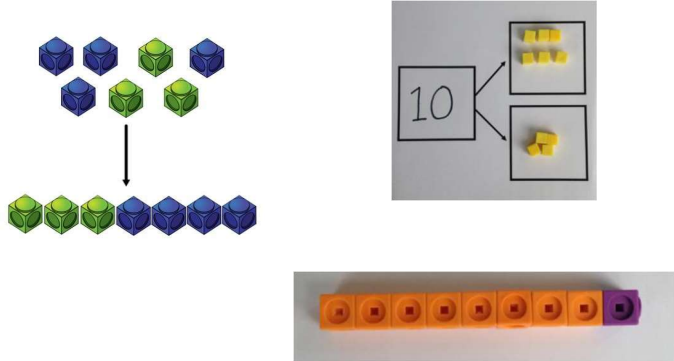
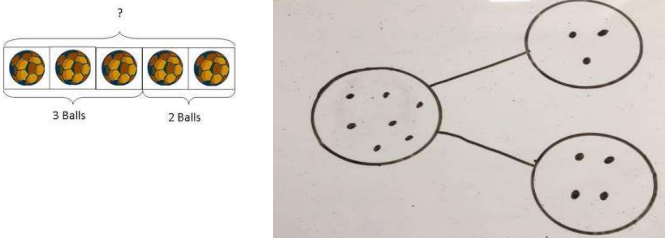
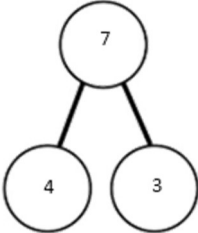
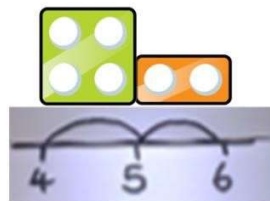
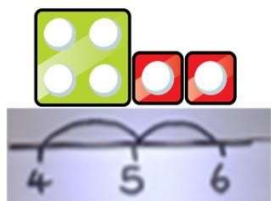
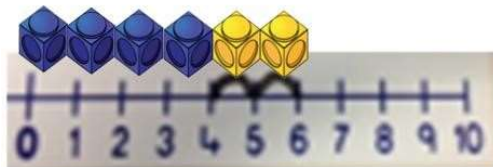


Calculation policy: Addition

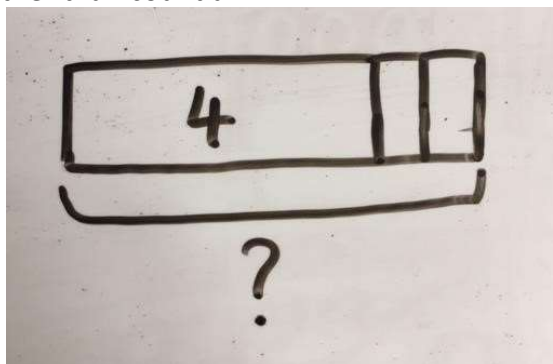
Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Concrete	Pictorial	Abstract
<p data-bbox="94 456 741 523">Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p>  <p>The concrete representation shows two groups of cubes (blue and green) being combined into a single row of ten cubes. To the right, a ten-frame labeled '10' is shown with two boxes containing yellow cubes, representing the parts being added. Below this, a row of ten orange cubes is shown, representing the whole.</p>	<p data-bbox="853 456 1547 523">Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p>  <p>The pictorial representation shows two groups of balls (orange and yellow) being combined into a single row of five balls. To the right, a part-whole model is shown with a large circle containing four dots and a smaller circle containing two dots, representing the parts being added.</p>	<p data-bbox="1626 456 2051 560">$4 + 3 = 7$ Four is a part, 3 is a part and the whole is seven.</p>  <p>The abstract representation shows a part-whole model with a large circle containing the number 7 and two smaller circles containing the numbers 4 and 3, representing the parts being added.</p>

Counting on using number lines using cubes or Numicon.



A bar model which encourages the children to count on, rather than count all.



The abstract number line:

What is 2 more than 4?

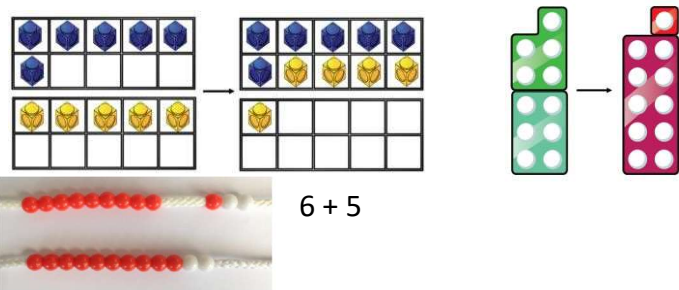
What is the sum of 2 and 4?

What is the total of 4 and 2?

$4 + 2$

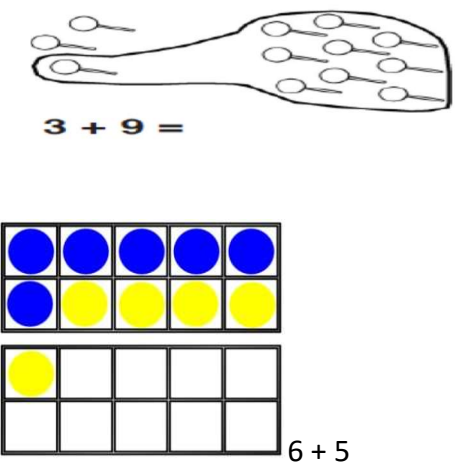


Regrouping to make 10; using ten frames and counters/cubes or using Numicon.

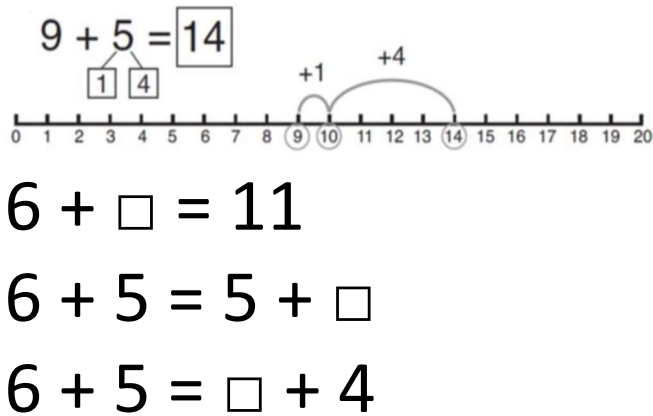


$6 + 5$

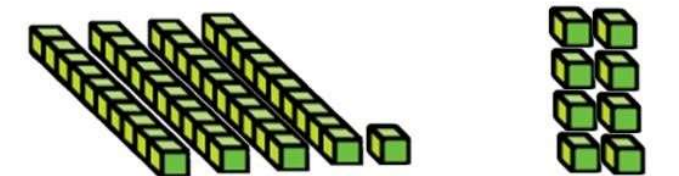
Children to draw the ten frame and counters/cubes.



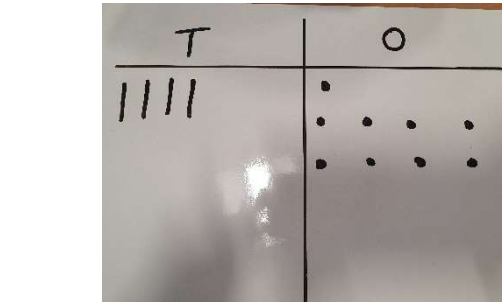
Children to develop an understanding of equality e.g.



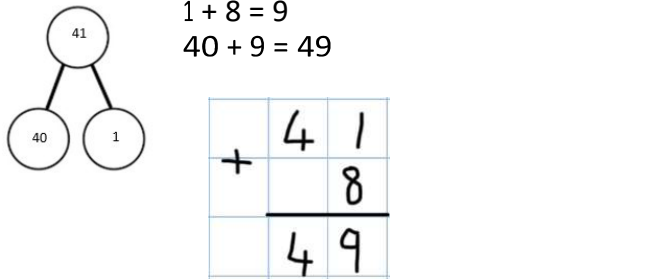
TO + **O** using base 10. Continue to develop understanding of partitioning and place value.
 $41 + 8$



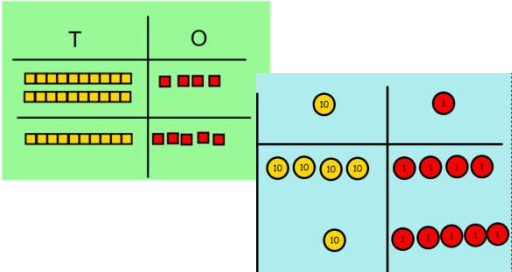
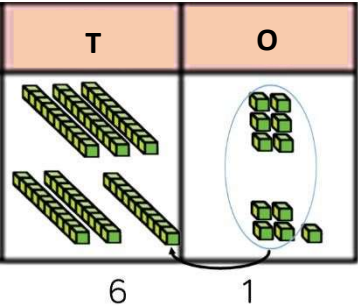
Children to represent the base 10 as lines for tens and dots for ones.



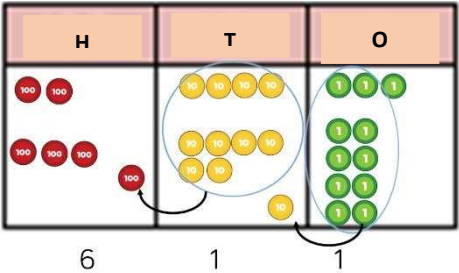
$41 + 8$



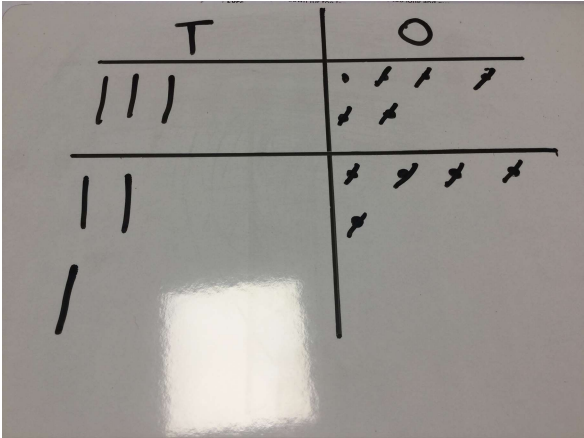
TO + TO using base 10. Continue to develop understanding of partitioning and place value.
 $36 + 25$



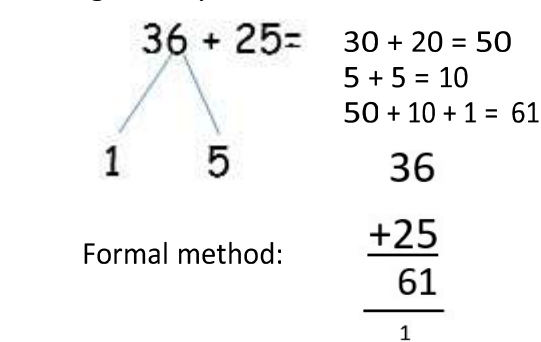
Use of place value counters to add **HTO + TO, HTO + HTO** etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.



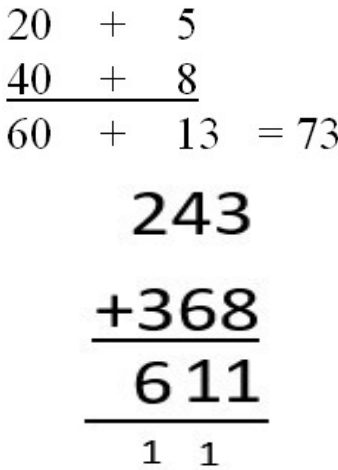
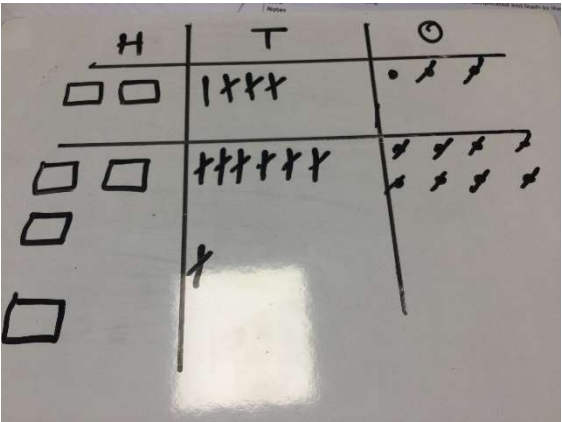
Children to represent the base 10 in a place value chart.



Looking for ways to make 10.



Children to represent the counters in a place value chart.



4628 + 2534 = 7162

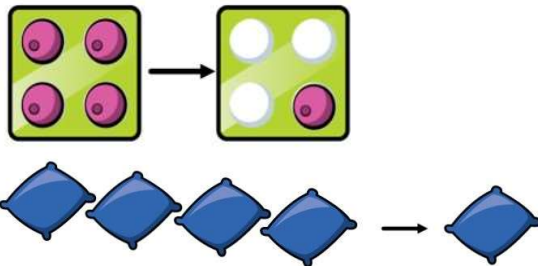
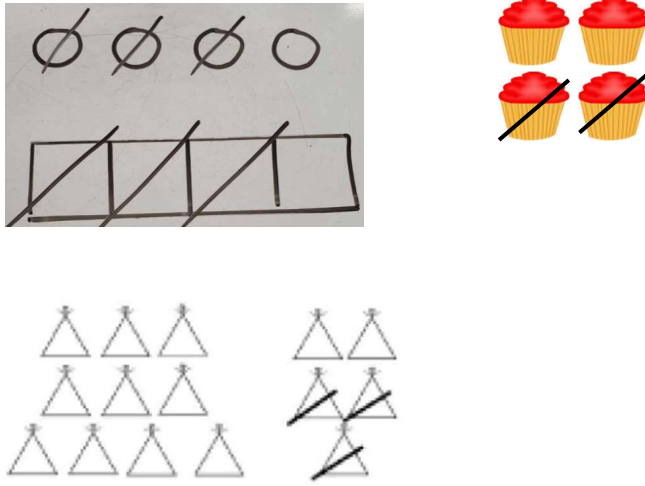

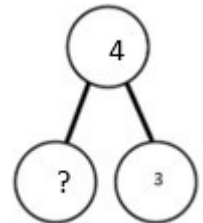
670

Th	H	T	O
TT	□□□		..
TT	□□□		..
TT	□□)))	..
TT	□□)))	..
T	□		

	4	6	2	8
+	2	5	3	4
	7	1	6	2
	1		1	

Calculation policy: Subtraction

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

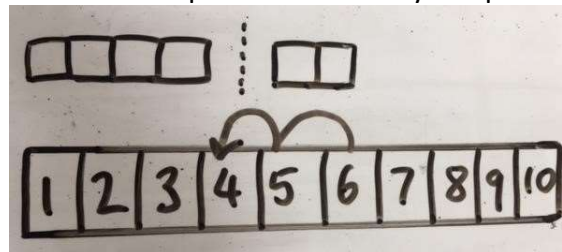
Concrete	Pictorial	Abstract				
<p>Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.</p>  <p>$15 - 3 = 12$</p>	<p>$4 - 3 =$</p> <p> $= 4 - 3$</p> <table data-bbox="1644 477 1957 557"><tr><td colspan="2">4</td></tr><tr><td>3</td><td>?</td></tr></table>  <p>$18 - 3 = 15$</p> <p>$8 - 2 = 6$</p>	4		3	?
4						
3	?					

Counting back (using number lines or number tracks) children start with 6 and count back 2.

$$6 - 2 = 4$$



Children to represent what they see pictorially e.g.

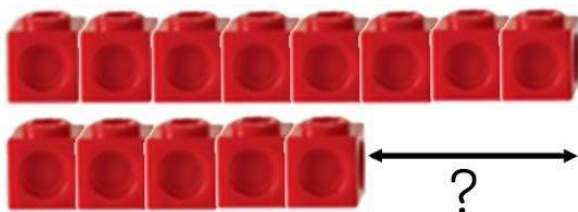


Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line

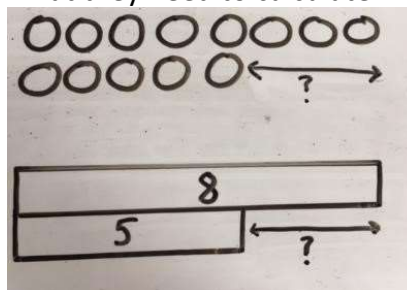


Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used).

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.

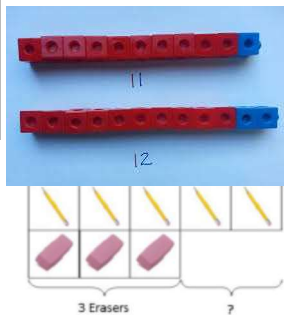


Find the difference between 8 and 5.

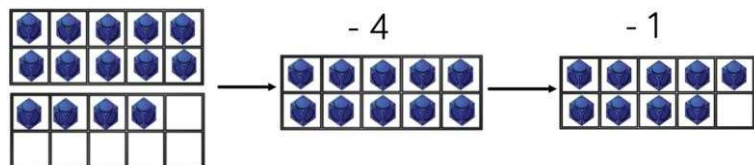
8 - 5, the difference is



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

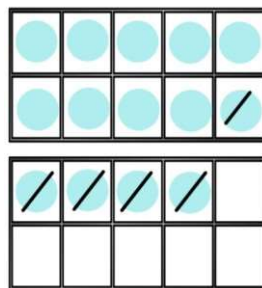


Making 10 using ten frames.



$$14 - 5$$

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.

$$14 - 5 = 9$$

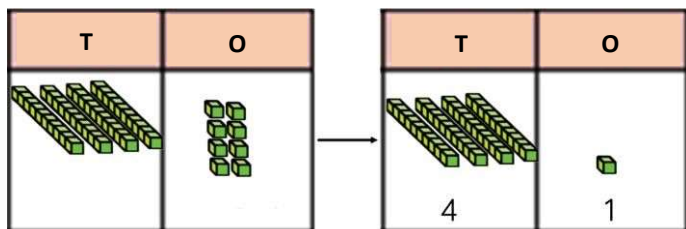
$$\begin{array}{c} 5 \\ / \quad \backslash \\ 4 \quad 1 \end{array}$$

$$14 - 4 = 10$$

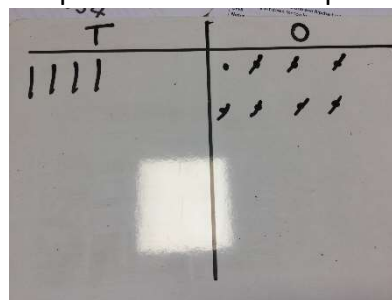
$$10 - 1 = 9$$

Column method using base 10.

$$48 - 7$$



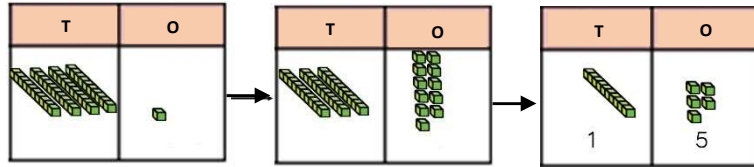
Children to represent the base 10 pictorially.



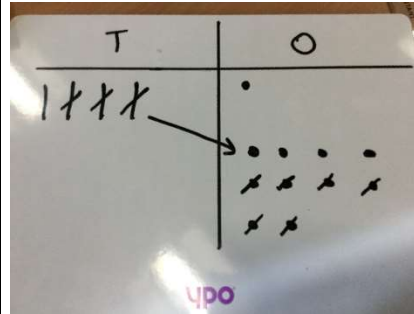
Column method or children could count back 7.

	4	8
-		7
	4	1

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



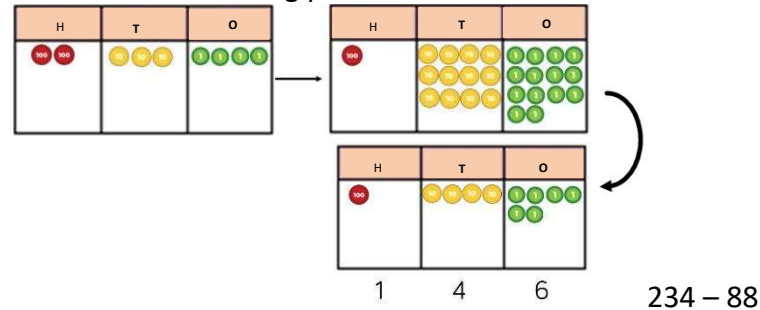
Represent the base 10 pictorially. Children do not need to use the arrow to show exchanging but it may help to begin with.



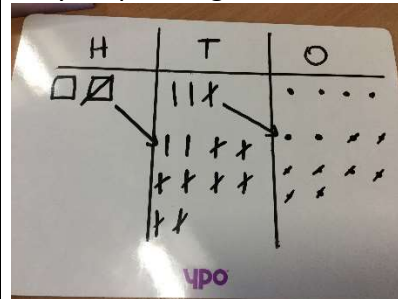
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because $41 = 30 + 11$.

	³ 4	¹ 1
-	2	6
	1	5

Column method using place value counters.



Represent the place value counters pictorially. Children do not need to use the arrow to show exchanging but it may help to begin with.

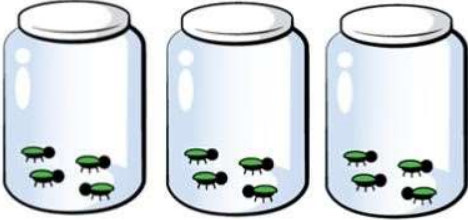
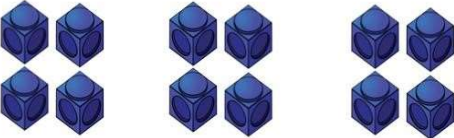
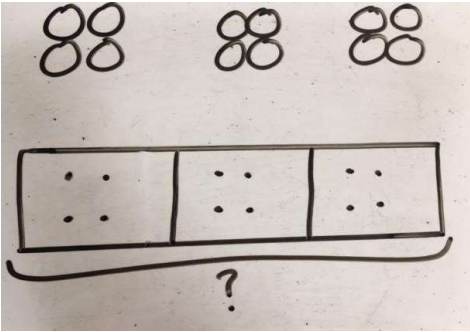


Formal column method. Children must understand what has happened when they have crossed out digits.

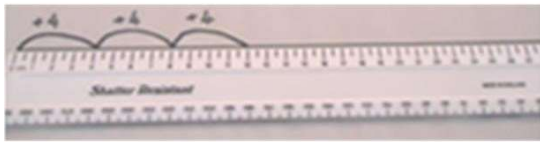
	² 2	¹ 3	4
-		8	8
			6

Calculation policy: Multiplication

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

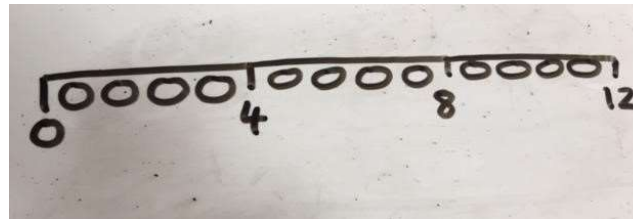
Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition 3×4 $4 + 4 + 4$</p> <p>There are 3 equal groups, with 4 in each group.</p>  	<p>Children to represent the practical resources in a picture and use a bar model.</p> 	<p>$3 \times 4 = 12$</p> <p>$4 + 4 + 4 = 12$</p>

Number lines to show repeated groups-



$$3 \times 4$$

Represent this pictorially alongside a number line
e.g.:



Abstract number line showing three jumps of four.

$$3 \times 4 = 12$$

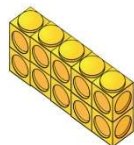


Use arrays to illustrate commutativity counters and other objects can also be used.

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

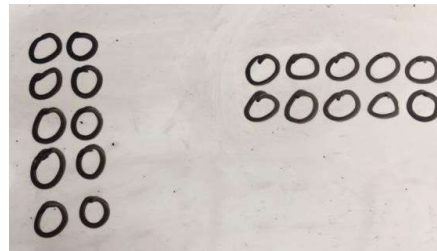


2 lots of 5



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.

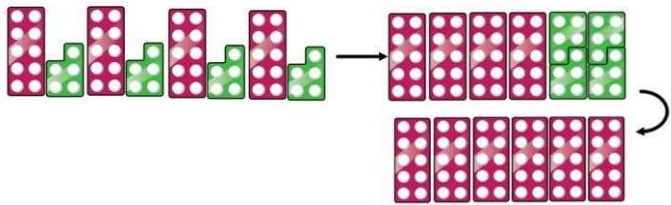
$$10 = 2 \times 5$$

$$5 \times 2 = 10$$

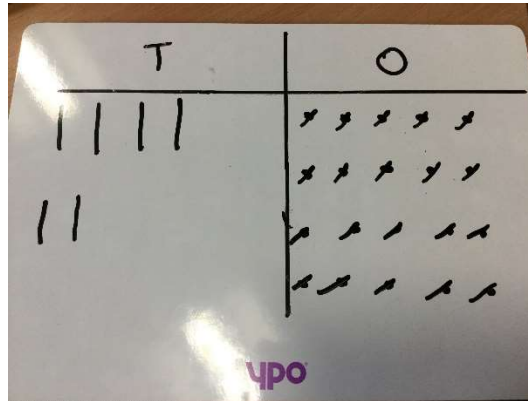
$$2 + 2 + 2 + 2 + 2 = 10$$

$$10 = 5 + 5$$

Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4×15



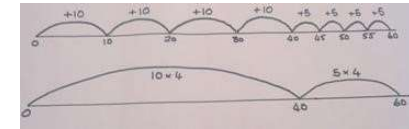
Children to represent the concrete manipulatives pictorially.



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

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

$$\begin{array}{l} 10 \times 4 = 40 \\ 5 \times 4 = 20 \\ 40 + 20 = 60 \end{array}$$

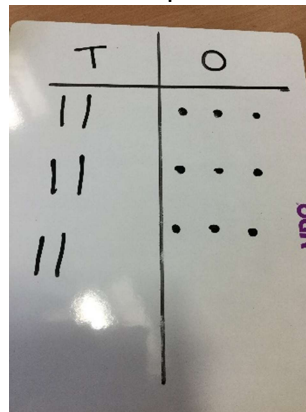


A number line can also be used

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

T	O
6	9

Children to represent the counters pictorially.



Children to record what it is they are doing to show understanding. 3×23
 $3 \times 20 = 60$





20 3




$$\begin{array}{l} 3 \times 3 = 9 \\ 60 + 9 = 69 \end{array}$$

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

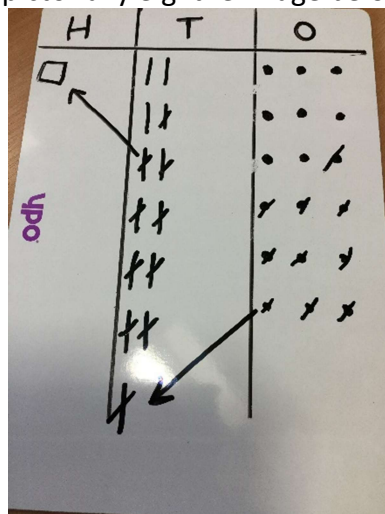
Formal column method with place value counters. 6×23

H	T	O
		



H	T	O
		

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 6×124 .

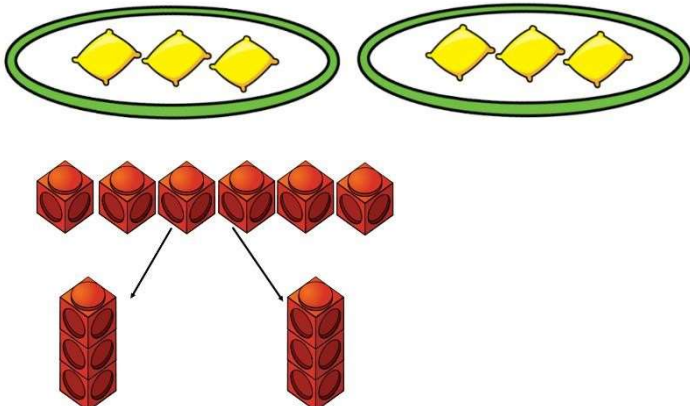
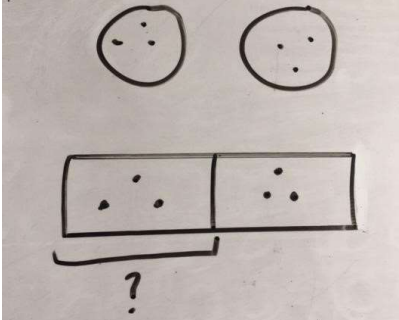
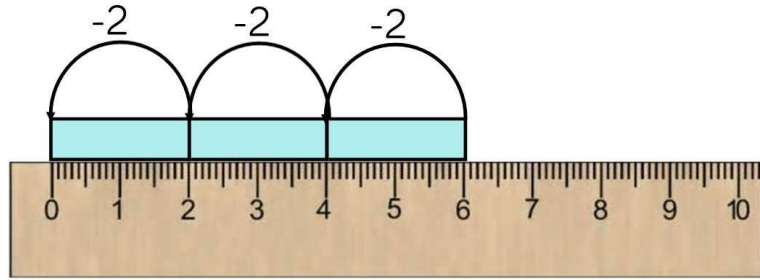
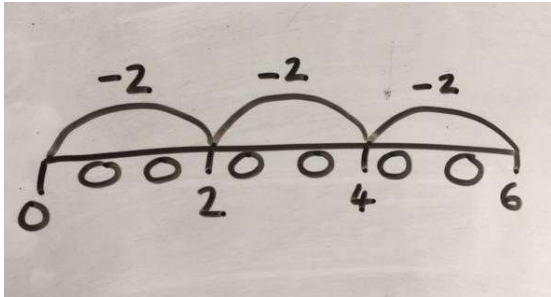
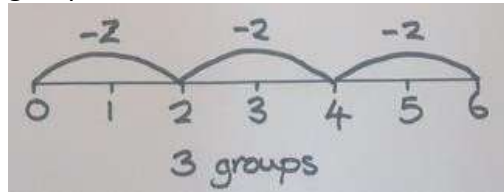
To get 2480 they have solved 20×124 .

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

Answer: 3224

Calculation policy: Division

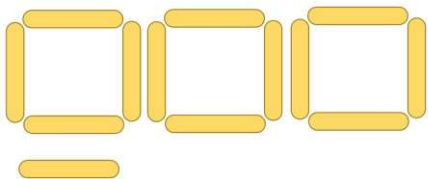
Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract		
<p>Sharing using a range of objects. $6 \div 2$</p>  <p>The image 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 fourth cubes to two separate stacks of two cubes each, illustrating the division of six items into two groups of three.</p>	<p>Represent the sharing pictorially.</p>  <p>The image 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, suggesting a problem to be solved.</p>	<p>$6 \div 2 = 3$</p> <table border="1" data-bbox="1552 434 2007 502"><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 image shows a wooden ruler with markings 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 image shows a hand-drawn number line from 0 to 6. Three circles are drawn at each integer mark. Three arcs, each labeled '-2', connect the points 0 to 2, 2 to 4, and 4 to 6, illustrating the process of repeated subtraction.</p>	<p>Abstract number line to represent the equal groups that have been subtracted.</p>  <p>The image shows a hand-drawn number line from 0 to 6. Three arcs, each labeled '-2', connect the points 0 to 2, 2 to 4, and 4 to 6. Below the number line, the text '3 groups' is written.</p>		

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

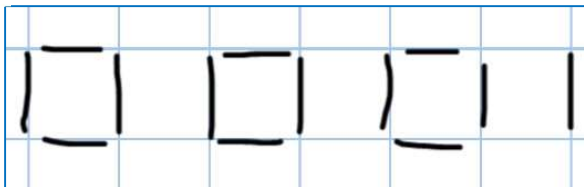
$$13 \div 4$$

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.

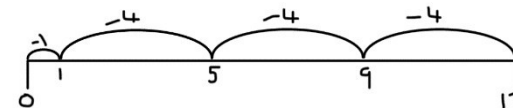


There are 3 whole squares, with 1 left over.

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

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.

$$42 \div 3 = 14$$



T	O

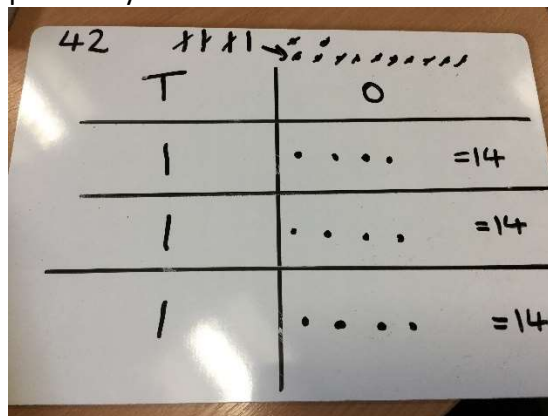
T	O
●	
●	
●	

T	O
●	●●●●
●	●●●●
●	●●●●

= 14

T	O
●	
●	
●	

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.

$$42 \div 3$$

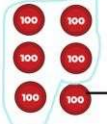
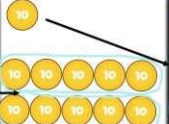

$$42 = 30 + 12$$

$$30 \div 3 = 10$$

$$12 \div 3 = 4$$

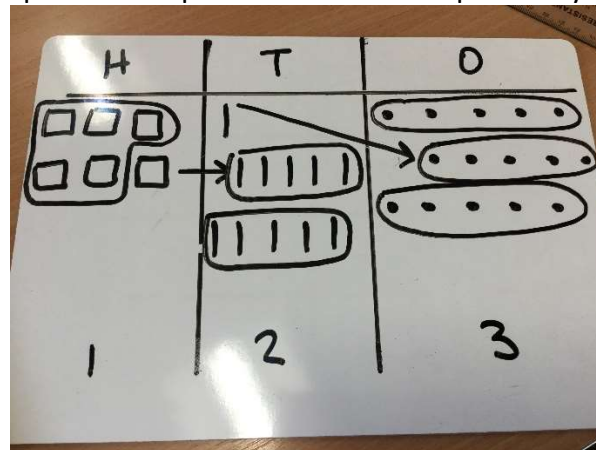
$$10 + 4 = 14$$

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

H	T	O
		
1	2	3

1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?





Represent the place value counters pictorially.






Children to the calculation using the short division scaffold.

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

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




Th	H	T	O
			

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

Th	H	T	O
			




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

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

Th	H	T	O
			

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

$$\begin{array}{r}
 0 \ 2 \ 1 \\
 12 \overline{) 2544} \\
 \underline{24} \\
 14 \\
 \underline{12} \\
 2
 \end{array}$$

Th	H	T	O
			

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

$$\begin{array}{r}
 0 \ 2 \ 1 \ 2 \\
 12 \overline{) 2544} \\
 \underline{24} \\
 14 \\
 \underline{12} \\
 24 \\
 \underline{24} \\
 0
 \end{array}$$