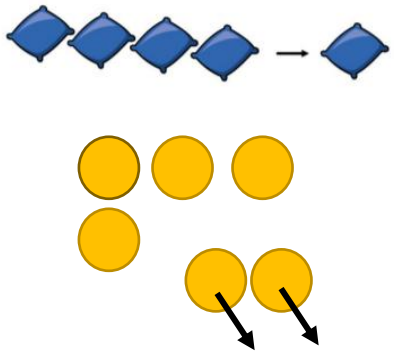
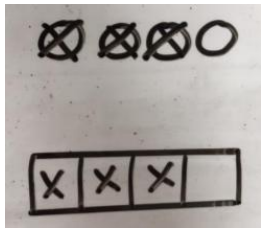
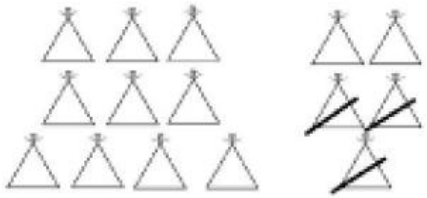
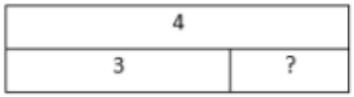
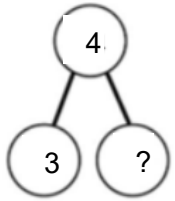
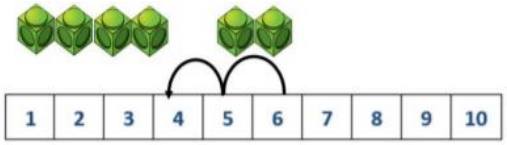
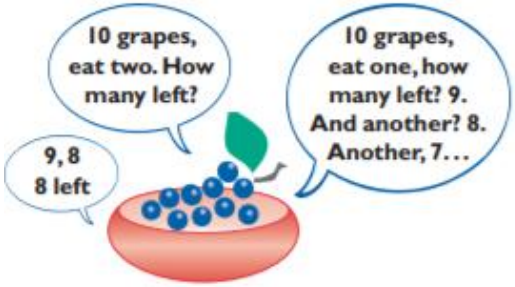
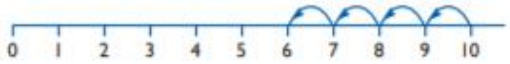
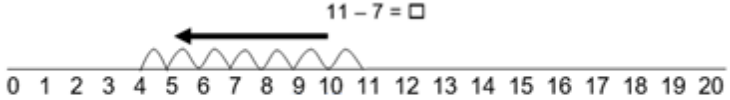
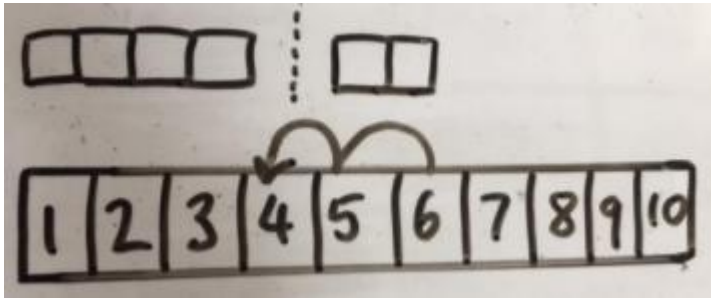
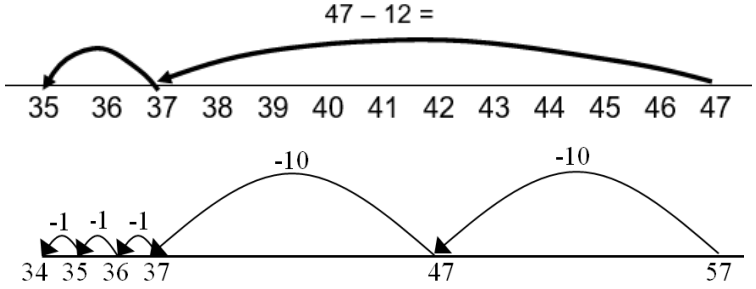
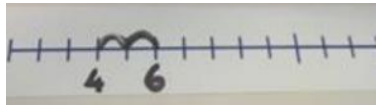
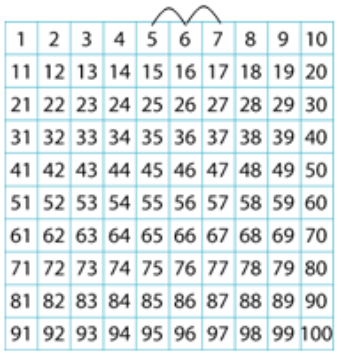
The teaching of **subtraction** in Chaddlewood Primary School

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.

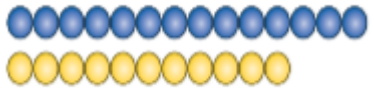
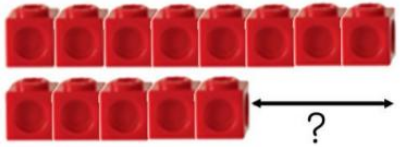
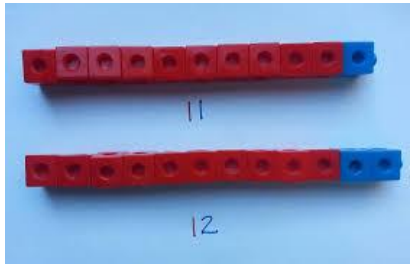
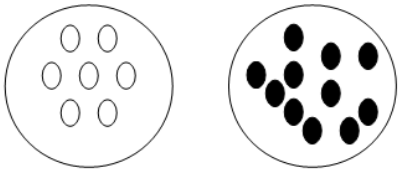
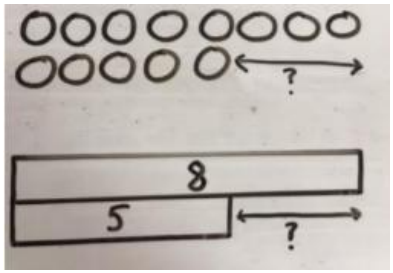
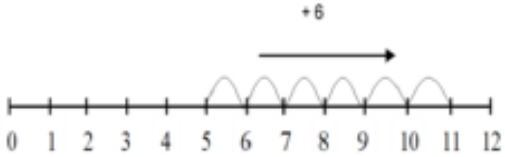
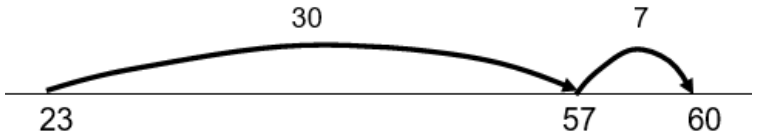
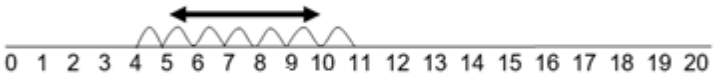
Objective and Strategies	Concrete	Pictorial	Abstract
Taking away/ subtracting ones	Use objects such as counters and cubes to show how objects can be 'taken away'. 	Cross out drawn objects to show what has been subtracted.   	Represent mathematical problems using bar and 'part-part-whole' models.   Record mathematically using numerals and simple equations. □ = 4 – 3 8 – 2 = 6

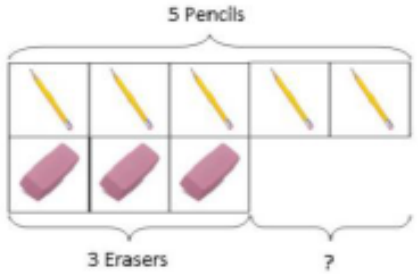
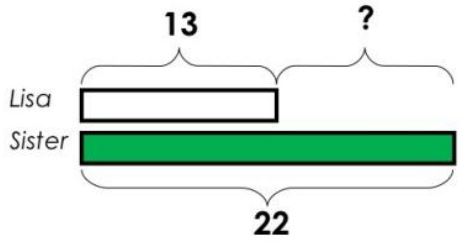
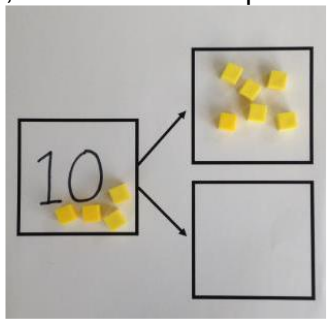
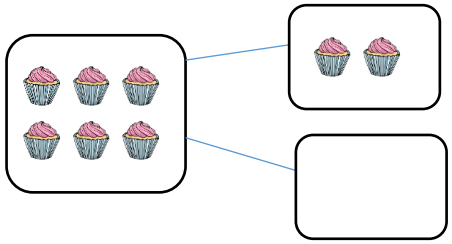
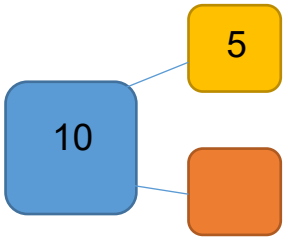
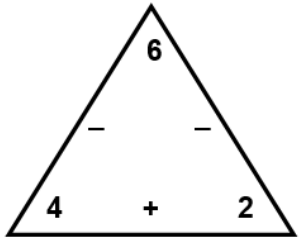
Counting back	Make the larger number, then move the beads along a bead string as you count backwards in ones. 13 – 4  Count back in ones using a number line.    	Count back on a number line.  Start on 11, and 'jump back' 7 spaces. Represent counting back pictorially using a drawn number line.  Start on the larger number and count back the smaller number, showing the jumps on a blank number line. Appropriate to the size of the numbers, jumps could be in tens, hundreds, etc.  	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line   Put 13 in your head and count back 4. How many are your left with?

Counting back (cont.)	Use counters and move them away from the group as you take them away, counting backwards as you go.  Use a hundred square. 7 count back 2 = 5  58 – 12 = ☐ 		

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	60
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

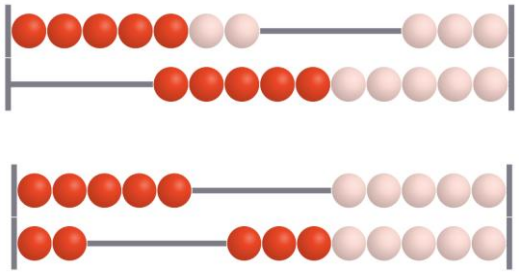
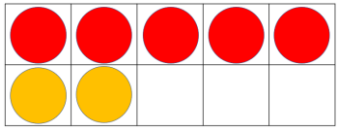
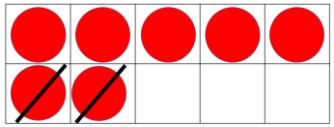
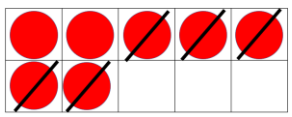
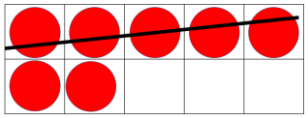
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

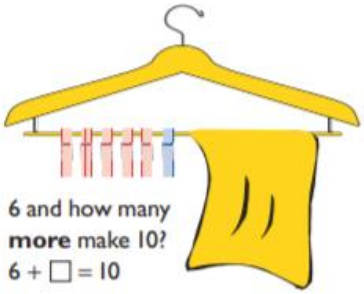
Find the difference	Compare amounts and objects to identify ‘what is the same’ and ‘what is different’.    Which line has **most** money? How much **more**?  Use cubes to build towers, or make bars to find the difference  	Use jottings to represent concrete objects or use a bar model to illustrate. Which plate holds the most: black or white? How many more? What is the difference?   Count on to find the difference using a number line.    Children will start on either number and ‘jump’ until they reach the other (this is possible in either direction, but is normally thought of as ‘jumping on’).	Use mathematical numerals, vocabulary, symbols and word problems. 8 – 5, the difference is ☐ 9 - 6 = 8 – 5 Hannah has 23 sandwiches and Helen has 15 sandwiches. Find the difference between the number of sandwiches that each of the girls have.

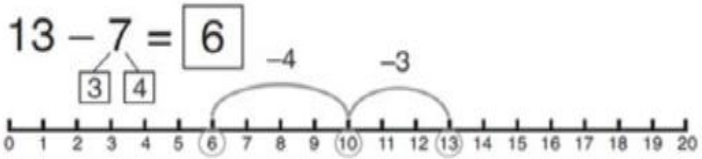
Find the difference (cont.)	Use basic bar models with items to find the difference  	Draw bars to find the difference between 2 numbers. *Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*  	
Part-part-whole models	***Link to addition.*** Use part-part-whole models to explain the relationship between addition and subtraction. If 10 is the whole and 6 is one of the parts, what is the other part worth?  	Show using object representations within a part-part-whole model. 	Use numbers within a part-part-whole model.  Introduce number trios to illustrate the relationship between addition and subtraction. 

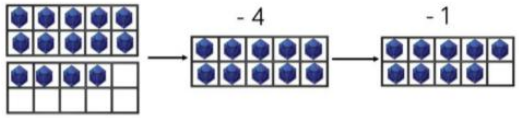
<table>
<tr>
<td>Making amounts</td>
<td>Use rekenrek to decompose other numbers.

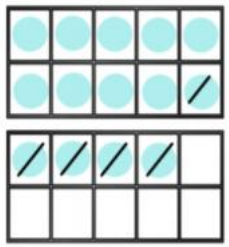
Use stem sentences such as ‘7 is the whole. 5 is a part and 2 is a part’.

This is represented by either of the following rekenrek images.
  </td>
<td>Use two different coloured dots on a tens frame.
 
Use a tens frame and cross out subtrahend.
 
  or  </td>
<td>Record mathematically using numerals.

7 – 5 = 2
7 – 2 = 5</td>
</tr>
<tr>
<td>Make 10</td>
<td>Use physical objects to represent number bonds to 10.
 

Make 14 on a ten frame. Subtract 5 by subtracting 4, then one more.
 
.</td>
<td>Breach ten using a number line.
 

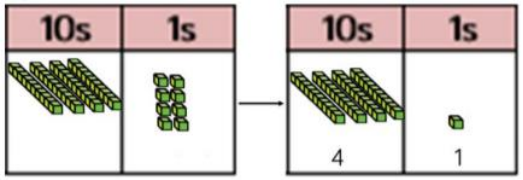
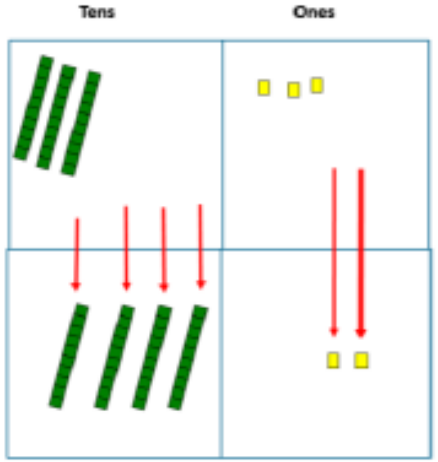
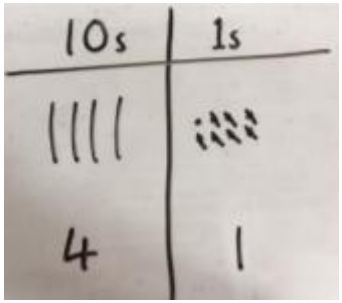
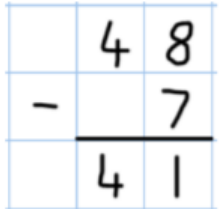
Use jottings of tens frames.
 

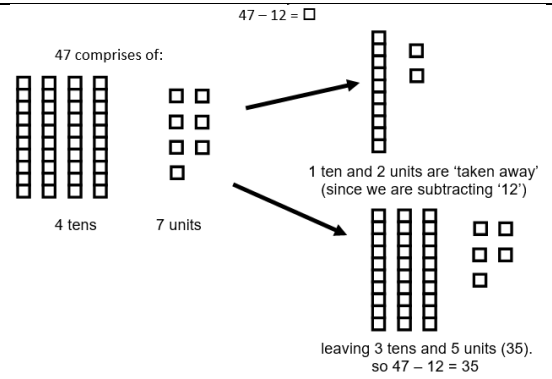
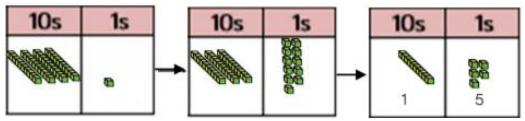
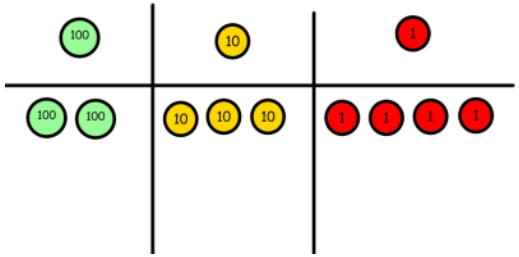
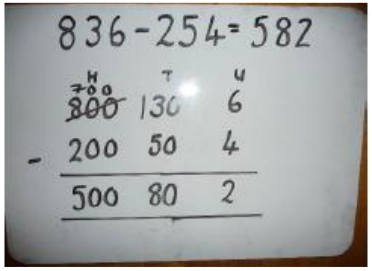
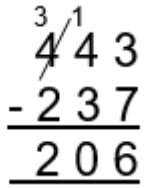
  </td>
<td>Use numerals in mathematical equations.

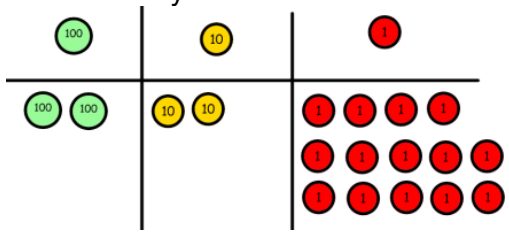
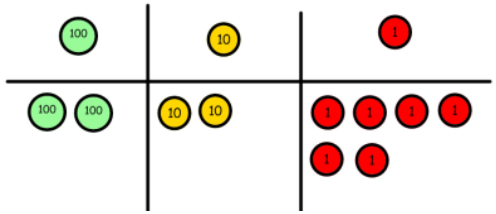
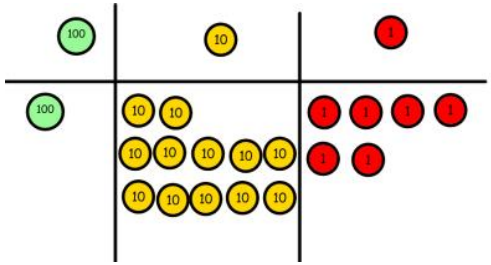
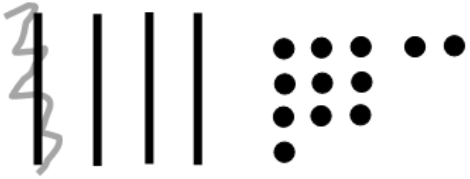
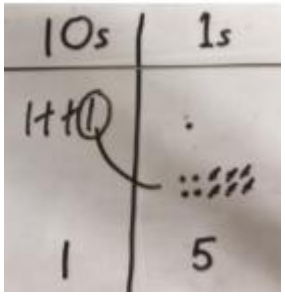
14 – 4 = 10

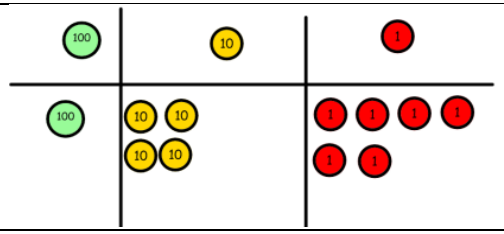
14 - 5 = 9
4 1

16 – 8 = 8</td>
</tr>
</table>

Column method without regrouping	Illustrate the column method using base 10/Deinnes or place value counters. 48-7  Use Deinnes to make the bigger number, then subtract the smaller. Subtract the ones first, then move on to each subsequent column to the left.  	Represent base 10 blocks/Deinnes pictorially using lines to represent tens, and dots for ones. "47 is made up of 4 TENS and 7 ONES"  "I need to subtract 12. That's 1 TEN and 2 ONES"  "I have 3 TENS and 5 ONES left, so the answer is 35"  	Use the formal column method for subtraction.  243 - 122 121

Column method without regrouping (cont.)			
Column method with regrouping	Illustrate the column method using base 10/Deinnes and place value counters where exchanging is necessary. 41 – 26  Make the larger number with the Deinnes or place value counters  Starting with the ones, can I subtract 8 from 4 easily? I need to exchange one	Represent the base 10 blocks/Deinnes pictorially, remembering to show the exchange	Use the formal written method by partitioning the number into place value columns.  Use the formal column method for subtraction.  Represent more complex calcualtions, including decimals.

Column method with regrouping (cont.)	of my tens for ten ones.  Now I can subtract my ones.  Now look at the tens, can I subtract 8 tens easily? I need to exchange one hundred for ten tens.  Now I can subtract eight tens and complete my subtraction	"4 is made up of 4 TENS and 2 ONES"  "I only have 2 UNITS and need to subtract 7 ONES. So I will exchange a TEN for 10 ONES"  "I can now subtract 1 TEN and 7 ONES"  "I have 2 TENS and 5 ONES left, so the answer is 25" 	$\begin{array}{r} {}^{2}\not{3}\,{}^{1}4.8 \\ -\,2\,6.4 \\ \hline 0\,8.4 \end{array}$ $\begin{array}{r} 3\,4.8\,4 \\ -\,2\,6.4\,0 \\ \hline 0\,8.4\,4 \end{array}$

Column method with regrouping (cont.)			

Mathematical variation and the impact upon this policy.

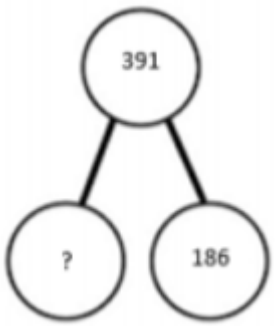
Variation theory is a way of analysing and planning teaching and learning activities. The approach focuses on what changes, what stays the same and the effect this might have.

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 391-186)

<table>
<tr>
<td>


<table>
<tr><td colspan="2">391</td></tr>
<tr><td>186</td><td>?</td></tr>
</table>
</td>
<td>Word problems: Raj spent £391 and Timmy spent £186. How much more did Raj spend than Timmy?

391 - 186 = 205. Prove it.

Calculate the difference between 391 and 186.</td>
<td>□ = 391 – 186

391
-186
____

391 - 186 =

What is 186 less than 391?</td>
<td>Fill in the missing digits.

3 9 □
- □ □ 6
□ 0 5</td>
</tr>
</table>