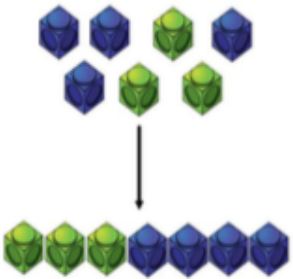
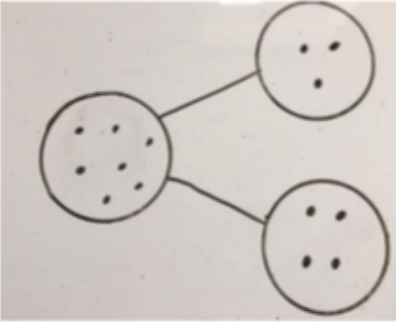
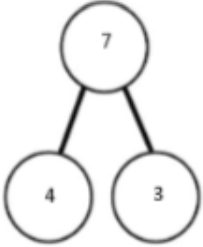
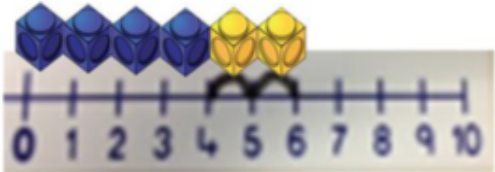
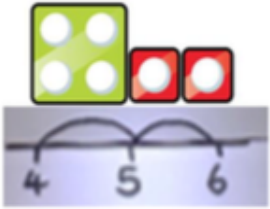
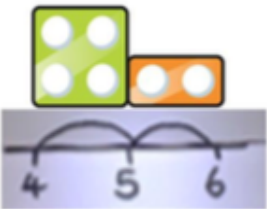
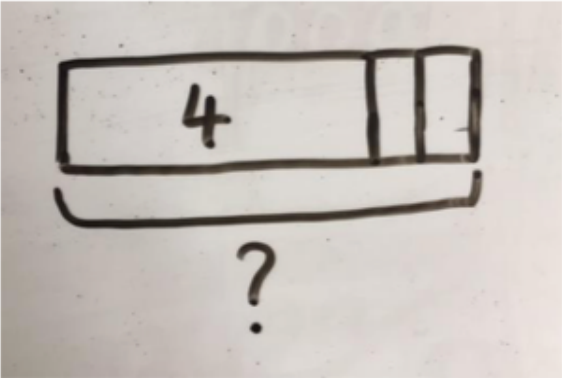



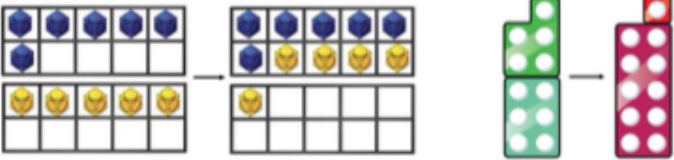
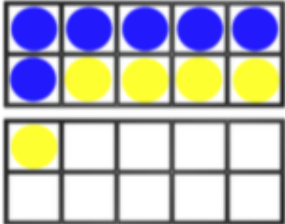
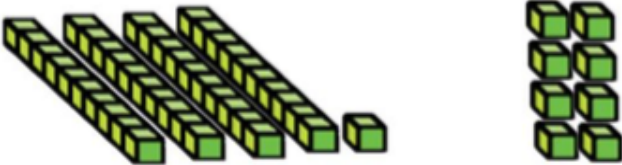
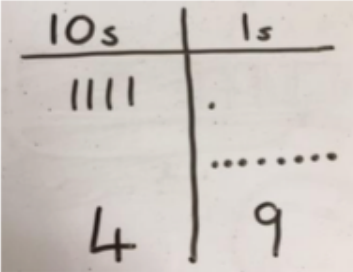
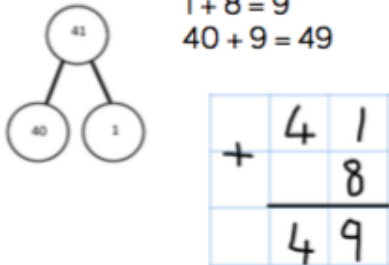
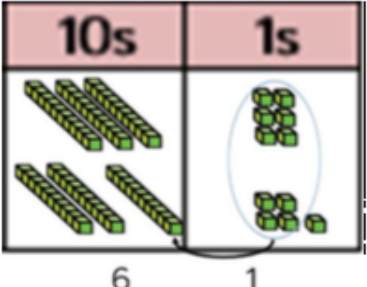
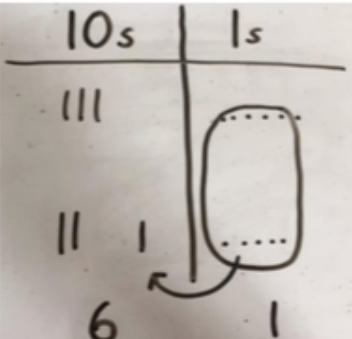
# CALCULATION POLICY: ADDITION

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

Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p><math>4 + 3 = 7</math> Four is a part, 3 is a part and the whole is seven.</p> 
<p>Counting on using number lines using cubes or Numicon.</p>   	<p>A bar model which encourages the children to count on, rather than count all.</p> 	<p>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? <math>4 + 2</math></p> 

# CALCULATION POLICY: ADDITION

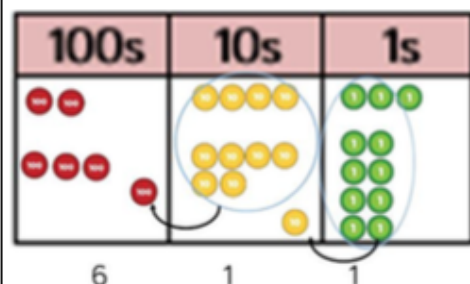
Key Vocabulary: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'

<p><b>Regrouping to make 10;</b> using ten frames and counters/cubes or using Numicon.</p> <p>6 + 5</p> 	<p>Children to draw the ten frame and counters/cubes.</p> 	<p>Children to develop an understanding of equality e.g.</p> $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
<p><b>TO + O using base 10.</b> Continue to develop understanding of partitioning and place value.</p> <p>41 + 8</p> 	<p>Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.</p> 	<p>41 + 8</p> <p>1 + 8 = 9 40 + 9 = 49</p> 
<p><b>TO + TO using base 10.</b> Continue to develop understanding of partitioning and place value.</p> <p>36 + 25</p> 	<p>Children to represent the base 10 in a place value chart.</p> 	<p>Looking for ways to make 10.</p> <p>36 + 25 =</p> <p>1 5</p> <p>Formal method:</p> $\begin{array}{r} 36 \\ +25 \\ \hline 61 \\ \hline 1 \end{array}$ <p>30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61</p>

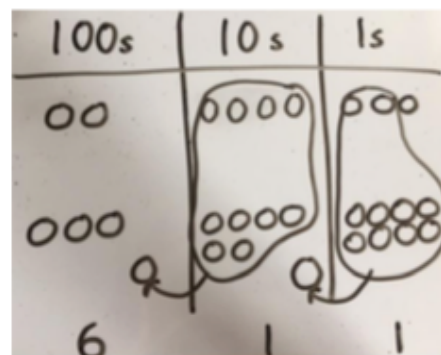
## CALCULATION POLICY: ADDITION

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

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.



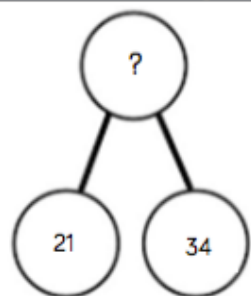
Children to represent the counters in a place value chart, circling when they make an exchange.



243

$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ 11 \end{array}$$

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



?	
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.

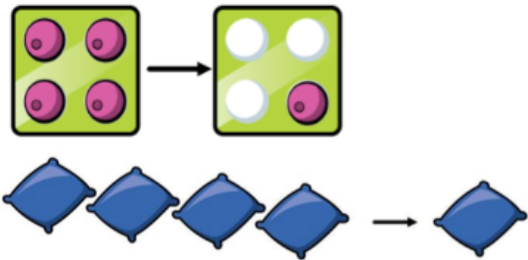
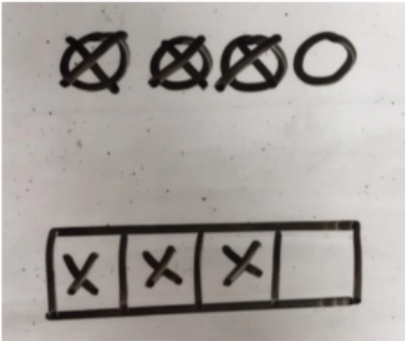
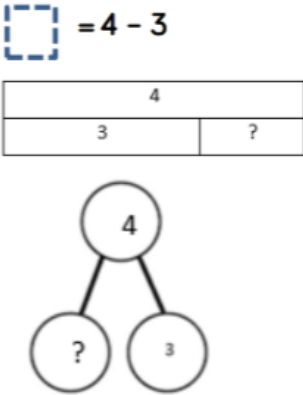
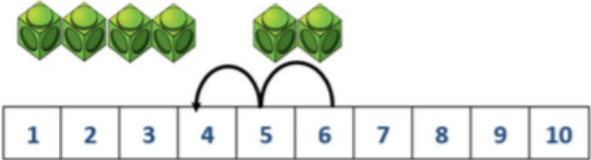
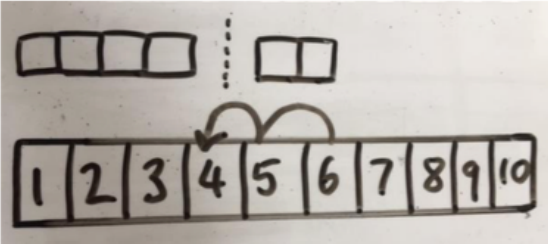
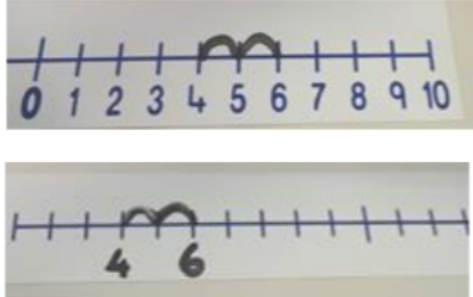


Missing digit problems:

10s	1s
20	1
30	?
?	5

# CALCULATION POLICY: SUBTRACTION

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

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

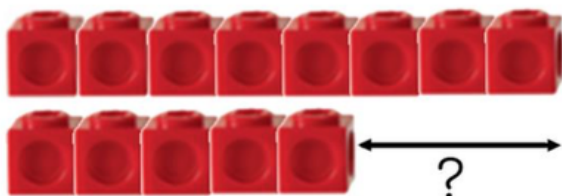


# CALCULATION POLICY: SUBTRACTION

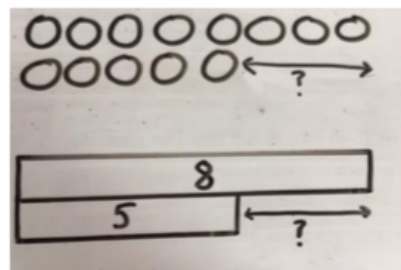
**Key Vocabulary:** take away, less than, the difference, subtract, minus, fewer, decrease

**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 which they have used or use the bar model to illustrate what they need to calculate.



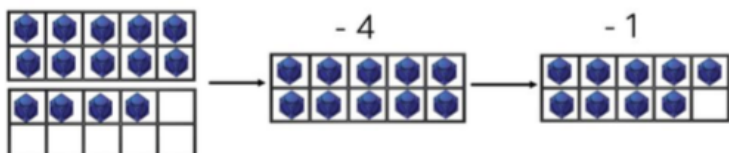
Find the difference between 8 and 5.

8 - 5, the difference is

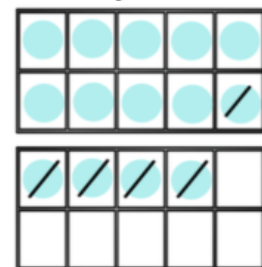
Children to explore why  
 $9 - 6 = 8 - 5 = 7 - 4$  have the same difference.

**Making 10** using ten frames.

14 - 5



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



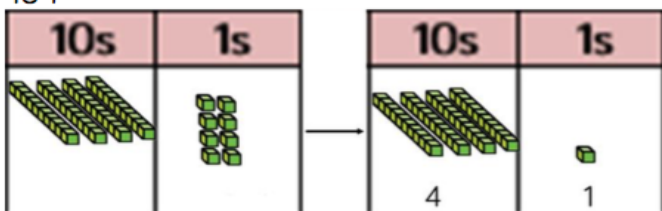
Children to show how they can make 10 by partitioning the subtrahend.

$$\begin{array}{r} 14 - 5 = 9 \\ \swarrow \quad \searrow \\ 4 \quad \quad 1 \end{array}$$

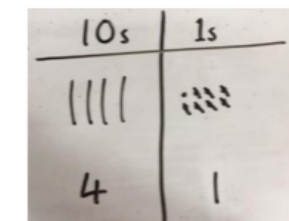
$$\begin{array}{l} 14 - 4 = 10 \\ 10 - 1 = 9 \end{array}$$

**Column method** using base 10.

48 - 7



Children to represent the base 10 pictorially.

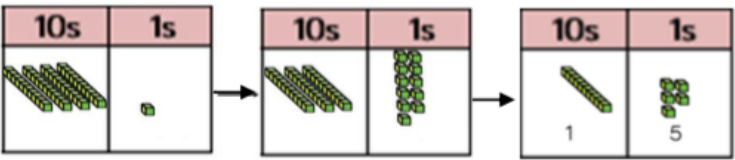
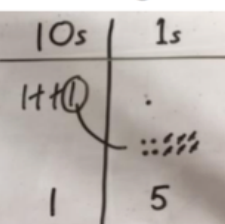
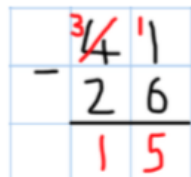
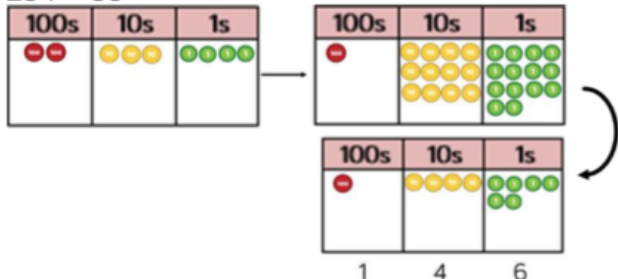
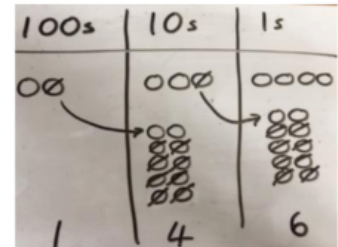
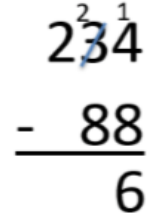


Column method or children could count back 7.

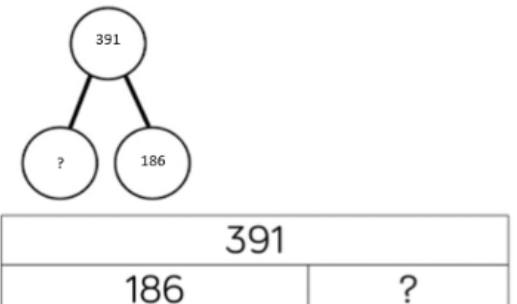

	4	8
-		7
	4	1

# CALCULATION POLICY: SUBTRACTION

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

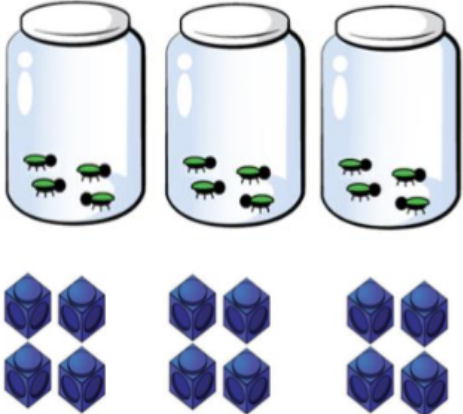
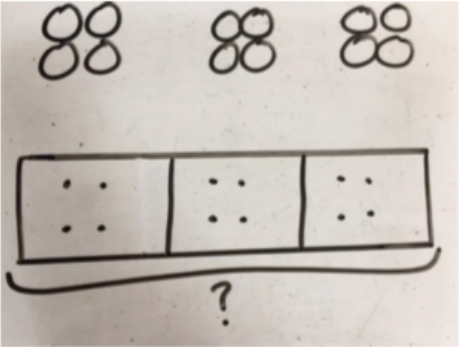

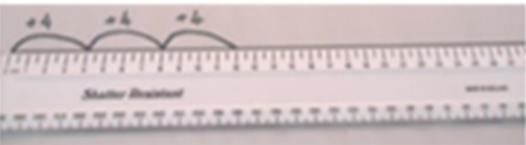
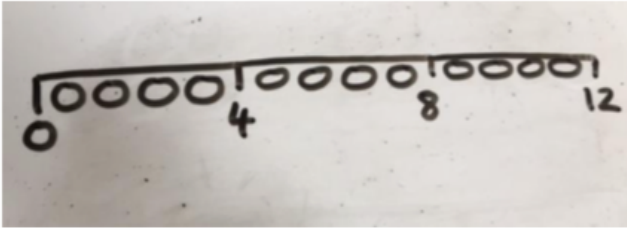
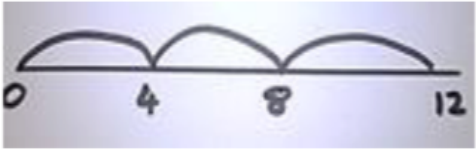
<p>Column method using base 10 and having to exchange. 41 – 26</p> 	<p>Represent the base 10 pictorially, remembering to show the exchange.</p> 	<p>Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because <math>41 = 30 + 11</math>.</p> 
<p>Column method using place value counters. 234 – 88</p> 	<p>Represent the place value counters pictorially; remembering to show what has been exchanged.</p> 	<p>Formal column method. Children must understand what has happened when they have crossed out digits.</p> 

## Conceptual variation; different ways to ask children to solve 391 – 186

	<p>Raj spent £391, Timmy spent £186. How much more did Raj spend?</p> <p>Calculate the difference between 391 and 186.</p>	<p><math>\square = 391 - 186</math></p> <p>391 -186 —</p> <p>What is 186 less than 391?</p>	<p>Missing digit calculations</p> 
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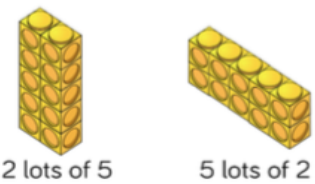
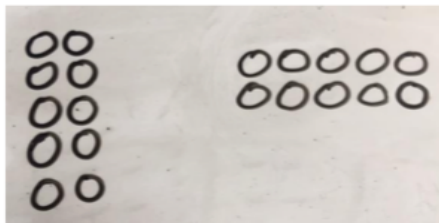
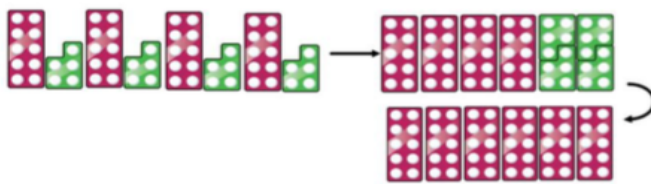
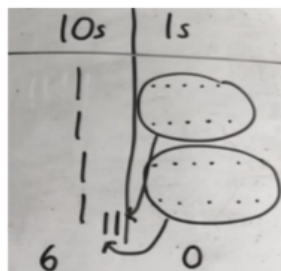
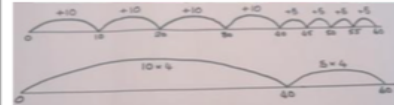

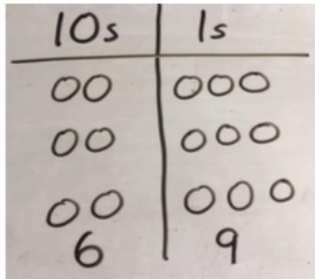
# CALCULATION POLICY: MULTIPLICATION

Key Vocabulary: double, times, multiply by, the product of, lots of, equal groups

Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition  <math>3 \times 4</math>  <math>4 + 4 + 4</math>            There are 3 equal groups, with 4 in each group.</p> 	<p>Children to represent the practical resources in a picture and use a bar model.</p> 	<p><math>3 \times 4 = 12</math>  <math>4 + 4 + 4 = 12</math></p>
<p>Number lines to show repeated groups-  <math>3 \times 4</math></p>   <p>Cuisenaire rods can be used too.</p>	<p>Represent this pictorially alongside a number line e.g.:</p> 	<p>Abstract number line showing three jumps of four.</p> <p><math>3 \times 4 = 12</math></p> 

# CALCULATION POLICY: MULTIPLICATION

Key Vocabulary: double, times, multiply by, the product of, lots of, equal groups

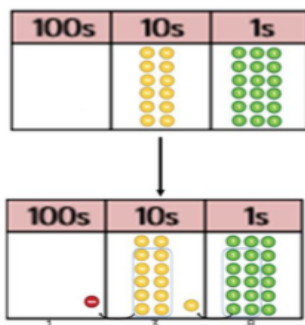
<p>Use arrays to illustrate commutativity counters and other objects can also be used.  <math>2 \times 5 = 5 \times 2</math></p>  <p>2 lots of 5      5 lots of 2</p>	<p>Children to represent the arrays pictorially.</p> 	<p>Children to be able to use an array to write a range of calculations e.g.</p> <p> <math>10 = 2 \times 5</math>  <math>5 \times 2 = 10</math>  <math>2 + 2 + 2 + 2 + 2 = 10</math>  <math>10 = 5 + 5</math> </p>
<p>Partition to multiply using Numicon, base 10 or Cuisenaire rods.  <math>4 \times 15</math></p> 	<p>Children to represent the concrete manipulatives pictorially.</p> 	<p>Children to be encouraged to show the steps they have taken.</p> <p> <math>4 \times 15</math>  <math>\begin{array}{r} 10 \\ 5 \end{array}</math> </p> <p> <math>10 \times 4 = 40</math>  <math>5 \times 4 = 20</math>  <math>40 + 20 = 60</math> </p> <p>A number line can also be used</p> 
<p>Formal column method with place value counters (base 10 can also be used.) <math>3 \times 23</math></p>  <p>6      9</p>	<p>Children to represent the counters pictorially.</p> 	<p>Children to record what it is they are doing to show understanding.</p> <p> <math>3 \times 23</math>      <math>3 \times 20 = 60</math>  <math>\begin{array}{r} 20 \\ 3 \end{array}</math>      <math>3 \times 3 = 9</math>  <math>60 + 9 = 69</math> </p> <p> <math>\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}</math> </p>



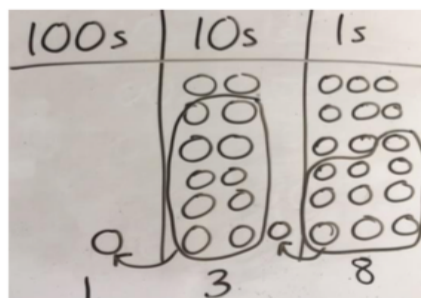
# CALCULATION POLICY: MULTIPLICATION

Key Vocabulary: double, times, multiply by, the product of, lots of, equal groups

Formal column method with place value counters.  
 $6 \times 23$



Children to represent the counters/base 10, pictorially  
 e.g. the image below.



Formal written method

$$\begin{array}{r} 6 \times 23 = \\ 23 \\ \times 6 \\ \hline 138 \\ 11 \end{array}$$

When children start to multiply  $3d \times 3d$  and  $4d \times 2d$  etc., they should be confident with the abstract:

To get 744 children have solved  $6 \times 124$ .  
 To get 2480 they have solved  $20 \times 124$ .

$$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \end{array}$$

Answer: 3224

## Conceptual variation; different ways to ask children to solve $6 \times 23$

23	23	23	23	23	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  $6 \times 23$   
 $= 138$

Find the product of 6 and 23

$$6 \times 23 =$$

$$\boxed{\phantom{00}} = 6 \times 23$$

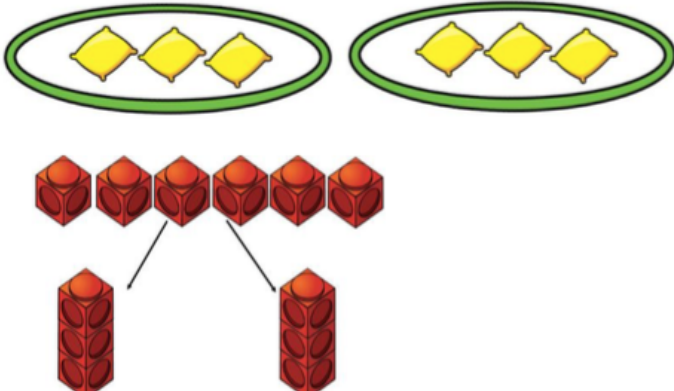
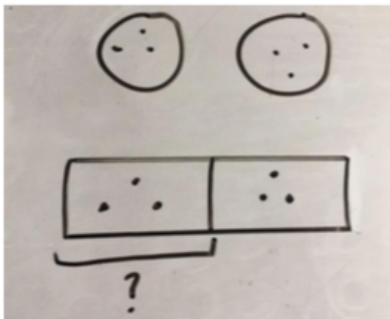
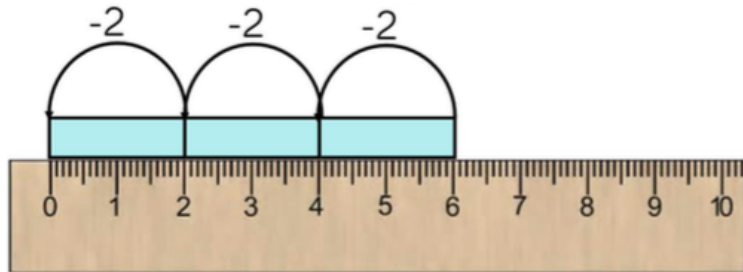
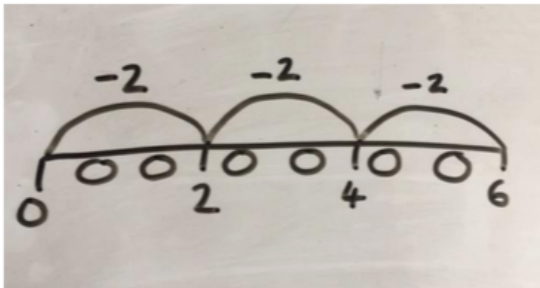
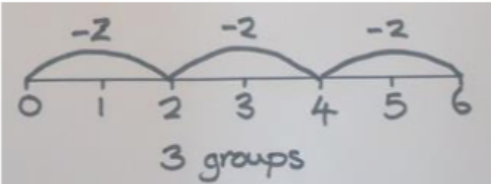
$$\begin{array}{r} 6 \quad 23 \\ \times 23 \\ \hline \end{array} \quad \begin{array}{r} 6 \quad 23 \\ \times 6 \\ \hline \end{array}$$

What is the calculation?  
 What is the product?

100s	10s	1s
	20	18

# CALCULATION POLICY: DIVISION

Key Vocabulary: share, group, divide, divide by, half

Concrete	Pictorial	Abstract		
<p><b>Sharing</b> using a range of objects. <math>6 \div 2</math></p> 	<p>Represent the sharing pictorially.</p> 	<p><math>6 \div 2 = 3</math></p> <table border="1" data-bbox="1552 437 1995 501"><tr><td>3</td><td>3</td></tr></table> <p>Children should also be encouraged to use their 2 times tables facts.</p>	3	3
3	3			
<p><b>Repeated subtraction</b> using Cuisenaire rods above a ruler. <math>6 \div 2</math></p>  <p>3 groups of 2</p>	<p>Children to represent repeated subtraction pictorially.</p> 	<p>Abstract number line to represent the equal groups that have been subtracted.</p> 		

## CALCULATION POLICY: DIVISION

Key Vocabulary: share, group, divide, divide by, half

**$2d \div 1d$  with remainders** using lollipop sticks. Cuisenaire rods, above a ruler can also be used.

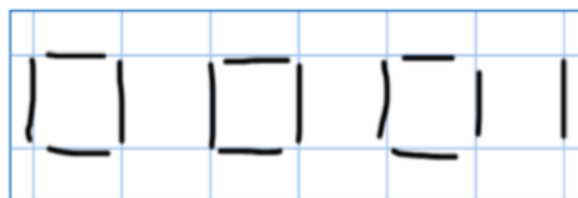
$$13 \div 4$$

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.

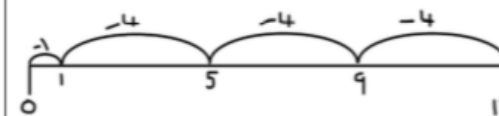


There are 3 whole squares, with 1 left over.

$$13 \div 4 = 3 \text{ remainder } 1$$

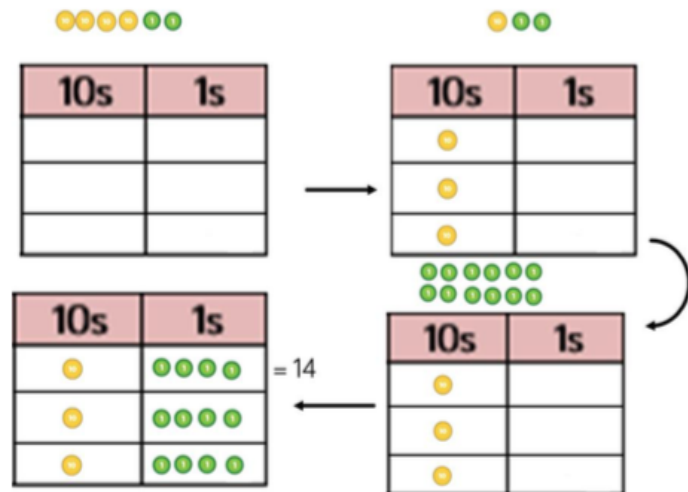
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

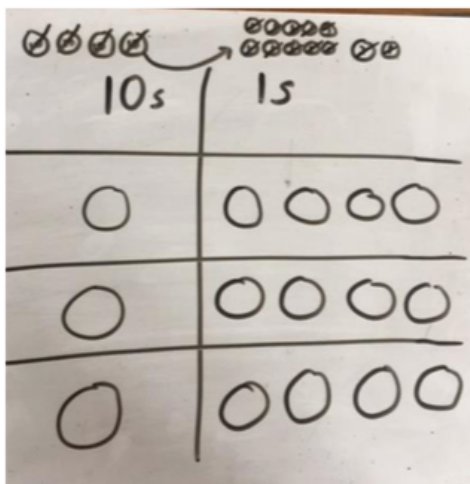


**Sharing using place value counters.**

$$42 \div 3 = 14$$



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.

$$\begin{aligned} 42 \div 3 \\ 42 &= 30 + 12 \\ 30 \div 3 &= 10 \\ 12 \div 3 &= 4 \\ 10 + 4 &= 14 \end{aligned}$$

## CALCULATION POLICY: DIVISION

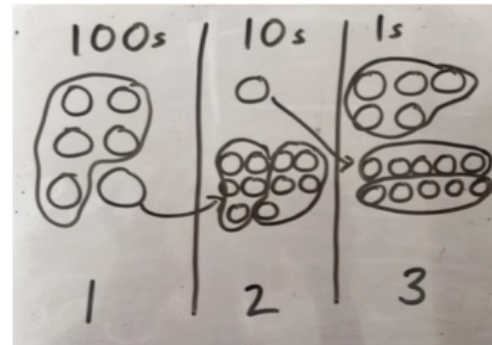
Key Vocabulary: share, group, divide, divide by, half

**Short division** using place value counters to group.  
 $615 \div 5$

100s	10s	1s
1	2	3

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.

$$\begin{array}{r} 123 \\ 5 \overline{) 615} \\ \underline{5} \phantom{00} \\ 11 \phantom{0} \\ \underline{10} \phantom{0} \\ 15 \\ \underline{15} \\ 0 \end{array}$$

**Long division** using place value counters  
 $2544 \div 12$

1000s	100s	10s	1s

We can't group 2 thousands into groups of 12 so will exchange them.

1000s	100s	10s	1s

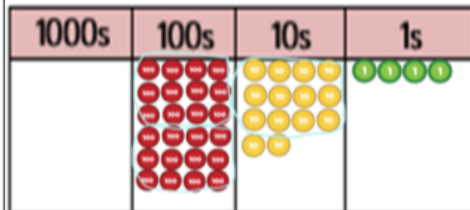
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$\begin{array}{r} 02 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{00} \\ 1 \phantom{00} \end{array}$$



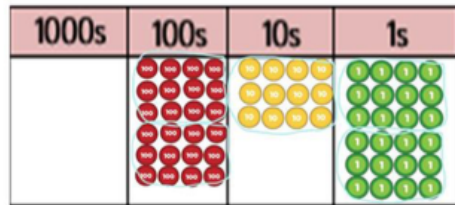
## CALCULATION POLICY: DIVISION

Key Vocabulary: share, group, divide, divide by, half



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

$$\begin{array}{r} 021 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 2 \phantom{00} \end{array}$$

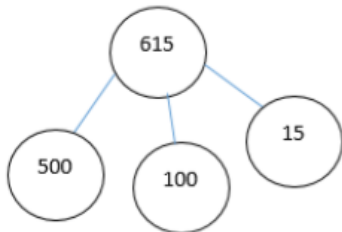


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 24 \phantom{00} \\ \underline{24} \phantom{00} \\ 0 \end{array}$$

### Conceptual variation; different ways to ask children to solve $615 \div 5$

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?

$$5 \overline{) 615}$$

$$615 \div 5 =$$

$$\boxed{\phantom{000}} = 615 \div 5$$

What is the calculation?  
What is the answer?



## CALCULATION OVERVIEW

	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	<p>Combining two parts to make a whole: part whole model.</p> <p>Starting at the bigger number and counting on- using cubes.</p> <p>Regrouping to make 10 using ten frame.</p>	<p>Adding three single digits.</p> <p>Use of base 10 to combine two numbers.</p>	<p>Column method- regrouping.</p> <p>Using place value counters (up to 3 digits).</p>	<p>Column method- regrouping.</p> <p>(up to 4 digits)</p>	<p>Column method- regrouping.</p> <p>Use of place value counters for adding decimals.</p>	<p>Column method- regrouping.</p> <p>Abstract methods.</p> <p>Place value counters to be used for adding decimal numbers.</p>
Subtraction	<p>Taking away ones</p> <p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10 using the ten frame</p>	<p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10</p> <p>Use of base 10</p>	<p>Column method with regrouping.</p> <p>(up to 3 digits using place value counters)</p>	<p>Column method with regrouping.</p> <p>(up to 4 digits)</p>	<p>Column method with regrouping.</p> <p>Abstract for whole numbers.</p> <p>Start with place value counters for decimals- with the same amount of decimal places.</p>	<p>Column method with regrouping.</p> <p>Abstract methods.</p> <p>Place value counters for decimals- with different amounts of decimal places.</p>

## CALCULATION OVERVIEW

Multiplication	<p>Recognising and making equal groups.</p> <p>Doubling</p> <p>Counting in multiples Use cubes, Numicon and other objects in the classroom</p>	<p>Arrays- showing commutative multiplication</p>	<p>Arrays</p> <p><math>2d \times 1d</math> using base 10</p>	<p>Column multiplication- introduced with place value counters.</p> <p>(2 and 3 digit multiplied by 1 digit)</p>	<p>Column multiplication</p> <p>Abstract only but might need a repeat of year 4 first (up to 4 digit numbers multiplied by 1 or 2 digits)</p>	<p>Column multiplication</p> <p>Abstract methods (multi-digit up to 4 digits by a 2 digit number)</p>
	<p>Sharing objects into groups</p> <p>Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?</p> <p>Use cubes and draw round 3 cubes at a time.</p>	<p>Division as grouping</p> <p>Division within arrays- linking to multiplication</p> <p>Repeated subtraction</p>	<p>Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction.</p> <p><math>2d</math> divided by <math>1d</math> using base 10 or place value counters</p>	<p>Division with a remainder</p> <p>Short division (up to 3 digits by 1 digit- concrete and pictorial)</p>	<p>Short division</p> <p>(up to 4 digits by a 1 digit number including remainders)</p>	<p>Short division</p> <p>Long division with place value counters (up to 4 digits by a 2 digit number)</p> <p>Children should exchange into the tenths and hundredths column too</p>