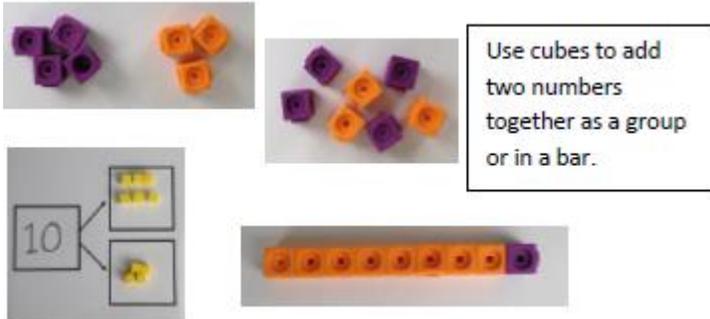
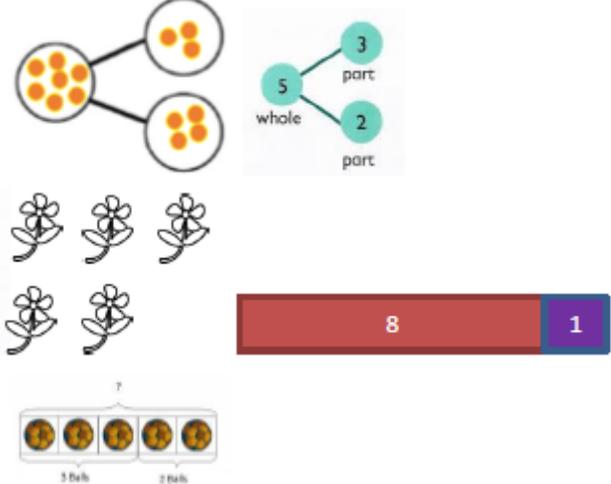
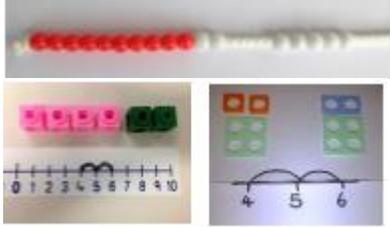
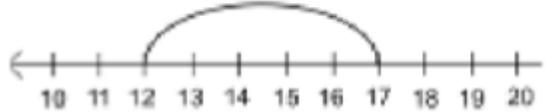
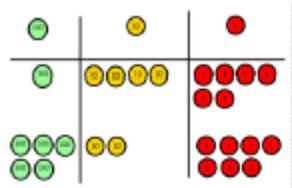


Addition

Objective	Concrete	Pictorial	Abstract				
<p>Combining two parts to make a whole</p>	 <p>Use cubes to add two numbers together as a group or in a bar.</p>		<p>$4 + 3 = 7$</p> <p>Four is a part, three is a part and the whole is seven.</p> <p>Addend + addend = sum</p> <p>$7 = 4 + 3$</p>				
<p>Counting on from the biggest number</p>		<p>$12 + 5 = 17$</p>  <table border="1" data-bbox="1064 957 1384 1082"> <tr> <td>4</td> <td>?</td> </tr> <tr> <td colspan="2">6</td> </tr> </table>	4	?	6		<p>$12 + 5 = 17$</p> <p>$17 = 12 + 5$</p> <p>$4 + 2 = 6$</p> <p>$6 = 4 + 2$</p>
4	?						
6							

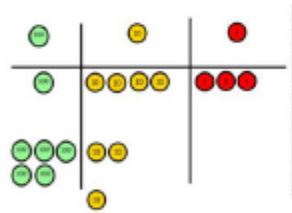
Column addition
- with regrouping
(Year 2+)

Make both numbers on a place value grid.



$$\begin{array}{r} 146 \\ + 527 \\ \hline \end{array}$$

Add up the ones and exchange 10 ones for one 10.

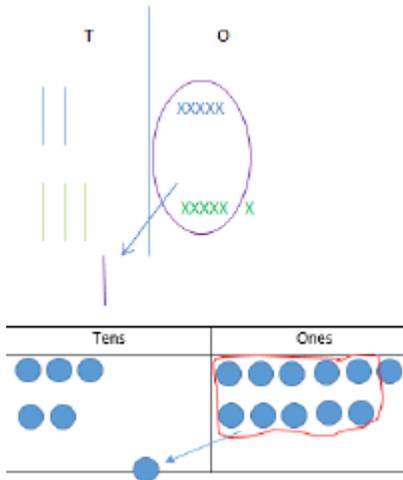
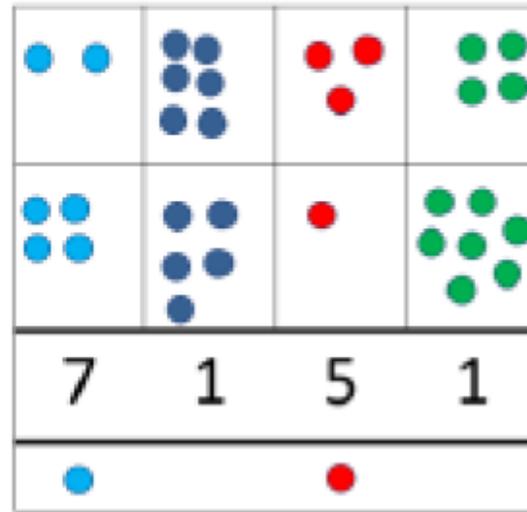


$$\begin{array}{r} 146 \\ + 527 \\ \hline \end{array}$$

Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.

This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.

Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.



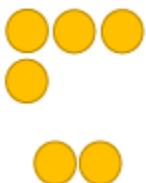
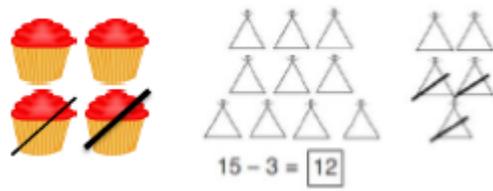
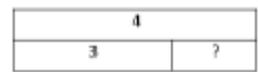
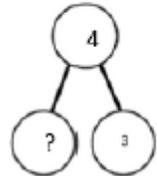
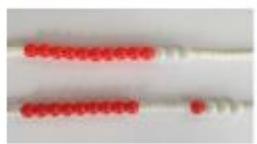
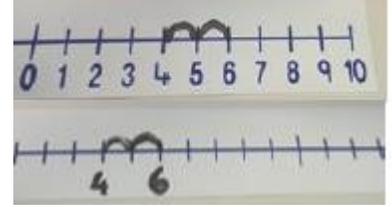
Looking for ways to make 10

$$\begin{array}{r} 36 + 25 = \\ \swarrow \quad \searrow \\ 1 \quad 5 \end{array} \quad \begin{array}{l} 30 + 20 = 50 \\ 5 + 5 = 10 \\ 50 + 10 + 1 = 61 \end{array}$$

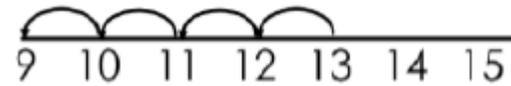
$$\begin{array}{r} 20 + 5 \\ 40 + 8 \\ 60 + 13 = 73 \end{array}$$

$$\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$$

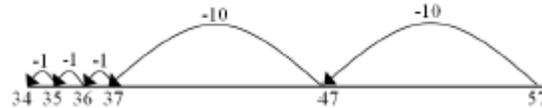
Subtraction

Objective	Concrete	Pictorial	Abstract
<p><i>Taking away ones</i></p>	<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  <p>$6 - 2 = 4$</p>	<p>Cross out drawn objects to show what has been taken away.</p>  <p>$15 - 3 = 12$</p> <hr/> <p>Children to draw the concrete resources they are using and cross out.</p>  <p>Use of the bar model:</p>   	<p>$4 - 3 =$</p> <p><input type="text"/> = $4 - 3$</p>
<p><i>Counting back</i></p>	<p>Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.</p> <p>$13 - 4$</p> 		 <p>Six subtract four is two.</p>

Count back on a number line or number track



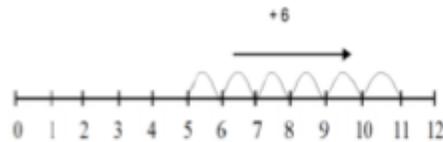
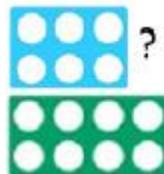
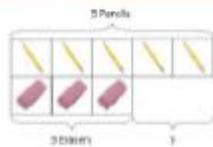
Start at the bigger number and count back the smaller number showing the jumps on the number line.



This can progress all the way to counting back using two 2 digit numbers.

Minuend – subtrahend = difference

Find the difference

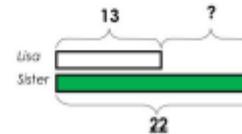


Count on to find the difference.

Comparison Bar Models

Draw bars to find the difference between 2 numbers.

Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.



Children to draw the cubes/other concrete objects which they have used

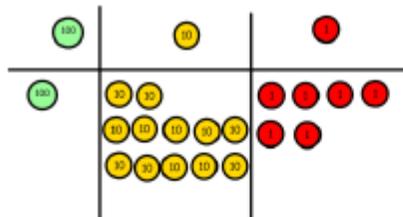
XXXXXXXXXX
XXXXXX

Use of the bar model



The difference between 8 and 6 is 2.

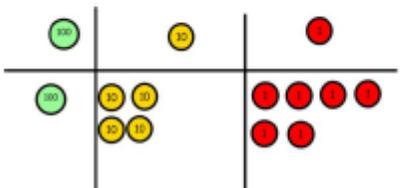
Children to also explore why $9 - 7 = 8 - 6$ (the difference of each digit has changed by 1).



Calculations

$$\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$$

Now I can take away eight tens and complete my subtraction

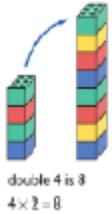
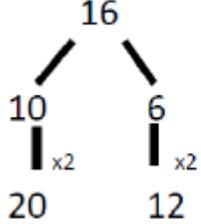
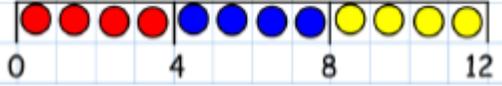
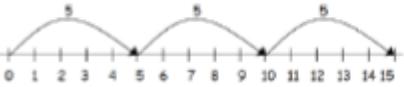
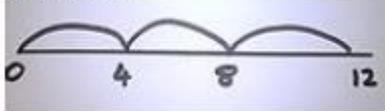


Calculations

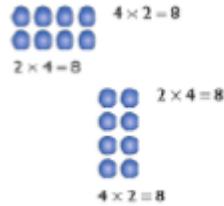
$$\begin{array}{r} 234 \\ - 88 \\ \hline 146 \end{array}$$

Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

Multiplication

Objective	Concrete	Pictorial	Abstract
Doubling	 <p>double 4 is 8 $4 \times 2 = 8$</p>	<p>Draw pictures to show how to double a number.</p> <p style="text-align: center;">Double 4 is 8</p> 	<p style="text-align: right;">Partition a number and then double each part before recombining it back together.</p> 
Repeated addition	<p>Repeated grouping/repeated addition (does not have to be restricted to cubes) 3×4 or 3 lots of 4</p>  	<p>Children to represent the practical resources in a picture e.g.</p> <p>XX XX XX XX XX XX</p> <p>Use of a bar model for a more structured method</p>  <p>Represent this pictorially alongside a number line e.g:</p>   <p>$5 + 5 + 5 = 15$</p> <p>There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?</p>  <p style="text-align: center;">2 add 2 add 2 equals 6</p>	<p style="text-align: center;">3×4</p> <p style="text-align: center;">$4 + 4 + 4$</p> <p>Abstract number line $3 \times 4 = 12$</p>  <p style="text-align: center;"><i>Factor x factor = product</i></p>

Arrays
(commutative)



Draw arrays in different rotations to find commutative multiplication sentences.

$$5 + 5 + 5 = 15$$

$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

Grid method
(Year 3+)

Show the link with arrays to first introduce the grid method.

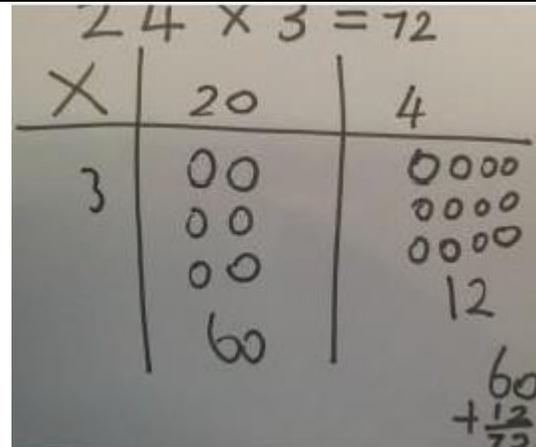
x	10	3
4		

4 rows of 10
4 rows of 3

Move on to using Base 10 to move towards a more compact method.

x	T	U

4 rows of 13



x	30	5
7	210	35

$$210 + 35 = 245$$

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

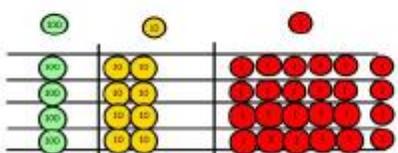
	10	8
10	100	80
3	30	24

Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.



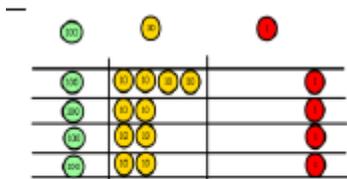
Calculations
 4×126

Fill each row with 126.



Calculations
 4×126

Add up each column, starting with the ones making any exchanges needed.



Then you have your answer.



Column
multiplication
~
(Year 4+)

Make 23, 3 times. See how many ones, then how many tens



Children to represent the counters in a pictorial way



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

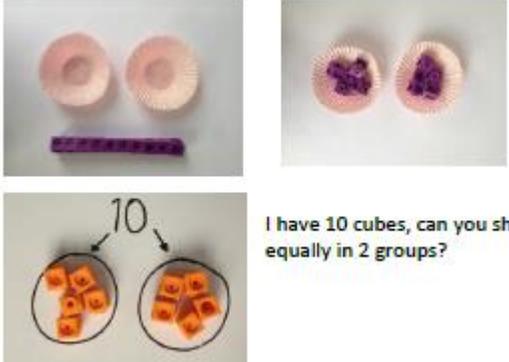
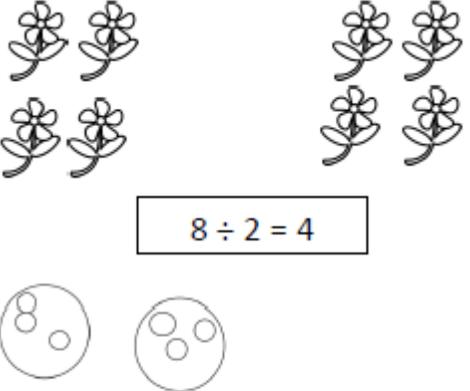
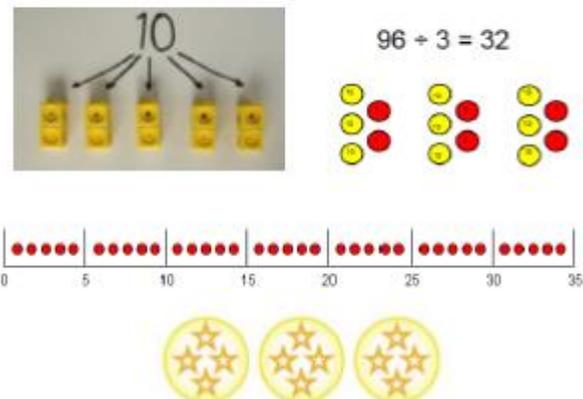
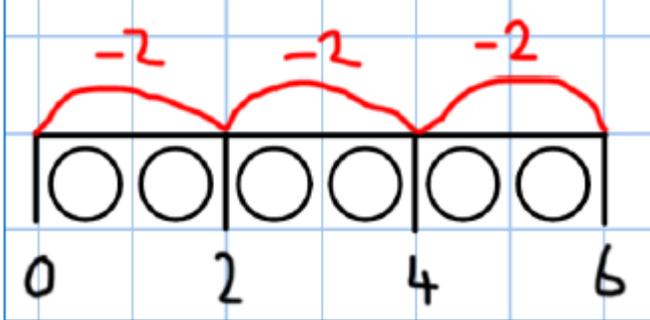
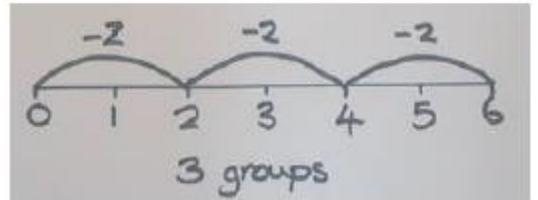
$$3 \times 23 \quad 3 \times 20 = 60$$

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

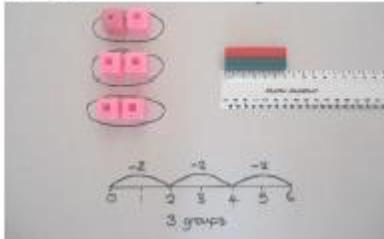
$$60 + 9 = 69$$

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

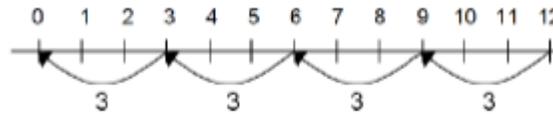
Division

Objective	Concrete	Pictorial	Abstract		
<p>Sharing objects into groups</p>	 <p>I have 10 cubes, can you share them equally in 2 groups?</p>	<p>Children use pictures or shapes to share quantities.</p>  <p style="text-align: center;">$8 \div 2 = 4$</p> <p>This can also be done in a bar so all 4 operations have a similar structure:</p> 	<p>$6 \div 2 = 3$</p> <p>What's the calculation?</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 50px; text-align: center;">3</td> <td style="width: 50px; text-align: center;">3</td> </tr> </table>	3	3
3	3				
<p>Division as grouping</p>	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p> 		<p>Abstract number line</p>  <p>$6 \div 2 = 3$</p>		

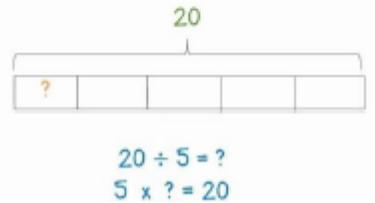
$6 \div 2$



Use a number line to show jumps in groups. The number of jumps equals the number of groups.



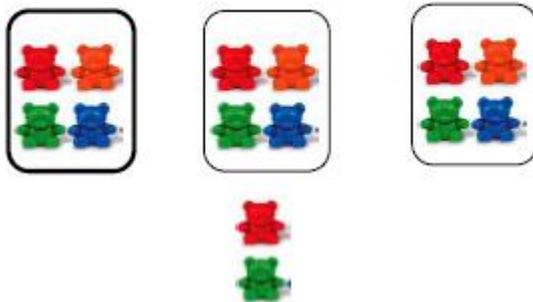
Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.



Division with a remainder
~
(Year 2+)

$14 \div 3 =$

Divide objects between groups and see how much is left over



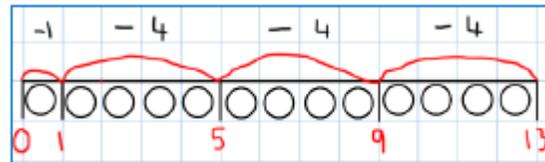
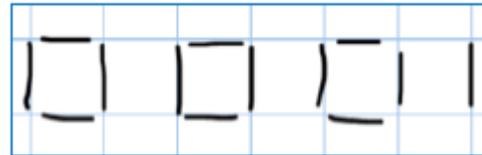
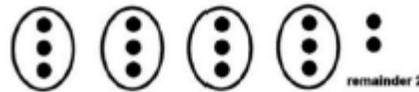
Use of lollipop sticks to form wholes



Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.

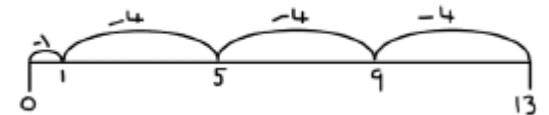


Draw dots and group them to divide an amount and clearly show a remainder.

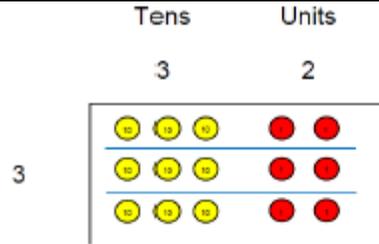


$$29 \div 8 = 3 \text{ REMAINDER } 5$$

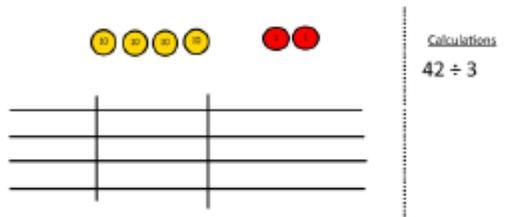
↑ ↑ ↑ ↑
 dividend divisor quotient remainder



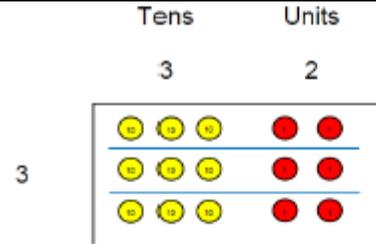
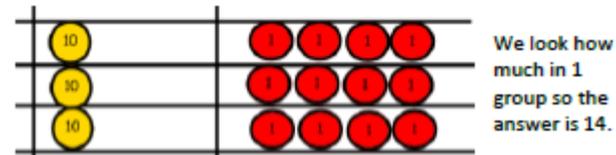
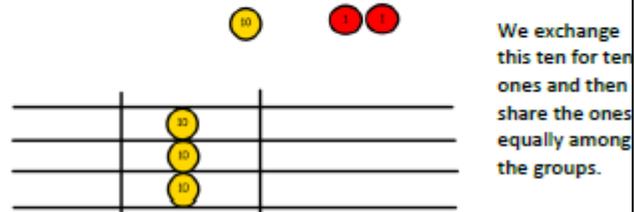
Short
division
(End of
year 4+)



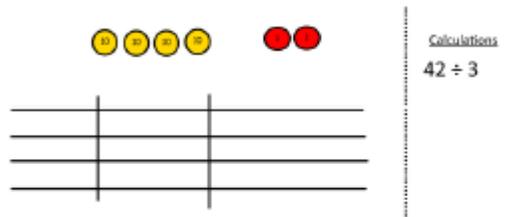
Use place value counters to divide using the bus stop method alongside



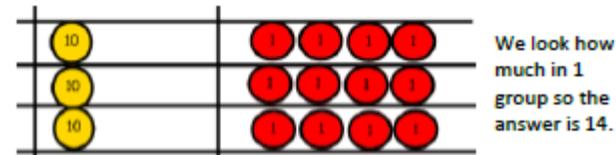
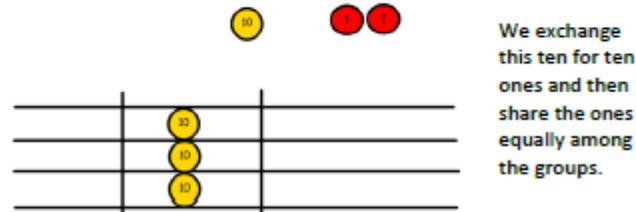
Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.



Use place value counters to divide using the bus stop method alongside



Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.



Begin with divisions that divide equally with no remainder.

$$\begin{array}{r} 218 \\ 3 \overline{) 872} \end{array}$$

Move onto divisions with a remainder.

$$\begin{array}{r} 86 \text{ r } 2 \\ 3 \overline{) 432} \end{array}$$

Finally move into decimal places to divide the total accurately.

$$\begin{array}{r} 14.6 \\ 35 \overline{) 511.0} \end{array}$$

Long
division
(Year 5+)



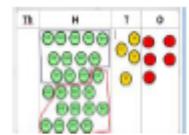
$$2544 \div 12$$

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

How many groups of 12 thousands do we have? None



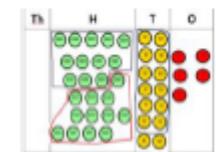
Exchange 2 thousand for 20 hundreds.



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

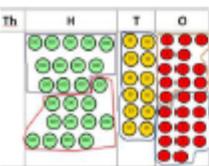
How many groups of 12 are in 25 hundreds? 2 groups. Circle them.

We have grouped 24 hundreds so can take them off and we are left with one.



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

Exchange the one hundred for ten tens so now we have 14 tens. How many groups of 12 are in 14? 1 remainder 2.



Exchange the two tens for twenty ones so now we have 24 ones. How many groups of 12 are in 24? 2

Children to represent the counters, pictorially and record the subtractions beneath.

$$\begin{array}{r} 0 \\ 12 \overline{) 2544} \end{array}$$

Step one- exchange 2 thousand for 20 hundreds so we now have 25 hundreds.

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

Step two- How many groups of 12 can I make with 25 hundreds? The 24 shows the hundreds we have grouped. The one is how many hundreds we have left.

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

Exchange the one hundred for 10 tens. How many groups of 12 can I make with 14 tens? The 14 shows how many tens I have, the 12 is how many I grouped and the 2 is how many tens I have left.

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

Exchange the 2 tens for 20 ones. The 24 is how many ones I have grouped and the 0 is what I have left.