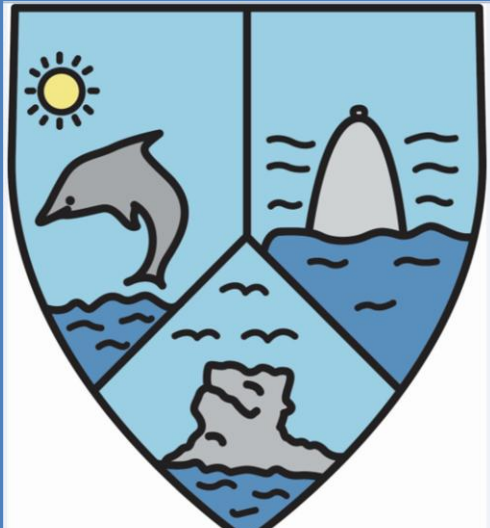


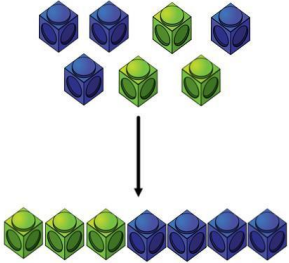
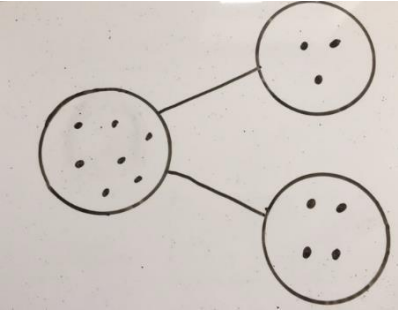
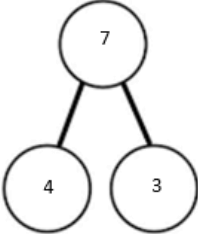
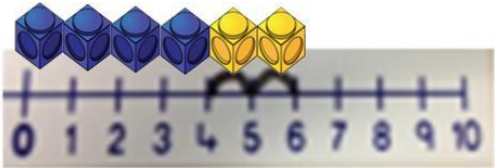
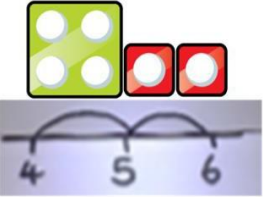
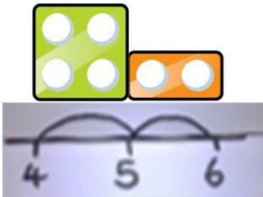
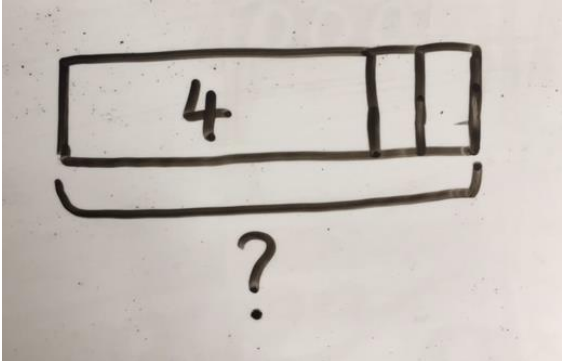

CALCULATION POLICY PORTREATH SCHOOL



September 2024

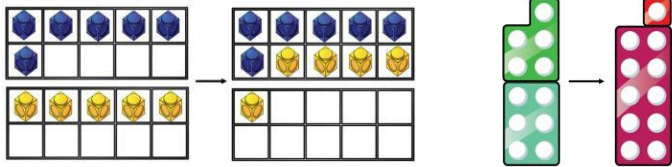
Calculation policy: Addition

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

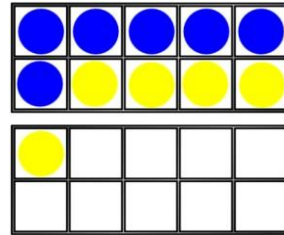
Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p>$4 + 3 = 7$ Four is a part, 3 is a part and the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

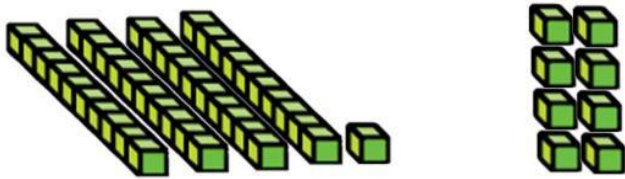
$6 + \square = 11$

$6 + 5 = 5 + \square$

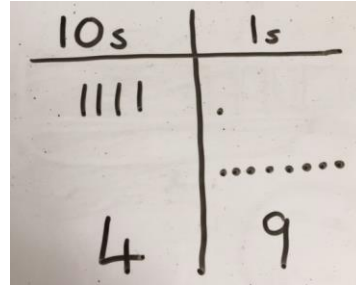
$6 + 5 = \square + 4$

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

41 + 8

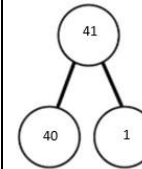


Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.



41 + 8

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

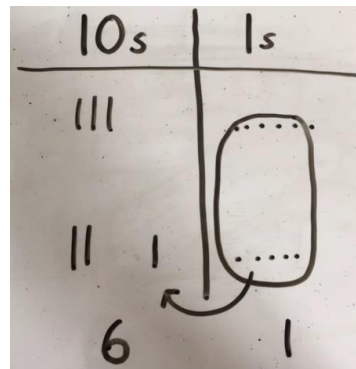


	4	1
+		8
<hr/>		
	4	9

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

36 + 25

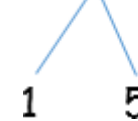
Children to represent the base 10 in a place value chart.



Looking for ways to make 10.

$36 + 25 =$

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

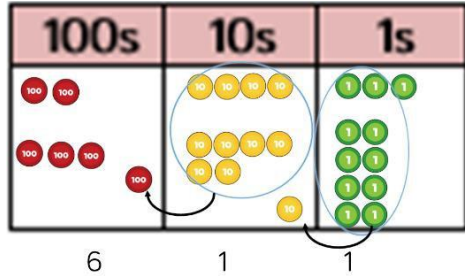


36

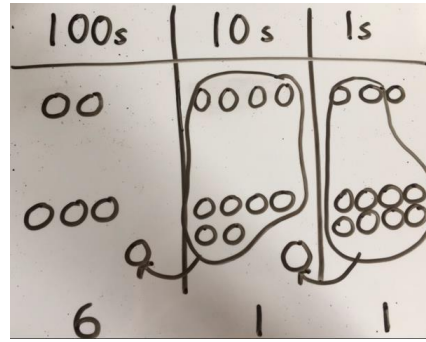
Formal method:

	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.

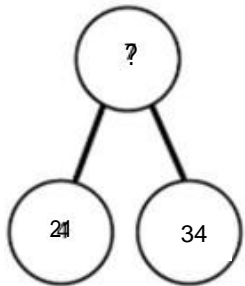


Children to represent the counters in a place value chart, circling when they make an exchange.



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

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?

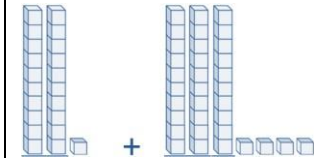
$$21 + 34 = 55. \text{ Prove it}$$

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

$$21 + 34 =$$

$$\square = 21 + 34$$

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

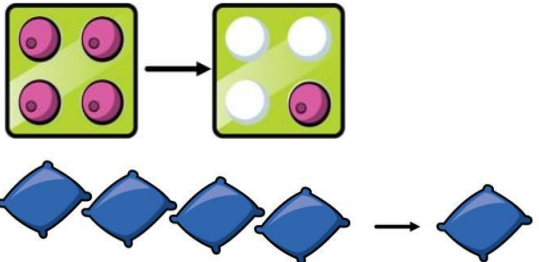
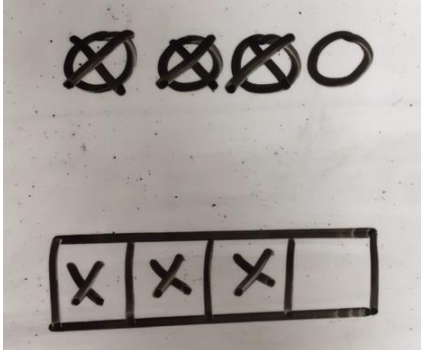
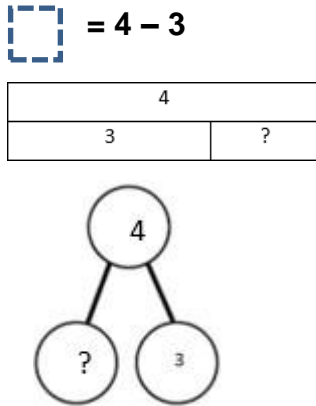
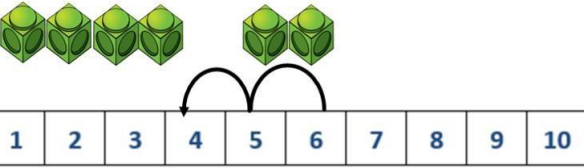
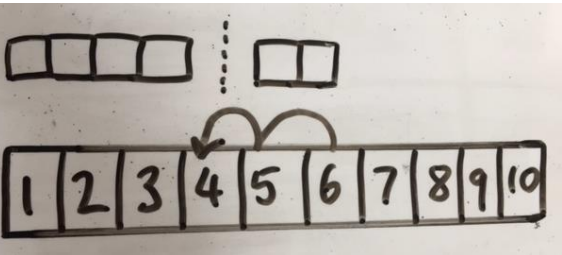
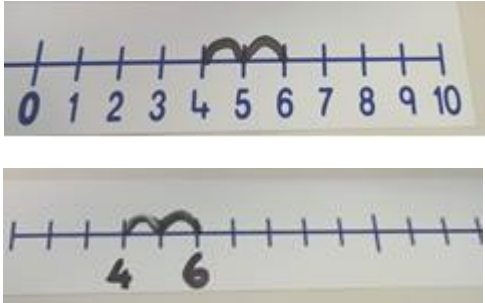


Missing digit problems:

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

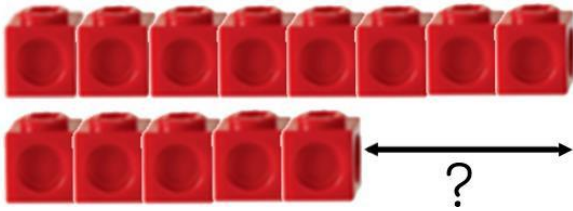
Subtraction

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

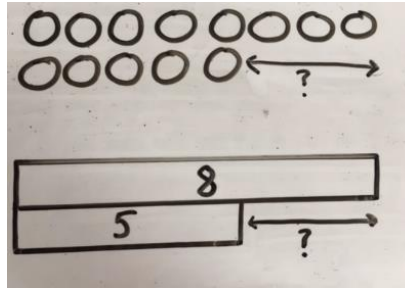
Concrete	Pictorial	Abstract
<p>Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also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



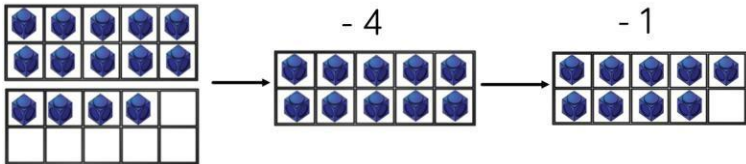
Find the difference between 8 and 5.

$8 - 5$, the difference is

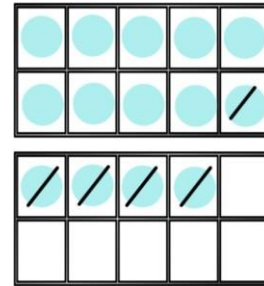
Children to explore why $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.

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.

$$14 - 5 = 9$$

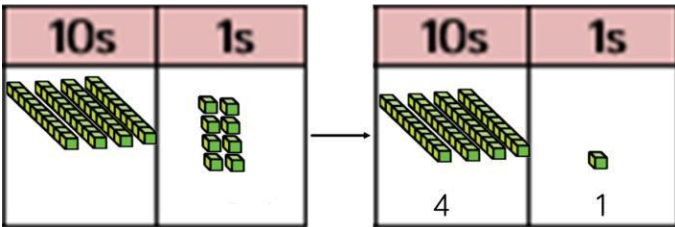
$$\begin{array}{c} 4 \quad 1 \end{array}$$

$$14 - 4 = 10$$

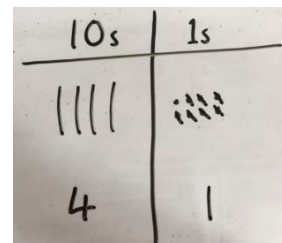
$$10 - 1 = 9$$

Column method using base 10.

$48 - 7$



Children to represent the base 10 pictorially.

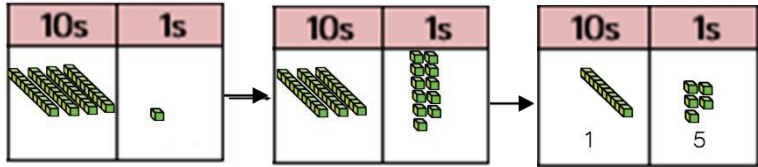


Column method or children could count back 7.

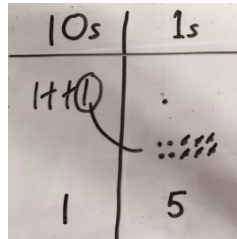
	4	8
-		7
	4	1

Column method using base 10 and having to exchange.

41 – 26



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



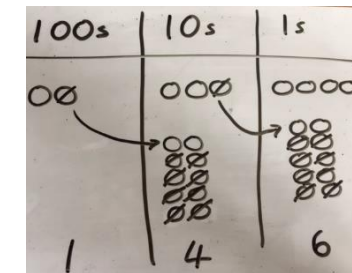
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because $41 = 30 + 11$.

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

Column method using place value counters.

234 – 88

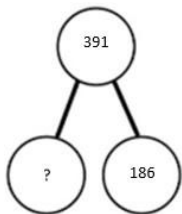
Represent the place value counters pictorially; remembering to show what has been exchanged.



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.

$\square - \square = 391 - 186$

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

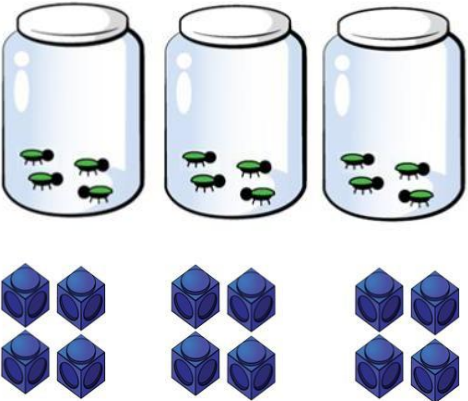
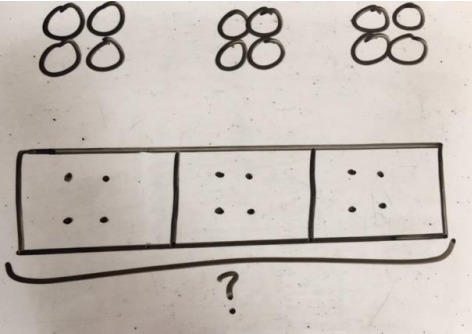
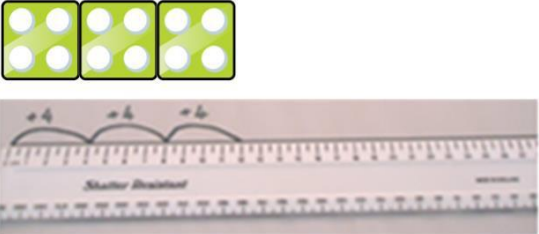
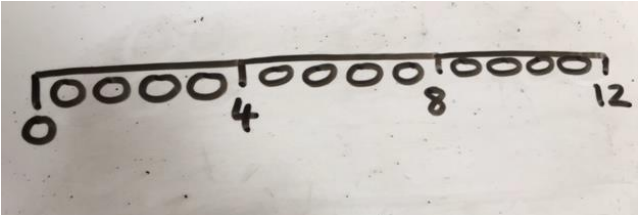
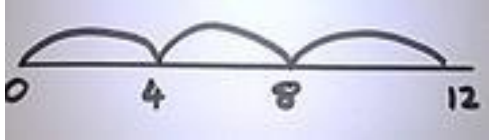
What is 186 less than 391?

Missing digit calculations

$$\begin{array}{r} 3 9 \square \\ - \square \square 6 \\ \hline \square 0 5 \end{array}$$

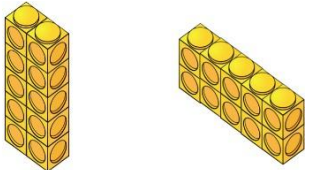
Calculation policy: Multiplication

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>Three jars, each containing four green beetles. Below them are three groups of four blue cubes.</p>	<p>Children to represent the practical resources in a picture and use a bar model.</p>  <p>Hand-drawn pictorial representation showing three groups of two pairs of circles and a bar model with three sections, each containing two pairs of dots, with a question mark below.</p>	<p>$3 \times 4 = 12$ $4 + 4 + 4 = 12$</p>
<p>Number lines to show repeated groups- 3×4</p>  <p>Three green rods with four white dots each, and a ruler with three jumps of four units.</p> <p>Cuisenaire rods can be used too.</p>	<p>Represent this pictorially alongside a number line e.g.:</p>  <p>Hand-drawn number line from 0 to 12 with three jumps of four units.</p>	<p>Abstract number line showing three jumps of four.</p> <p>$3 \times 4 = 12$</p>  <p>Abstract number line from 0 to 12 with three jumps of four units.</p>

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

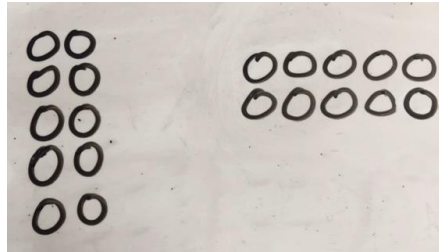
$$2 \times 5 = 5 \times 2$$



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.

$$10 = 2 \times 5$$

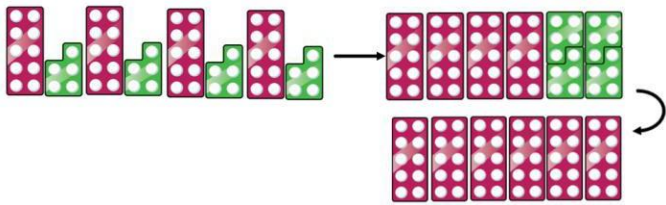
$$5 \times 2 = 10$$

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

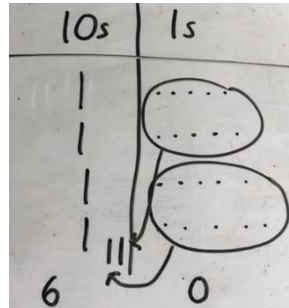
$$10 = 5 + 5$$

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.

$$4 \times 15$$

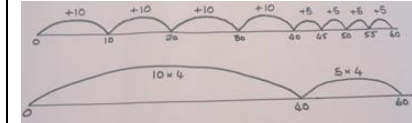
$$\begin{array}{r} 10 \\ 5 \end{array}$$

$$10 \times 4 = 40$$

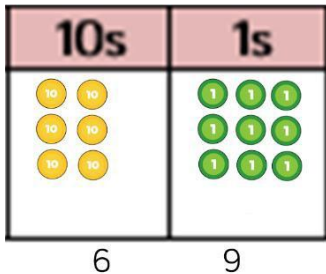
$$5 \times 4 = 20$$

$$40 + 20 = 60$$

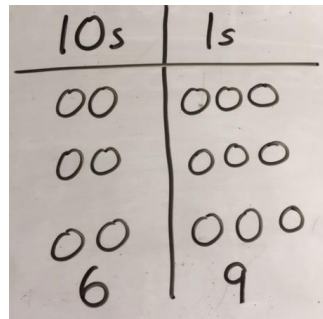
A number line can also be used



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



Children to represent the counters pictorially.



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

$$3 \times 23 \quad 3 \times 20 = 60$$

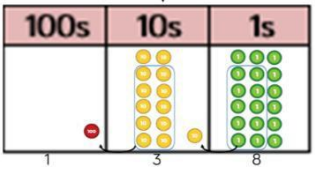
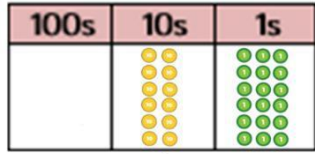
$$20 \quad 3 \quad 3 \times 3 = 9$$

$$60 + 9 = 69$$

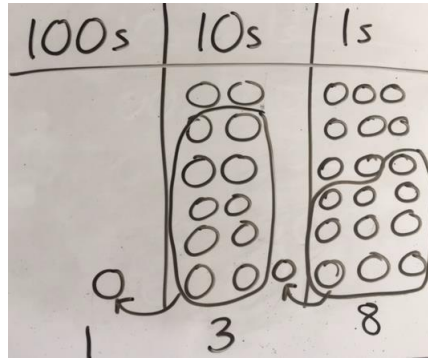
$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

Formal column method with place value counters.

6 x 23



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



Formal written method (when introducing show expanded method alongside e.g. Y4 spring week 1-3)

$$6 \times 23 =$$

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

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

To get 744 children have solved 6 x 124.
To get 2480 they have solved 20 x 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 x 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 x 23 = 138

Find the product of 6 and 23

$$6 \times 23 =$$

$$= 6 \times 23$$

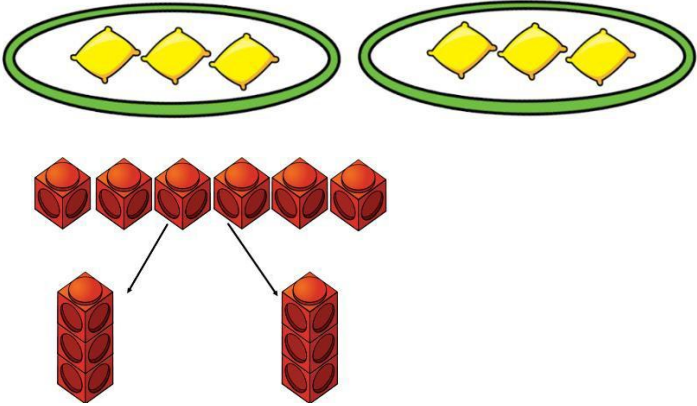
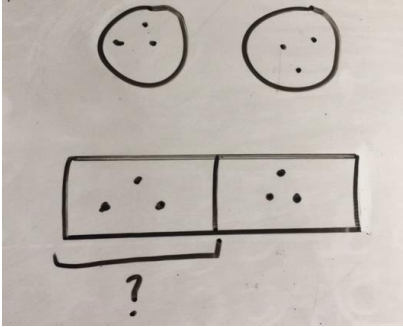
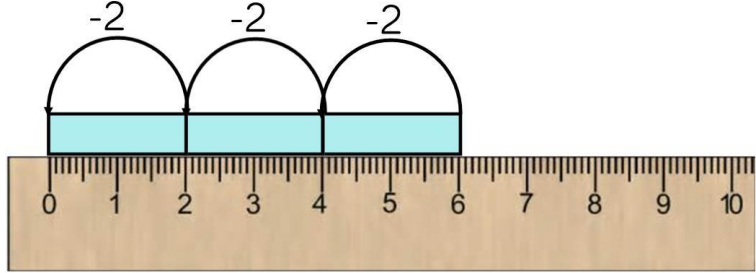
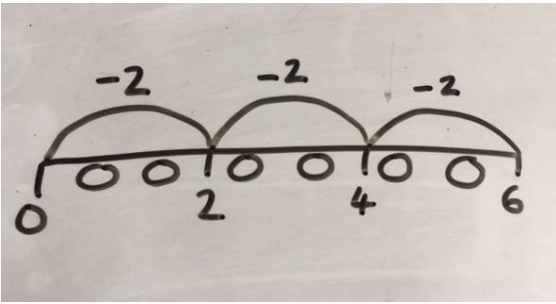
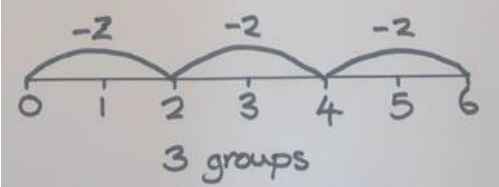
$$\begin{array}{r} 6 \quad 23 \\ \times 23 \quad \times 6 \\ \hline \quad \quad \end{array}$$

What is the calculation?
What is the product?



Calculation policy: Division

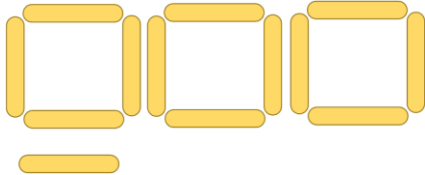
Key language: share, group, divide, divided by, half.

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 them is a row of six red cubes. Two arrows point from the first and second cubes to two separate vertical stacks of three cubes each, illustrating the sharing process.</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 478 2004 547"><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, each representing 2 units, are placed above the ruler. Arched lines above each rod are labeled '-2', showing the process of subtracting 2 from 6.</p> <p>3 groups of 2</p>	<p>Children to represent repeated subtraction pictorially.</p>  <p>The diagram shows a hand-drawn number line from 0 to 6. Three arcs are drawn above the line, each labeled '-2'. The arcs start at 0, 2, and 4, and end at 2, 4, and 6 respectively. The numbers 0, 2, 4, and 6 are written below the line.</p>	<p>Abstract number line to represent the equal groups that have been subtracted.</p>  <p>The diagram shows a hand-drawn number line from 0 to 6. Three arcs are drawn above the line, each labeled '-2'. The arcs start at 0, 2, and 4, and end at 2, 4, and 6 respectively. The numbers 0, 1, 2, 3, 4, 5, and 6 are written below the line. 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.

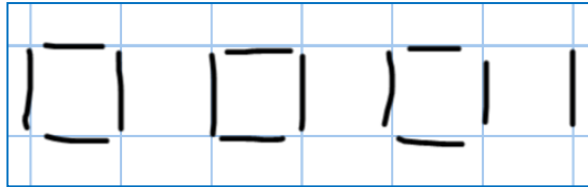
$$13 \div 4$$

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.

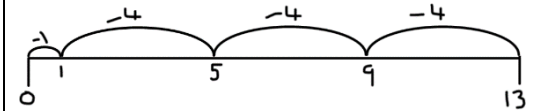


There are 3 whole squares, with 1 left over.

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

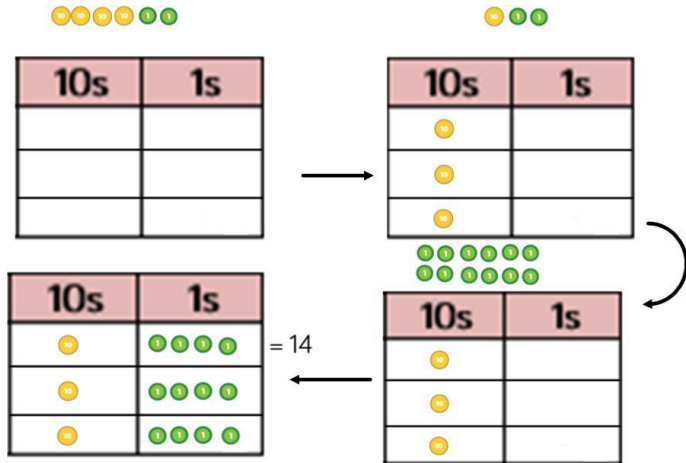
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

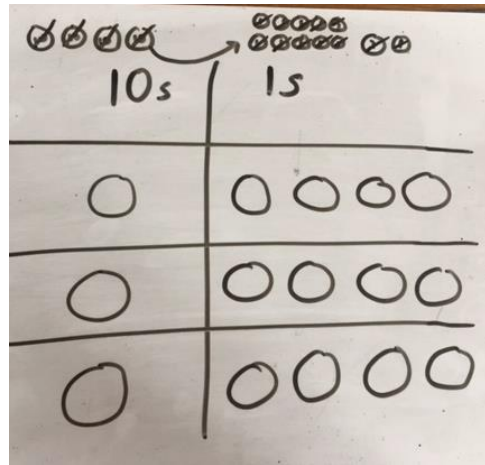


Sharing using place value counters.

$$42 \div 3 = 14$$



Children to represent the place value counters pictorially.

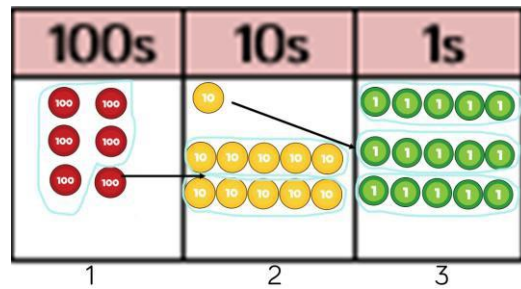


Children to be able to make sense of the place value counters and write calculations to show the process.

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

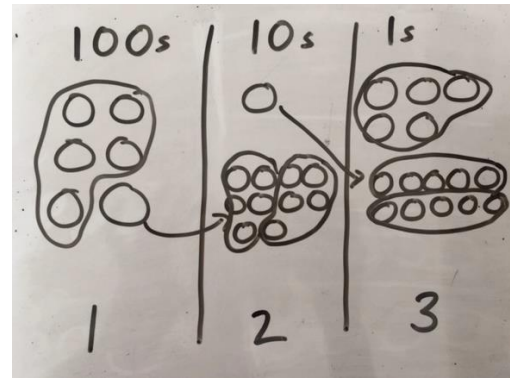
Short division using place value counters to group.

$$615 \div 5$$



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.



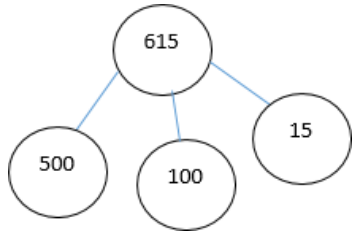
Children to the calculation using the short division scaffold.

$$\begin{array}{r} 123 \\ 5 \overline{) 615} \end{array}$$

Long division (year 6) is taught in the same way as short division with the children being encouraged to jot the multiples of the divisor first

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?

$$5 \overline{)615}$$

$$615 \div 5 =$$
$$= 615 \div 5$$

What is the calculation?
What is the answer?

