RFPS Calculation Policy

Name of Policy	RFPS Calculation Policy	
Policy Level (Trust/School)	School	
Document control		
Date	**Revision Amendment Details**	**By whom**
Sept 2022	Review and internal consultation	Mathematics Lead
March 2023	Approved	Head Teacher
March 2026	Proposed date for review	Mathematics Lead

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Rugby, Warwickshire CV22 5PE

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1. Introduction and Rationale

This calculation policy sets out expectations for the mastery of addition, subtraction, multiplication and division as written in the National Curriculum 2014 as well as the progression of concrete, pictorial and abstract methods used at Rugby Free Primary School.

It is vital that pupils are taught according to the stage at which they are currently working, being moved onto the next stage as soon as they are ready, or working at a lower stage until they are secure enough to move on. Children should not be discouraged from using previously taught methods in which they are secure while new concepts are becoming embedded.

The long-term aim is for children to be able to select an efficient method that is appropriate for a given task. They should do this by always asking themselves:

- **'Can I do this in my head?'**
- **'Can I do this in my head using equipment or drawings?'**
- **'Do I need to use a written method and, if so, which one would be most efficient?'**

It is important that calculations are given a real life context or problem solving approach where possible to help build children's understanding of the purpose of calculation and to help them recognise when to use certain operations and methods when faced with problems.

2. Aims

- To ensure consistency and progression in our approach to calculation.
- To ensure that children develop efficient and reliable mental and written methods of calculation for all operations.
- To ensure that children have mastery of these methods, using them accurately and appropriately with confidence and understanding.
- To ensure that all adults, including parents/carers, are able to support children in an effective and coherent manner.

3. Teachers – How to use this policy

- Use this policy as the basis of your planning but ensure you use the previous or following year's guidance to allow for personalised learning.
- Always use assessment for learning to identify suitable next steps in calculation for groups of children.
- Always use suitable resources, models and images to support children's understanding of calculation, as appropriate.
- If, at any time, children are making significant errors, return to the previous stage in calculation/ or previous resources.

4. Parents/Carers – How to use this policy

- When supporting your child with a particular calculation, use the policy to identify with your child the method which they are most familiar with. Children should choose the method that they feel is most suited to the task.

- Use suitable resources, models and images to support children's understanding of calculation, as appropriate (e.g. counters, number lines etc.)
- If, at any time, your child is making significant errors, try returning to the previous stage in calculation and/or previous resources.

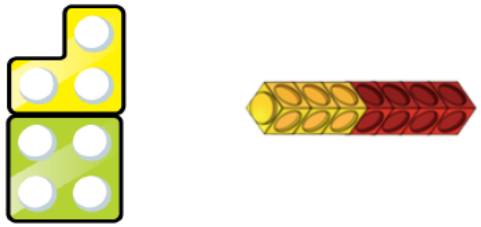
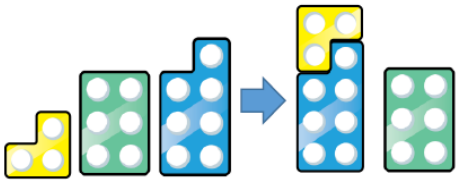
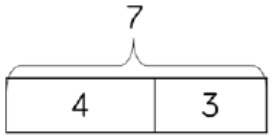
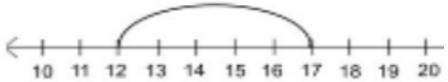
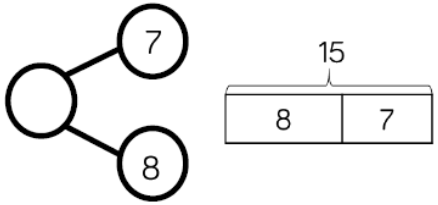
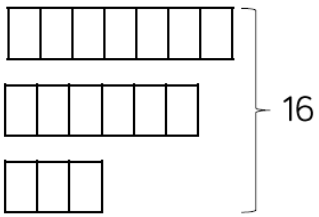
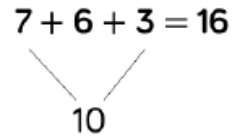
5. Vocabulary

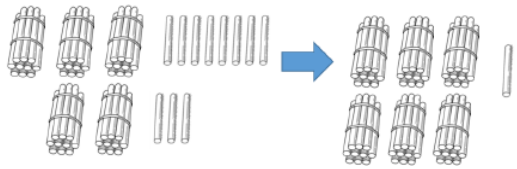
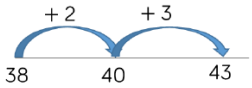
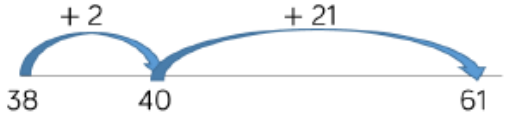
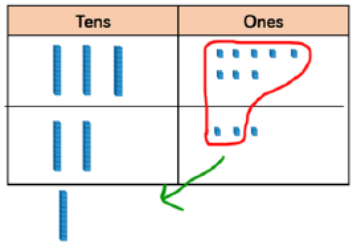
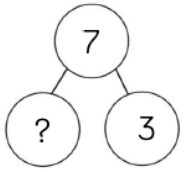
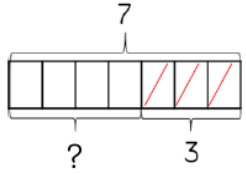
The following key vocabulary in the tables below should be used age appropriately. Please note:

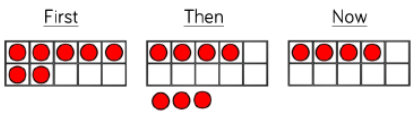
- **'Sum'** should only be used to refer to **addition calculations**, and not used in a more general sense, e.g. 'lets do these sums' when referring to other operations like subtraction, multiplication or division.
- When transferring ones, tens and hundreds, etc. from one place value column to another when using the column method for addition or subtraction, this should be referred to as 'moving' rather than 'carrying', 'borrowing', or 'exchanging'. 'Exchanging' should be used to show that an exchange is made and then the amount is 'moved' to the next column.
- We should not always use the term 'equals'. It is useful to sometimes use the terminology 'is the same as' to clarify the meaning of the symbol. ***E.g. when reading aloud 3 + 3 = 6, you could say 'three plus three is the same as six'.***

Addition	**Subtraction**
Add, addition, more, plus, increase, jump forward, count on, sum, total, altogether, get some more, tens, units, hundreds, thousands, place value, digit, value, combine, total, score, double, near double, how many more to make….?, equals, sign, inverse.	Subtract, take away, minus, decrease, leave, jump back, count back, how many are left/left over? Difference between, half, halve, how many more/fewer is….. than….?, how much more/less is….?, equals, inverse.
Multiplication	**Division**
Lots of, groups of, times, product, multiply, multiplied by, multiple of, once, twice, three times... ten times, repeated addition, array, double, inverse.	Divide, share, share equally, halve, one each, two each, three each…., group in pairs, threes….tens, equal groups of, divide, divided by, divided into, divisible by, remainder, factor, quotient, inverse.

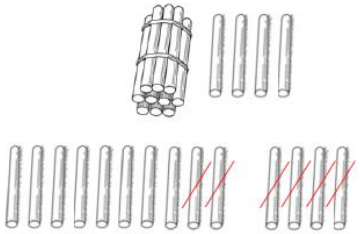
Key Stage 1

	Concrete	Pictorial	Abstract
Addition	Use the part part whole model, add numbers together.  Add amounts together, e.g. using cubes or numicon.  Counting on by starting from the largest number, this example uses a bead string..   Using Dienes or a hundred square ||| □□□□□□□□□ + □□□□□ =	Using pictures   When using number lines, start at the largest number to count on.  12 + 5 = 17  	4 + 3 = 7 3 + 4 = 7 7 = 3 + □ If I have 12 and I add 5 my answer would be 17. What do I add to 5 to make 17? 8 + 7 = 15 7 + 8 = 15 15 = 8 + 7 15 = □ + 8 Using number bonds to support addition.  38 + 2 takes me to 40. That leaves 3 to add on. 40 + 3 = 45

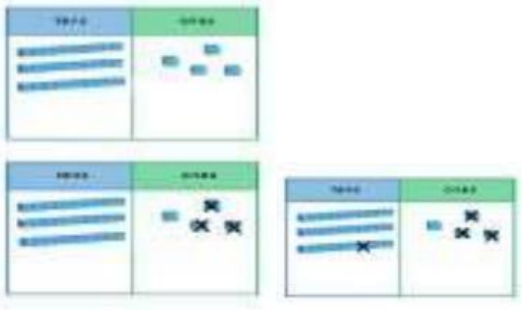
	<table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr><tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr><tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr><tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr><tr><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td><td>57</td><td>58</td><td>59</td><td>60</td></tr><tr><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td></tr><tr><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td></tr><tr><td>81</td><td>82</td><td>83</td><td>84</td><td>85</td><td>86</td><td>87</td><td>88</td><td>89</td><td>90</td></tr><tr><td>91</td><td>92</td><td>93</td><td>94</td><td>95</td><td>96</td><td>97</td><td>98</td><td>99</td><td>100</td></tr></table> Add 2 digit numbers using Dienes, place value counters, Numicon or toher physical manipulatives. 	Adding 1 and 2 digit numbers to 100 using number lines    Show the concrete through a representation of exchanging ones to tens before moving into the correct column.  	Model the column method alongside the pictorial. 38 + 23 61 1
Subtraction	Use physical objects such as counters, cubes, lollipop sticks etc to show how objects can be taken away. .E.g. for 7-3 = 4 	  	7 – 3 = 4 7 – 4 = 3 I know that 3 and 4 make 7, so if I subtract 3 from 7, I should have 4.

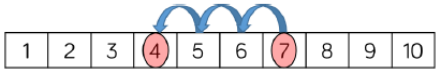


Physically remove from the bundles which will then lead onto pictorial.

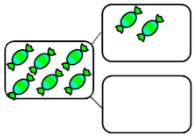


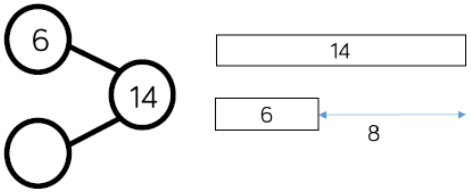
Using Dienes, this example shows what will be removed at each point to find the final answer for 34 – 13.



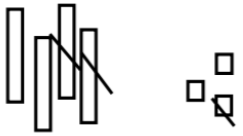


Pictorial part whole models.





Drawings to show subtraction.



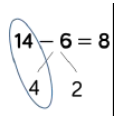
Using pictorial representations, including regrouping. Children will need manipulatives/concrete resources to embed this skill before this stage.

If I have 6 sweets and I eat 2, how many sweets will I have left?

Draw back on pictorial representations to reason.

Put 14 in your head. Can you count back 6?

Partition to cross 10s.Use known facts e.g 10 – 2 will leave me with 8.



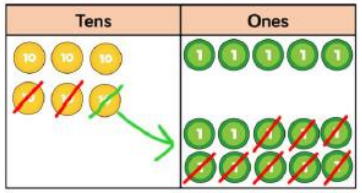
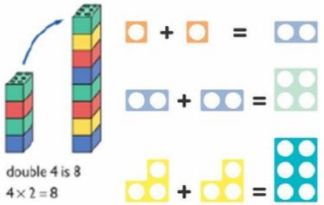
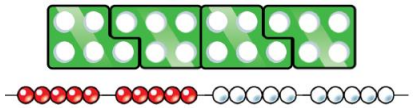
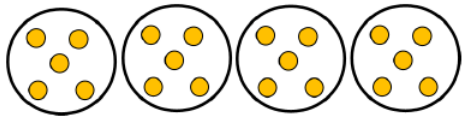
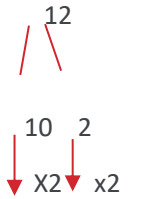
43 – 21 = 22

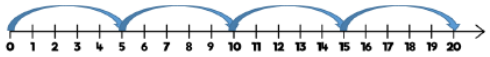
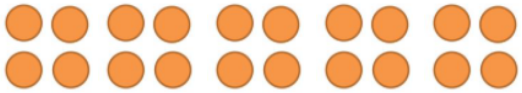
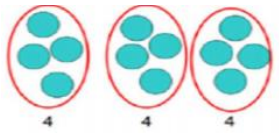
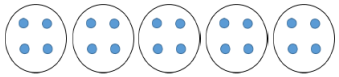
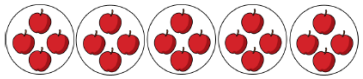
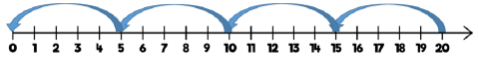
Partitioning e.g.

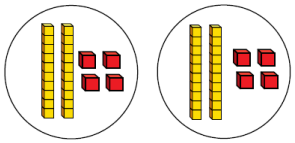
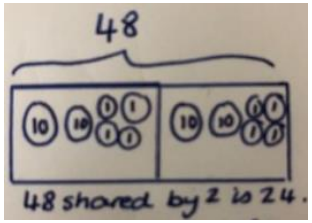
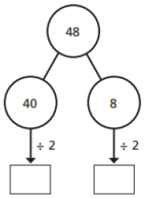
40 – 20 = 20

3 – 1 = 2

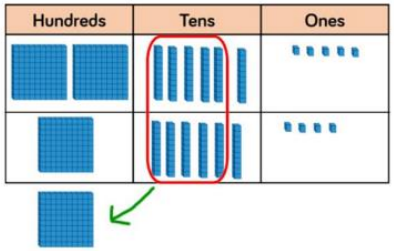
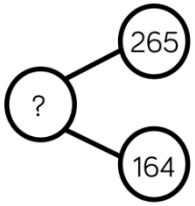
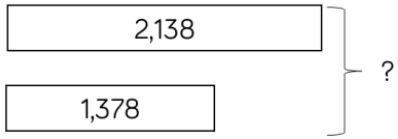
So 43 – 21 = 22

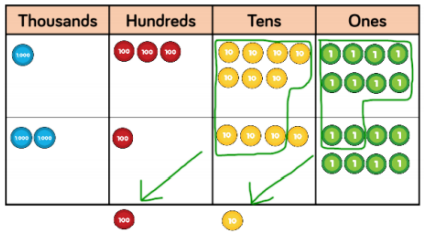
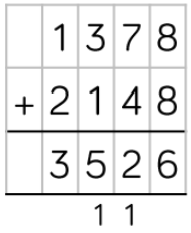
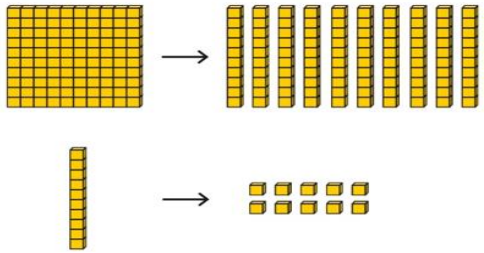
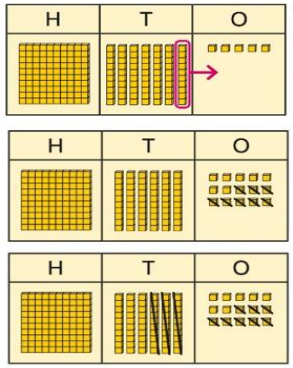
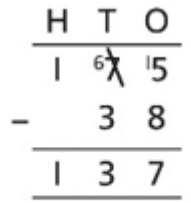
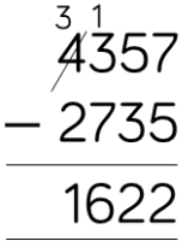
			5 1 6 5 − 2 8 3 7
Multiplication	Using practical activities and manipulatives for doubling.  Doubling with Dienes is very effective. Make equal groups and count the total.  Examples of repeated addition 	Double 4 is 8  Drawing groups to multiply.  Draw  to show 4 x 5 = 20 Number lines to demonstrate repeated addition.	Partitioning e.g. Double 12  20 + 4 = 24 5 + 5 + 5 + 5 = 20 4 x 5 = 20 5 x 4 = 20 Note: In Year 2, children are introduced to the multiplication symbol, in Year 1 they will focus on mainly concrete and pictorial representations

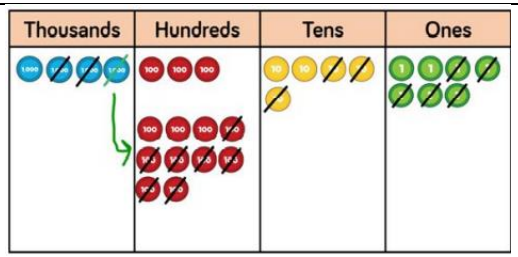
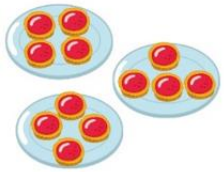
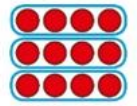
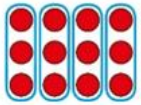
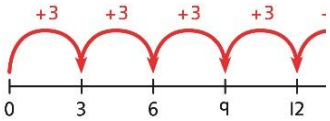
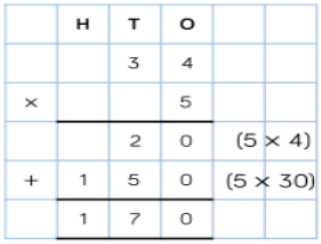
	5 + 5 + 5 = 15 Arrays using counters, cubes Numicon etc. 		
Division	**Sharing** using manipulatives such as cubes and counters.   **Grouping** A range of manipulative cans be used, in this instance numicon and bead strings.  	Use pictures or shapes to share.    	12 shared by 3 is 4. There are 20 apples altogether. They are shared equally between 5 bags. How many apples are there in each bag? 20 ÷ 5 = 4 There are 20 apples altogether. They are put into bags of 5. How many bags are there? 20 ÷ 5 = 4

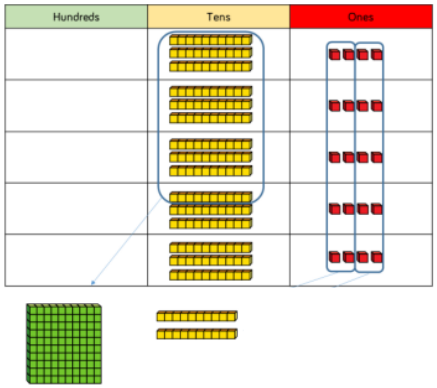
	Divide 2 digits by 1 digit (no exchange) 		48 ÷ 2 = 24 

Lower Key Stage 2

	Concrete	Pictorial	Abstract
Addition	Using concrete place value equipment to represent the calculation. 	As in concrete, represent this, circling and moving to show exchanges.  	264 + 164 = 429 265 + 164 429 1

	 Blank counters may also be used on a place value grid to physically exchange and move.		
Subtraction	Use equipment to enact the exchange of 1 hundred for 10 tens, and 1 ten for 10 ones.  Both place value counters and dienes are effective in modelling and practicing subtraction and exchanging.	Represent pictorially.  *I need to subtract 8 ones, so I will exchange a ten for 10 ones. I will move that ten to the ones column.*	 175 – 38 = 137 

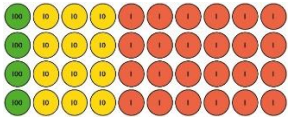
			
Multiplication	**Grouping**   **Multiplying 2 digits by 1 digit.**	Showing commutativity using arrays.  3 groups of four af four groups of 3.  	4 + 4 + 4 = 12 3 + 3 + 3 + 3 = 12 4 x 3 = 12 3 x 4 = 12 



Using concrete resources to develop representing this pictorially.

Multiplying 3 digits by 1 digit

Make 4 × 136 using equipment.



I can work out how many 1s, 10s and 100s.

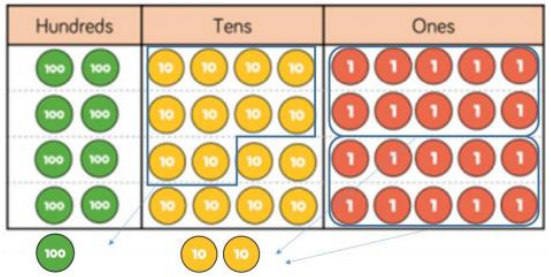
There are 4 × 6 ones… 24 ones

There are 4 × 3 tens … 12 tens

There are 4 × 1 hundreds …4 hundreds

24 + 120 + 400 = 544

Pictorial representations alongside written calculations.

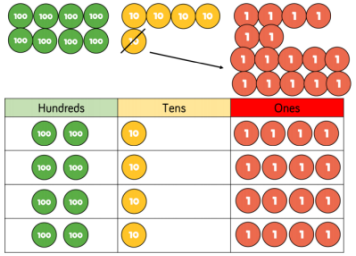
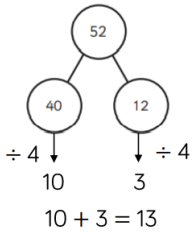
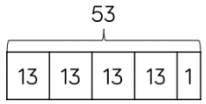
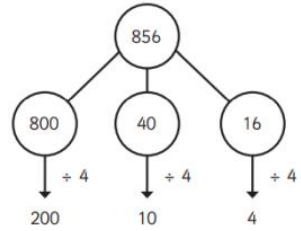
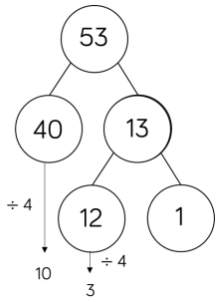
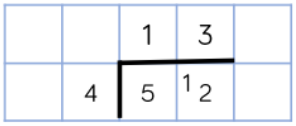


	H	T	O	
		3	4	
×			5	
	1	7	0	

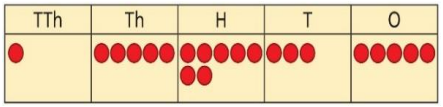
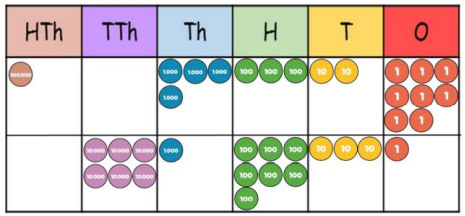
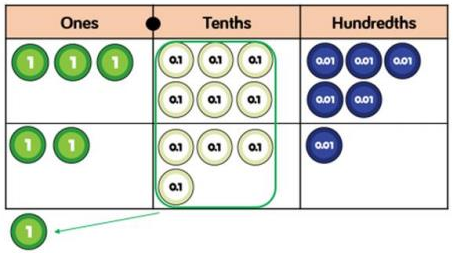
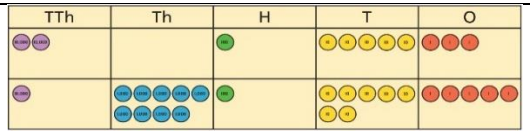
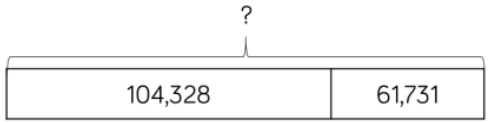
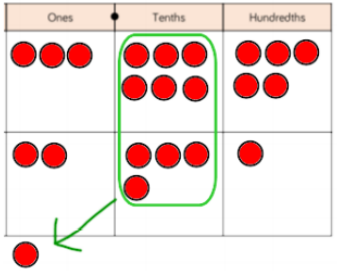
1 2

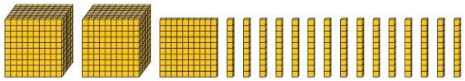
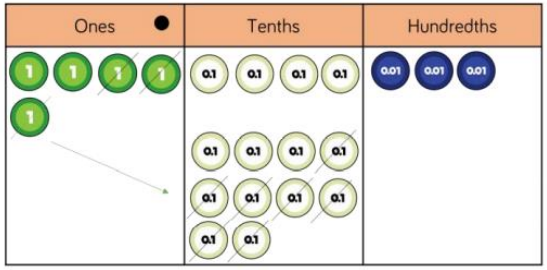
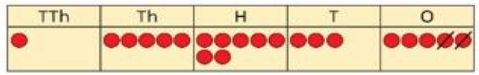
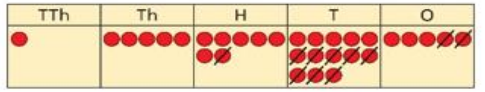
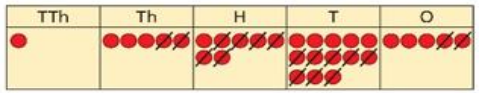
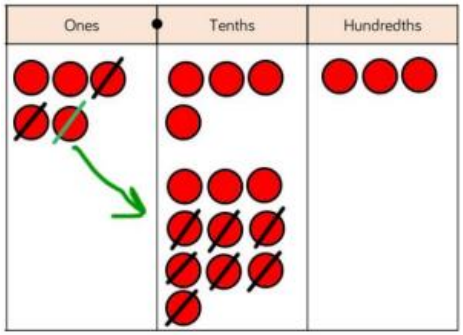
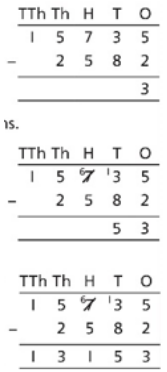
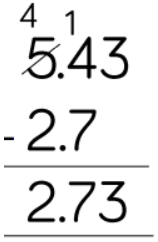
	H	T	O
	2	4	5
×			4
	9	8	0

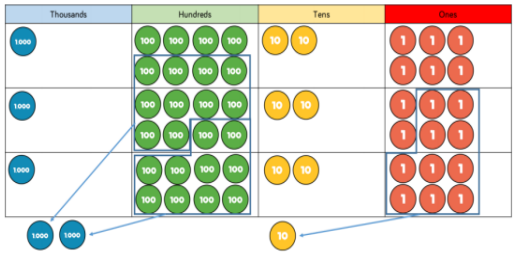
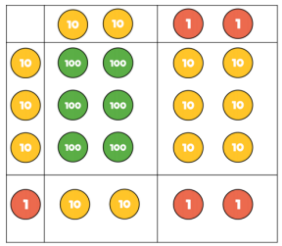
1 2

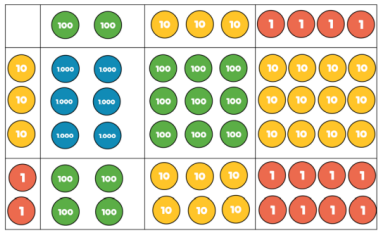
Division	**Divide 2 digits by 1 digit (sharing with exchange)**  Use concrete resources to model and practise. **Divide 2 digits by 1 digit (sharing with remainders)**  **Divide 3 digits by 1 digit**  	 10 + 3 = 13   	Partition using part whole models and refer to known facts to solve.  	 Combine flexible partitioning and part whole models. E.g. 53 ÷ 4 = 40 + 13 = 53 12 + 1 = 13 40 ÷ 4 = 10 12 ÷ 4 = 3

Upper Key Stage 2

	Concrete	Pictorial	Abstract
Addition	**Adding numbers with more than 4 digits.** Use place value equipment to represent additions. *Add a row of counters onto the place value grid to show 15,735 + 4,012.*   **Add with up to 3 decimal places**  	 At this point, children should be able to draw pictorial representations, but may need to physically exchange and move with concrete resources.   Draw counters on place value grids. Show the exchange by circling and showing where the counter will move to.	TTh Th H T O 2 0 1 5 3 + 1 9 1 7 5 3 9 3 2 8 1 I need to exchange 10 tens for a hundred. 1 0 4 3 2 8 + 6 1 7 3 1 1 6 6 0 5 9 1 3.65 + 2.41 6.06 1

Subtraction	Use place value equipment to understand where exchanges are required. *E.g. 2,250 – 1,070*  **Subtracting with up to 3 decimal places.** Using place value counters. 	Represent the stages of the calculation using place value equipment on a grid alongside the calculation, including exchanges where required. e.g. *15,735 – 2,582 = 13,153*  Now subtract the 10s. Exchange 1 hundred for 10 ter  Subtract the 100s, 1,000s and 10,000s.  	Stages in solving 15,735 – 2,582.  5.43-2.7= 2.73 

Multiplication	**Multiplying 4 digit numbers by 1 digit**  **Multiplying 2 digit numbers by 2 digits.**  Place concrete resources in an area model like this to support understanding. **Multiply 3 digits by 2 digits**.	Use the concrete resources to move onto visually representing alongside The grid method links into the area model well. Use this before using formal method. the calculation. × | 20 | 2 30 | 600 | 60 1 | 20 | 2	Th H T O 1 8 2 6 × 3 5 4 7 8 2 1 H T O 2 2 × 3 1 2 2 6 6 0 6 8 2

<table>
<tr>
<td></td>
<td>  </td>
<td>

×	200	30	4
30	6,000	900	120
2	400	60	8

</td>
<td>

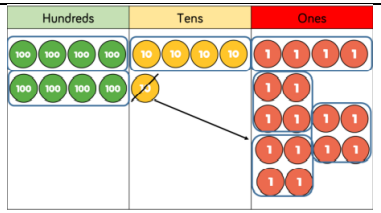
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
$^{1}7$	$^{1}0$	2	0
7	4	8	8

Multiply 4 digits by 2 digits

TTh	Th	H	T	O
	2	7	3	9
×			2	8
$^{2}2$	$^{5}1$	$^{3}9$	$^{7}1$	2
$^{1}5$	4	$^{1}7$	8	0
7	6	6	9	2

^{1}

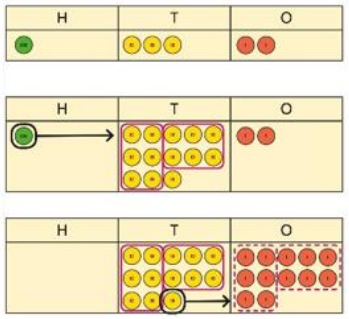
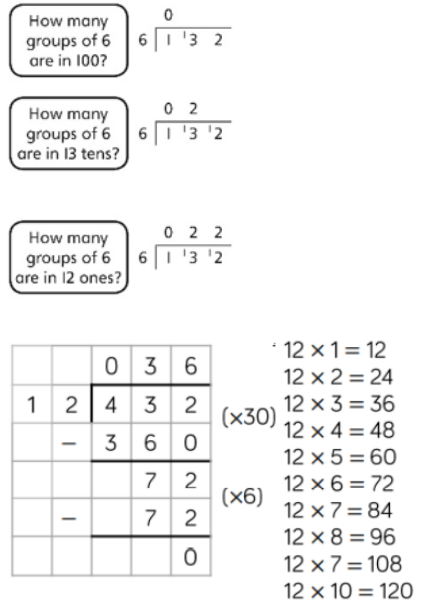
As children become more confident, encourage multiple exchanges.
</td>
</tr>
<tr>
<td>Division</td>
<td>Divide 3 and 4 digits by 1 digit

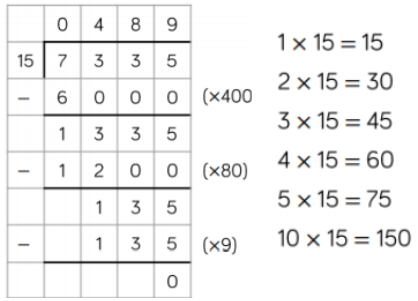
Cocnrete resources can be used to model and pratise this (see pictorial representation).</td>
<td> 
</td>
<td>

		2	1	4
	4	8	5	$^{1}6$

	4	2	6	6
2	8	5	$^{1}3$	$^{1}2$

</td>
</tr>
</table>

	Dividing by 2 digit numbers (long division) Year 6 *At this point in children's learning, formal written methods become more effective than concrete and pictorial. Concrete and pictorial should be used to scaffold and support where necessary.*		

0 4 8 9
15 7 3 3 5
– 6 0 0 0 (×400
1 3 3 5
– 1 2 0 0 (×80)
1 3 5
– 1 3 5 (×9)
0
1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150