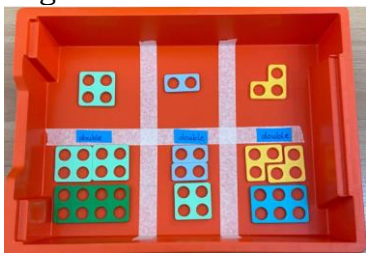
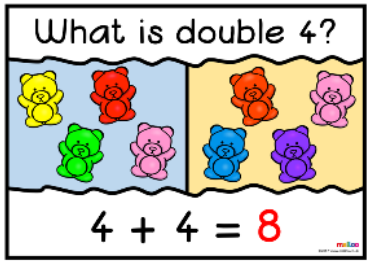
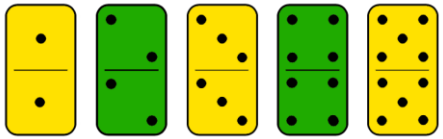
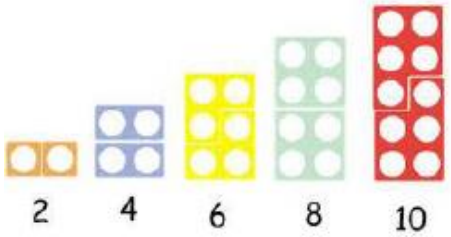
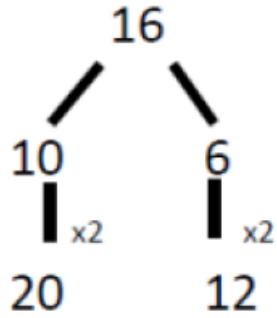
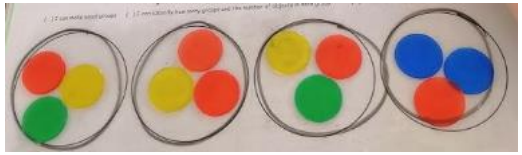
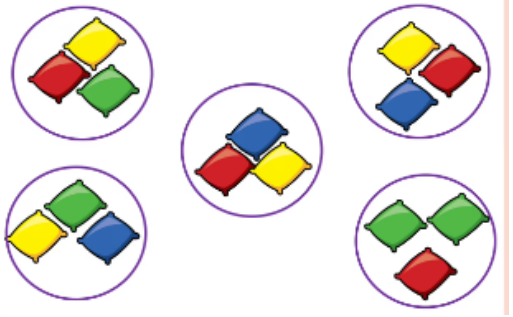
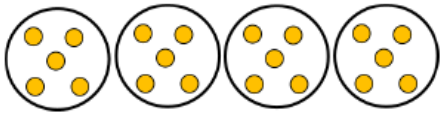
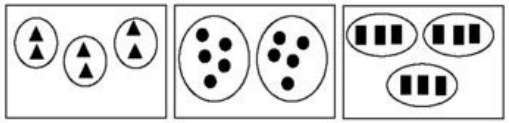
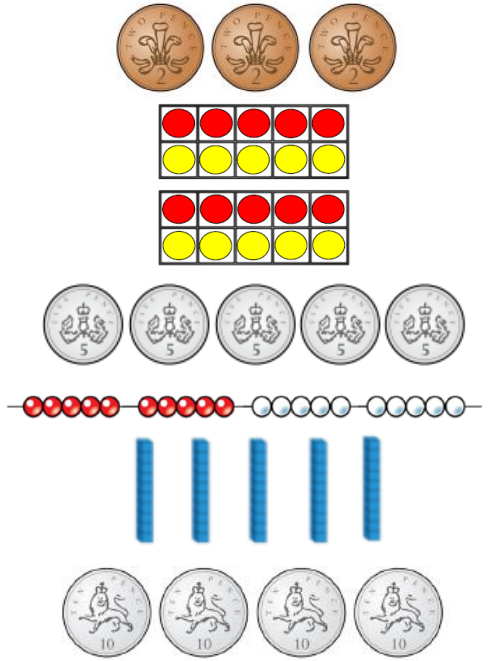
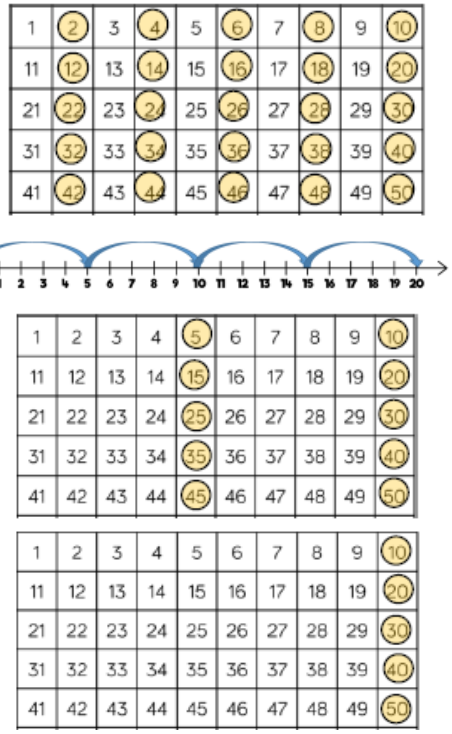
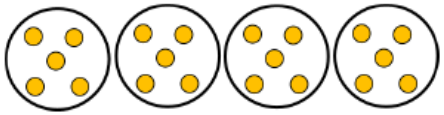
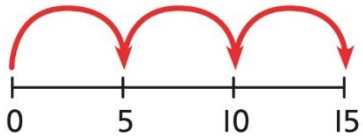
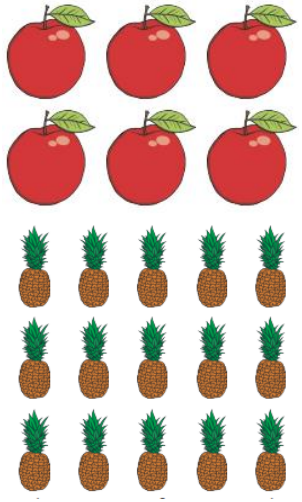
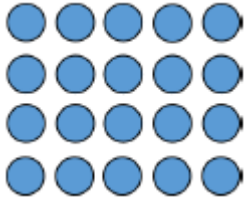
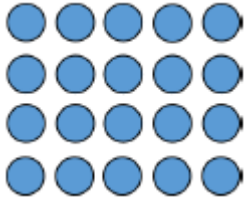
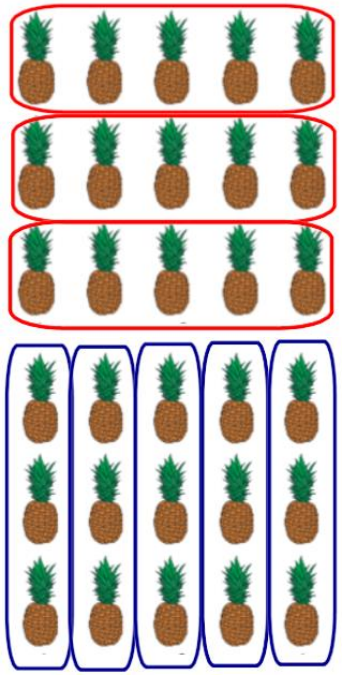
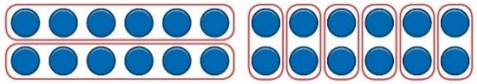
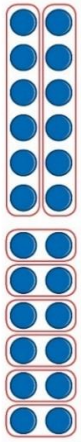
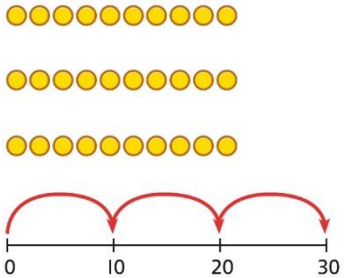
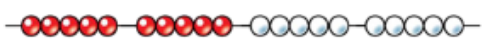
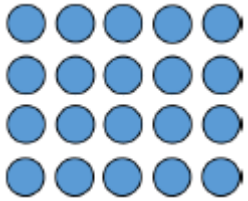
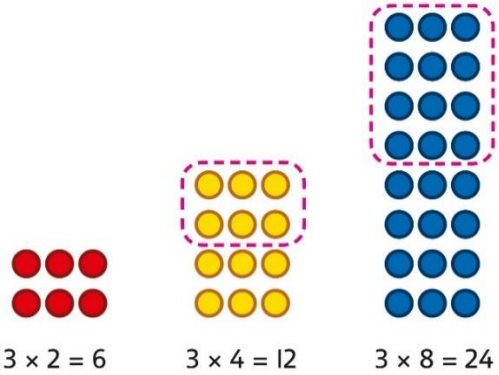
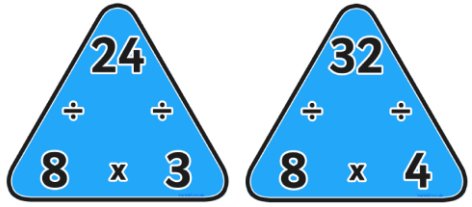
Calculation Policy – Progression in Calculations

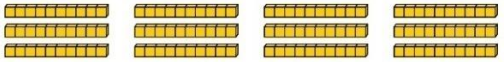
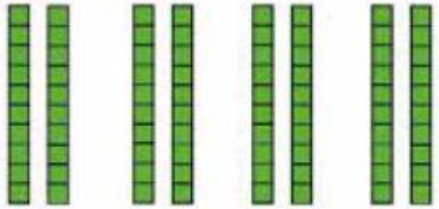
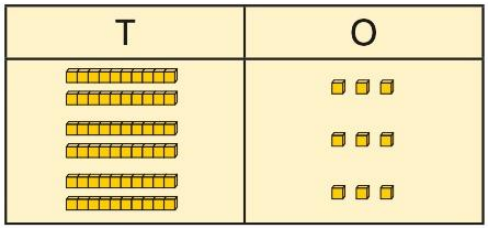
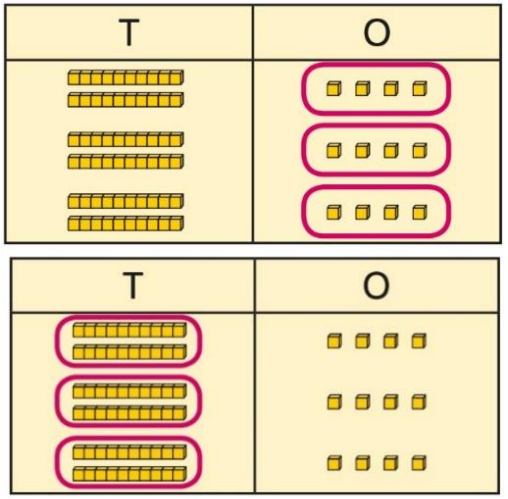
Progression in Calculations - Multiplication				
Expected Year Group	**Objectives**	**Concrete**	**Pictorial**	**Abstract**
EYFS & Year 1	Counting in 2s and doubling	Physical and real-life examples that encourage children to see the concept of doubling as adding two equal groups. Songs to help the learning of counting in 2s.  	Pictures that encourage the children to see the concept of doubling as adding two equal groups.   	If appropriate, begin to introduce written addition calculations for adding two equal groups. 1+1= 7+7= 2+2= 8+8= 3+3= 9+9= 4+4= 10+10= 5+5= 11+11= 6+6= 12+12= Year 1 – partition a number and then double each part before recombining it back together. 

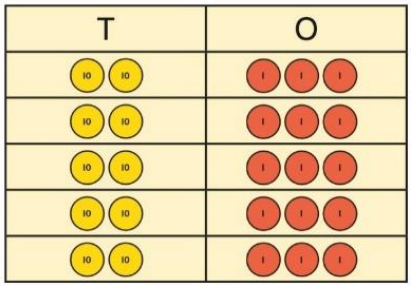
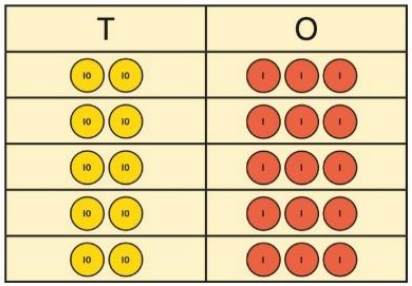
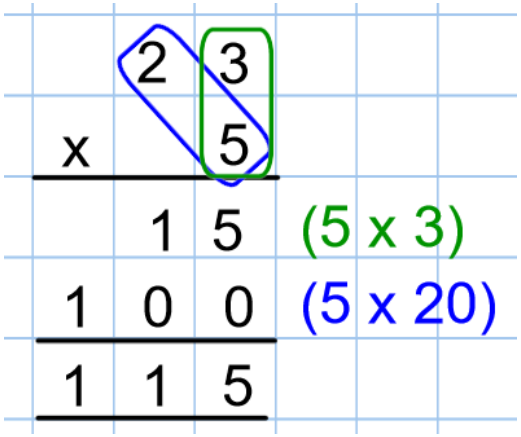
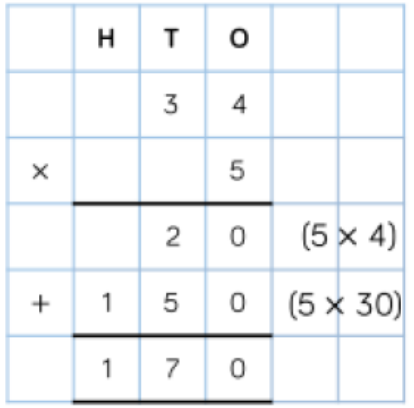
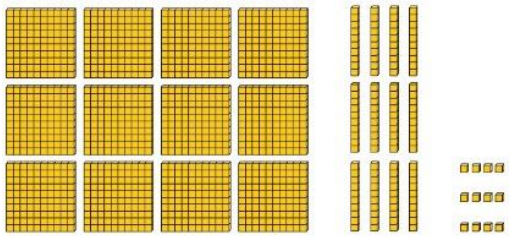
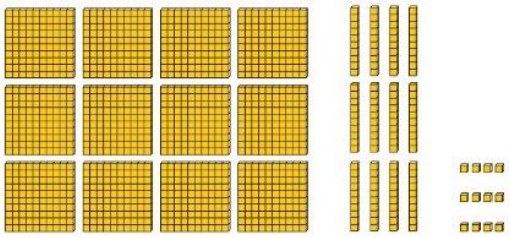
Year 1	Recognising and making equal groups.	Using practical equipment to make groups of the same size.  	Drawing pictures to represent equal groups or make finding equal groups more efficient.  	Describe equal groups using words: **Three equal groups of 4.** **Four equal groups of 3.** If appropriate, beginning to record this information using repeated addition. **5 + 5 + 5 + 5 = 20** **2 + 2 + 2 = 6**
Year 1	Counting in 2s, 5s, 10s	Using practical equipment to make groups of 2, 5 or 10. Also, using songs to reinforce patterns. 	Using number squares and number lines to identify patterns. 	Beginning to record this information using numerals. If appropriate, introducing the 'x' sign. **2, 4, 6, 8, 10, 12 etc** **1 x 2 = 2** **2 x 2 = 4** **3 x 2 = 6** **5, 10, 15, 20, 25 etc** **1 x 5 = 5** **2 x 5 = 10** **3 x 5 = 15** **10, 20, 30, 40, 50 etc** **1 x 10 = 10** **2 x 10 = 20** **3 x 10 = 30**

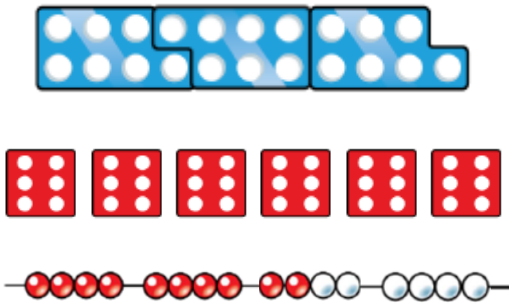
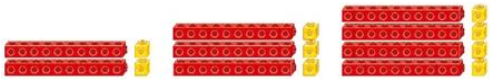
Year 1 & Year 2	Repeated addition	Physically showing the addition of equal groups and how this can be worded using the language 'lots of'. **2 lots of 5 is 10** **4 lots of 2 is 8** **4 lots of 5 is 20**	Pictorial representations alongside numerals.  **5 + 5 + 5 + 5 = 20** **4 lots of 5 = 20**	Beginning to record and show the link between addition statements and simple multiplications. $5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$ Using a number line to support where needed.  **5 + 5 + 5 = 15** **3 × 5 = 15**
Year 1 & Year 2	Recognising and using arrays	Use objects laid out in arrays to find the answers to 2 lots of 3, 3 lots of 5 etc. 	Use dots laid out in arrays to find the answers to 4 lots of 5 etc. 	Linking arrays to the use of the multiplication sign.  **4 x 5 = 20**

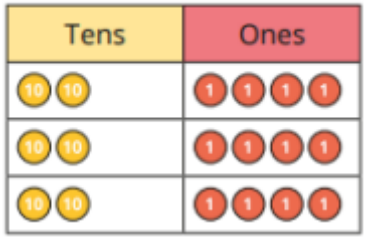
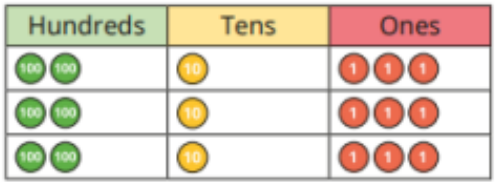
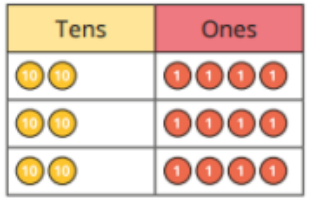
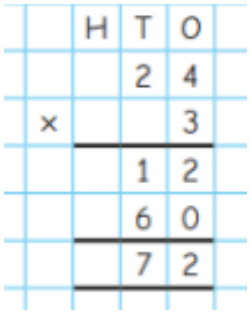
Year 2	Understanding commutativity	Using arrays to demonstrate commutivity.  **I can see 3 groups of 5.** **I can also see 5 groups of 3.**	Create arrays using counters or dots to visualise commutativity.  ***There are 2 groups of 6 and also 6 groups of 2.*** Rotate the array to show that orientation does not change the multiplication. 	Use arrays to visualise commutativity and support this with numerals to show repeated addition and use of the 'x' sign if appropriate. **4 + 4 + 4 + 4 + 4 = 20** **5 + 5 + 5 + 5 = 20** **4 × 5 = 20 and 5 × 4 = 20**
Year 2	Learning ×2, ×5 and ×10 table facts	Understand how to unitise groups of 2, 5 and 10 and learn the corresponding times table facts (with apparatus as required). **4 groups of 10 … 10, 20, 30, 40** **4 × 10 = 40** 	Relate counting in unitised groups and repeated addition with knowing key times table facts.  **10 + 10 + 10 = 30** **3 × 10 = 30**	Understand how the times tables increase and contain patterns. **1 x 10 = 10** **2 x 10 = 20** **3 x 10 = 30** **4 x 10 = 40** **5 x 10 = 50**

Year 2	Using the inverse (taught alongside division)	Using apparatus to show the link between multiplication and division facts.  **4 lots of 5 is 20.** **20 shared between 4 is 5.** **4 x 5 = 20** **20 ÷ 4 = 5**	Using arrays to generate multiplication and division facts.  **5 x 4 = 20** **4 x 5 = 20** **20 ÷ 4 = 5** **20 ÷ 5 = 4**	Finding and writing related number facts. **Can you find all 8 fact family sentences?** **2 4 8** **2 x 4 = 8** **4 x 2 = 8** **8 ÷ 4 = 2** **8 ÷ 2 = 4** **8 = 2 x 4** **8 = 4 x 2** **2 = 8 ÷ 4** **4 = 8 ÷ 2**
Year 3	Understanding and using ×3, x6, ×2, ×4 and ×8 tables.	Physically showing the addition of equal groups and how this can be worded using the language 'lots of', 'sets of' or 'groups of'. **There are 3 lots of 4 pens.** **3 x 4 = 12** **There are 6 groups of 4 pens.** **6 x 4 = 24**	Children understand how the ×2, ×4 and ×8 tables are related through repeated doubling. Similarly, with the x3 and x6 tables.  3 × 2 = 6 3 × 4 = 12 3 × 8 = 24	Children understand the relationship between related multiplication and division facts within the tables that they know. 

Year 3	Using known facts to multiply 10s, for example 3 × 40	Explore the relationship between known times tables and multiples of 10 using place value equipment. Make 4 groups of 3 ones. Make 4 groups of 3 tens.  **What is the same?** **What is different?**	Explore the relationship between known times tables and multiples of 10 using pictures if needed.  **4 x 2 = 8** **4 x 20 = 80**	Understand how to use known times-tables to multiply multiples of 10. **8 × 4 = 32** **80 × 4 = 320**
Year 3	Multiplying a 2-digit number by a 1-digit number using the grid method	Introduce the children to the grid method using base-10 equipment.  23 x 3 means I have 3 groups of 20 and 3 groups of 3. Altogether, I have 6 tens and 9 ones which is 69.	Use pictorial representations to move away from manipulatives. Showing how the calculation can be partitioned and then re-joined to get the total.  **3 x 4 = 12** **3 × 20 = 60** **60 + 12 = 72** **So, 3 × 24 = 72**	Using the grid method to partition but without the pictorial element. **X** **10** **3** **8** **80** **24** **= 104**

Year 3	Multiplying a 2-digit number by a 1-digit number using the expanded column method	Use of place value counters or base 10 to partition.  **5 × 23 = ?** **5 × 3 = 15** **5 × 20 = 100** **5 × 23 = 115**	Use of place value pictures alongside the expanded column method.   	
Year 4	Multiplying by multiples of 10 and 100	Use place value equipment to understand how to multiply by multiples of 10 and 100.  **3 x 4 ones = 12 ones = 12** **3 x 4 tens = 12 tens = 120** **3 x 4 hundreds = 12 hundreds = 1200**	Use pictorial representations instead of physical manipulatives.  **3 × 4 = 12** **3 × 40 = 120** **3 × 400 = 1,200**	Use known facts and their understanding of commutativity to multiply mentally. **4 × 8 = 32** **4 × 80 = 320** **40 × 8 = 320** **4 × 800 = 3,200** **400 × 8 = 3,200** **40 x 80 = 3,200**

<table>
<tr>
<td>Year 4</td>
<td>Understanding times-tables up to 12 × 12</td>
<td>Using a range of apparatus to represent and understand different times tables.
  </td>
<td>Representing a range of times tables using efficient pictorial representations.
 
2 x 11 = 22
3 x 11 = 33
4 x 11 = 44

1 x 12 = 12
2 x 12 = 24
3 x 12 = 36</td>
<td>Looking for patterns within times tables and using known tables to support the learning of others, for example using the 6 times table to find the 12 times table.
<table>
<tr><td>9</td><td>18</td><td>27</td><td>36</td><td>45</td></tr>
<tr><td>54</td><td>63</td><td>72</td><td>81</td><td>90</td></tr>
</table>
<table>
<tr><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td></tr>
<tr><td>36</td><td>42</td><td>48</td><td>54</td><td>60</td></tr>
<tr><td>66</td><td>72</td><td>78</td><td>84</td><td>90</td></tr>
</table>
If 4 x 6 = 24 then 4 x 12 is double this which is 48.</td>
</tr>
<tr>
<td>Year 4</td>
<td>Column multiplication for 2-digit and 3-digit numbers multiplied by a single digit</td>
<td>Use place value equipment to make multiplications.
24 x 3
 
213 x 3
  </td>
<td>Show the expanded column method alongside the pictorial representation. Firstly, with no exchanges and then with.
 
  </td>
<td>Use the formal column method for 3-digit numbers multiplied by a single digit.
<table>
<tr><td></td><td>3</td><td>1</td><td>2</td></tr>
<tr><td>×</td><td></td><td></td><td>3</td></tr>
<tr><td></td><td>9</td><td>3</td><td>6</td></tr>
</table>
Look at the links between the expanded column and formal column method when exchanging is required.
<table>
<tr><td></td><td>H</td><td>T</td><td>O</td></tr>
<tr><td></td><td>2</td><td>4</td><td>5</td></tr>
<tr><td>×</td><td></td><td></td><td>4</td></tr>
<tr><td></td><td>9</td><td>8</td><td>0</td></tr>
<tr><td></td><td></td><td>1</td><td>2</td></tr>
</table></td>
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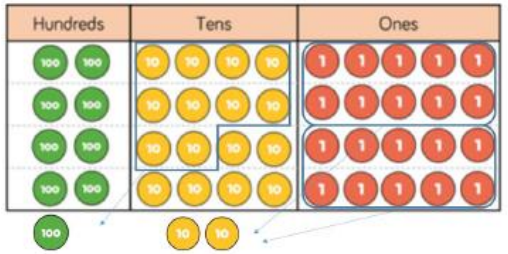
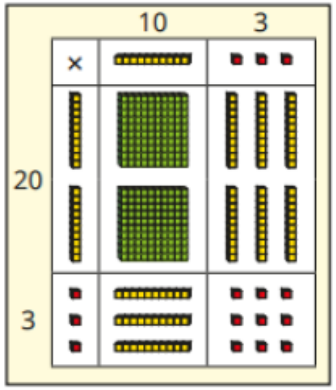
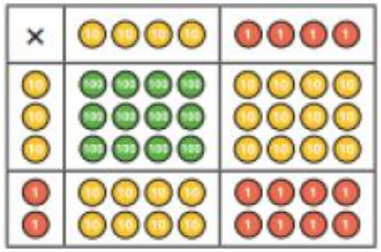
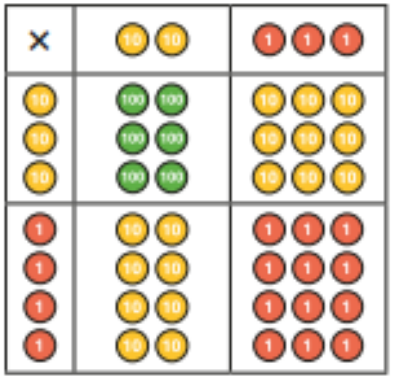
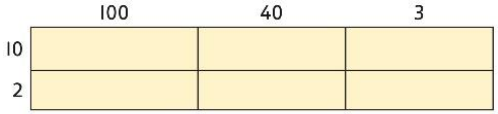
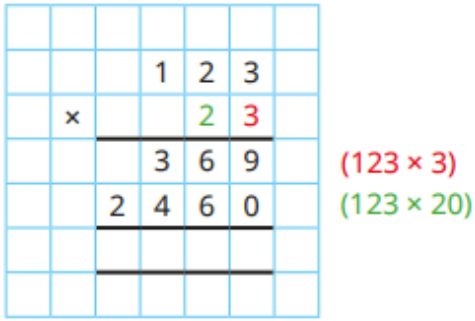
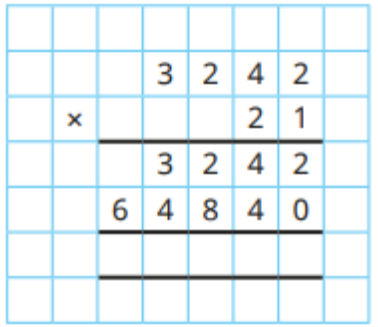
			 2 4 5 x 4 2 0 (4 x 5) 1 6 0 (4 x 40) 8 0 0 (4 x 200) 9 8 0	2 4 5 x 4 2 0 (4 x 5) 1 6 0 (4 x 40) 8 0 0 (4 x 200) 9 8 0
Year 5	Multiplying up to 4-digit numbers by a single digit	*See year 4 (Column multiplication for 2-digit and 3-digit numbers multiplied by a single digit) but expand to include thousands too.*		
Year 5	Multiplying 2-digit numbers by 2-digit numbers	Use base 10 to show how the calculation can be broken down. 	Pictorial representations used to show the stages alongside a grid method representation. 	Once the children are secure with the stages, they can use the grid method without pictorial representations alongside or start to use the expanded multiplication method. **X** **20** **3** **20** **400** **60** **8** **160** **24** **= 644**

		Use place value counters to show how the calculation can be broken down. 	<table><tr><th>×</th><th>40</th><th>4</th></tr><tr><td>30</td><td>1,200</td><td>120</td></tr><tr><td>2</td><td>80</td><td>8</td></tr></table>	52 x 17 14 (2 x 7) 20 (2 x 10) 350 (50 x 7) 500 (50 x 10) 884
Year 5 & Year 6	Multiplying up to 4-digits by 2-digits	Place value counters can be used alongside the pictorial and abstract representations however this may over complicate things now.	Use of the grid method alongside the expanded partitioning method if still appropriate however discussion may be had with the children about the inefficiency of this method for larger calculations and the need to move to a more formal method.  	Children using the formal layout with the multiplication sentences written next to each part to begin with to show we are multiplying by the ones and multiplying by the tens.  Discussions had about why the second answer line starts with a zero as a place holder (because we are multiplying by 2 x 10 not 2).

Year 6	Multiplying up to 4-digits by 2-digits			Children should now be able to use the formal method for long multiplication, remembering the stages needed.