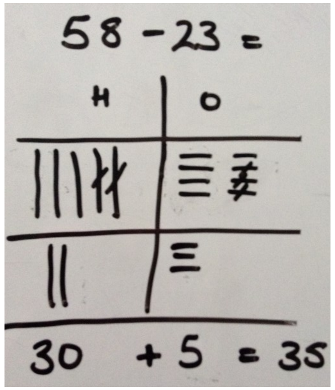
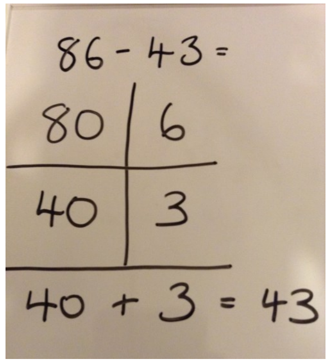
	Objective	Concrete	Pictorial	Abstract
	Adding 3 single digit numbers	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.  Use numicon to make those number bonds to 10. 	Add together three groups of objects. Draw a picture to recombine the groups to make 10 .  	$\underbrace{4 + 7 + 6}_{10} = \boxed{10} + \boxed{7}$ $= \boxed{17}$ Combine the two numbers that make 10 and then add on the remainder.
	Column method without regrouping	24+15= Add the ones together first and then the tens. Children use base 10..  When children are confident with place value, place value counters can be introduced. 	After the children are confident using the manipulatives, children can draw their own sticks and stones .  Later the children can draw place value counters. 	24 + 15+ 20 | 4 10 | 5 30 + 9 = 39 Children use numbers instead of pictures. When children are secure with place value and the strategy, the compact method should be introduced in KS2. 24 15 39

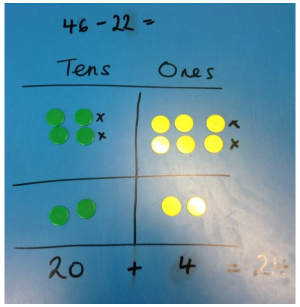
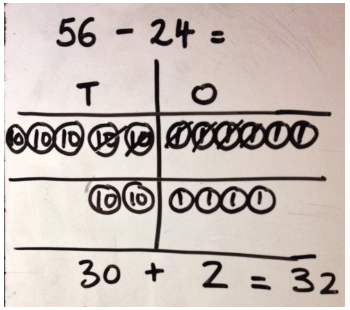
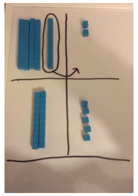
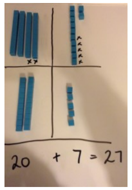
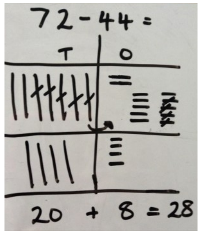
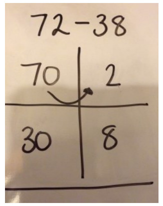
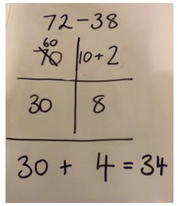
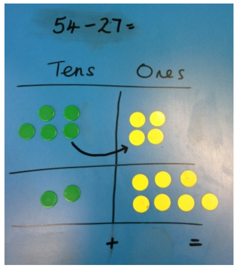
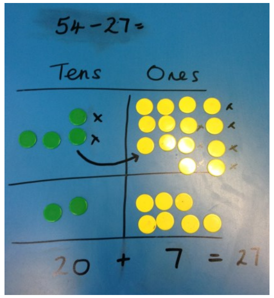
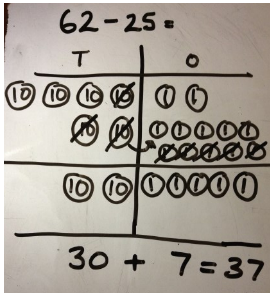
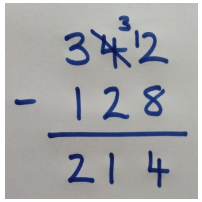
	Objective	Concrete	Pictorial	Abstract
	Column method- re-grouping	Make both numbers in base 10 using a place value grid. Complete adding of the ones and tens as usual and calculate the totals. Then use base 10 to form the two new numbers that have been created. Add them together to get the final total.  When the children are confident with place value - use place value counters. Make both numbers on a place value grid.  Add up the ones and exchange 10 ones for one 10.  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. As children move on to decimals, money and decimal place value counters can be used to support learning.	Children can draw a pictorial representation of the columns, base 10 and place value counters to further support their learning and understanding. **Stem sentences**  **First I partition the number into tens and ones. Next I add the ones together to get___12___.** **Because I have too many ones, I exchange ten ones for one ten.** **Then I add the tens together to make __80___.** **Finally I add the _80_ and _2_ to make __82_.**  	40 + 9 20 + 3 60 + 12 = 72 100 + 40 + 6 500 + 20 + 7 600 + 70 + 3 = 673 As the children progress, they will move from the expanded to the compacted method. 146 + 527 1 673 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.

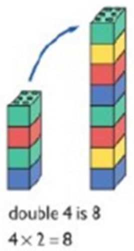
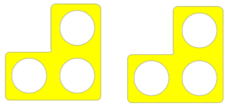
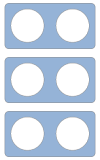
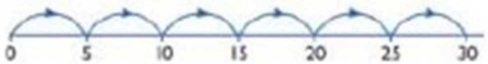
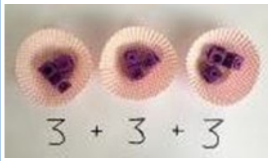
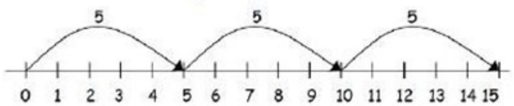
Calculation Policy for Subtraction

2018

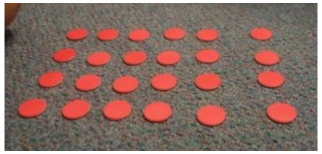
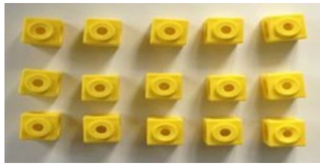
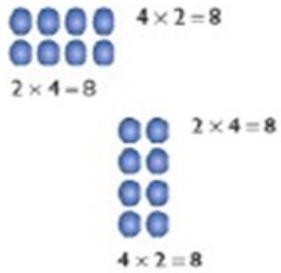
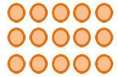
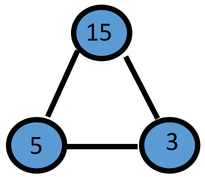
	Objective	Concrete	Pictorial	Abstract
	Taking away ones	Use physical objects, counters, cubes etc. to show how objects can be taken away. 6—4 = 	Objects can be drawn and then crossed out to show what has been taken away.  Children could draw tens and ones and cross out.  	4 – 2 = 2 15– 3 = 12
	Counting backwards	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4 = 9  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 track.  Start at the bigger number and count back the smaller number, showing the jumps on the number line.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.
	Using number bonds Part-whole model	Link to addition—use the part whole model to explain the inverse.  If 10 is the whole and 6 is one of the parts—what is the missing part? Numicon to reinforce number bond knowledge.  	Use a pictorial representation of objects to show the part part whole model.  Use bar models to show the link between addition and subtraction.	Move to using numbers within the part whole model. 

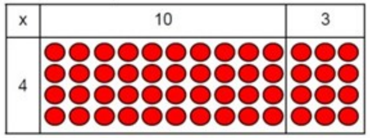
	Objective	Concrete	Pictorial	Abstract
	Make ten	14– 9 =  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer. 	17– 8= How many do we take off to reach the next 10? How many do we have left to take off?
	Counting on - finding 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 two numbers. 	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
	Column method without regrouping	Use base 10 to make the two numbers like addition. Use the equipment to model how to subtract and write the numbers at the bottom. 	The children can draw sticks and stones to represent the two digit numbers. Lay it out in the same way as the base ten and then physically cross out the amount, then count the remainder to find the answer. 	Children partition the number and then layout them out in a column. 

<table>
<tr><th></th><th>Objective</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr><td></td><td>Column method without regrouping - continued.</td><td>When children are secure with place value, they could use the place value counters in the same method.
</td><td>When the children are secure with place value they could draw their place value counters
</td><td>When children are secure they can move to more formal Column subtraction.
78
- 43
35</td></tr>
<tr><td></td><td>Column method with regrouping.</td><td>Use base 10, lay out in the same way to establish the column method. Children exchange one ten and replace with ten ones. Begin with one exchange and then move to two.
 </td><td>When children are secure, they can draw the sticks and stones and exchange by crossing out the ten and adding ten ones.
</td><td>Children can start their formal written method by partitioning the number into clear place value columns.
</td></tr>
<tr><td></td><td>Column method with regrouping - Continued.</td><td>When children are secure with place value, they can use the place value counters with the same method.
</td><td>When they are confident with the equipment, the children can draw the place value counters and exchange by crossing out the counters.
<u>Stem sentences</u>
First I partition the numbers into tens and ones. Next I subtract the ones. Because I do not have enough ones, I exchange 1 ten for ten ones. Now I subtract _5_ ones from _12_ ones to make _7_ ones. Then I subtract _2_ tens from the _5_ tens to make _3_ tens.
Finally I add the _30_ and _7_ to make _37_.</td><td>Children move onto a more compact method when they are secure.
This will lead to an understanding of subtracting any number including decimals.</td></tr>
</table>

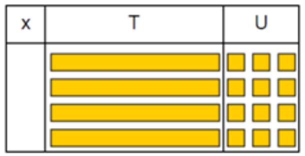
	Objective	Concrete	Pictorial	Abstract
	Doubling	 Use practical activities to show how to double a number. 	Draw pictures to show how to double a number. Double 4 is 8. 	Partition a number and then double each part before re-combining back together.
	Counting in multiples	 Count in multiples supported by concrete objects in equal groups.  	  Use a number line or pictures to continue to support 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
	Repeated addition	   Use different objects to add equal groups.	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?  2+2+2= 6  5+5+5= 15	Write addition sentences to describe objects and pictures.  2+2+2= 6

<table>
<tr><th></th><th>Objective</th><th>Concrete</th><th>Pictorial</th><th>Abstract</th></tr>
<tr>
<td></td>
<td>Arrays

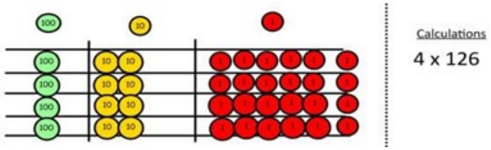
- showing communicative multiplication.</td>
<td>Create arrays using counters/cubes to show multiplication sentences.

</td>
<td>Draw arrays in different rotations to find the communicative multiplication sentences.

</td>
<td>Use an array to write multiplication sentences and reinforce repeated addition .

5x3= 15
3x5=15
5 + 5 + 5 = 15
3 + 3 + 3 + 3 + 3 = 15


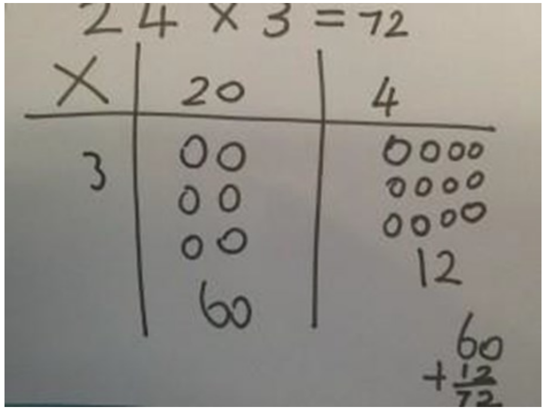
Inverse triangles show their understanding of communicative multiplication.</td>
</tr>
<tr>
<td></td>
<td>Grid Method</td>
<td>Show the link with arrays to first introduce the grid method.


4 rows of 10 and 4 rows of

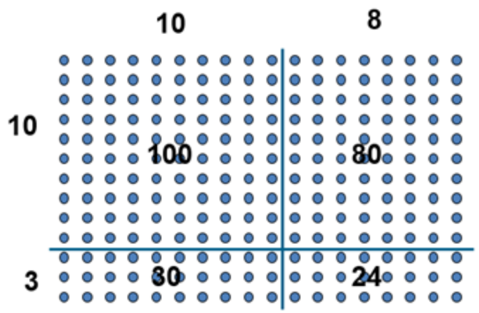
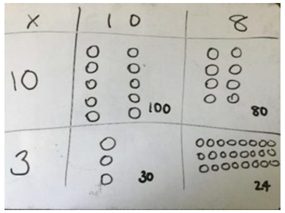
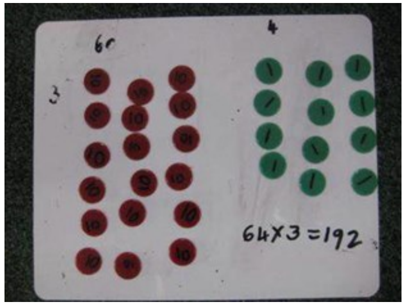
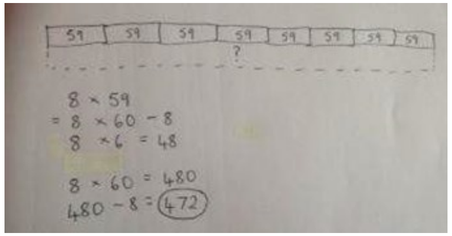
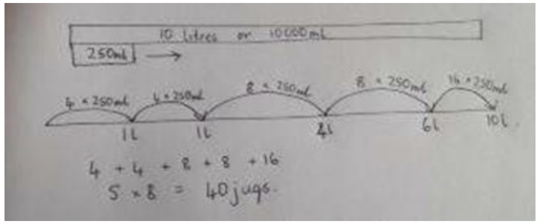
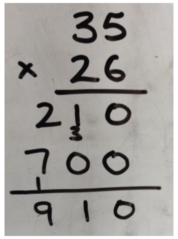
Then move to base 10.


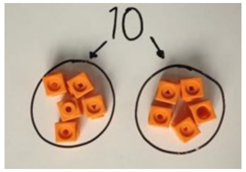
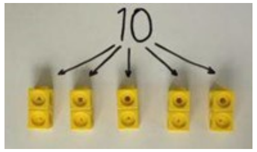
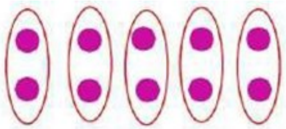
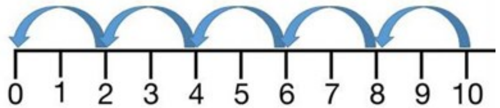
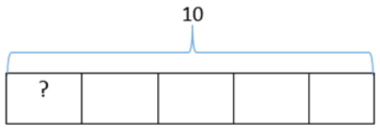
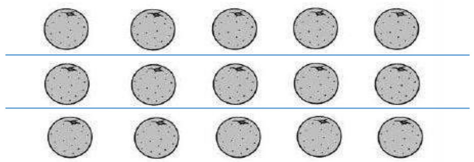
Then move to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.

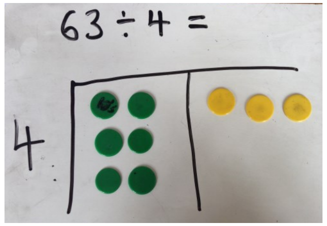
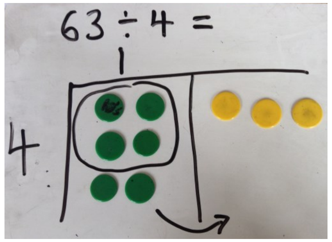
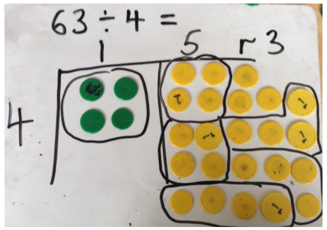
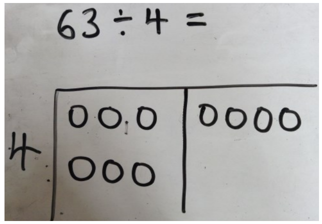
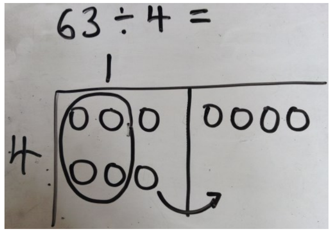
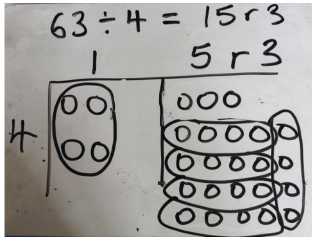
4 x 126 =

</td>
<td>Children can represent the work they have done with place value counters in a way that they understand.

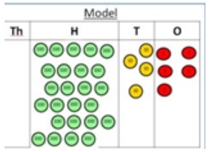
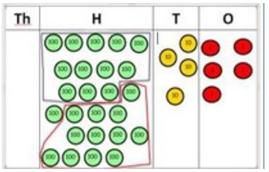
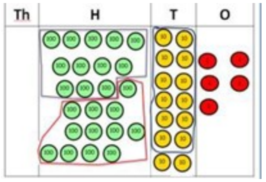
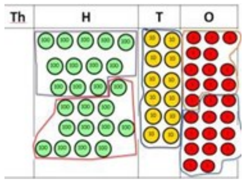
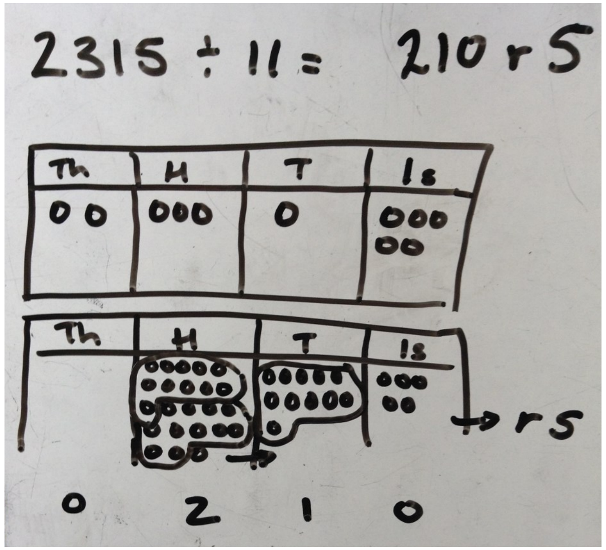
They can draw the counters, using the correct colours or just use circles in the different columns to show their thinking.

</td>
<td>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.
<table>
<tr><th>x</th><th>30</th><th>5</th></tr>
<tr><td>7</td><td>210</td><td>35</td></tr>
</table>
210 + 35 = 245

Continuing from this, multiply by a 2 digit number showing the different rows within the grid method.
<table>
<tr><th></th><th>10</th><th>8</th></tr>
<tr><td>10</td><td>100</td><td>80</td></tr>
<tr><td>3</td><td>30</td><td>24</td></tr>
</table>
<table>
<tr><th>X</th><th>1000</th><th>300</th><th>40</th><th>2</th></tr>
<tr><td>10</td><td>10000</td><td>3000</td><td>400</td><td>20</td></tr>
<tr><td>8</td><td>8000</td><td>2400</td><td>320</td><td>16</td></tr>
</table>
</td>
</tr>
</table>

	Objective	Concrete	Pictorial	Abstract
	Column multiplication. Expanded method	Show the link with arrays to first introduce the expanded method. 	Once children are secure with the concept, the children can move onto pictorial representation. **Stem sentences.** **First I partition the numbers into tens and ones.** **Next I multiply each section together. Finally I add the totals together to get _____.** 	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. 18 x 13 24 (3 x 8) 30 (3 x 10)) 80 (10 x 8) 100 (10 x 10) 234
	Compact method.	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.  	Start with 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 This moves to the more compact method. 

	Objective	Concrete	Pictorial	Abstract
	Sharing	I have 10 cubes, can you share them equally between two people?  	Children use pictures or shapes to share quantities.  10 ÷ 2 = 5	Share 8 buns between two people. 10 ÷ 2 = 5
	Grouping	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.  10 ÷ 5 = ? 5 x ? = 10	10 ÷ 5 = 2 Divide 10 into 5 groups. How many are in each group?
	Division with arrays	Link division to multiplication 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 multi-plication and division sentences by creating four linking number sen-tences. 5 x 3 = 15 3 x 5 = 15 15 ÷ 5 = 3 15 ÷ 3 = 5

	Objective	Concrete	Pictorial	Abstract
	Short division	**Stem sentences** **First I partition the dividend into tens and ones.**  **Next I circle all the groups of 4 tens in the tens column.**  **Because I have too many tens, I exchange them for ones. Then I circle all the groups of 4 ones in the ones column. Finally any left over are the remainder.**  .	The children use place value counters to partition the numbers into tens and ones.  This method teaches children to take groups of the divisor from the dividend.  The children write the number of complete groups above. Because there are some left over, they exchange each ten for ten ones.  Then they take groups of 4 from the ones. Any left over become the remainder.	Begin with divisions that divide equally with no remainder. 2 1 8 3 4 | 8 7 2 Move onto divisions with a remainder. 8 6 r 2 3 5 | 4 3 2 Finally move into decimal places to divide the total accurately. 1 4 . 6 16 21 3 5 | 5 1 1 . 0

	Objective	Concrete	Pictorial	Abstract
	Long division	 2544 ÷ 12 How many groups of 12 thousands do we have? None.  Exchange 2 thousand for 20 hundreds. 0 12 | 2544 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.  0 2 12 | 2544 24 1 Exchange the one hundred for ten tens so now we have 14 tens. How many groups of 12 are in 14? 1 remainder 2.  0 2 1 12 | 2544 24 14 12 2 Exchange the two tens for twenty ones so now we have 24 ones. How many groups of 12 are in 24? 2.  0 2 1 2 12 | 2544 24 14 12 24 24 0	Instead of using physical counters, students 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.	Children will use long division to divide numbers with up to 4 digits by 2 digit numbers.