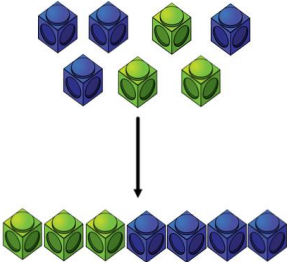
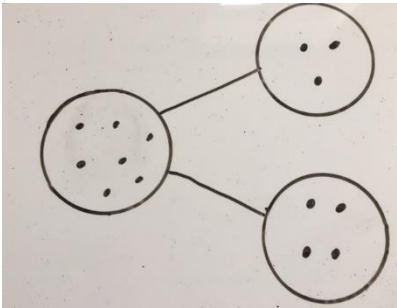
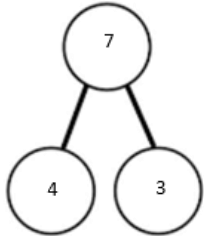
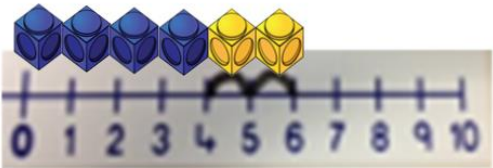
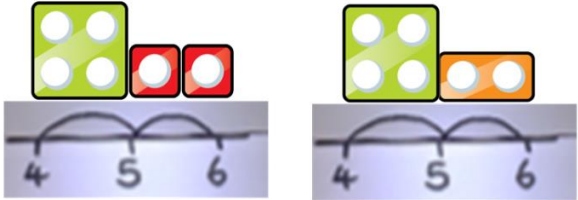
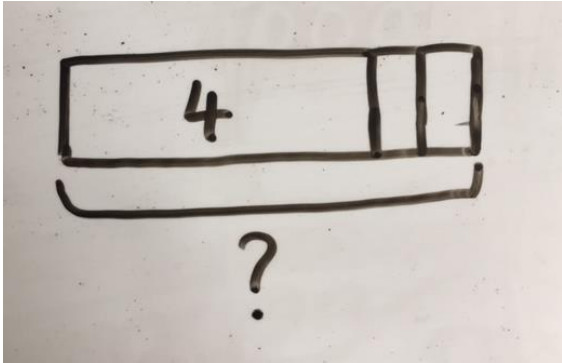


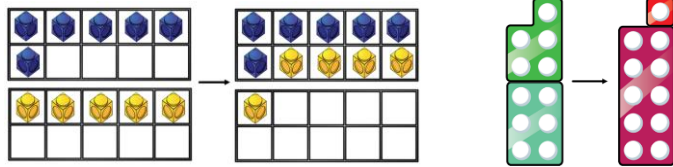
# Calculation policy: Addition

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

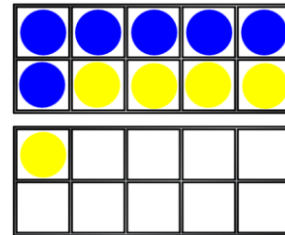
| Concrete                                                                                                                                                                                                                                    | Pictorial                                                                                                                                                                                            | Abstract                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Combining two parts to make a whole</b> (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><br/>Four is a part, 3 is a part and the whole is seven.</p>                                                                   |
| <p><b>Counting on using number lines</b> 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:<br/>What is 2 more than 4?<br/>What is the sum of 2 and 4?<br/>What is the total of 4 and 2?<br/><math>4 + 2</math></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.

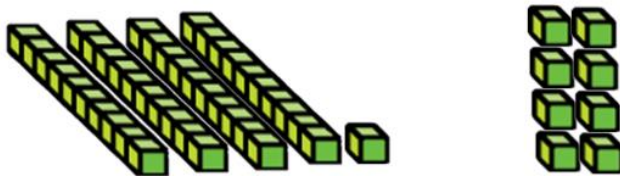
$$6 + \square = 11$$

$$6 + 5 = 5 + \square$$

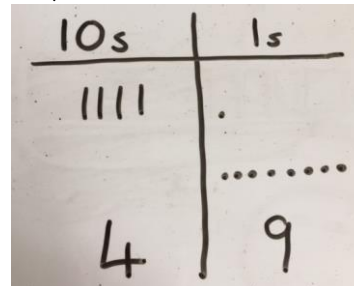
$$6 + 5 = \square + 4$$

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

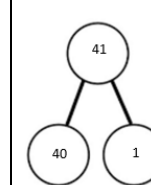
$$41 + 8$$



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



$$41 + 8$$



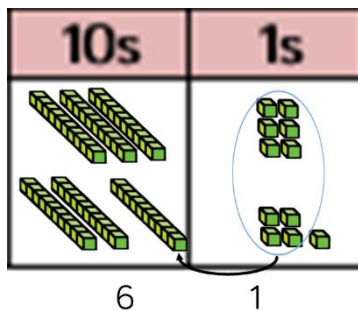
$$1 + 8 = 9$$

$$40 + 9 = 49$$

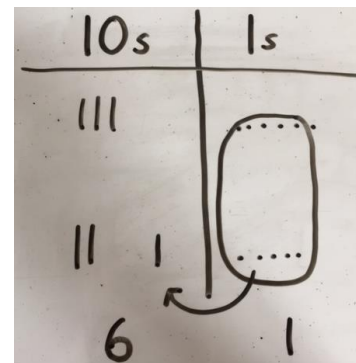
|   |   |   |
|---|---|---|
|   | 4 | 1 |
| + |   | 8 |
|   | 4 | 9 |

**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.

$$36 + 25 =$$

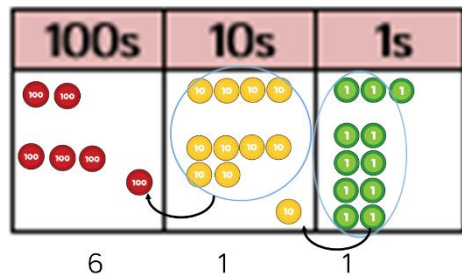
1      5

Formal method:

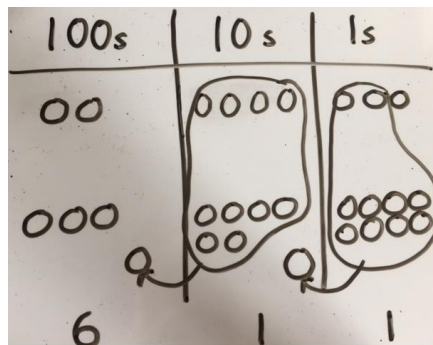
|   |    |
|---|----|
|   | 36 |
| + | 25 |
|   | 61 |
|   | 1  |

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

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.



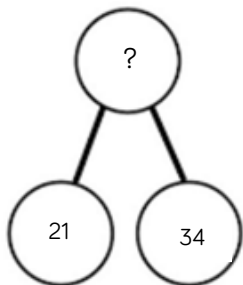
Children to represent the counters in a place value chart, circling when they make an exchange.



243

$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ 1 \quad 1 \end{array}$$

## 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

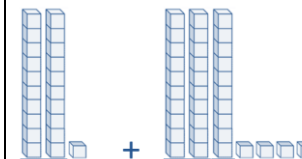
+34

—

$21 + 34 =$

   =  $21 + 34$

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

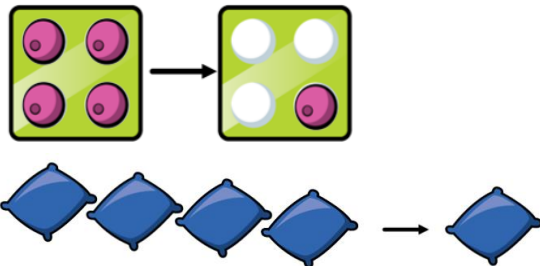
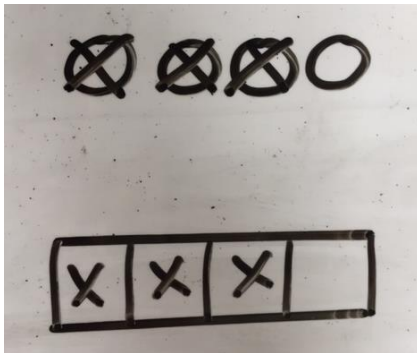
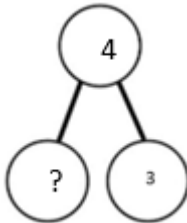
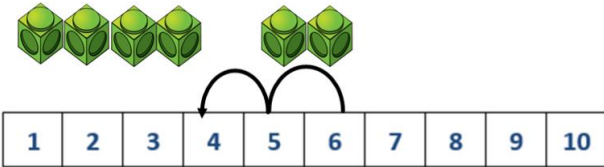
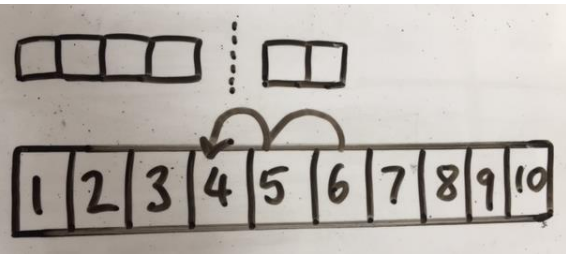
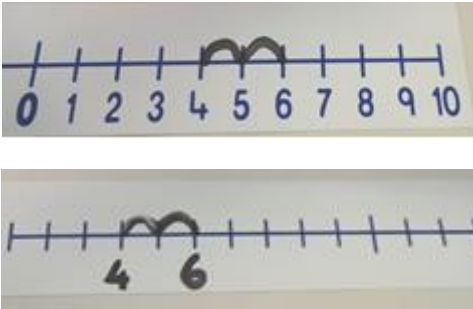


Missing digit problems:

| 10s      | 1s |
|----------|----|
| 10 10    | 1  |
| 10 10 10 | ?  |
| ?        | 5  |

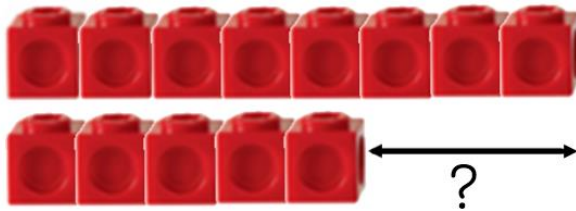
# Calculation policy: Subtraction

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

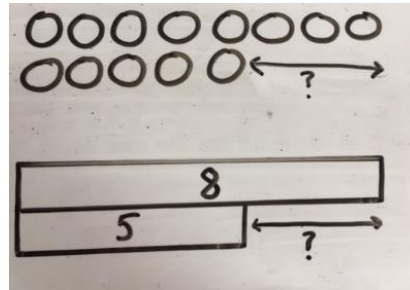
| Concrete                                                                                                                                                                                                                                                     | Pictorial                                                                                                                                                                                                          | 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><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> <math>= 4 - 3</math></p> <table border="1" data-bbox="1646 550 1960 630"><tr><td colspan="2">4</td></tr><tr><td>3</td><td>?</td></tr></table>  | 4 |  | 3 | ? |
| 4                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                      |   |  |   |   |
| 3                                                                                                                                                                                                                                                            | ?                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                      |   |  |   |   |
| <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>                                                                                                              |   |  |   |   |

**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.



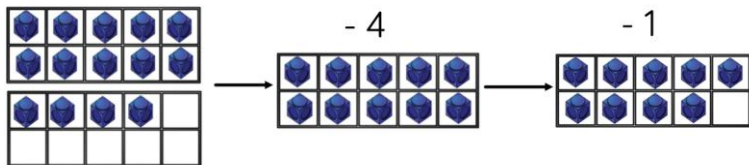
Find the difference between 8 and 5.

8 - 5, the difference is

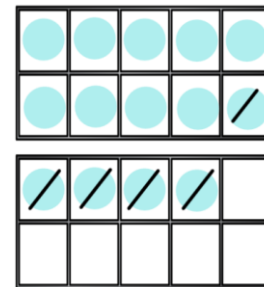
Children to explore why  
 $9 - 6 = 8 - 5 = 7 - 4$  have the same difference.

**Making 10** using ten frames.

14 - 5



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



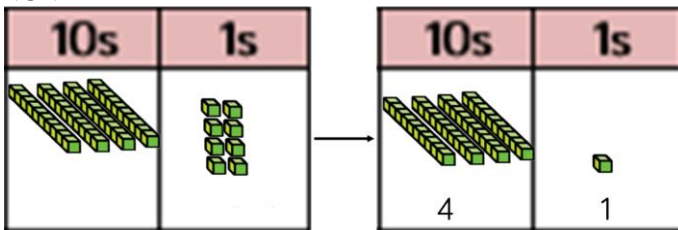
Children to show how they can make 10 by partitioning the subtrahend.

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

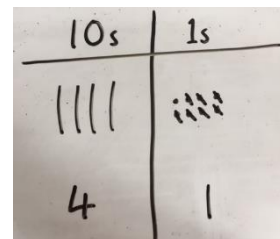
$$\begin{array}{l} 14 - 4 = 10 \\ 10 - 1 = 9 \end{array}$$

**Column method** using base 10.

48 - 7



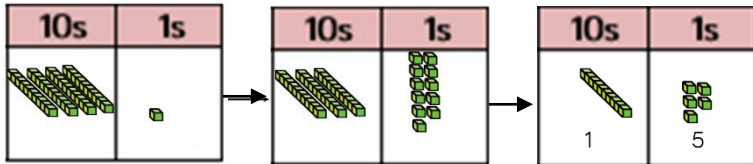
Children to represent the base 10 pictorially.



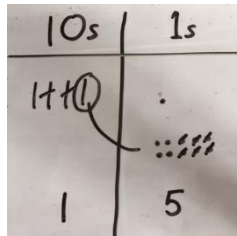
Column method or children could count back 7.

|   |   |   |
|---|---|---|
|   | 4 | 8 |
| - |   | 7 |
|   | 4 | 1 |

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



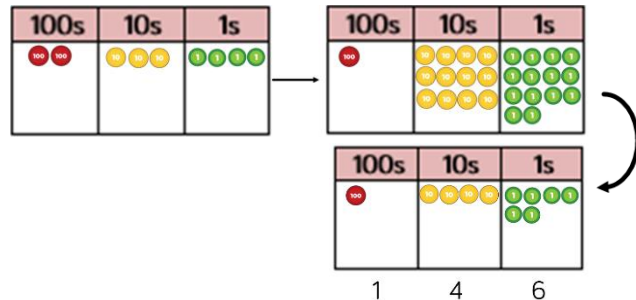
Represent the base 10 pictorially, remembering to show the exchange.



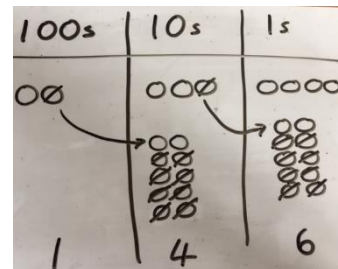
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because  $41 = 30 + 11$ .

$$\begin{array}{r} \text{3} \cancel{4} \text{ } 1 \\ - \quad 2 \quad 6 \\ \hline \quad 1 \quad 5 \end{array}$$

**Column method** using place value counters.  
234 – 88



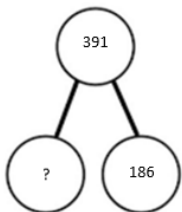
Represent the place value counters pictorially; remembering to show what has been exchanged.



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

$$\begin{array}{r} \text{}^2\text{}^1 2 \cancel{3} 4 \\ - \quad 88 \\ \hline \quad 6 \end{array}$$

## 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.

$$\boxed{\phantom{000}} = 391 - 186$$

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

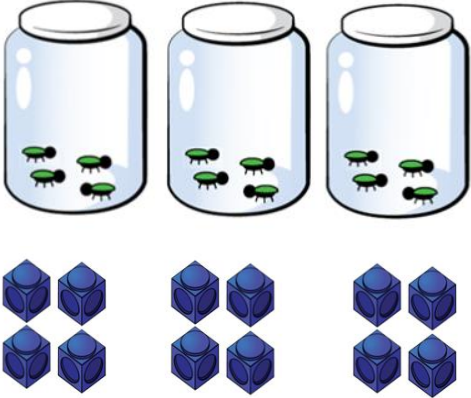
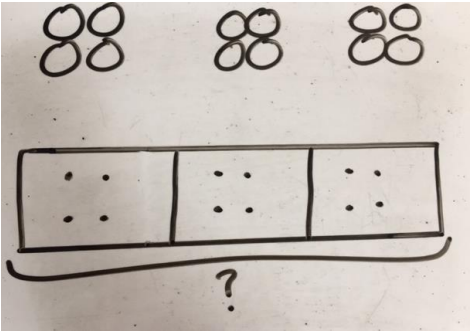
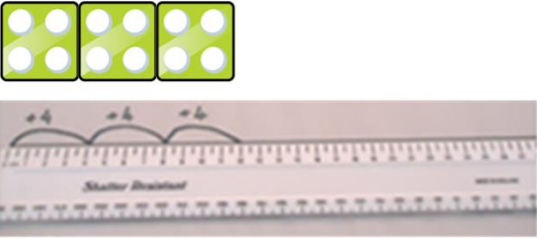
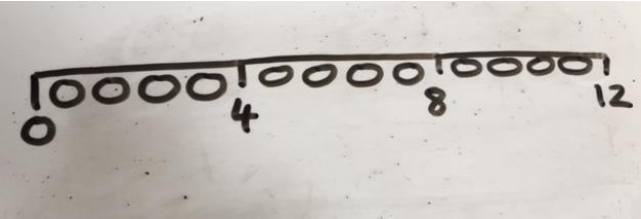
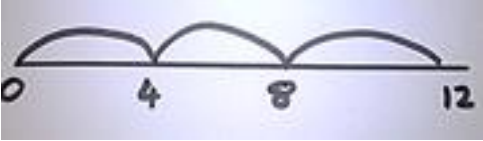
What is 186 less than 391?

Missing digit calculations

$$\begin{array}{r} \quad 3 \quad 9 \quad \boxed{\phantom{0}} \\ - \quad \boxed{\phantom{0}} \quad \boxed{\phantom{0}} \quad 6 \\ \hline \boxed{\phantom{0}} \quad 0 \quad 5 \end{array}$$

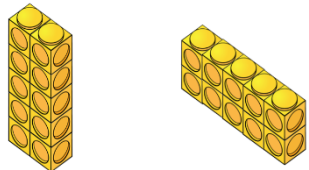
# Calculation policy: Multiplication

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

| Concrete                                                                                                                                                                                                                                                              | Pictorial                                                                                                                                                                 | Abstract                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Repeated grouping/repeated addition</b><br/> <math>3 \times 4</math><br/> <math>4 + 4 + 4</math><br/>                     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><br/> <math>4 + 4 + 4 = 12</math></p>                                                                                                               |
| <p><b>Number lines to show repeated groups-</b><br/> <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>  |

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

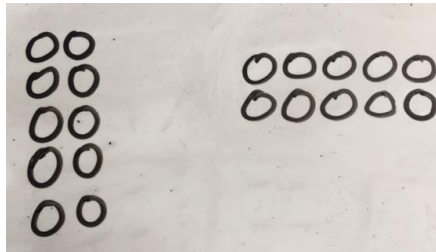
$$2 \times 5 = 5 \times 2$$



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.

$$10 = 2 \times 5$$

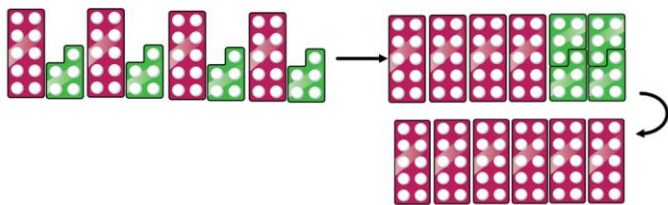
$$5 \times 2 = 10$$

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

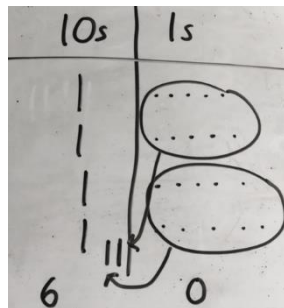
$$10 = 5 + 5$$

**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.

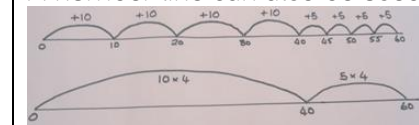
$$\begin{array}{r} 4 \times 15 \\ \swarrow \searrow \\ 10 \quad 5 \end{array}$$

$$10 \times 4 = 40$$

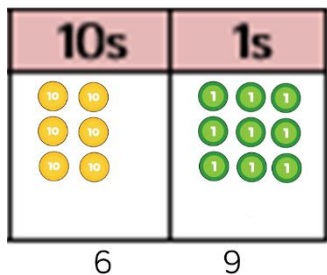
$$5 \times 4 = 20$$

$$40 + 20 = 60$$

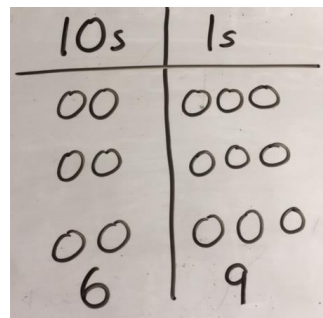
A number line can also be used



**Formal column method** with place value counters (base 10 can also be used.)  $3 \times 23$



Children to represent the counters pictorially.



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

$$3 \times 23$$

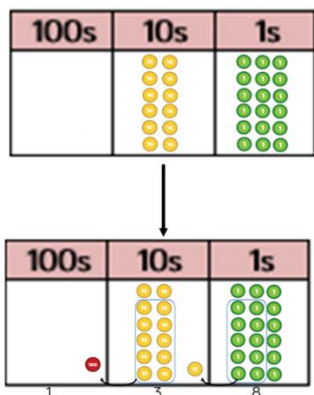
$$3 \times 20 = 60$$

$$3 \times 3 = 9$$

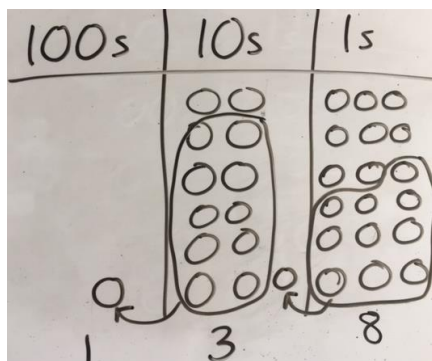
$$60 + 9 = 69$$

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

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



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



Formal written method

$$6 \times 23 =$$

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

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  $6 \times 124$ .  
 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

$$6 \times 23 =$$

$$\square = 6 \times 23$$

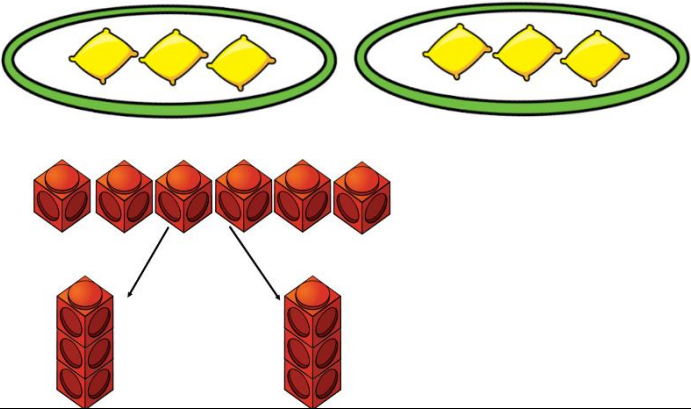
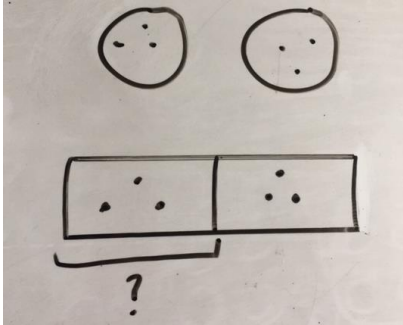
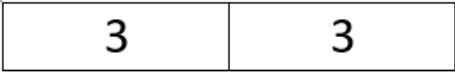
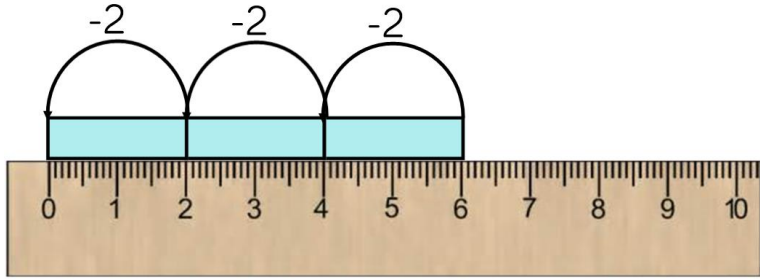
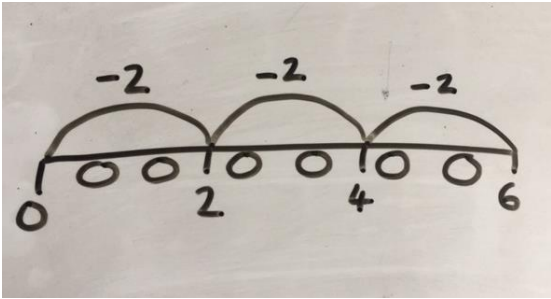
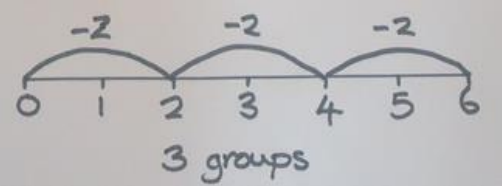
$$\begin{array}{r} 6 \\ \times 23 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ \times 6 \\ \hline \end{array}$$

What is the calculation?  
 What is the product?

| 100s | 10s | 1s |
|------|-----|----|
|      | 20  | 18 |

# Calculation policy: Division

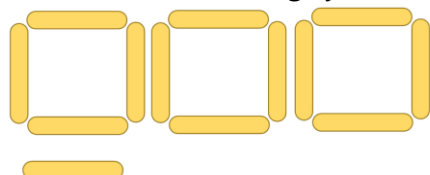
Key language: share, group, divide, divided by, half.

| Concrete                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Pictorial                                                                                                                                                                                                                                                                                                                                                                                                                                 | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Sharing</b> using a range of objects.<br/><math>6 \div 2</math></p>  <p>The diagram shows two green ovals, each containing three yellow diamond-shaped objects. Below these, there are six red cube-shaped objects arranged in a single row. Two arrows point from the first and fourth cubes to two separate vertical stacks of three cubes each, illustrating the division of 6 objects into 2 equal groups of 3.</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, with three dots in each half. A bracket under the first half is labeled with a question mark, indicating the task of representing the division pictorially.</p> | <p><math>6 \div 2 = 3</math></p>  <p>Children should also be encouraged to use their 2 times tables facts.</p>                                                                                                                                                                                                                           |
| <p><b>Repeated subtraction</b> using Cuisenaire rods above a ruler.<br/><math>6 \div 2</math></p>  <p>The diagram shows a wooden ruler with a scale from 0 to 10. Three light blue Cuisenaire rods, each labeled '-2', are placed end-to-end above the ruler, starting from 0 and ending at 6. Below the ruler, the text '3 groups of 2' is written.</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. Small circles are drawn at each integer point on the number 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 text '3 groups' is written below the number line.</p> |

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

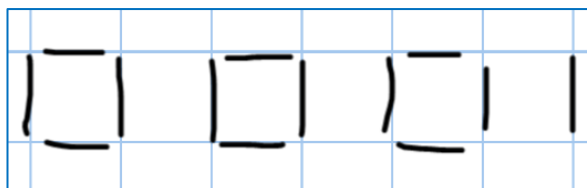
$$13 \div 4$$

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.

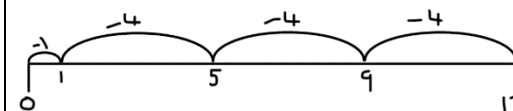


There are 3 whole squares, with 1 left over.

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

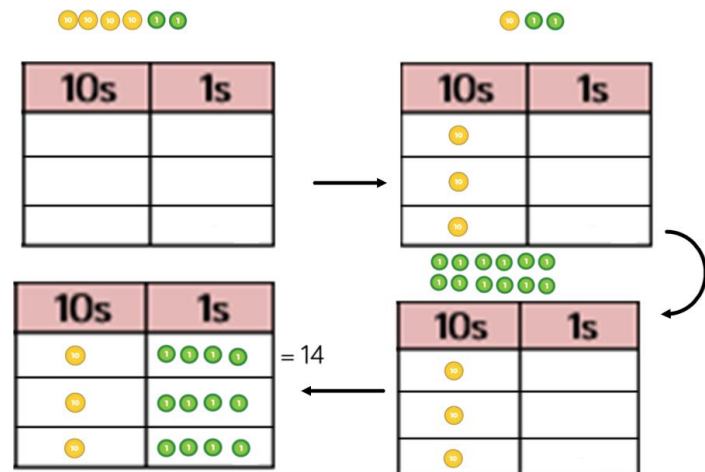
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

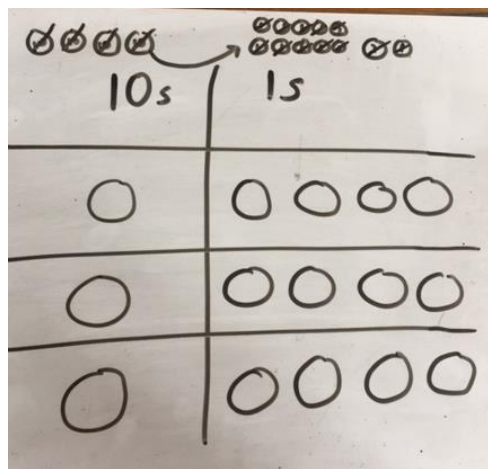


**Sharing using place value counters.**

$$42 \div 3 = 14$$



Children to represent the place value counters pictorially.

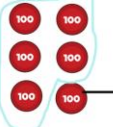
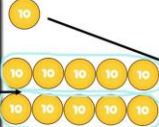
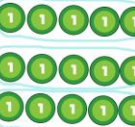


Children to be able to make sense of the place value counters and write calculations to show the process.

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

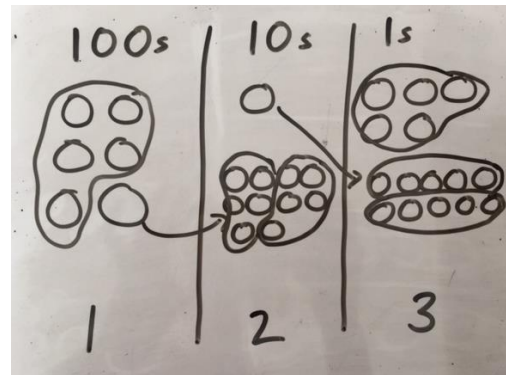
**Short division** using place value counters to group.

$$615 \div 5$$

| 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.

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

**Long division** using place value counters

$$2544 \div 12$$

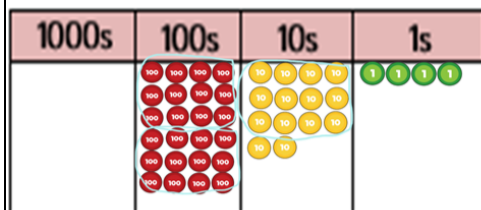
| 1000s                                                                               | 100s                                                                                | 10s                                                                                 | 1s                                                                                  |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |

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

| 1000s | 100s                                                                                | 10s                                                                                 | 1s                                                                                  |
|-------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|       |  |  |  |

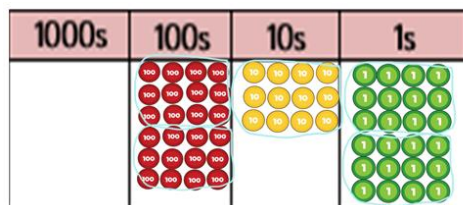
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

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



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

$$\begin{array}{r} 021 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{0} \\ 14 \phantom{0} \\ \underline{12} \phantom{0} \\ 2 \phantom{0} \end{array}$$

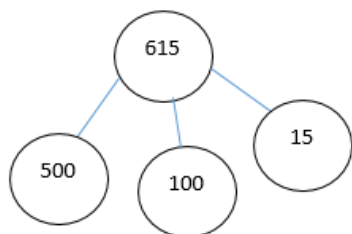


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

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

## 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?

