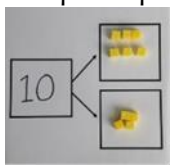
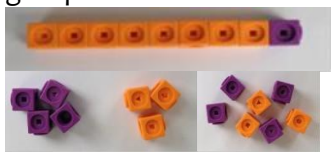
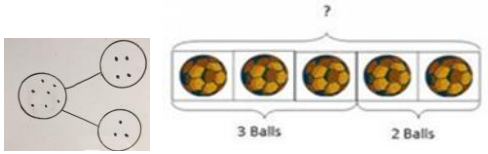
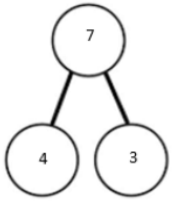
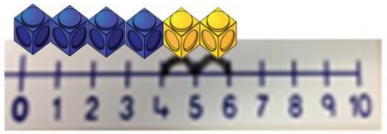
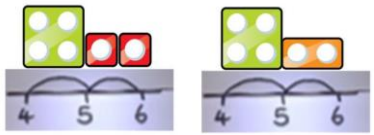
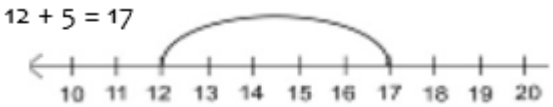
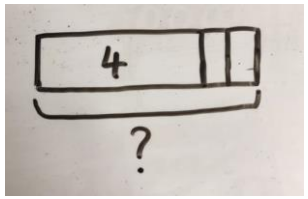
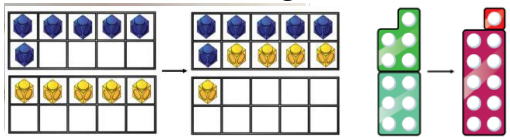
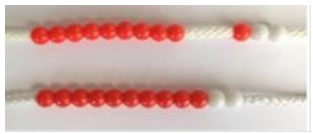
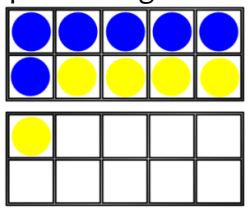
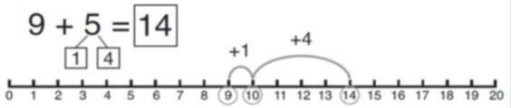
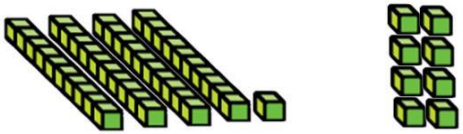
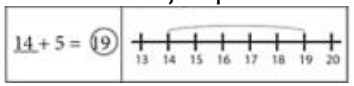
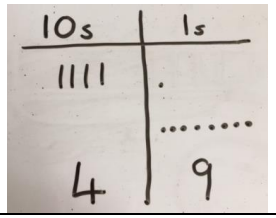
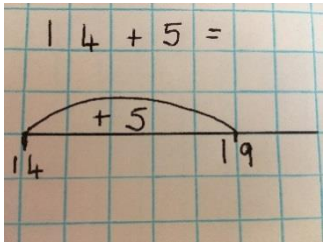
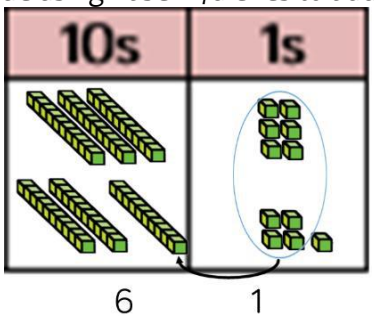
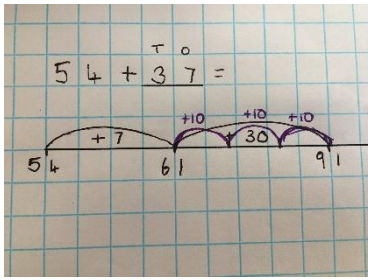
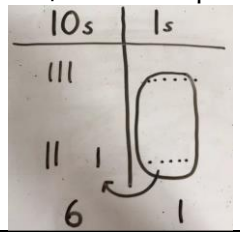
Wrenbury Primary School calculation policy

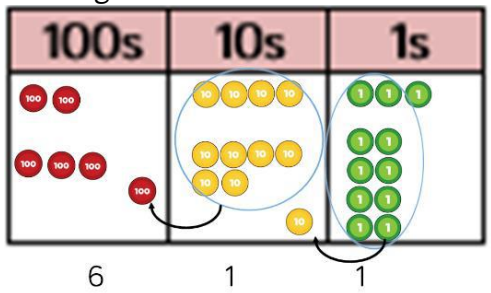
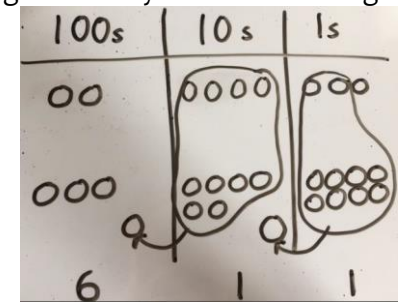
Wrenbury Primary School
'...where we all matter'

(adapted from the Whiterose Maths Hub calculation policy, this is a working document and will be amended as necessary)

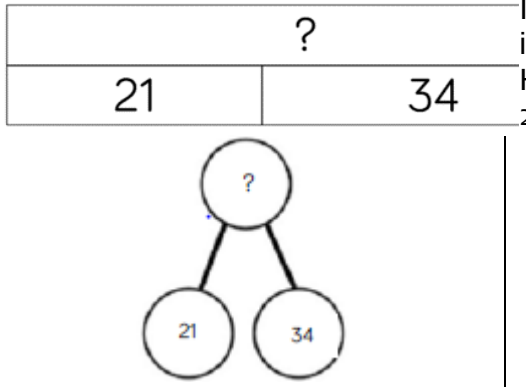
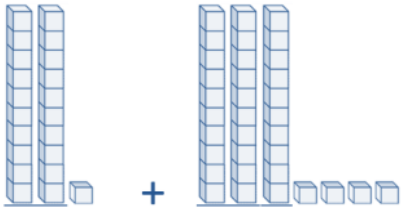
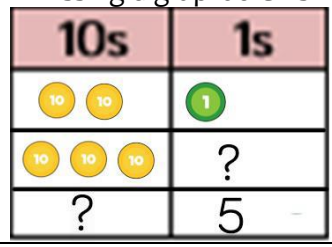
Addition

Objective	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part – part whole model	Use part – part whole model.  Use cubes to add two numbers together as a group of in a bar 	Use pictures to add two numbers together as a group or in a bar   	Use the part – part whole diagrams shown below to move into the abstract 4 + 3 = 7 Four is a part, 3 is a part and the whole is 7 
Counting on from the biggest number	Counting on using bead strings, cubes on a number line or Numicon on a number line   	Count on in ones along a number line starting with the biggest number  Using a bar model to count on from the biggest number 	Place the larger number in your head and count on the smaller number to find your answer. 5 + 12 = 17 Using an abstract number line 

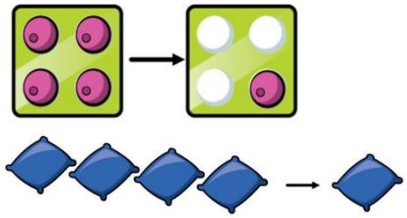
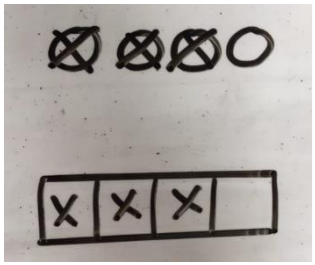
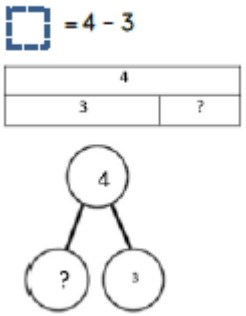
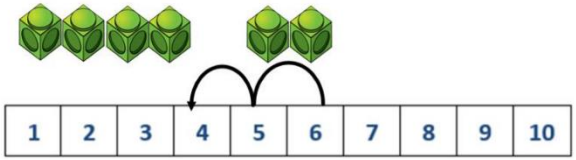
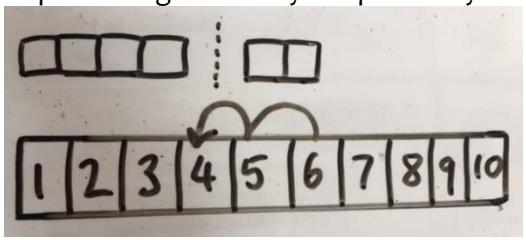
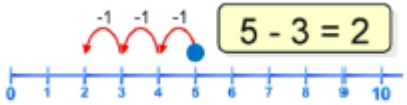
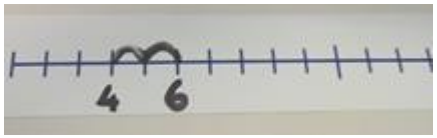
Regrouping to make ten	Using ten frames with counters/cubes, using Numicon or bead strings  	Children to draw the ten frame with counters/cubes or using a number line, regrouping or partitioning smaller number  	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
2 digit number add a one digit number (TO + O)	Develop understanding of partitioning and place value using Base 10/dienes to add 41 + 8 	Using a number line to jump on in ones  Drawing Base 10/dienes to add on ones 41 + 8 	Using an abstract number line  Counting on from the biggest number in your head/using your fingers to support
2 digit number add a 2 digit number (TO + TO)	Develop understanding of partitioning and place value using Base 10/dienes to add 	Adding ones and tens on a number line  Represent Base 10/dienes in a place value chart 	Using an abstract number line Formal method (if appropriate) 36 +25 61 1

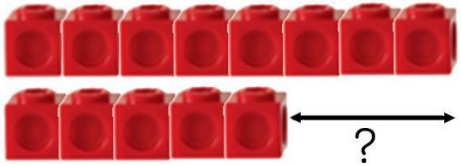
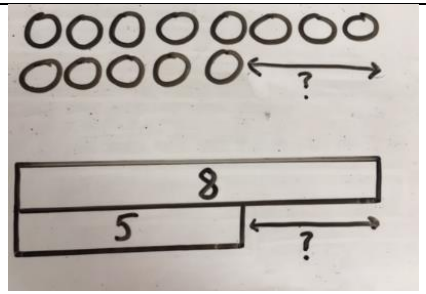
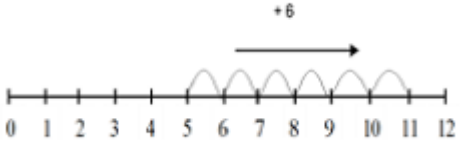
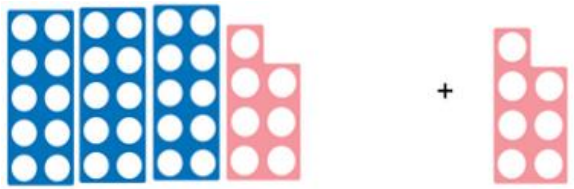
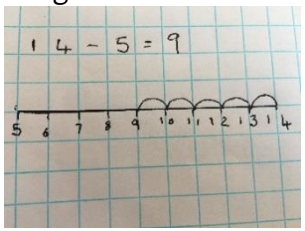
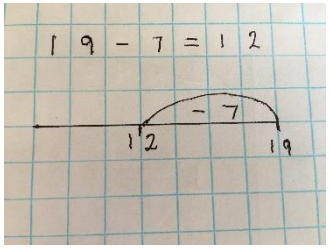
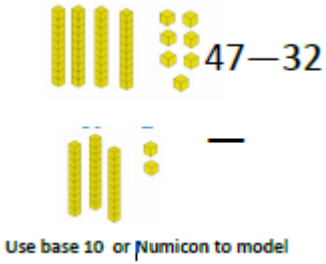
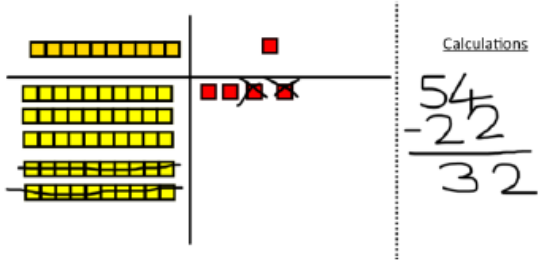
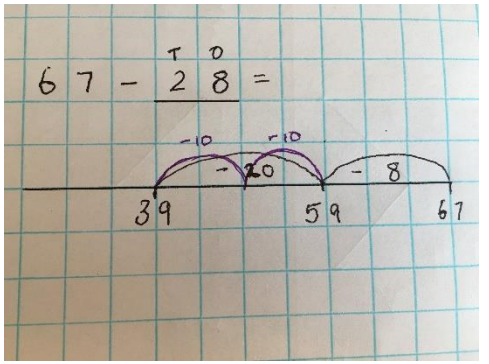
3 digit number add 2 digit/3/digit etc. numbers (HTO + TO/HTO)	Using Base 10/dienes to further develop an understanding of addition. Where there are 10 ones in the 1s column, we exchange them for 1 ten, when there are 10 tens in the 10s column, we exchange them for 1 hundred.  	Represent counters in a place value chart, showing when they make an exchange  	Formal written method 243 +368 611 1 1

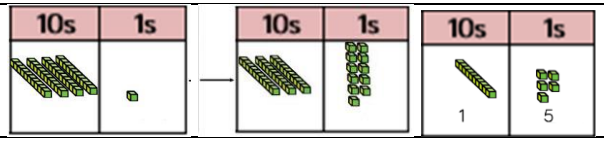
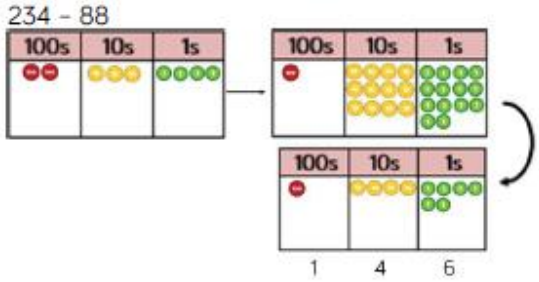
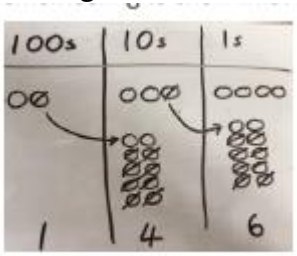
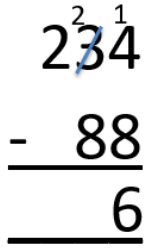
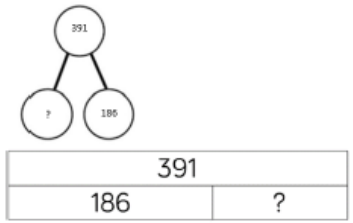
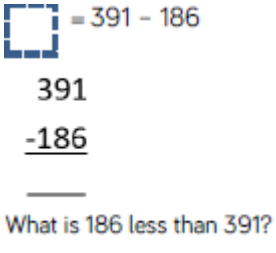
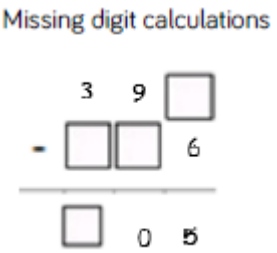
Conceptual variation; different ways to ask children to solve 21 + 34

 	Word problems: In year 3, there are 21 children and in year 4, there are 34 children. How many children in total? 21 + 34 = 55. Prove it	21 +34 _____ 21 + 34 = □ = 21 + 34 Calculate the sum of twenty-one and thirty-four.	 Missing digit problems 

Subtraction

Objective	Concrete	Pictorial	Abstract
Subtraction as taking away	Physically taking away and removing objects from a whole (tens frames, Numicon, cubes and other items such as bean bags) 4 – 3 = 1 	Drawing the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	Using numbers within part, part whole models or bar models. 4- 3 = 
Subtraction as counting back	Counting Back from the biggest number (using number lines or number tracks) Children start with 6 and count back 2 6 – 2 = 4  Moving the beads along the bead string as you count backwards 	Representing what they see pictorially  Counting back on a number lines 	Counting back on a blank number line or counting back in their heads (using fingers if necessary) 
The difference between two amounts	Finding the difference (using cubes, Numicon, Cuisenaire rods or another appropriate resource)	Children to draw cubes/concrete objects or use the bar model to illustrate what they need to calculate	Find the difference between 8 and 5 – children to understand that finding the difference is the same as taking away and therefore using counting back methods to find the answer.

	Calculate the difference between 8 and 5  	 Count on using a number line to find the difference  	
2 digit number subtract a 1 digit number	Using Numicon to create a 2-digit number and adding on the 1-digit number to find the total 37 + 7  	Count back using a number line  	Abstract number line  Count back from the biggest number
2 digit number subtract a 2 digit number	 Column method using base 10 and having to exchange. 41 – 26	Draw representations to support understanding  	Subtract ones and tens using an abstract number line 

<table>
<tr><td></td><td> 
</td><td></td><td></td></tr>
<tr><td>Subtracting 3 digit numbers and 2 digit numbers etc.</td><td>Column methods using place value counters or base 10/dienes
 
</td><td>Represent the place value counters or base 10/dienes pictorially, showing what has been exchanged
 
</td><td>Formal column method. Children must understand what has happened when they have crossed out digits
 
</td></tr>
<tr><td colspan="4">Conceptual variation; different ways to ask children to solve 391 - 186</td></tr>
<tr><td> 
</td><td>Raj spent £391, Timmy spent £186.
How much more did Raj spend?
Calculate the difference between 391 and 186.</td><td> 
</td><td> 
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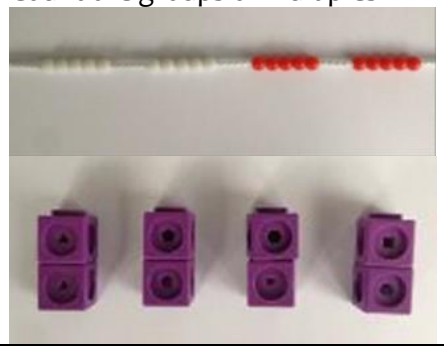
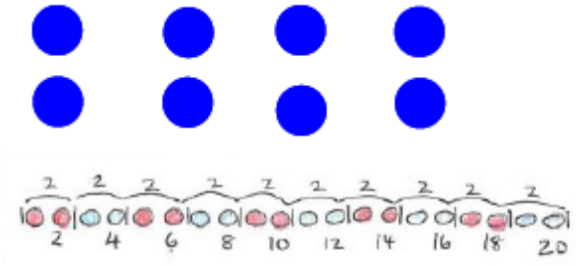
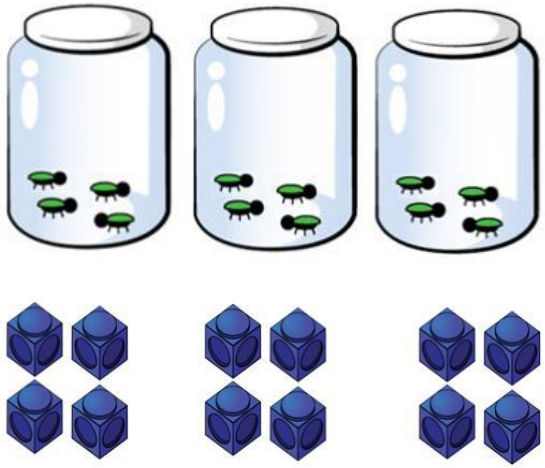
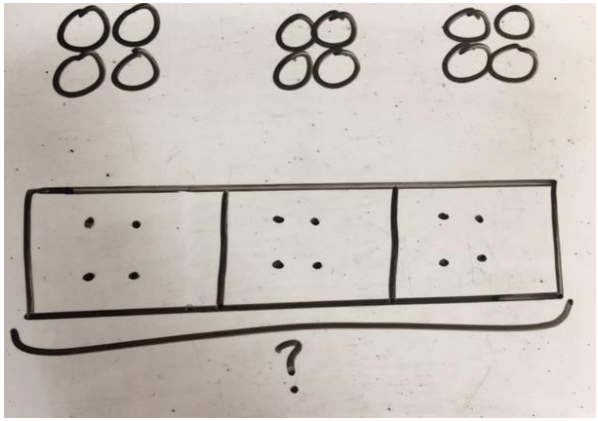
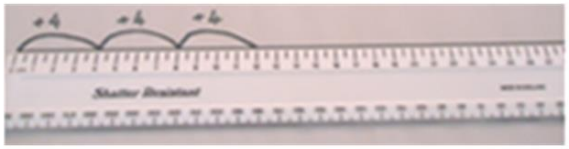
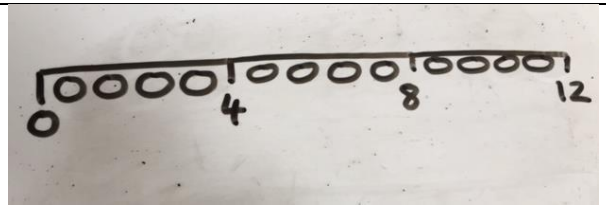
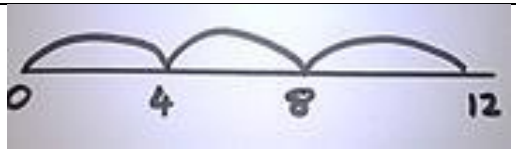
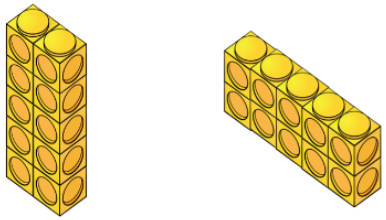
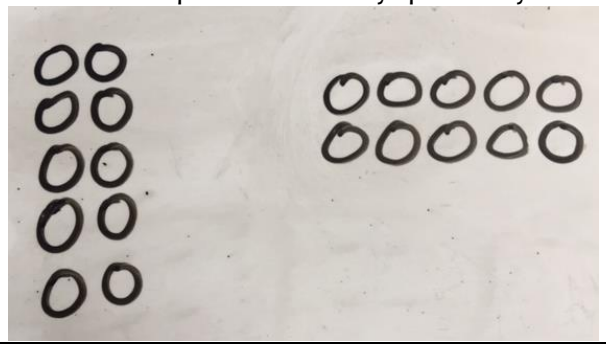
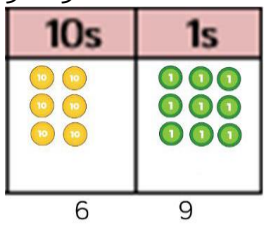
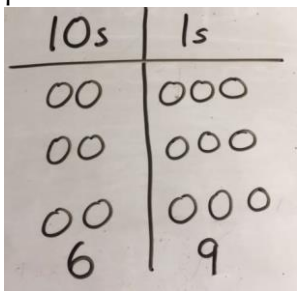
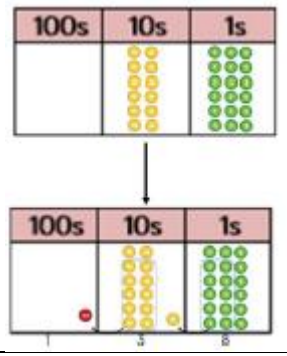
Multiplication

Objective	Concrete	Pictorial	Abstract
Counting in multiples	Count the groups of multiples 	Draw representations for counting in multiples 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Multiplication as repeated addition	Repeated grouping/repeated addition 3 x 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group 	Represent practical resources in a picture and use a bar model 	3 x 4 = 12 4 + 4 + 4 = 12
Multiplication as repeated groups	Number lines to show repeated groups 3 x 4	Represent this pictorially alongside a number line	Abstract number line showing three jumps of 4 3 x 4 = 12

	  Cuisenaire rods can be used too		
Show that multiplication of two numbers can be done in any order (commutative)	Use arrays to illustrate commutativity, counters and other objects can be used 	Children to represent the arrays pictorially 	Children to be able to use an array to write a range of calculations 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
Multiplying a 2 digit number by a 1 digit number	Formal column method to multiply a 2-digit number by a 1-digit number using place value counters/dienes 3 x 23  6 x 23	Represent the column method by drawing place value counters  6 x 23	Record multiplication process step by step through partitioning or column method 3 × 23 20 3 3 × 20 = 60 3 × 3 = 9 60 + 9 = 69 23 × 3 69 6 x 23

<table>
<tr>
<td></td>
<td> 
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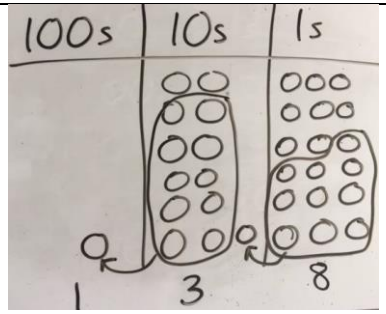
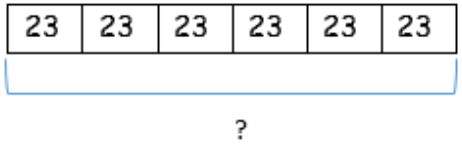
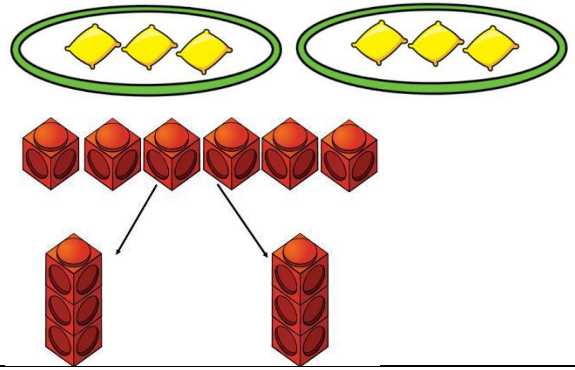
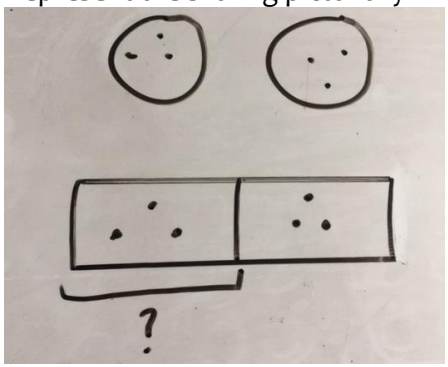
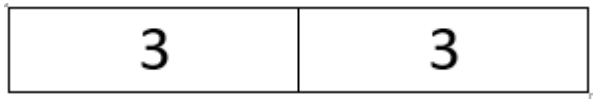
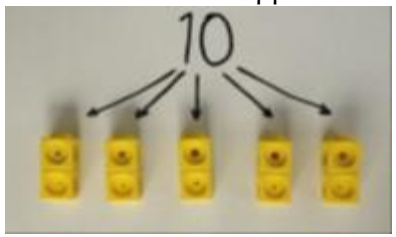
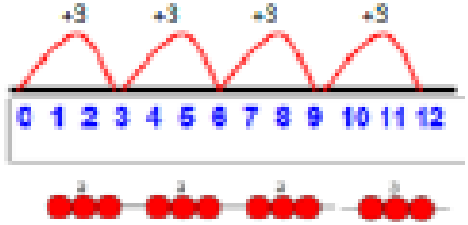
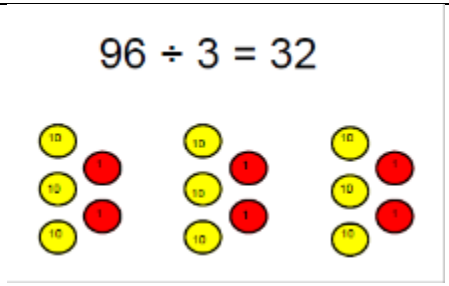
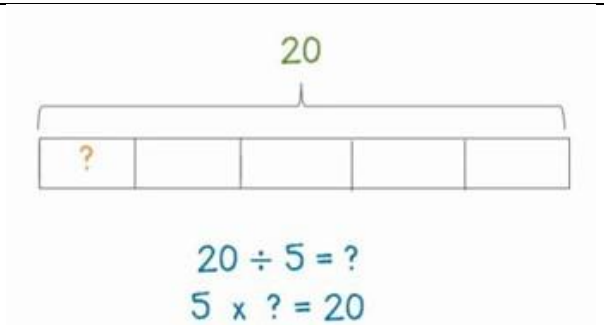
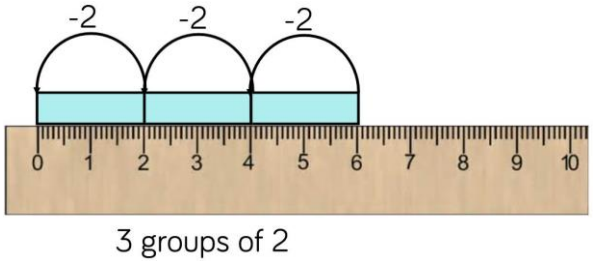
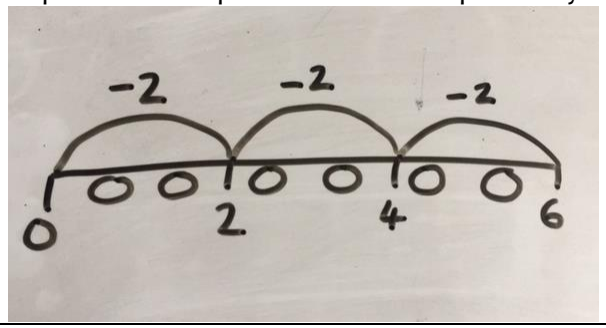
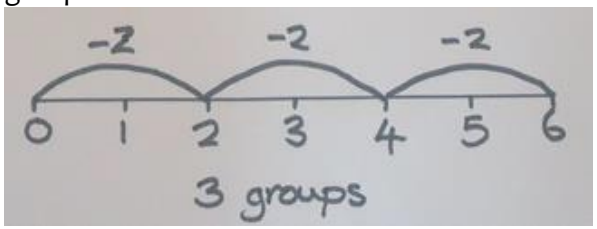
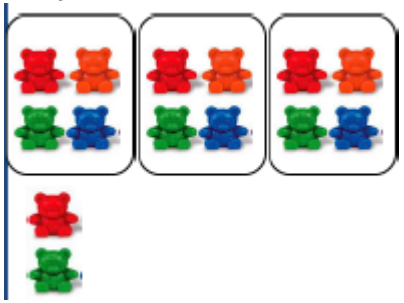
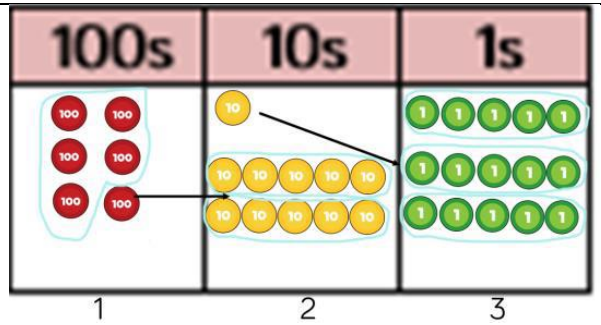
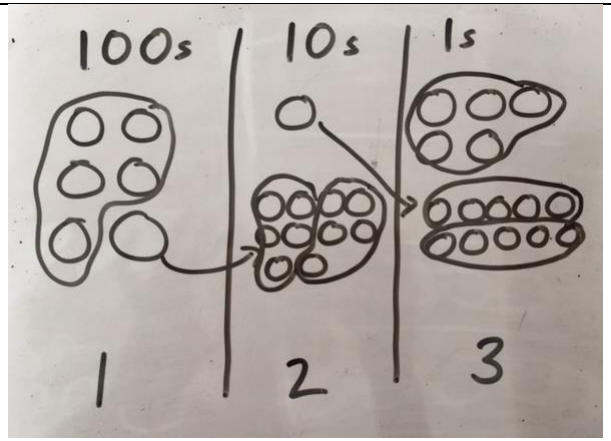
<td> 
</td>
<td>6 x 23 =
23
× 6
138
1 1</td>
</tr>
<tr>
<td>Multiply 3d x 3d or 4d x 2d etc.</td>
<td colspan="2">When children start to multiply 3d x 3d and 4d x 2d etc., they should be confident with the abstract methods</td>
<td>1 2 4
× 2 6
7 4 4
1 2
2 4 8 0
3 2 2 4
1 1
Answer: 3224</td>
</tr>
<tr>
<td colspan="4">Conceptual variation; different ways to ask children to solve 6 x 23</td>
</tr>
<tr>
<td> 
</td>
<td>Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?
With the counters, prove that 6 x 23 = 138</td>
<td>Find the product of 6 and 23
6 × 23 =
□ = 6 × 23
6 × 23
23 × 6</td>
<td>What is the calculation?
What is the product?
 
</td>
</tr>
</table>

Division

Objective	Concrete	Pictorial	Abstract
Division by sharing	Sharing using a range of objects 6 ÷ 2 	Represent the sharing pictorially 	Using bars to represent sharing 6 ÷ 2 = 3  Children should be encouraged to use their 2 times tables facts.
Division as grouping	Dividing quantities into equal groups Use cubes, counters, Numicon, objects or place value counters to support understanding   	Use number lines for grouping   Using a bar model to divide the bar into equal groups	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group? How many groups of 6 in 24? 24 ÷ 6 = 4

			
Division with repeated subtraction	Repeated subtraction using Cuisenaire rods above a ruler 	Represent the repeated subtraction pictorially 	Abstract number line to represent the equal groups that have been subtracted 
Division with remainders	Divide objects between groups to see how much is left over 14 ÷ 3 	Using a number line to jump forwards in equal jumps and see how many more you need to jump to find the remainder  Draw dots and group them to divide amount and clearly show the remainder 	Complete written divisions and show the remainder using r 
Short division	Short division using place value counters to groups 615 ÷ 5	Represent the place value counters pictorially	Children to do the calculation using the short division scaffold (bus stop)

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


1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?
</td>
<td>


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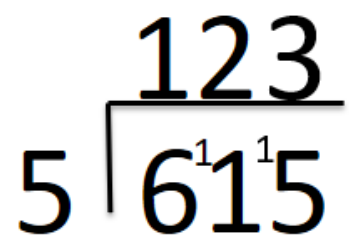
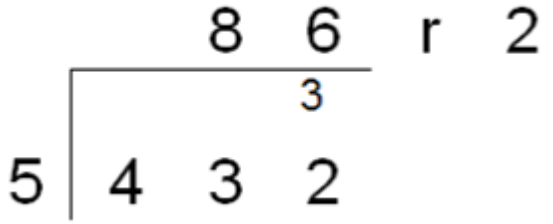
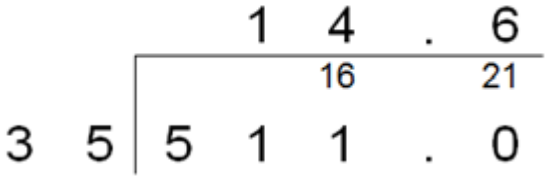
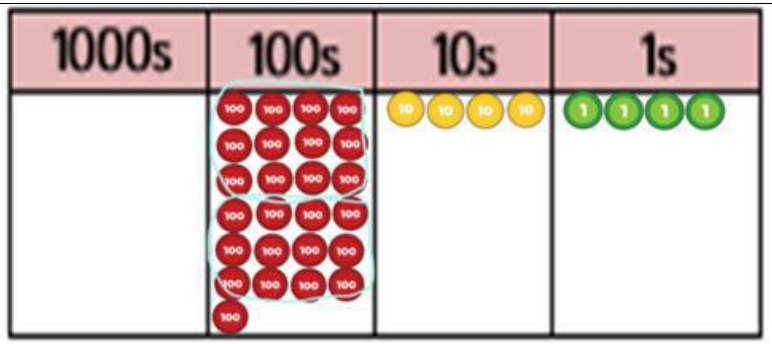


Division with remainders


Division that use the decimal places


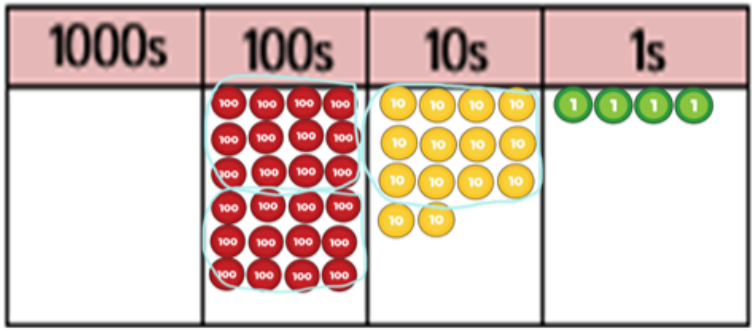
</td>
</tr>
<tr>
<td>Long division</td>
<td colspan="3">Long division using place value counters


We can't group 2 thousands into groups of 12 so will exchange them.
</td>
</tr>
</table>



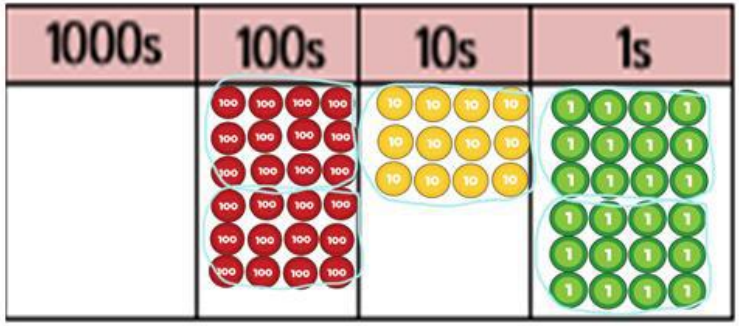
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$\begin{array}{r} 02 \\ 12\overline{)2544} \\ \underline{24} \\ 1 \end{array}$$



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

$$\begin{array}{r} 021 \\ 12\overline{)2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 2 \end{array}$$

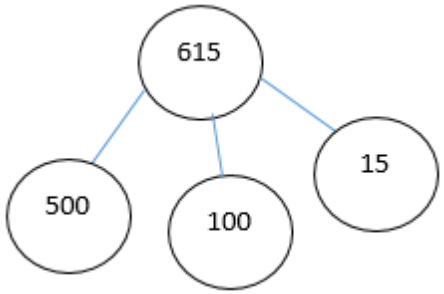


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12\overline{)2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

Conceptual variation; different ways to ask children to solve 615 ÷ 5

Using the part whole model below, how can you divide by 5 without using short division	I have £615 and share it equally between 5 bank accounts. How much will be in each account?	$5\overline{)615}$	What is the calculation? What is the answer?

	615 pupils need to be put into 5 groups. How many will be in each group?	615 ÷ 5 = __ = 615 ÷ 5