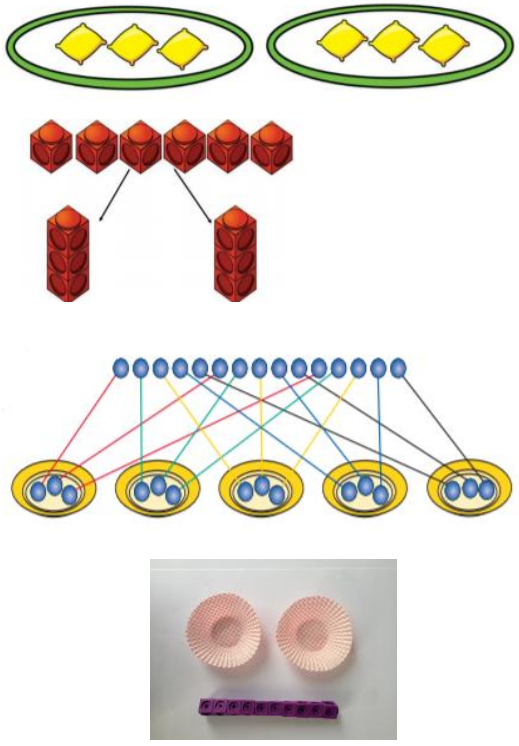
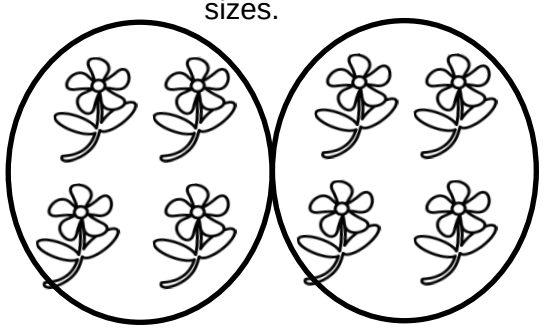
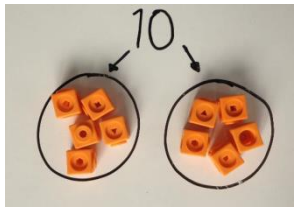
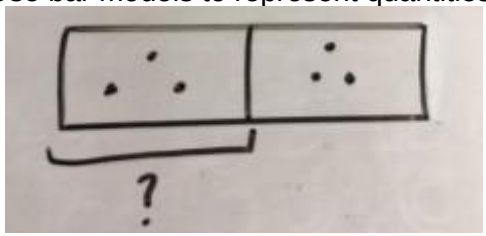
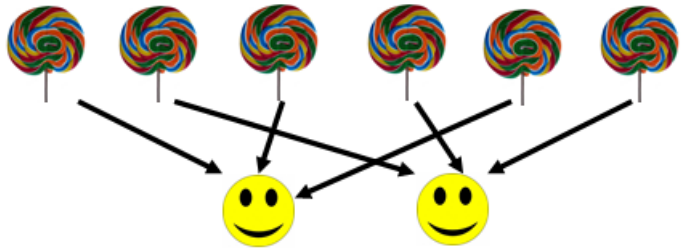
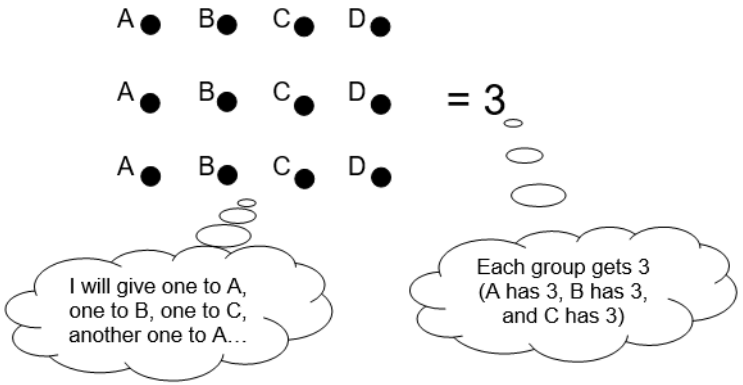
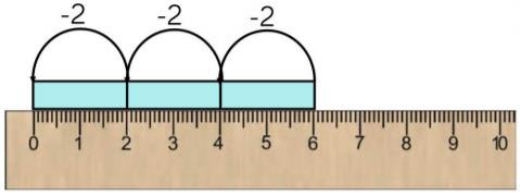
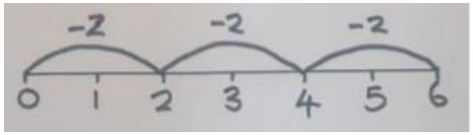
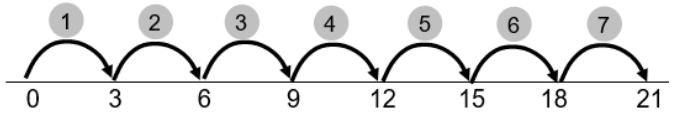
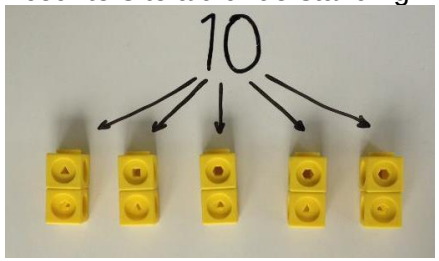
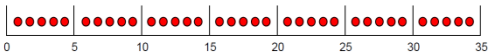
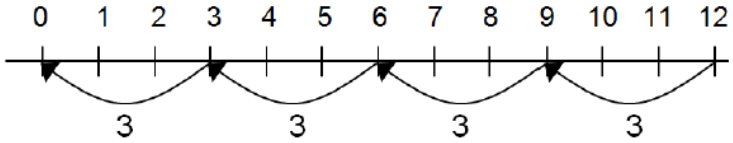
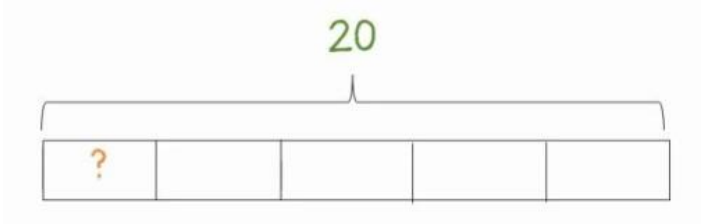
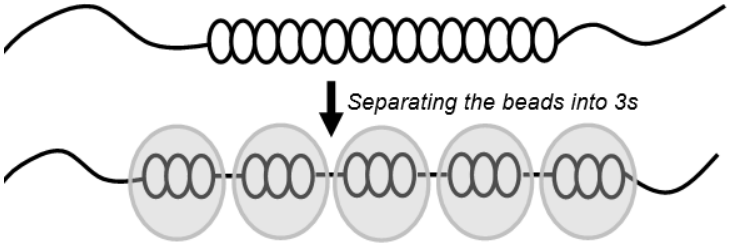
The teaching of **division** in Chaddlewood Primary School

Progression of models

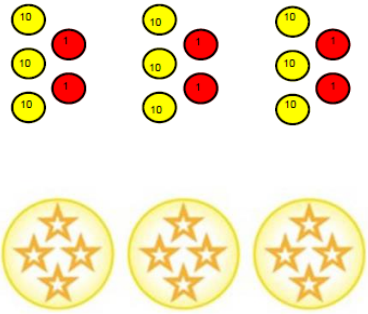
This policy outlines the progression in mathematical models and images from Foundation to Year 6. The policy draws upon the schools' 'Concrete, Pictorial, Abstract' approach, which emphasises the importance of mastery and the use of different representations, including through the use of conceptual variation.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

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	Use physical objects and share into different groups. 	Draw jottings to share a quantity between 2 or more groups.  Draw rings around a quantity to represent different group sizes. 	Record using numerals and mathematical symbols. 3 | 3 9 ÷ 3 = 3 Record as a fraction when objects cannot be shared fairly into integers. What is ½ of 6? What is ¼ of 12? 1/2 = 2/4 = 3/6…

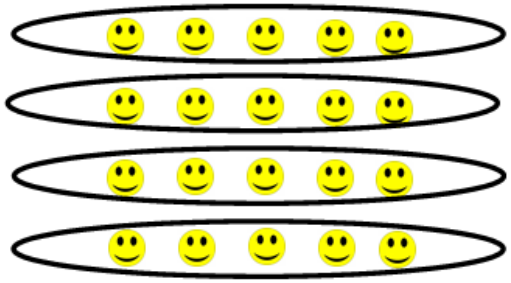
Sharing objects into groups (cont.)	 	Use bar models to represent quantities.   	

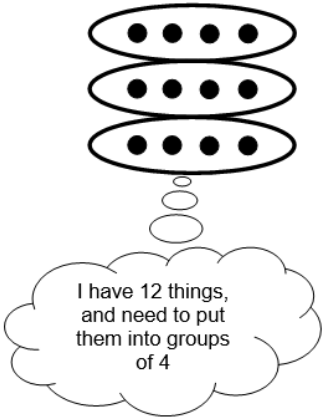
Repeated addition and subtraction	Count 'how many', using understanding of multiples as appropriate.  Use Cuisenaire rods above a ruler. 	Represent repeated addition/subtraction using a number line.  	Use mathematical equations. $20 - 5 - 5 = ?$ $? = 3 + 3 + 3 + 3$
Division as grouping	Put objects into pairs.  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.  Use bar models and bead strings.  	Use mathematical equations. $28 \div 7 = 4$ Recall multiplication and division facts instantly, alongside the 'circle', 'triangle' and 'square' symbols.  Count up in different multiples, using fingers as appropriate to support.

Division as grouping (cont.)

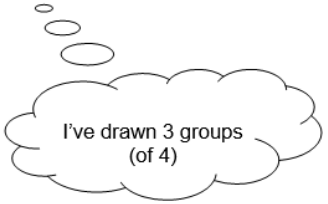


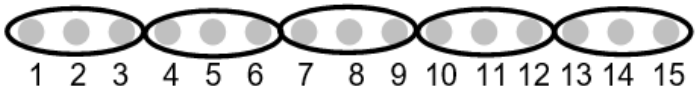
Circle jottings to illustrate groups.





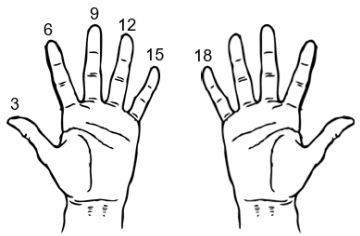
= 3

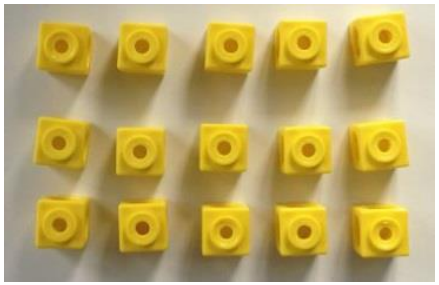
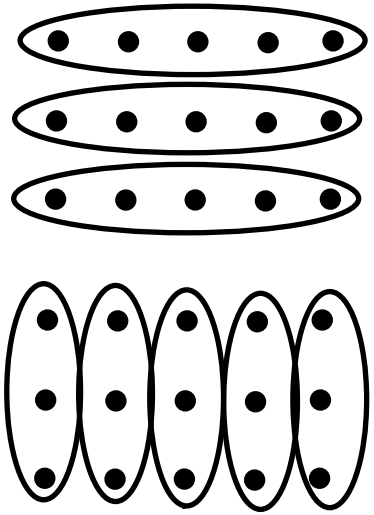
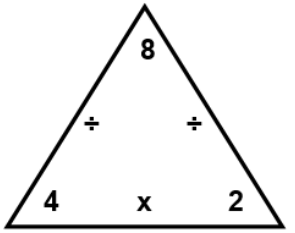
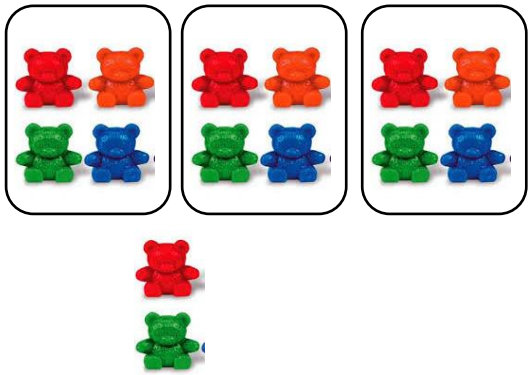
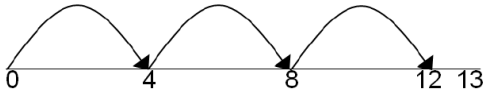


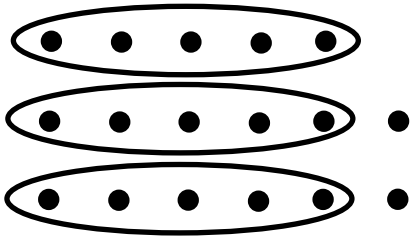


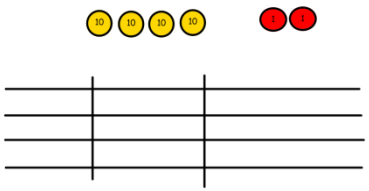
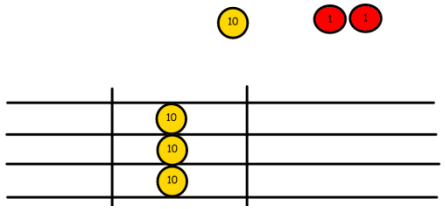
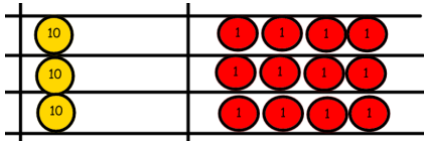
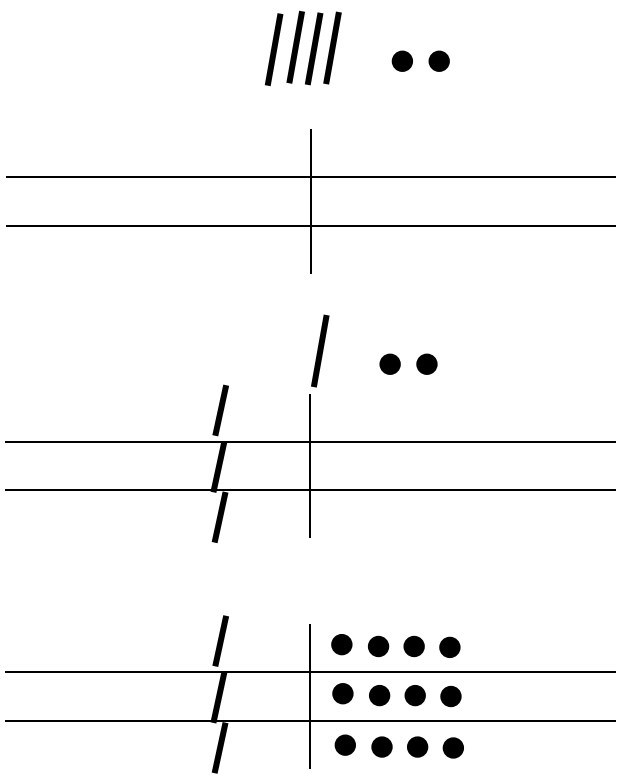
Use a hundred square to highlight multiples (for example groups of 5)

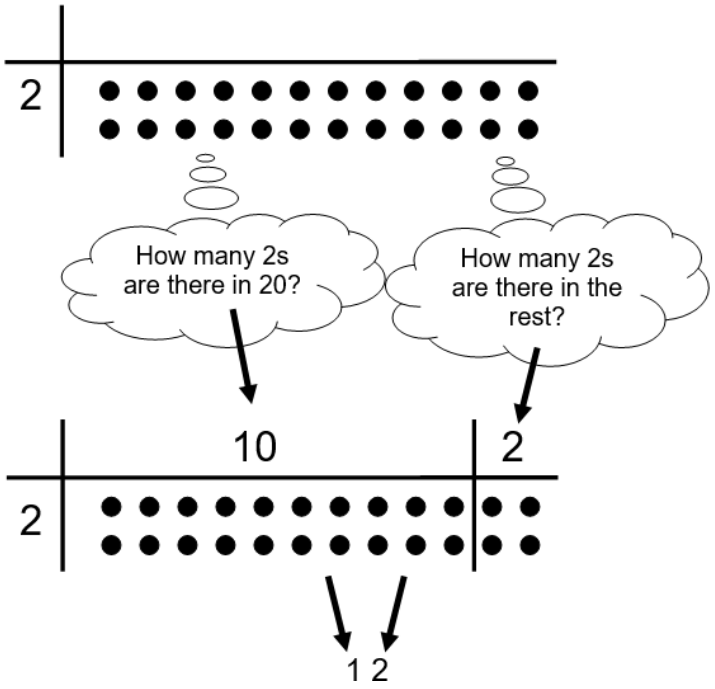
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	50
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



<table>
<tr>
<td>Division within arrays</td>
<td>Link division to multiplication.
Create an array and highlight the different horizzontal and vertical groups.
  </td>
<td>Draw an array and group using rings
  </td>
<td>Link to number trios.
Find 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
 
</td>
</tr>
<tr>
<td>Division with a remainder</td>
<td>Divide objects between groups. Identify how much is left over (the remainder).
  </td>
<td>Jump forward in equal amounts on a number line, until the next jump would pass the total. Identify the remaining quantity (the remainder).
 

Draw a jotting and draw rings around the group size. Identify the remainder that is not inside a ring.
  </td>
<td>Show the remainder using ‘r.’.
29 ÷ 4 = 7 r.1</td>
</tr>
</table>

Short division	Use place value counters to divide.  Start with the place value counters that are worth the most and share.  Exchange any remaining tens for ten ones and then share the ones equally among the groups.  Identify the solution by looking at one group.	As 'concrete', but with jottings to represent the different digits. 	Use the formal method for division, including with remainders and decimal numbers. $5\overline{)615}$ → 123 $15\overline{)432}$ → 28 r 12 300 132 −120 12 $15\overline{)432}$ → 28.8 300 132 −120 12.0 $8\overline{)356}$ → 044 r 4

Short division (cont.)		24 ÷ 2 = ? £24 was shared between 2 people. How much money do they each receive?  	

Mathematical variation and the impact upon this policy.

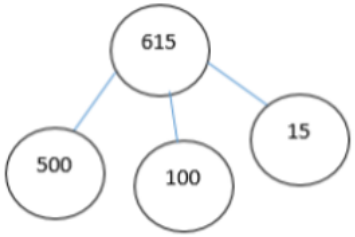
Variation theory is a way of analysing and planning teaching and learning activities. The approach focuses on what changes, what stays the same and the effect this might have.

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 615 ÷ 5)

Using the part-part-whole model, how can you divide 615 by 5 without using short division?  	Word problems: I have £615 and share it equally between 5 bank accounts. How much will be in each account? 615 pupils need to be put into 5 groups. How many will be in each group? 615 ÷ 5 = 123. Prove it.	$5\overline{)615}$ 615 ÷ 5 = $\square = 615 \div 5$	What is the calculation? What is the answer?