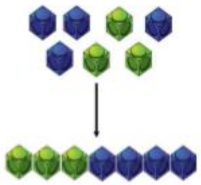
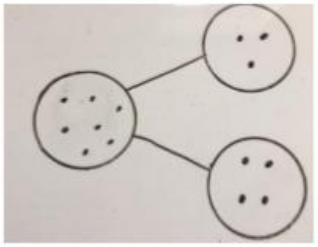
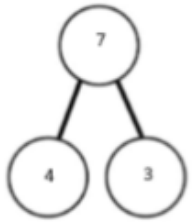
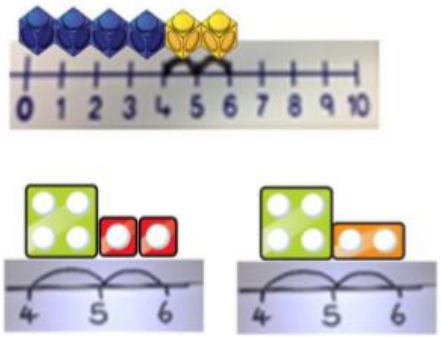
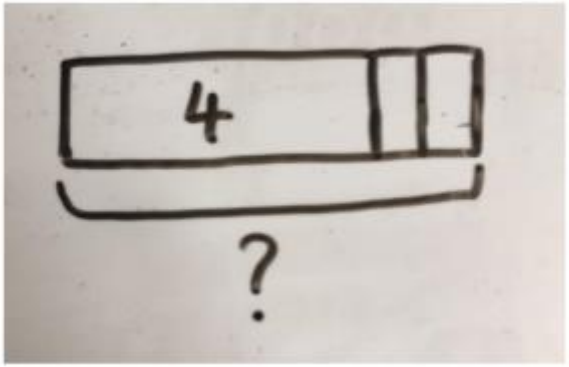
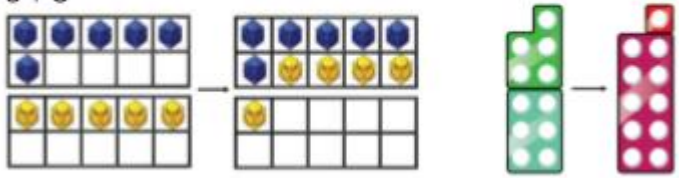
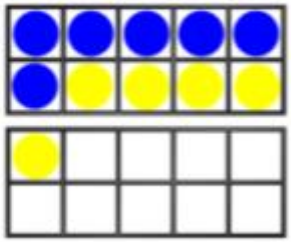
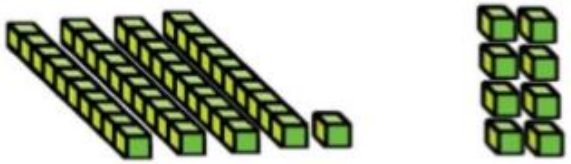
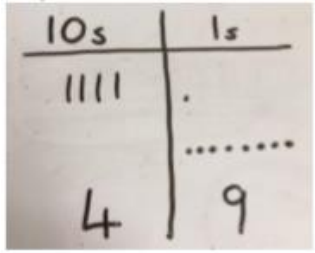
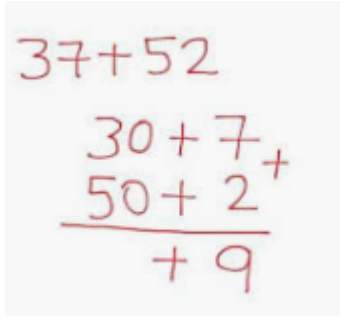
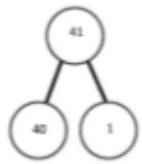
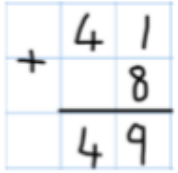
Calculation policy: Addition

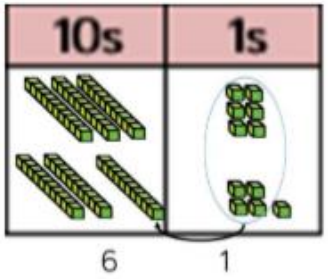
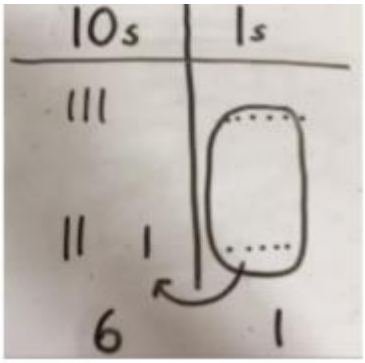
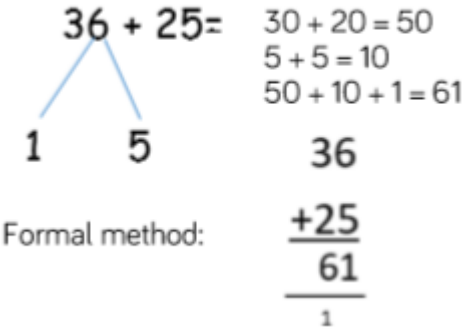
Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

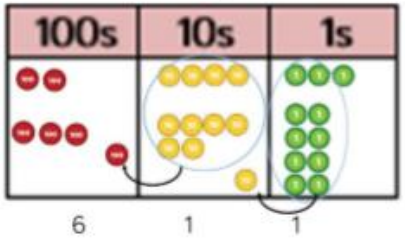
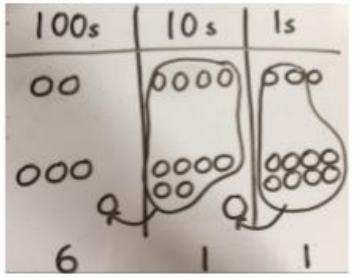
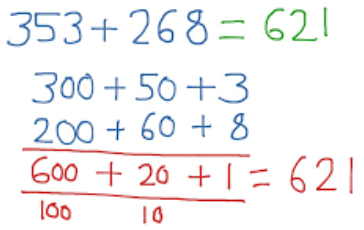
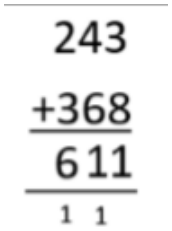
Use exchanging, or regrouping when moving into the next column.

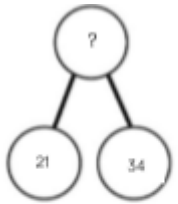
Concrete	Pictorial	Abstract
Combining two parts to make a whole – first by counting objects, then using mathematical equipment such as multilink or numicon.  	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	$4 + 3 = 7$ Four is a part, 3 is a part and the whole is seven. 

Counting on using number lines or numicon 	A bar model that encourages children to count on. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 
Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cube 	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4

TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	Column method starting with expansion  41 + 8  1 + 8 = 9 40 + 9 = 49 

TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Children to represent the base ten in a place value chart. 	Looking for ways to make 10. 

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.  	Chidren to represent the counters in a place value chart, circling when they make an exchange.  	Expanded method leading to column addition  
Conceptual variation – different ways to ask children to add 21 + 34		



?	
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 =

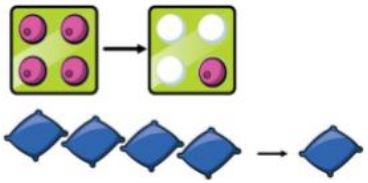
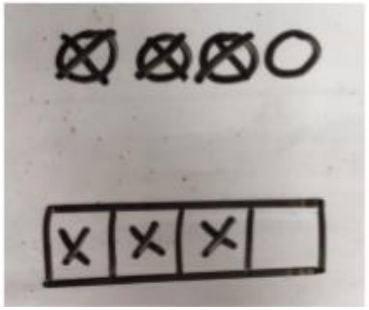
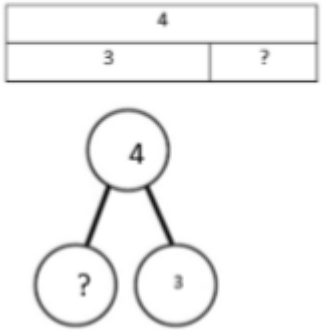
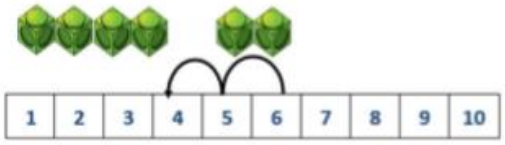
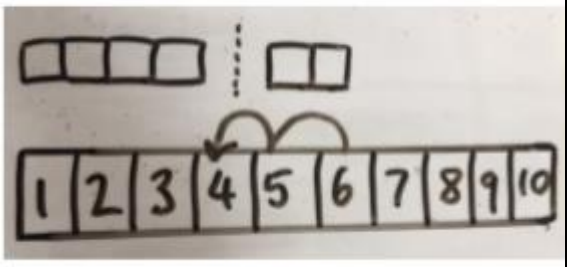
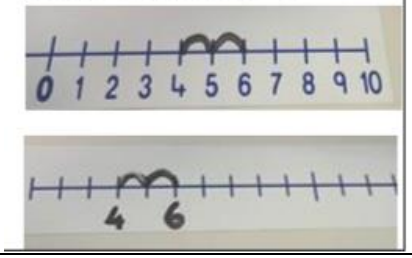
☐ = 21 + 34

Calculate the sum of twenty-one and thirty-four.

Missing digit problems:

Calculation policy: Subtraction

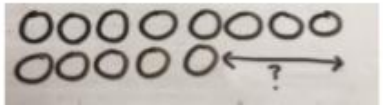
Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

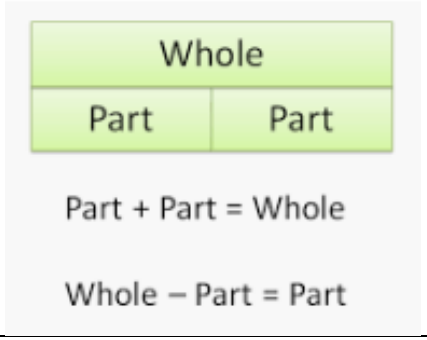
Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 – 3 = 1  Objects should be used first.	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4 - 3 = □ = 4 - 3 
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 – 2 = 4 	Children to represent what they see pictorially 	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line 

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used).

Calculate the difference between 8 and 5.

Children to draw the cubes/other concrete objects they have used or use the bar model to illustrate wh they need to calculate.



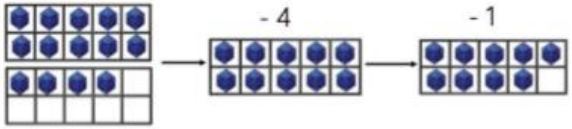


Find the difference between 8 and 5.

8 – 5, the difference is ☐

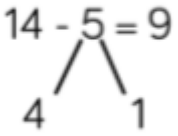
Children to explore why
9 - 6 = 8 – 5 = 7 – 4 have the same difference.

Making 10 using ten frames.
14 – 5



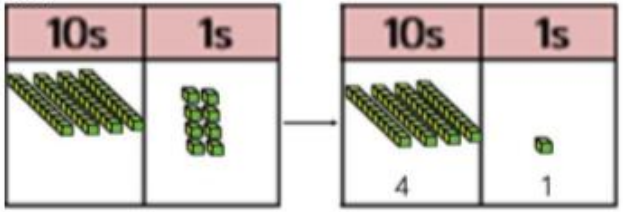
Children to present the ten frame pictorially and what they did to make 10.

Children to show how they can make 10 by partitioning the subtrahend.

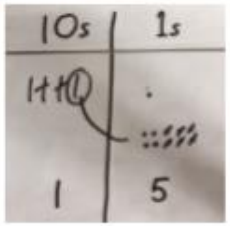


14 – 4 = 10
10 – 1 = 9

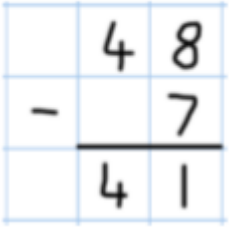
Column method using base 10.
48-7



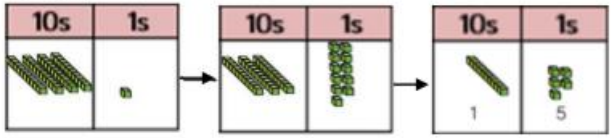
Represent the base 10 pictorially, remembering to the exchange.



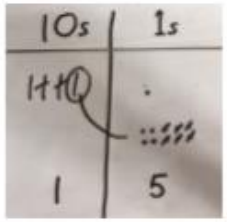
Column method or children could count back 7.

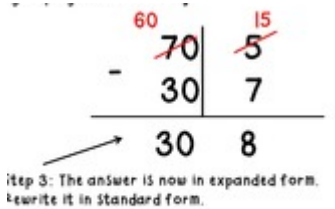


Column method using base 10 and having to exchange.
41 – 26

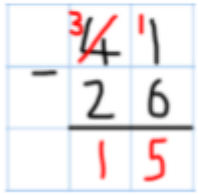


Represent the base 10 pictorially, remembering to the exchange.



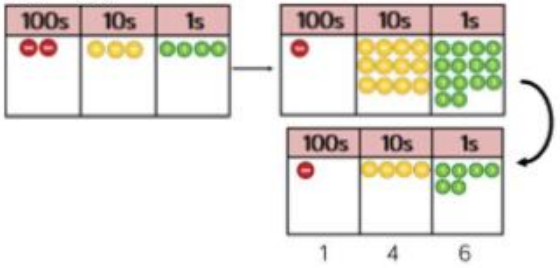


Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.

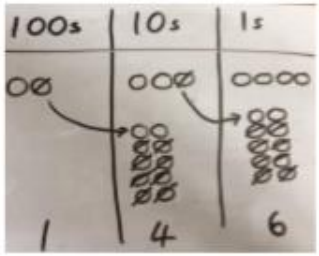


Column method using place value counters.

234 – 88



Represent the place value counters pictorially; remembering to show what has been exchange



Column subtraction

942—214

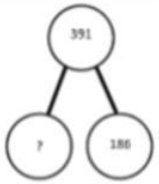
Expanded method

	900	30 40	12 2
-	200	10	4
	700	20	8

Compact Method

	3	12
	9	4 ~~2~~
-	2	1 4
	7	2 8

Conceptual variation; different ways to ask children to solve 391 - 186



391	
186	?

Raj spent £391, Timmy spent £186.
How much more did Raj spend?

Calculate the difference between 391 and 186.

□ = 391 – 186

391
-186
___

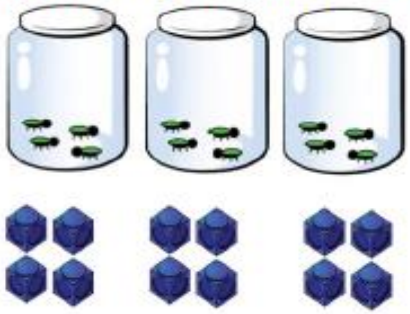
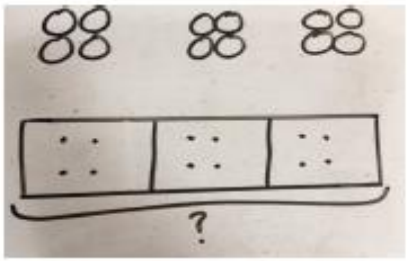
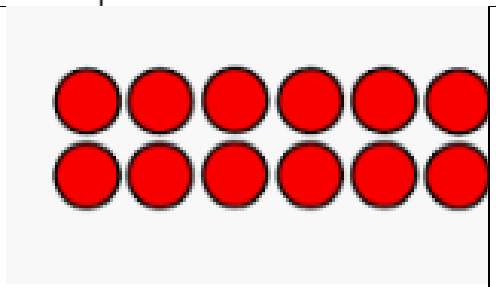
What is 186 less than 391?

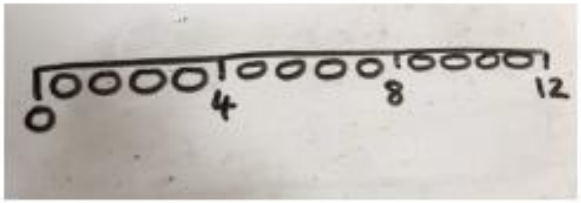
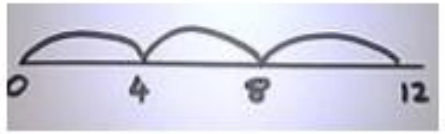
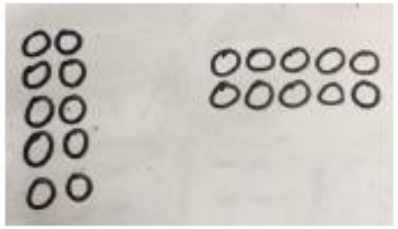
Missing digit calculations

	3	9	□
-	□	□	6
	□	0	5

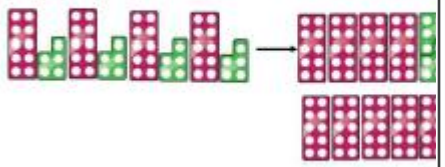
Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

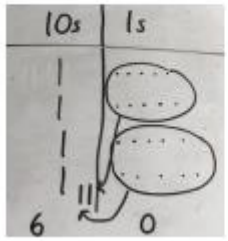
Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
		2 x 6 = 12 6 x 2 = 12 Two lots of six is twelve. Six lots of two is twelve. 2+2+2+2+2+2 = 12

Number lines to show repeated groups- 3 × 4   Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jump of four. 3 × 4 = 12 
Use arrays to illustrate commutativity counters and other objects can also be used. 2 × 5 = 5 × 2  2 lots of 5  5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to w range of calculations e.g. 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5

Partition to multiply using Numicon, base 10 o
rods.
4 × 15



Children to represent the concrete manipula
pictorially.

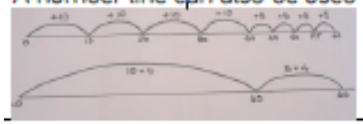


Children to be encouraged to show the steps
they have taken.

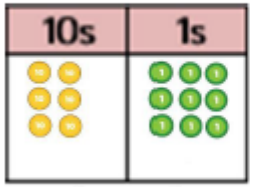
4 × 15
10 5

10 × 4 = 40
5 × 4 = 20
40 + 20 = 60

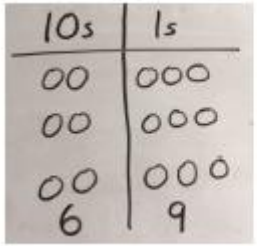
A number line can also be used



Formal column method with place value counte
(base 10 can also be used.) 3 × 23



Children to represent the counters pictoria



Then we introduce the grid method

3 x 23 =

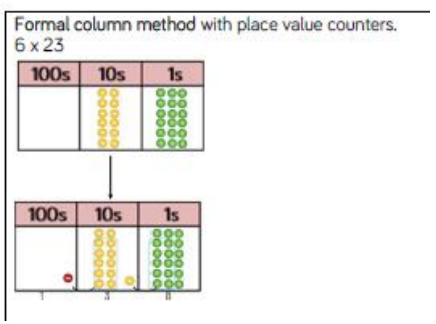
x	20	3	
3	60	9	=69

Children to record what it is they are
to show understanding.

3 × 23
20 3

3 × 20 = 60
3 × 3 = 9
60 + 9 = 69

23
× 3
69

<table>
<tr>
<td> 
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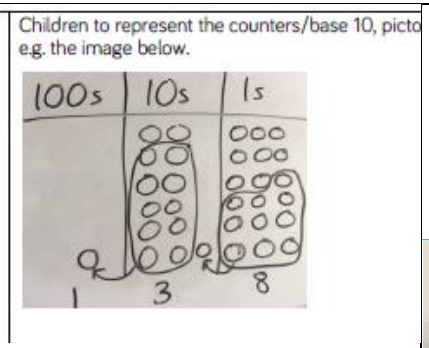
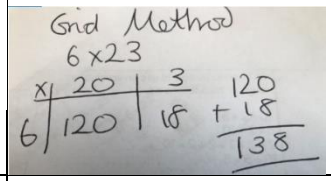
<td> 
</td>
<td>Use grid method to show 6 lots of 20 and 6 lots of 3
 
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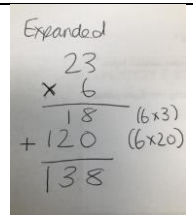
<td> 
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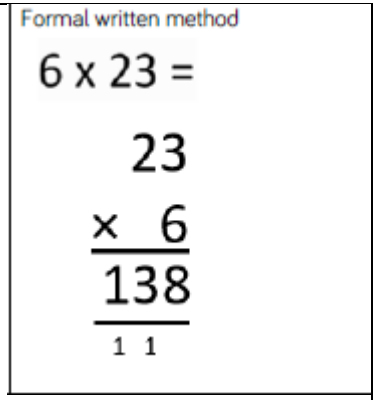
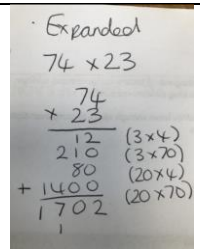
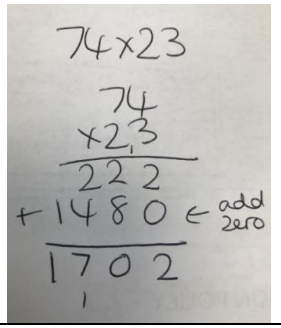
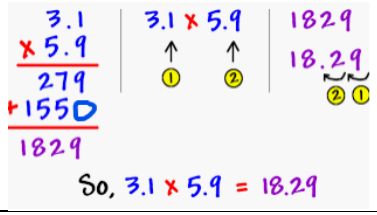
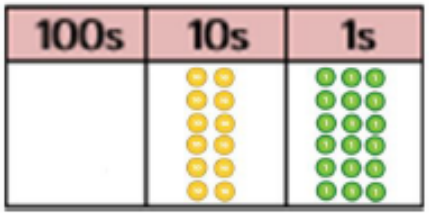
<td> 
</td>
</tr>
<tr>
<td>Multiplying 2-digit by 2-digit etc. Only move on to these type of calculations when children are confident and show understanding of the grid method. Teach understanding of adding the zero in the formal written method by saying that 20 is 10x larger than 2, so you need to add the zero to make the product 10x larger.</td>
<td><table>
<tr><td>x</td><td>20</td><td>3</td></tr>
<tr><td>70</td><td>1400</td><td>210</td></tr>
<tr><td>4</td><td>80</td><td>12</td></tr>
</table>
Then add together</td>
<td> 
</td>
<td>Formal written method
 
</td>
</tr>
<tr>
<td colspan="3">Multiplying with decimals – disregard the decimals to do the multiplication, and then insert the decimal point into the product. Match up the amount of decimal places in the multiplicands and the product as shown.</td>
<td colspan="2"> 
</td>
</tr>
<tr><td colspan="5"></td></tr>
</table>

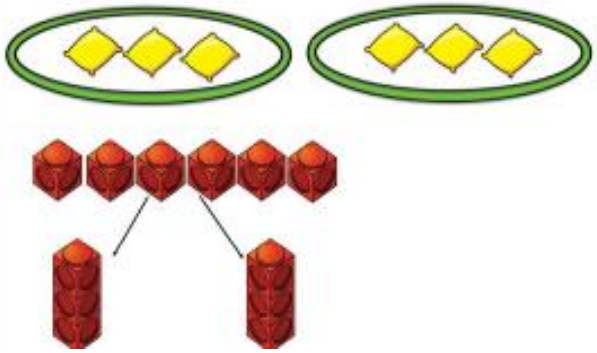
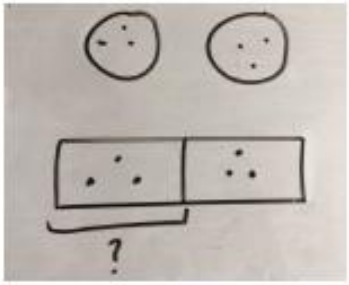
Answer: 3224

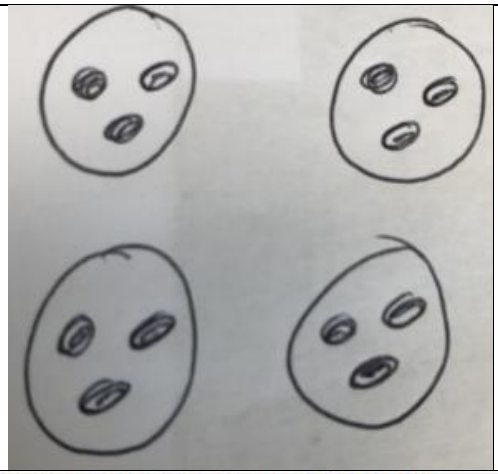
Conceptual variation; different ways to ask children to solve 6 × 23

	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	Find the product of 6 and 23 6 × 23 = ☐ = 6 × 23 6 × 23 = ____ 23 × 6 = ____	What is the calculation? What is the product? 

Calculation policy: Division

Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3 3 | 3 Children should also be encouraged to use their 2 times tables facts.

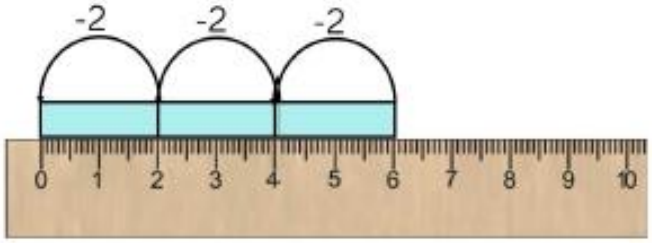


If you had 12 sweets and shared them between 4 children, how many would they get each?

12 shared between 4 is 3 each.

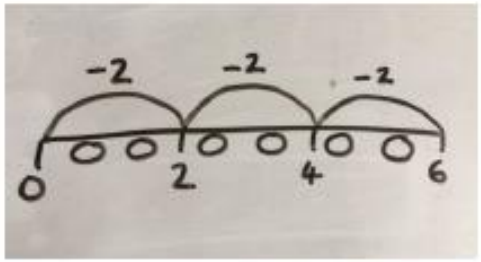
12 divided by 4 is 3.

Repeated subtraction using Cuisenaire rods above a ruler.
6 ÷ 2

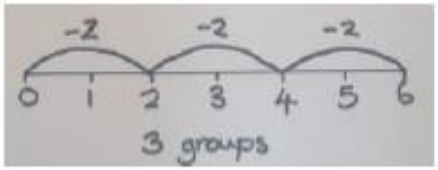


3 groups of 2

Children to represent repeated subtraction pictorially.



Abstract number line to represent the equal groups that have been subtracted.

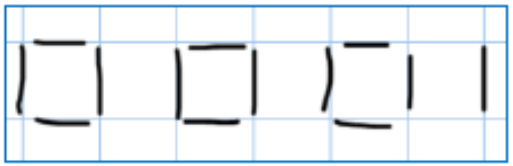


2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used.
13 ÷ 4

Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.

There are 3 whole squares, with 1 left over.

Children to represent the lollipop sticks pictorially.

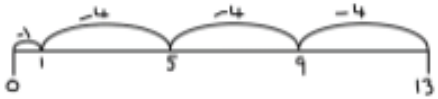


There are 3 whole squares, with 1 left over.

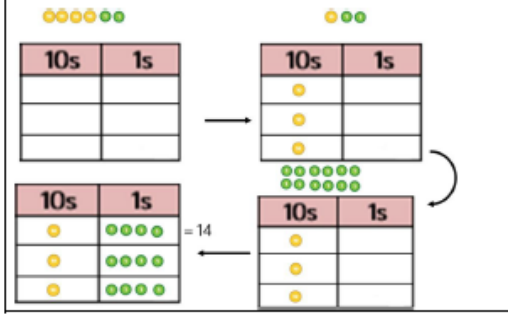
13 ÷ 4 = 3 remainder 1

Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

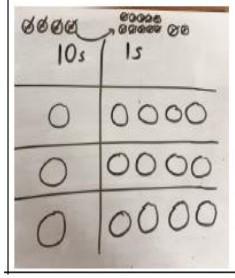
'3 groups of 4, with 1 left over'



Sharing using place value counters.
42 ÷ 3 = 14



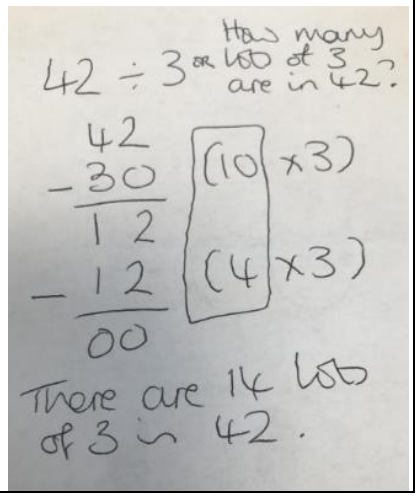
Children to represent the place value counters pictorially.



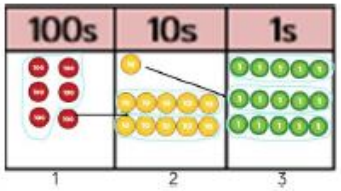
Children to be able to make sense of the place value counters and write calculations to show the process.

42 ÷ 3
42 = 30 + 12
30 ÷ 3 = 10
12 ÷ 3 = 4
10 + 4 = 14

Teach chunking as an important conceptual step – link 'lots of' with division and multiplication.

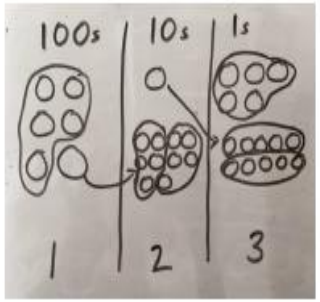


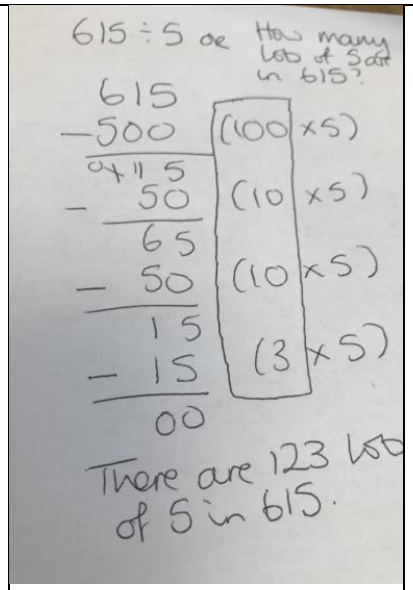
Short division using place value counters to group.
615 ÷ 5



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?

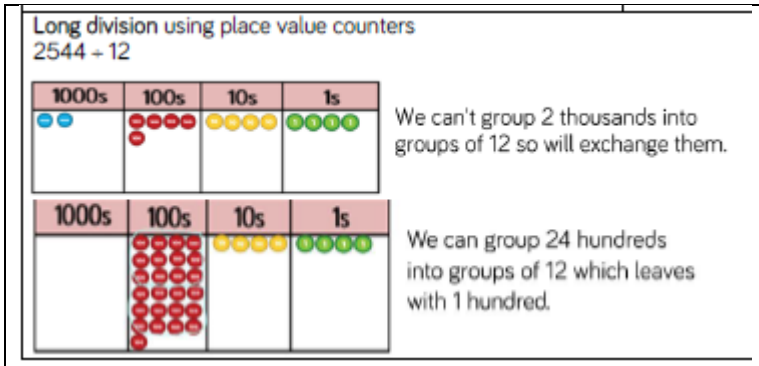
Represent the place value counters pictorially.





Children to the calculation using the short division scaffold.

$$5\overline{)615}^{\,123}$$

<table>
<tr>
<td> 
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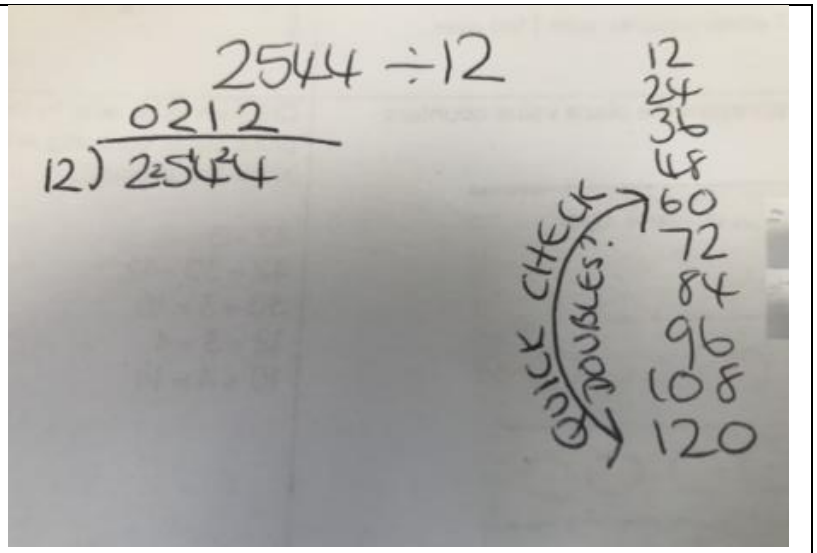
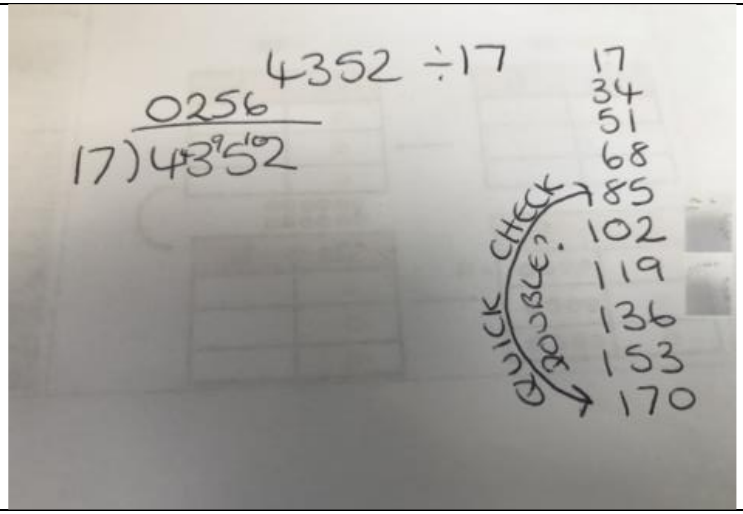
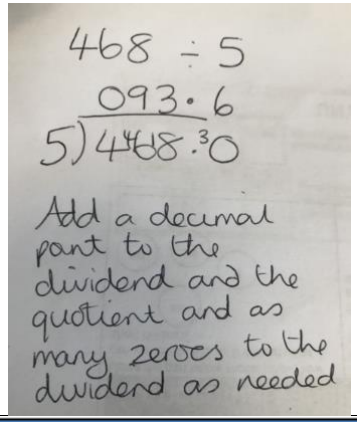
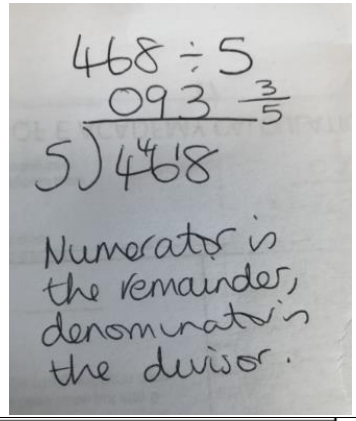
<td> 
</td>
</tr>
<tr>
<td>Encourage writing out of factors using repeated addition before attempting the long division calculation.

Make sure children leave enough space to carry over digits within the calculation.</td>
<td> 
</td>
</tr>
</table>

Division with remainders expressed as a decimal.	Decimals with remainders expressed as a fraction.





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

Using the part whole model below, how can you divide 615 by 5 without using short division?

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?

$5\overline{)615}$

615 ÷ 5 =

☐ = 615 ÷ 5

What is the calculation?
What is the answer?