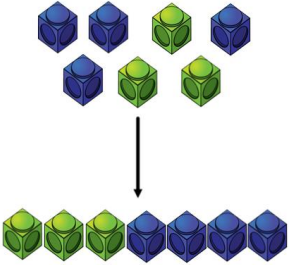
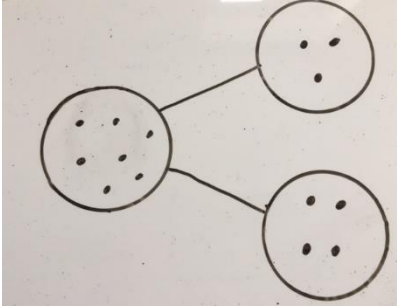
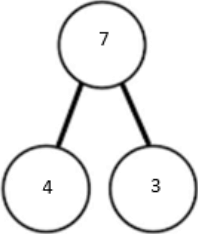
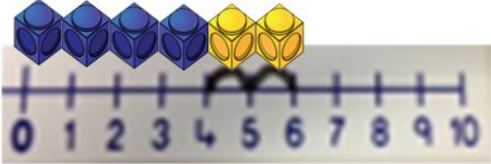
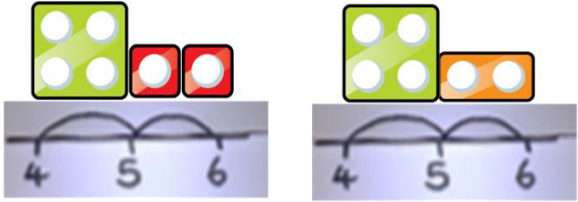
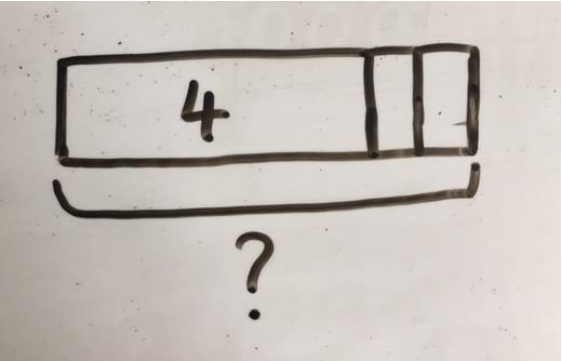



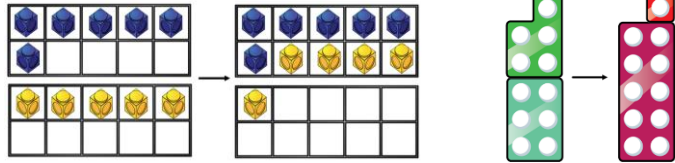
Calculation policy: Addition

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

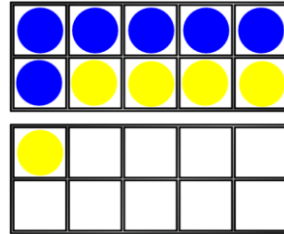
Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p>$4 + 3 = 7$ Four is a part, 3 is a part and the 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? $4 + 2$</p> 

Regrouping to make 10; using ten frames and counters/cubes or using Numicon.

6 + 5



Children to draw the ten frame and counters/cubes.



Children to develop an understanding of equality e.g.

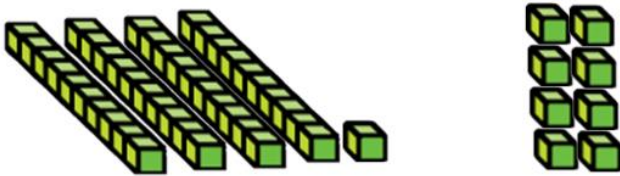
$6 + \square = 11$

$6 + 5 = 5 + \square$

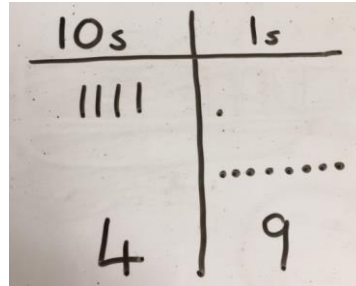
$6 + 5 = \square + 4$

TO + O using base 10. Continue to develop understanding of partitioning and place value.

41 + 8

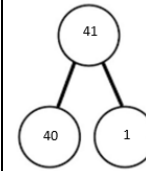


Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.



41 + 8

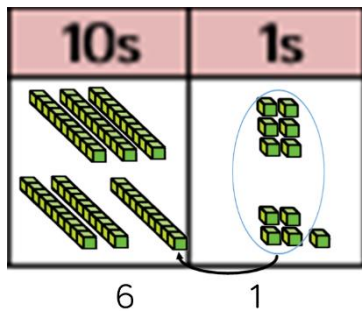
$1 + 8 = 9$
 $40 + 9 = 49$



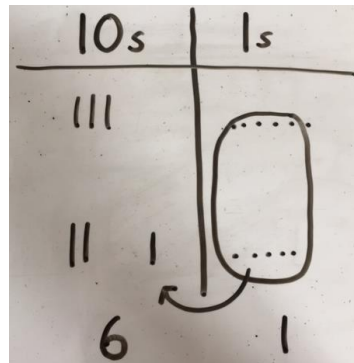
	4	1
+		8
<hr/>		
	4	9

TO + TO using base 10. Continue to develop understanding of partitioning and place value.

36 + 25



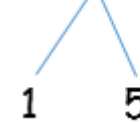
Children to represent the base 10 in a place value chart.



Looking for ways to make 10.

$36 + 25 =$

$30 + 20 = 50$
 $5 + 5 = 10$
 $50 + 10 + 1 = 61$

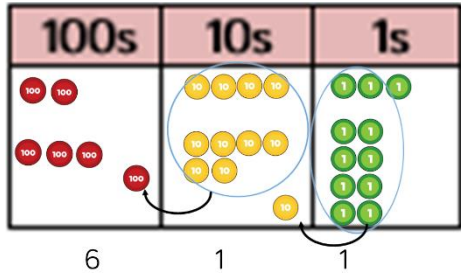


36

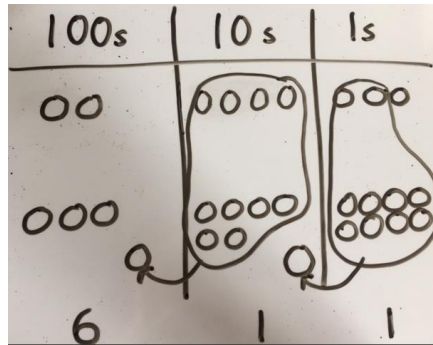
Formal method:

	+25
	36
<hr/>	
	61
	1

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.

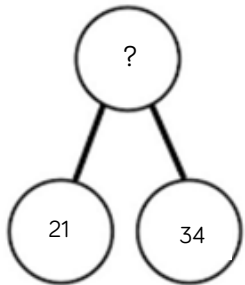


Children to represent the counters in a place value chart, circling when they make an exchange.



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

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?

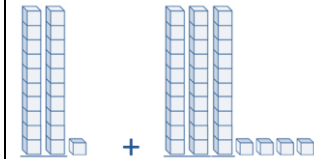
$21 + 34 = 55$. Prove it

$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$$

$21 + 34 =$

$$\square = 21 + 34$$

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

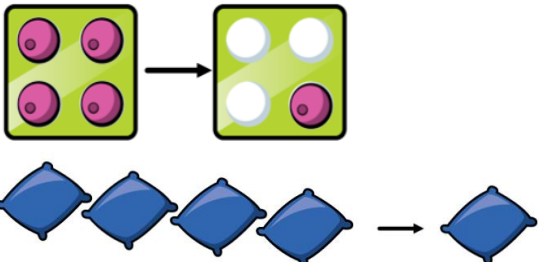
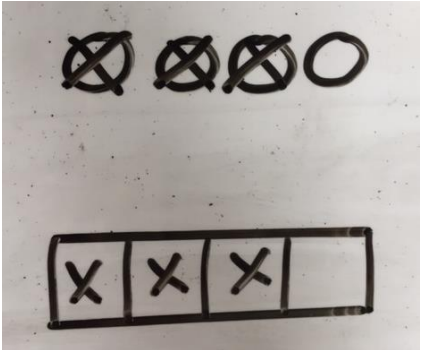
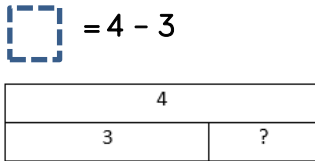
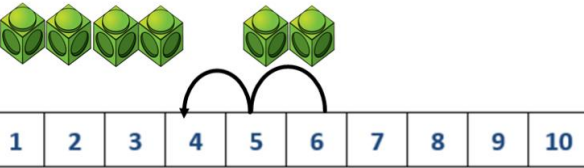
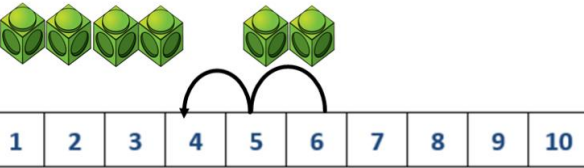
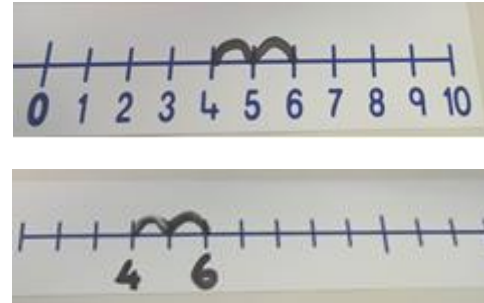


Missing digit problems:

10s	1s
10 10	1
10 10 10	?
?	5

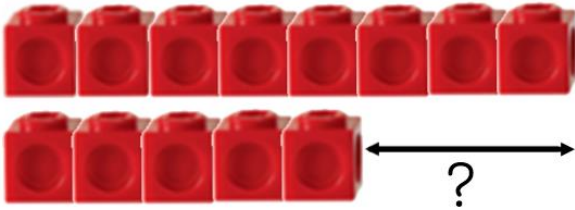
Calculation policy: Subtraction

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

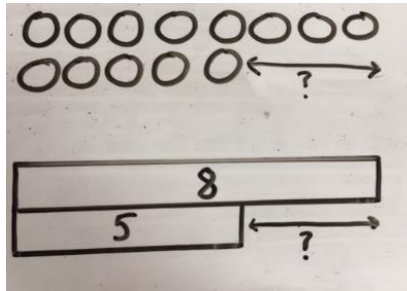
Concrete	Pictorial	Abstract
<p>Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.</p> 	<p>$4 - 3 =$</p> 
<p>Counting back (using number lines or number tracks) children start with 6 and count back 2.</p> <p>$6 - 2 = 4$</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> 

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.



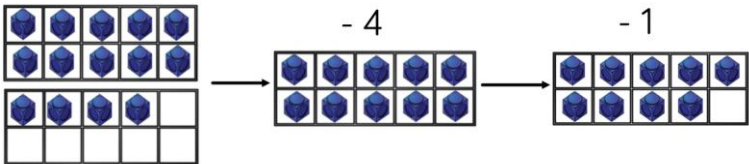
Find the difference between 8 and 5.

8 - 5, the difference is

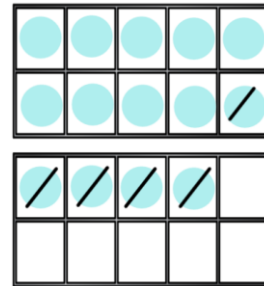
Children to explore why
 $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.

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.

$$14 - 5 = 9$$

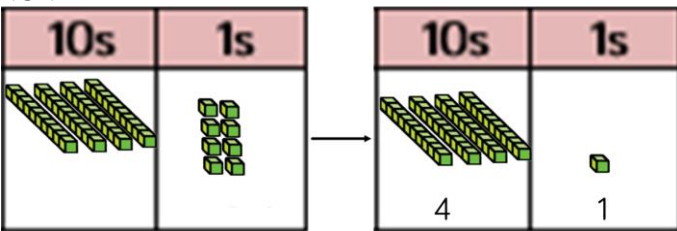
$$\begin{array}{c} 4 \quad 1 \end{array}$$

$$14 - 4 = 10$$

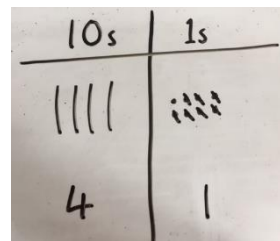
$$10 - 1 = 9$$

Column method using base 10.

$48 - 7$



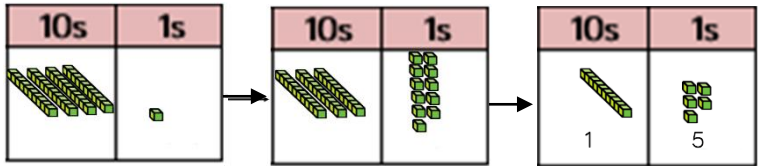
Children to represent the base 10 pictorially.



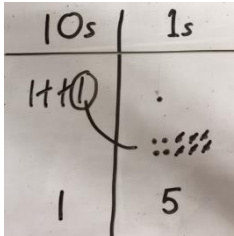
Column method or children could count back 7.

	4	8
-		7
	4	1

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



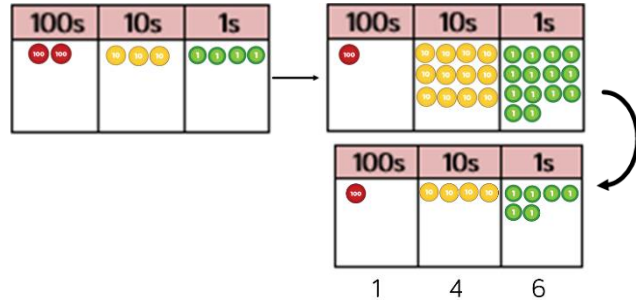
Represent the base 10 pictorially, remembering to show the exchange.



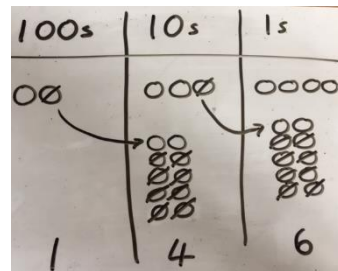
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because $41 = 30 + 11$.

$$\begin{array}{r} 3 \cancel{4} 1 \\ - 26 \\ \hline 15 \end{array}$$

Column method using place value counters.
234 - 88



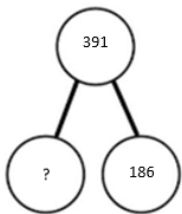
Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal column method. Children must understand what has happened when they have crossed out digits.

$$\begin{array}{r} 2 \cancel{3} 4 \\ - 88 \\ \hline 6 \end{array}$$

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.

$$\square = 391 - 186$$

$$\begin{array}{r} 391 \\ - 186 \\ \hline \end{array}$$

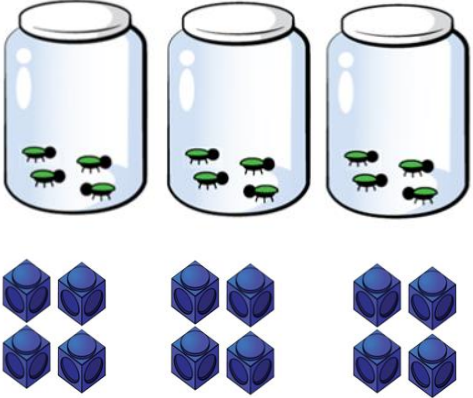
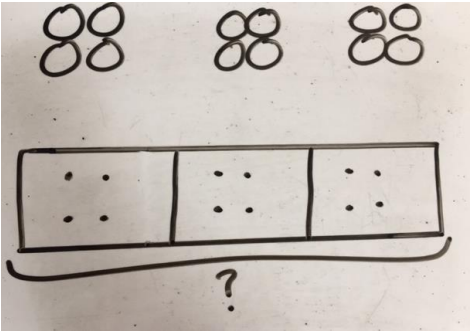
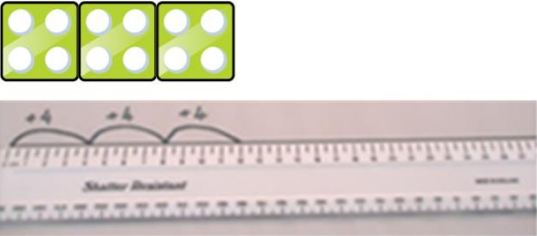
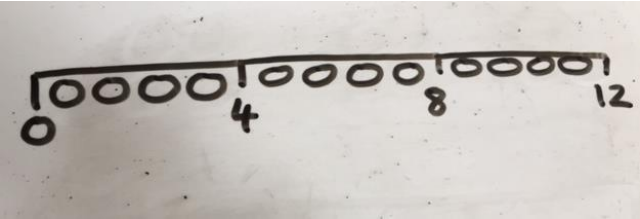
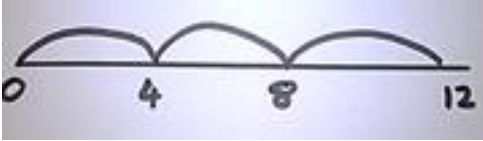
What is 186 less than 391?

Missing digit calculations

$$\begin{array}{r} 39\square \\ - \square\square 6 \\ \hline \square 05 \end{array}$$

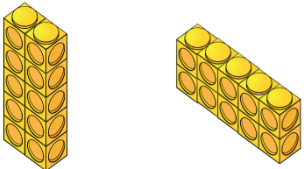
Calculation policy: Multiplication

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

Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition 3×4 $4 + 4 + 4$ There are 3 equal groups, with 4 in each group.</p>  <p>The concrete representation shows three identical jars, each containing four green beetles. Below the jars are three groups of four blue cubes, arranged in two rows of two.</p>	<p>Children to represent the practical resources in a picture and use a bar model.</p>  <p>The pictorial representation shows three groups of two circles each, arranged in a row. Below them is a hand-drawn bar model divided into three equal sections, each containing two dots. A bracket underneath the bar model is labeled with a question mark.</p>	<p>$3 \times 4 = 12$ $4 + 4 + 4 = 12$</p>
<p>Number lines to show repeated groups- 3×4</p>  <p>The concrete representation shows three green Cuisenaire rods, each representing a group of four. Below them is a ruler with three jumps of four units, labeled with '+4' above each jump.</p> <p>Cuisenaire rods can be used too.</p>	<p>Represent this pictorially alongside a number line e.g.:</p>  <p>The pictorial representation shows a hand-drawn number line from 0 to 12. There are three jumps of 4 units each, starting at 0 and ending at 4, 8, and 12. The numbers 4, 8, and 12 are written below the line.</p>	<p>Abstract number line showing three jumps of four.</p> <p>$3 \times 4 = 12$</p>  <p>The abstract number line shows a horizontal line from 0 to 12. There are three jumps of 4 units each, starting at 0 and ending at 4, 8, and 12. The numbers 4, 8, and 12 are written below the line.</p>

Use arrays to illustrate commutativity counters and other objects can also be used.

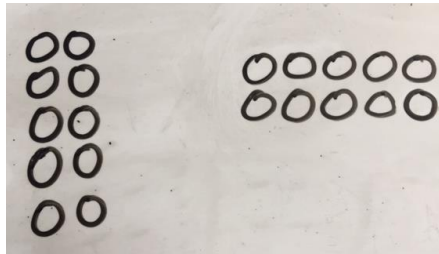
$$2 \times 5 = 5 \times 2$$



2 lots of 5

5 lots of 2

Children to represent the arrays pictorially.



Children to be able to use an array to write a range of calculations e.g.

$$10 = 2 \times 5$$

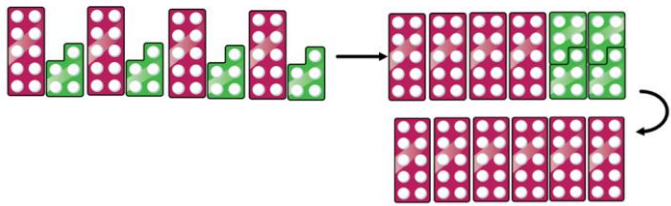
$$5 \times 2 = 10$$

$$2 + 2 + 2 + 2 + 2 = 10$$

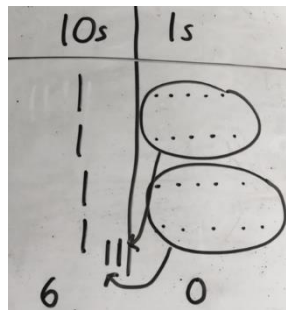
$$10 = 5 + 5$$

Partition to multiply using Numicon, base 10 or Cuisenaire rods.

$$4 \times 15$$



Children to represent the concrete manipulatives pictorially.



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

$$4 \times 15$$

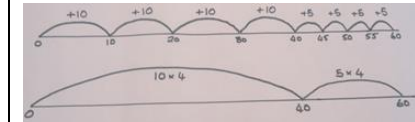
$$\begin{array}{r} 10 \\ 5 \end{array}$$

$$10 \times 4 = 40$$

$$5 \times 4 = 20$$

$$40 + 20 = 60$$

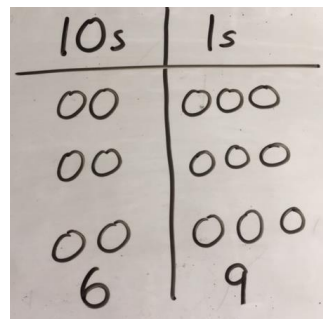
A number line can also be used



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

10s	1s
6	9

Children to represent the counters pictorially.



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

$$3 \times 23$$

$$3 \times 20 = 60$$

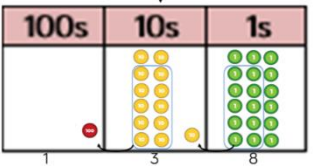
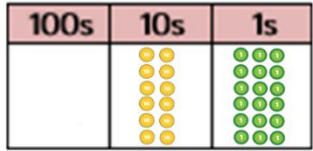
$$3 \times 3 = 9$$

$$60 + 9 = 69$$

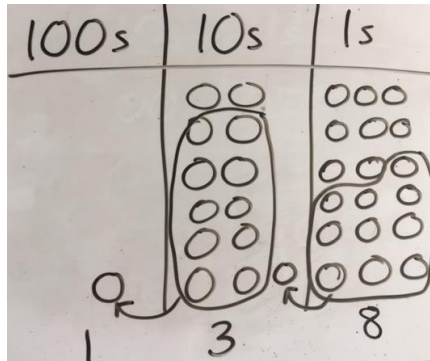
$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

Formal column method with place value counters.

6×23



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



Formal written method

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

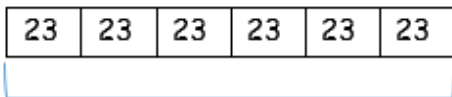
When children start to multiply $3d \times 3d$ and $4d \times 2d$ etc., they should be confident with the abstract:

To get 744 children have solved 6×124 .
 To get 2480 they have solved 20×124 .

$$\begin{array}{r}
 124 \\
 \times 26 \\
 \hline
 744 \\
 2480 \\
 \hline
 3224 \\
 11
 \end{array}$$

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 $6 \times 23 = 138$

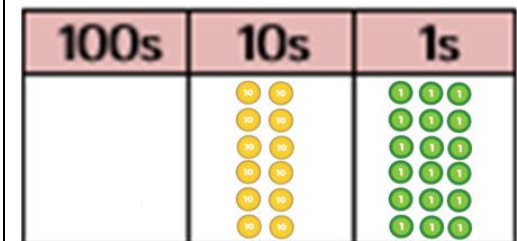
Find the product of 6 and 23

$6 \times 23 =$

$\square = 6 \times 23$

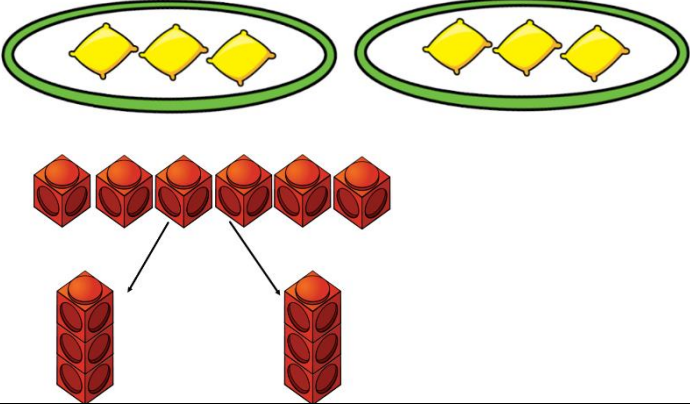
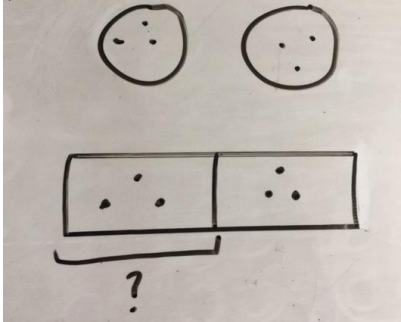
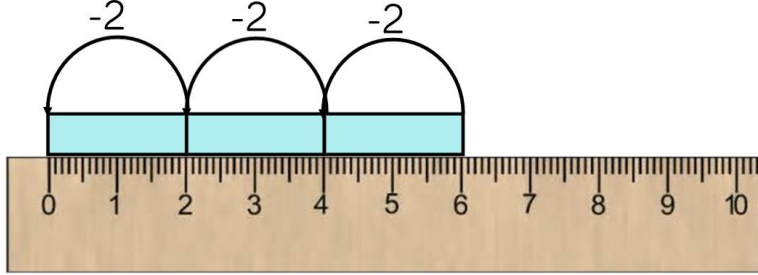
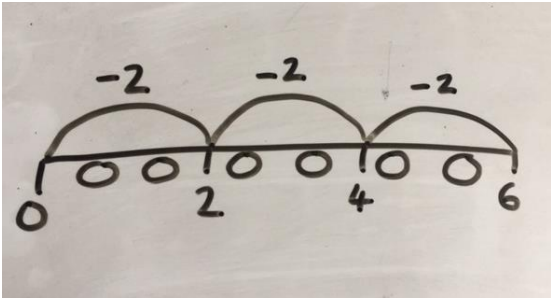
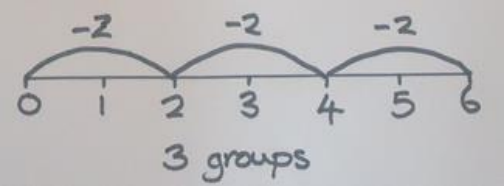
$$\begin{array}{r}
 6 \quad 23 \\
 \times \quad 23 \quad \times 6 \\
 \hline
 \quad \quad \quad \hline
 \end{array}$$

What is the calculation?
 What is the product?



Calculation policy: Division

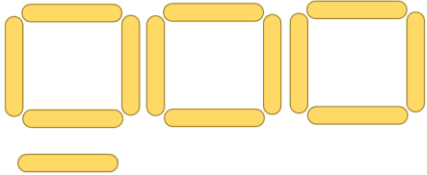
Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract		
<p>Sharing using a range of objects. $6 \div 2$</p>  <p>The diagram shows two green ovals, each containing three yellow diamonds. Below this, six red Cuisenaire rods are arranged in a row. Two arrows point from the first and fourth rods to two separate vertical stacks of three rods each, representing two groups of three.</p>	<p>Represent the sharing pictorially.</p>  <p>The diagram shows two hand-drawn circles, each containing three dots. Below them is a hand-drawn rectangle divided into two equal halves, each containing three dots. A bracket under the first half is labeled with a question mark, indicating the unknown number of groups.</p>	<p>$6 \div 2 = 3$</p> <table border="1" data-bbox="1554 480 2007 552"><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>Repeated subtraction using Cuisenaire rods above a ruler. $6 \div 2$</p>  <p>The diagram shows a ruler from 0 to 10. Three light blue Cuisenaire rods are placed above the ruler, each spanning from 0 to 2. Three arcs above the rods are labeled '-2', representing three groups of 2.</p> <p>3 groups of 2</p>	<p>Children to represent repeated subtraction pictorially.</p>  <p>The diagram shows a horizontal line with six small circles below it. The circles are numbered 0, 2, 4, and 6. Three arcs above the line are labeled '-2', representing three groups of 2.</p>	<p>Abstract number line to represent the equal groups that have been subtracted.</p>  <p>The diagram shows a number line from 0 to 6. Three arcs above the line are labeled '-2', representing three groups of 2. The text '3 groups' is written below the line.</p>		

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

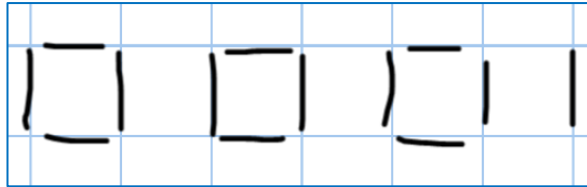
$$13 \div 4$$

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.

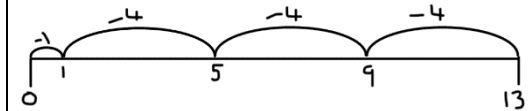


There are 3 whole squares, with 1 left over.

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

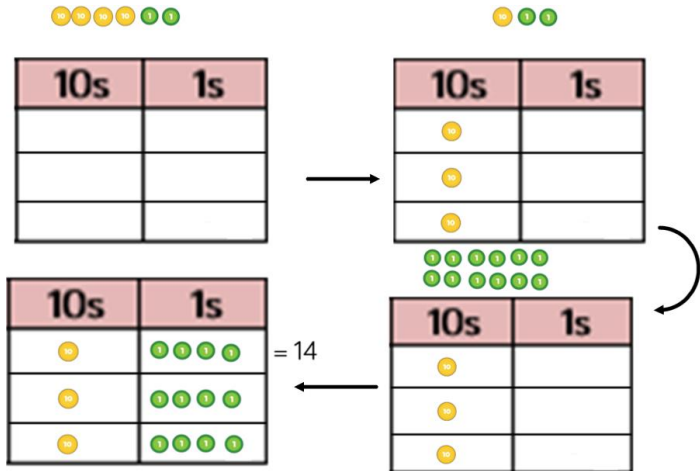
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

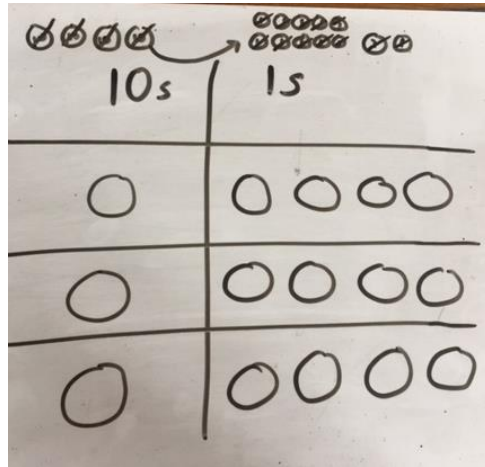


Sharing using place value counters.

$$42 \div 3 = 14$$



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.

$$42 \div 3$$

$$42 = 30 + 12$$

$$30 \div 3 = 10$$

$$12 \div 3 = 4$$

$$10 + 4 = 14$$