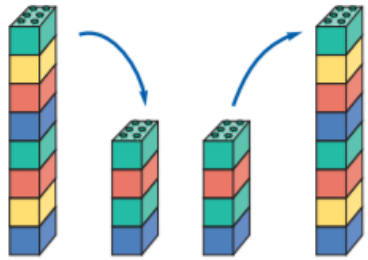
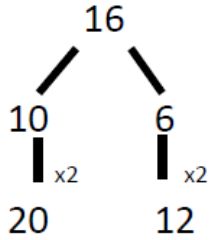
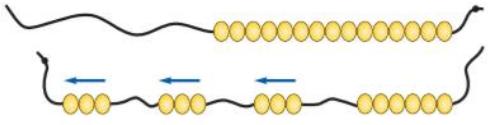
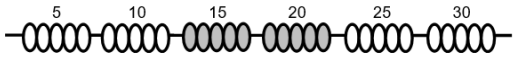
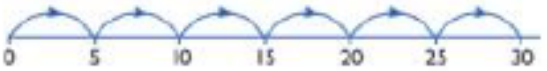
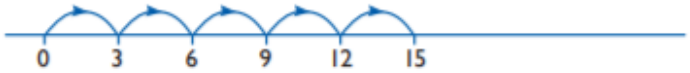
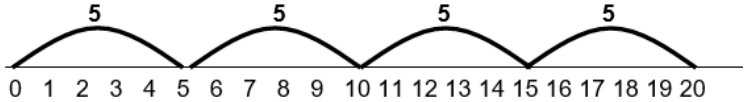
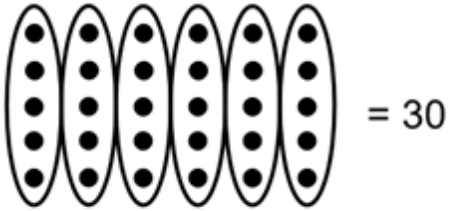
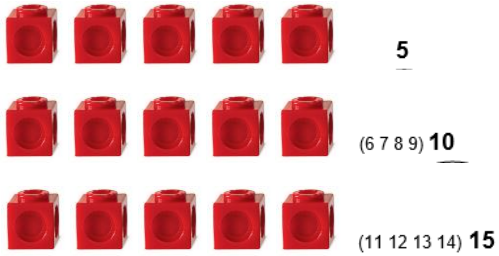
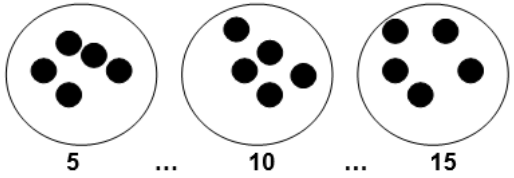
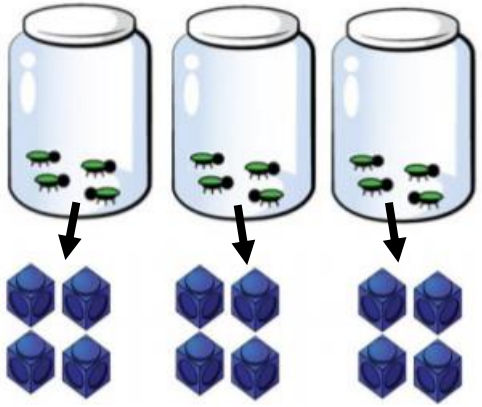
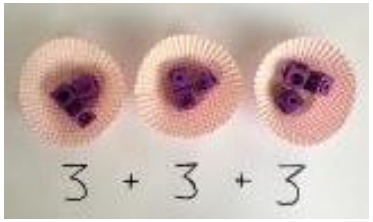
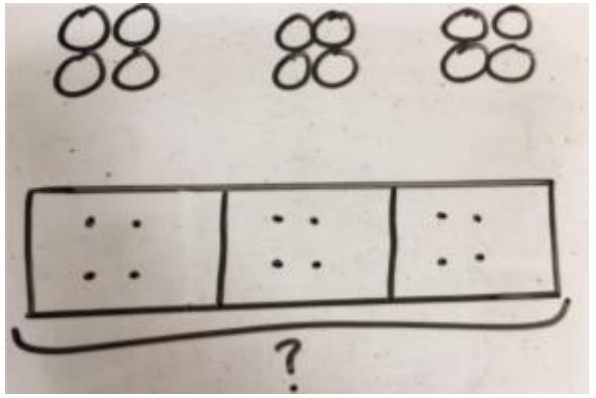
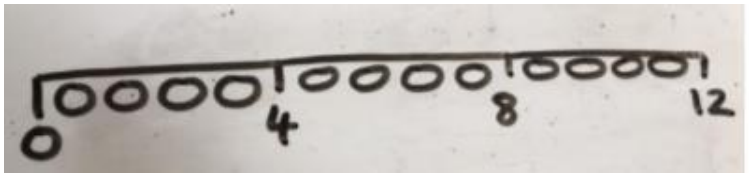
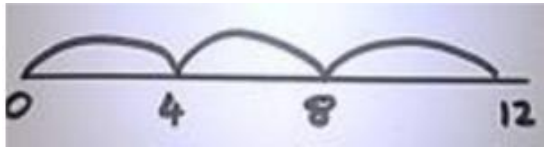
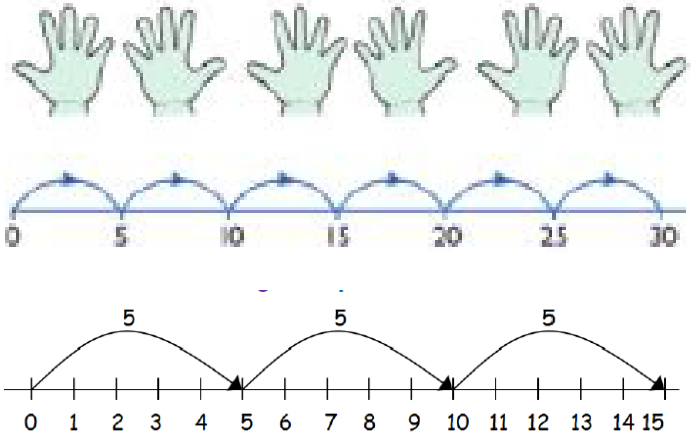
The teaching of **multiplication** in Chaddlewood Primary School

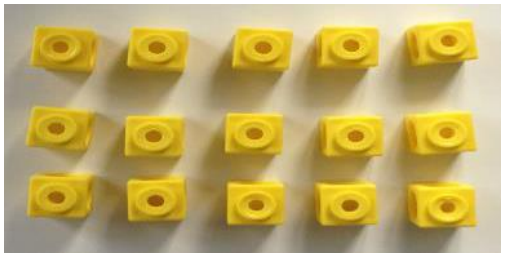
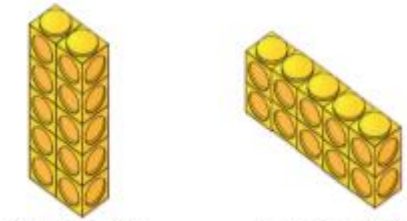
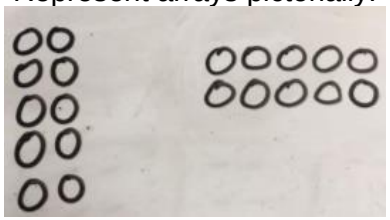
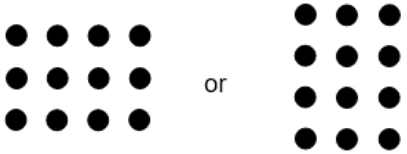
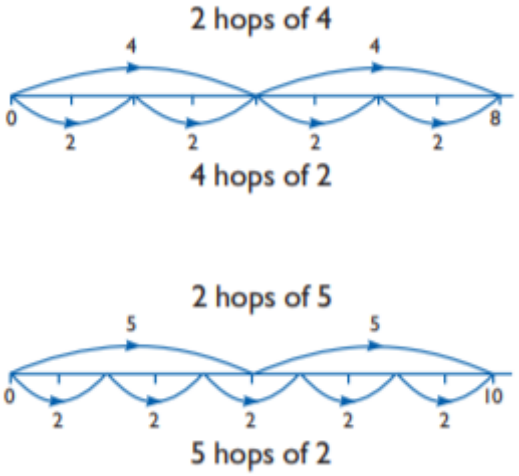
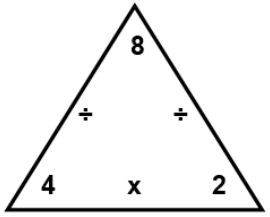
Progression of models

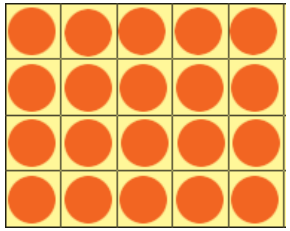
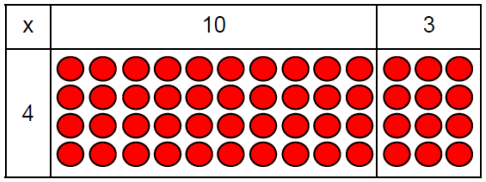
This policy outlines the progression in mathematical models and images from Foundation to Year 6. The policy draws upon the schools' 'Concrete, Pictorial, Abstract' approach, which emphasises the importance of mastery and the use of different representations, including through the use of conceptual variation. This policy should also be read in conjunction with the relevant calculation policy.

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use multilink cubes.  	Use jottings to show double an amount. Double 4 is 8 	Partition a number and then double each part. Recombine. 
Counting in multiples	Count in multiples using objects in equal groups. 	Use number lines and jottings to count in multiples.  	Count in multiples of a number aloud. Use fingers to support as necessary. 

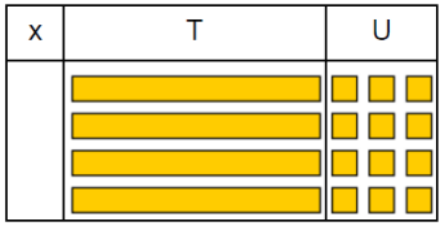
Counting in multiples (cont.)	   	   5 x 4 = ?   = 30	Write sequences with multiples. 2, 4, 6, 8, 10… 5, 10, 15, 20… Recall multiplication and division facts instantly, alongside the ‘circle’, ‘triangle’ and ‘square’ symbols. 
Repeated addition	Use physical resources to illustrate ‘lots of’ objects. 	Represent physical objects with jottings, including a ‘dot’ to illustrate a single object, bar models and number lines. 3 x 5 = □ There are 5 buns on a plate. How many buns are on 3 plates? 	Write addition sentences to describe objects, jottings and pictures.  2 + 2 + 2 + 2 + 2 = 10

Repeated addition (cont.)	 Use different objects to add groups with equal quantities.  	   Use numbers lines and jottings to count in multiples 	Record using numerals and mathematical symbols. $4 + 4 + 4 = 12$ $3 \times 4 = 12$

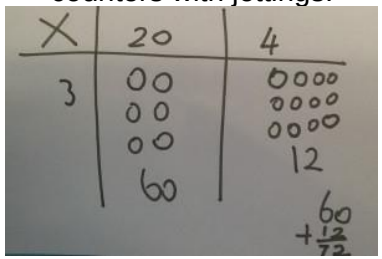
Arrays - showing multiplication as commutative	Create arrays using counters/cubes to show multiplication sentences    2 lots of 5 5 lots of 2	Represent arrays pictorially.  Draw arrays in different rotations to find commutative multiplication sentences.  Use number lines to illustrate multiplicative commutativity.  2 hops of 4 4 hops of 2 2 hops of 5 5 hops of 2	Interpret arrays and write multiplication and repeated addition sentences.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15 Link to number trios.  8 ÷ ÷ 4 x 2

<table>
<tr>
<td>Arrays - showing multiplication as commutative (cont.)</td>
<td></td>
<td>Link arrays to area of rectangles.
  </td>
<td></td>
</tr>
<tr>
<td>Grid Method</td>
<td>Use counters and arrays to introduce the grid method.
 

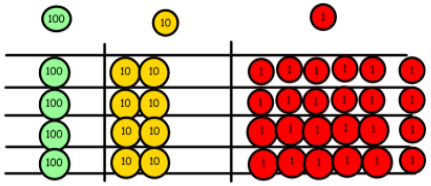
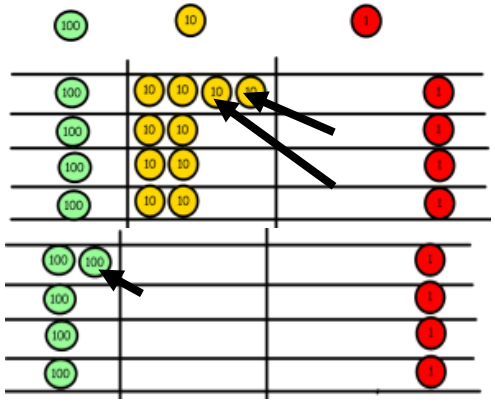
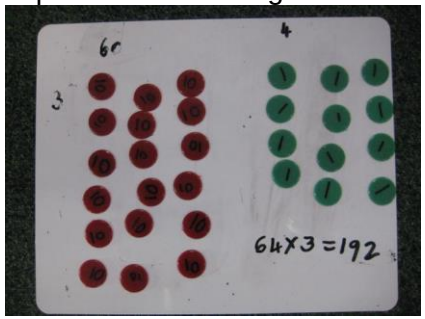
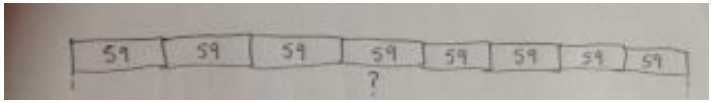
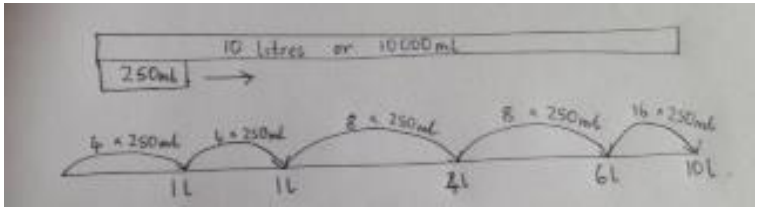
4 rows of 10, 4 rows of 3

Use base 10 blocks/Deinnes to move towards a more compact method.
 

4 rows of 13

Use place value counters to show how we are finding groups of a number. Emphasise how the number of rows needed equals the multiplier.</td>
<td>Replace base 10 blocks/Deinnes and place value counters with jottings.
 
</td>
<td>Use the grid method with numerals.
<table>
<tr><td>×</td><td>30</td><td>5</td></tr>
<tr><td>7</td><td>210</td><td>35</td></tr>
</table>
210 + 35 = 245

<table>
<tr><td>X</td><td>1000</td><td>300</td><td>40</td><td>2</td></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>

Grid Method (cont.)	For 4 x 126, we are multiplying by 4, so we need 4 rows. We fill each row with 126.  Add up each column, starting with the ones, making any exchanges needed. 		
Column multiplication	Use base 10 blocks/Deinnes and place value counters in the appropriate column. Ensure that the ones are multiplied first. Exchange as needed. 	Use bar models and number lines.  	Use expanded written method for multiplication. 24 x 6 24 (6 x4) 120 (6 x 20) 144

Column multiplication (cont.)			46 x 19 = ? 4 6 x 1 9 Step 1: Multiply ones x ones 5 4 (6x9) Step 2: Multiply tens x ones 3 6 0 (40x9) Step 3: Multiply ones x tens 6 0 (6x10) Step 4: Multiply tens x tens 4 0 0 (40x10) 1 Step 5: Add the answers together 8 7 4 4 6 X 1 9 Step 1: Multiply top amount x ones 4 1 4 (46x9) Step 2: Multiply top amount x tens 4 6 0 (46x10) Step 3: Add the answers together 8 7 4 5 2 x 4 ,3 Step 1: Multiply top amount x decimal 1 5 ,6 (52x0.3) Step 2: Multiply top amount x ones 2 0 8 .0 (52x4) 1 Step 3: Add the answers together 2 2 3 .6 Move towards the formal compact method for multiplication. Record any exchanges above the first horizontal line. 4 6 x 9 4 5 4 1 4

Mathematical variation and the impact upon this policy.

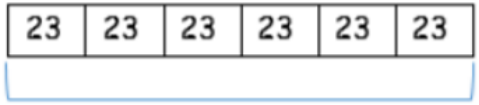
Variation theory is a way of analysing and planning teaching and learning activities. The approach focuses on what changes, what stays the same and the effect this might have.

There should be different emphases for different critical aspects when structuring variation in mathematics lessons, and learners should see difference before sameness, including counter or non-examples.

The models and images above, alongside appropriate mathematical variation, will help teachers to structure tasks to direct pupil attention most effectively. The patterns of variation include:

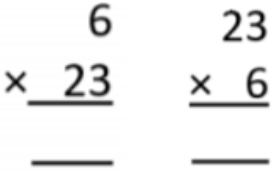
Contrast – To experience something we must experience something else to compare it with.
Generalisation – Experiencing and recognising varying appearances of the same thing (for example the different pictorial representations above)
Separation – Seeing one aspect as distinct from other aspects.
Fusion – Experiencing several critical aspects simultaneously (often called co-variation).

Conceptual variation (different ways to ask children to solve 6x23)

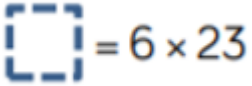


Word problems: Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week?

With place value counters, prove that 6x23=138.



6 x 23 =



Find the product of 6 and 23.

What is the calculation?
What is the product?