



HIS Calculation Policy

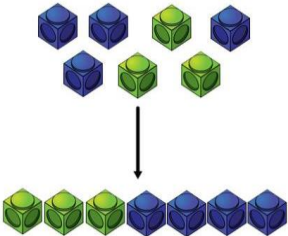
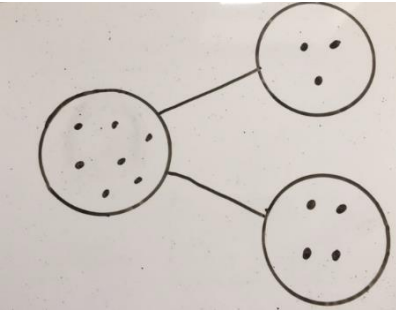
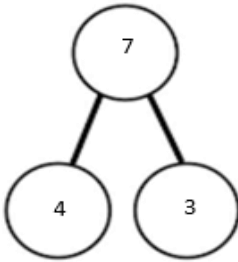
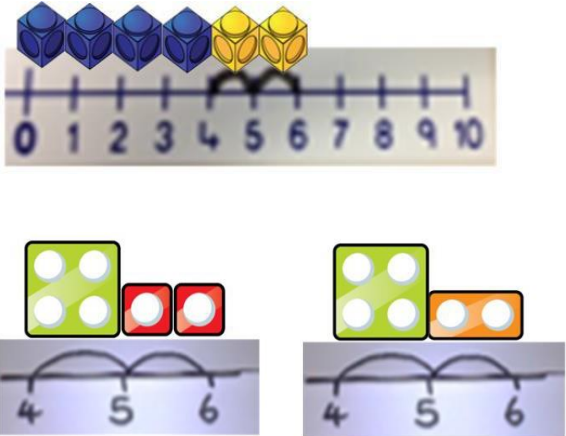
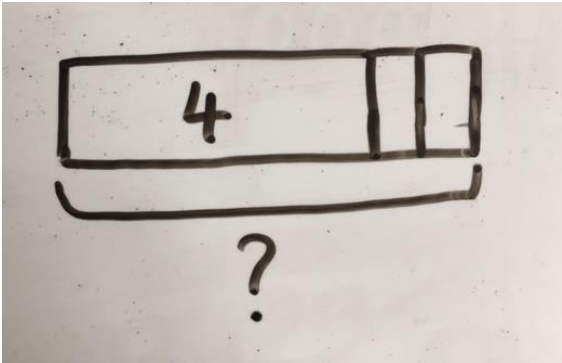



PROGRESSION THROUGH CALCULATION GUIDANCE

This guidance has been developed using the White Rose Calculation Policy: Working Document, which was written as a guide to indicate the progression through addition, subtract, multiplication and division.

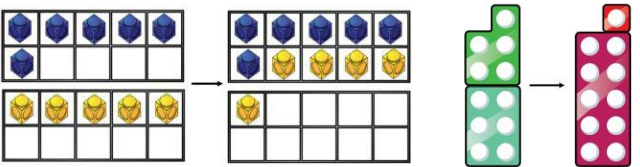
Addition

Key language: sum, total, part, whole, plus, add, altogether, more, equal to, the same as.

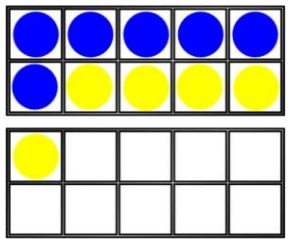
Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too, e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part-whole model too.</p> 	<p>$4 + 3 = 7$ Four is a part, 3 is a part and the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

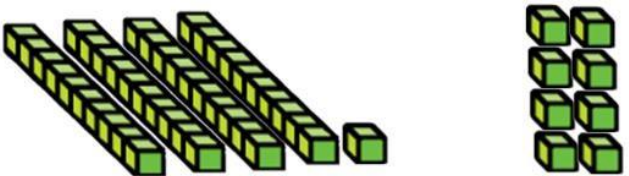


Children to develop an understanding of equality, e.g.

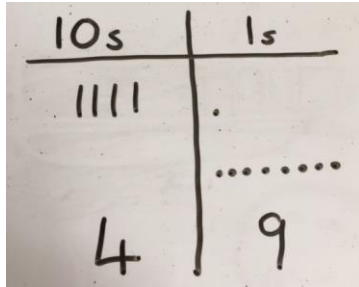
$6 + \square = 11$
 $6 + 5 = 5 + \square$
 $6 + 5 = \square + 4$

TO and O using dienes. Continue to develop understanding of partitioning and place value.

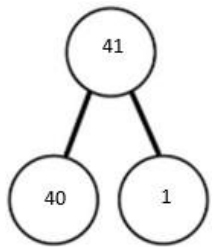
$41 + 8$



Children to represent the dienes, e.g. lines for tens and dot/square for ones.



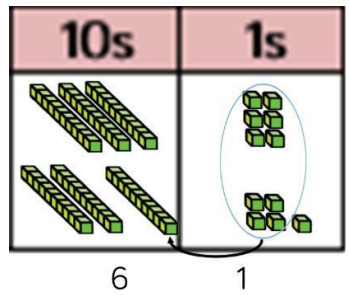
$41 + 8$



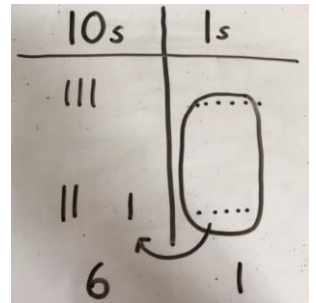
$1 + 8 = 9$
 $40 + 9 = 49$

TO and O using dienes. Continue to develop understanding of partitioning and place value.

$36 + 25$

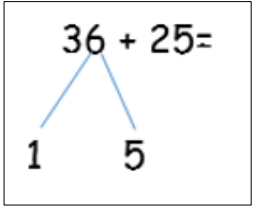


Children to represent the dienes in a place value chart.



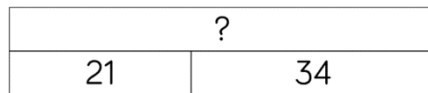
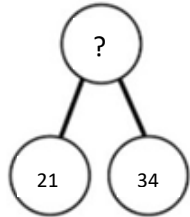
Looking for ways to make tens.

$36 + 25 =$



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

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



Word problems:

In year 1, there are 21 children and in year 2, there are 34 children.

How many children in total?

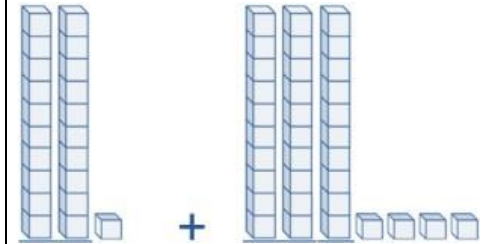
$$21 + 34 = 55$$

Prove it.

$$21 + 34 =$$

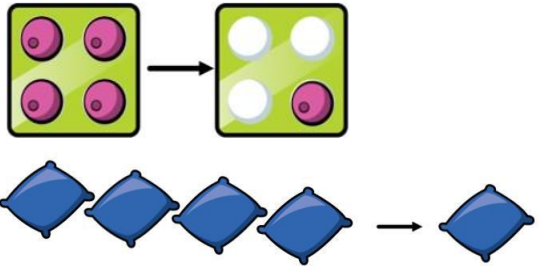
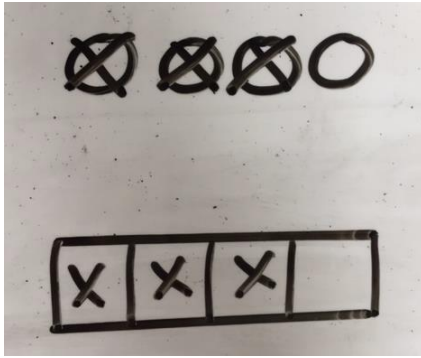
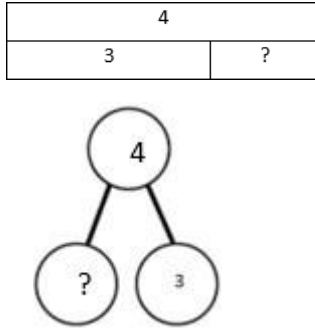
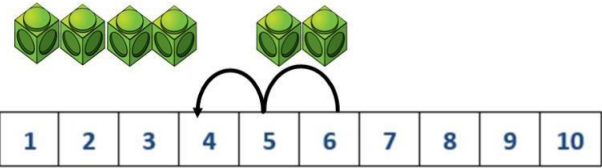
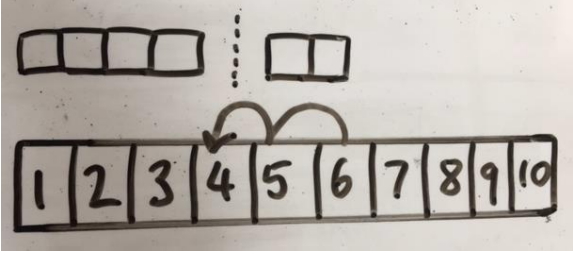
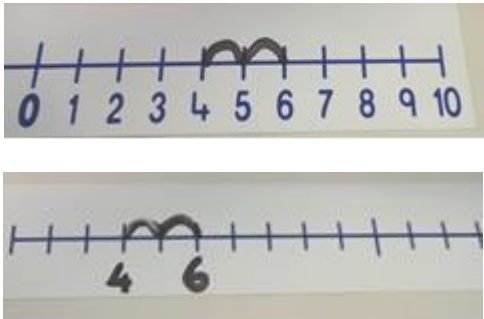
$$\square = 21 + 34$$

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



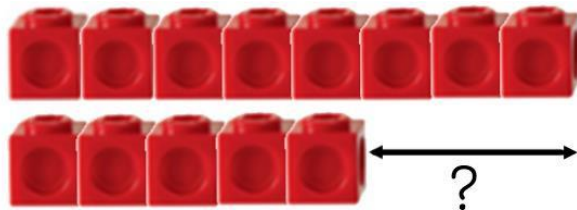
Subtraction

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

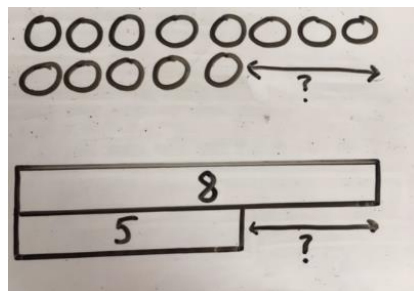
Concrete	Pictorial	Abstract
<p>Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items, such as beanbags could be used).</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also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



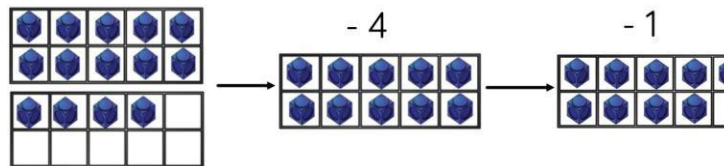
Find the difference between 8 and 5.

$8 - 5$, the difference is

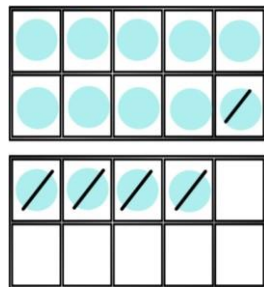
Children to explore why $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.

Making 10 using ten frames.

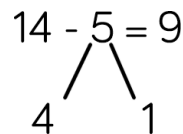
$14 - 5$



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



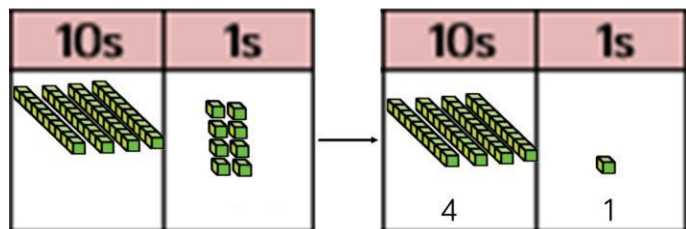
Children to show how they can make 10 by partitioning the subtrahend.



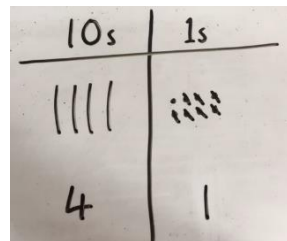
$14 - 4 = 10$
 $10 - 1 = 9$

Subtracting using dienes.

$48 - 7$



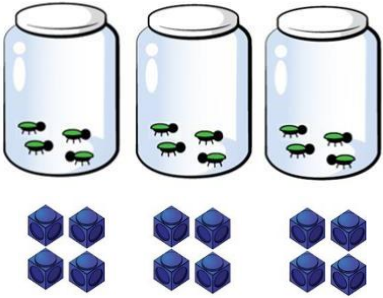
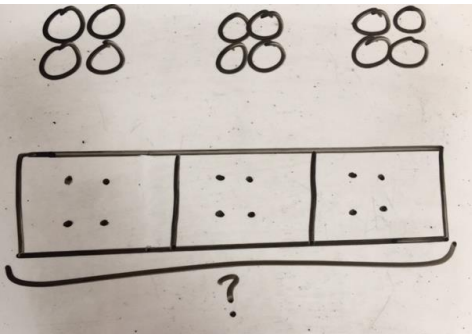

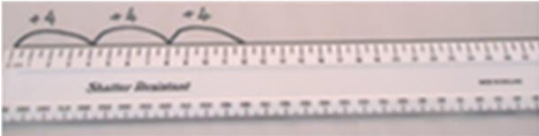
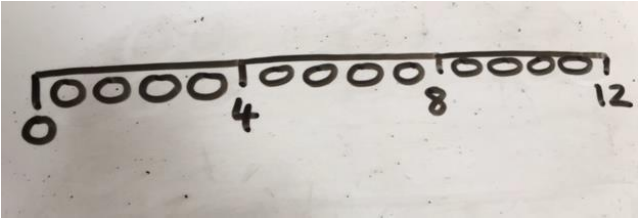
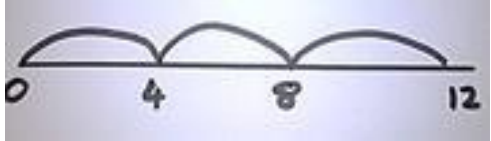
Children to represent the dienes pictorially.



Count back 7.

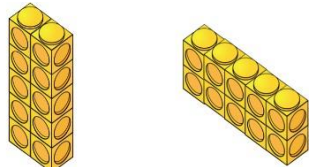
Multiplication

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

Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition.</p> <p>3×4 $4 + 4 + 4$</p> <p>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>$3 \times 4 = 12$</p> <p>$4 + 4 + 4 = 12$</p>
<p>Number lines to show repeated groups.</p> <p>3×4</p>  	<p>Represent this pictorially alongside a number line, e.g.</p> 	<p>Abstract number line showing three jumps of four.</p> <p>$3 \times 4 = 12$</p> 

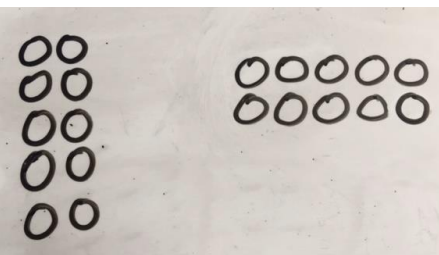
Use arrays to illustrate commutativity counters and other objects can also be used.

$2 \times 5 = 5 \times 2$



2 lots of 5 5 lots of 2

Children to represent the arrays pictorially.

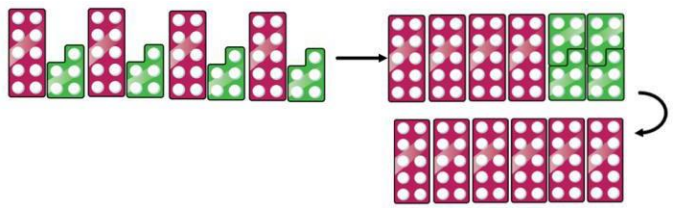


Children to be able to use an array to write a range of calculations, e.g.

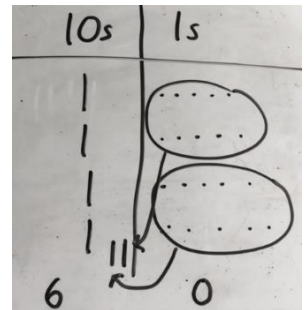
$10 = 2 \times 5$
 $5 \times 2 = 10$
 $2 + 2 + 2 + 2 + 2 = 10$
 $10 = 5 + 5$

Partition to multiply using Numicon, dienes, etc.

4×15



Children to represent the concrete manipulatives pictorially.



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

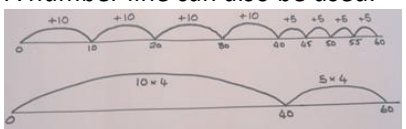
4×15

```

      4 x 15
        / \
       10  5
    
```



$10 \times 4 = 40$
 $5 \times 4 = 20$
 $40 + 20 = 60$

A number line can also be used.

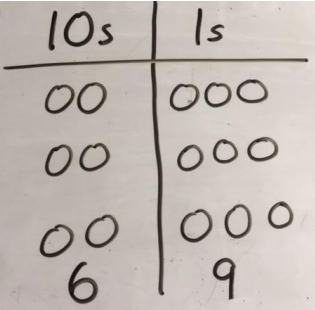


Formal column method with place value counters(dienes can also be used.)

3×23

10s	1s
	
6	9

Children to represent the counters pictorially.



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

3×23

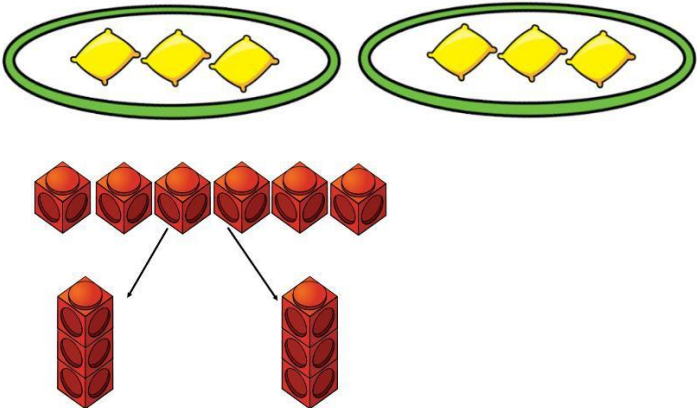
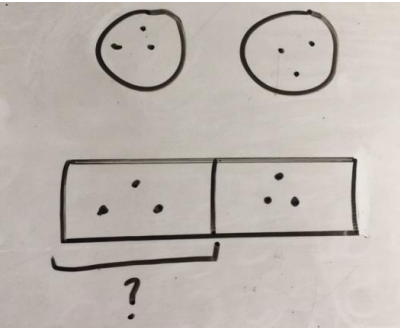
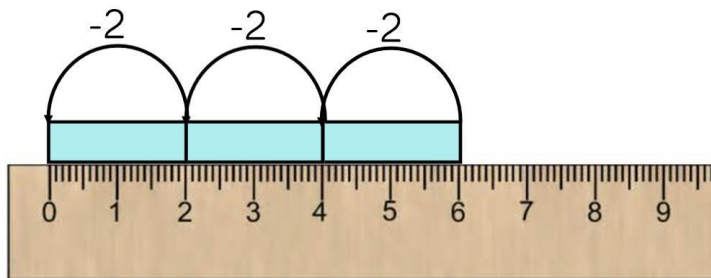
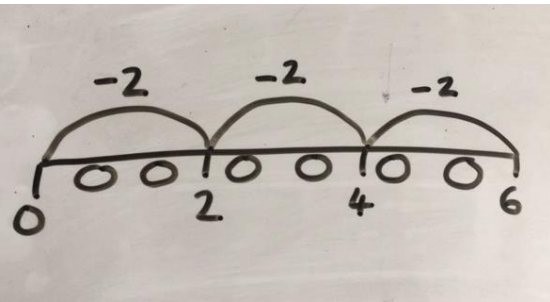
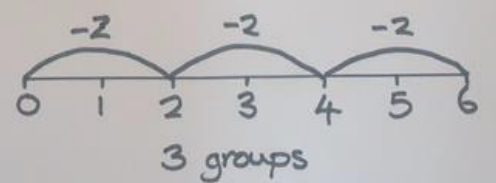
```

      3 x 23
        / \
       20  3
    
```

$3 \times 20 = 60$
 $3 \times 3 = 9$
 $60 + 9 = 69$

Division

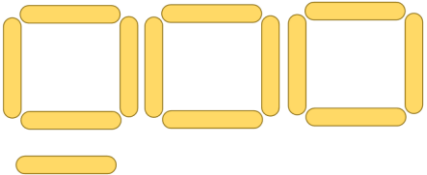
Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract		
<p>Sharing using a range of objects. $6 \div 2$</p> 	<p>Represent the sharing pictorially.</p> 	<p>$6 \div 2 = 3$</p> <table border="1" data-bbox="1556 475 2004 545"> <tr> <td>3</td> <td>3</td> </tr> </table> <p>Children should also be encouraged to use their 2 times table facts.</p>	3	3
3	3			
<p>Repeated subtraction using Cuisenaire rods above a ruler.</p> <p>$6 \div 2$</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> 		

Division 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.



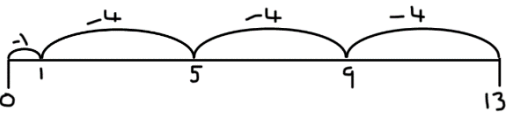
There are 4 whole squares with 1 left over.

Children to represent the lollipop sticks pictorially.

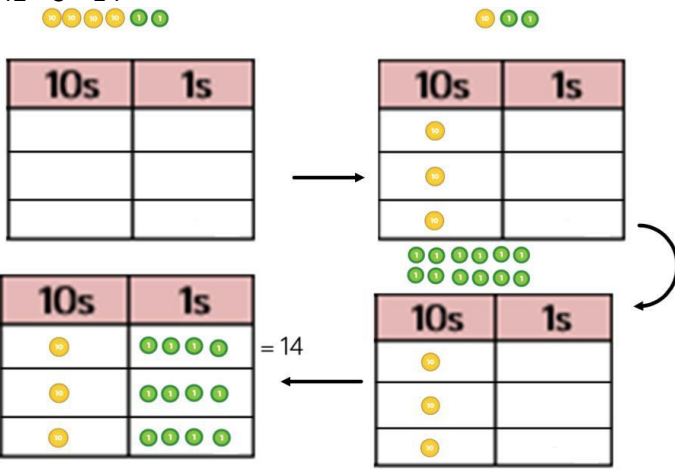
$13 \div 4 = 3$ remainder 1

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

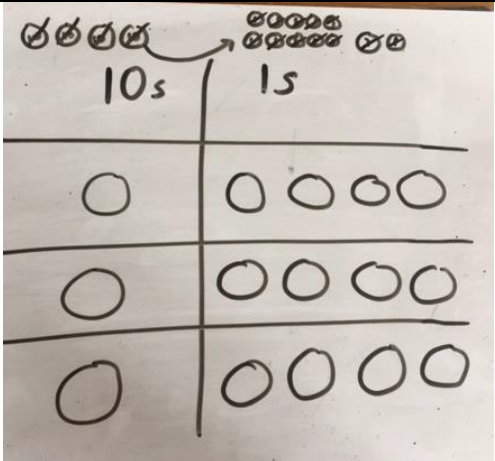
3 groups of 4 with 1 left over



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.

$42 \div 3$
 $42 = 30 + 12$
 $30 \div 3 = 10$
 $12 \div 3 = 4$
 $10 + 4 = 14$