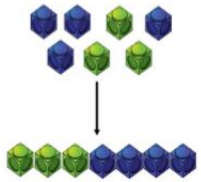
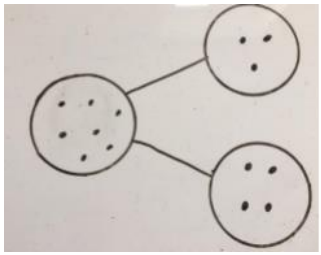
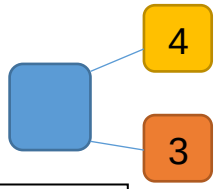
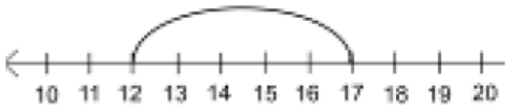
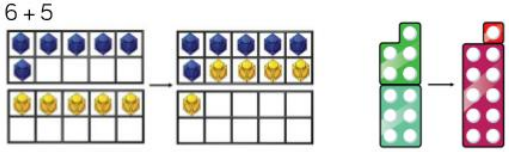
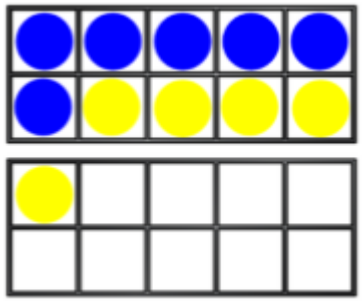
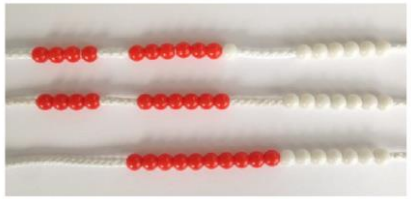
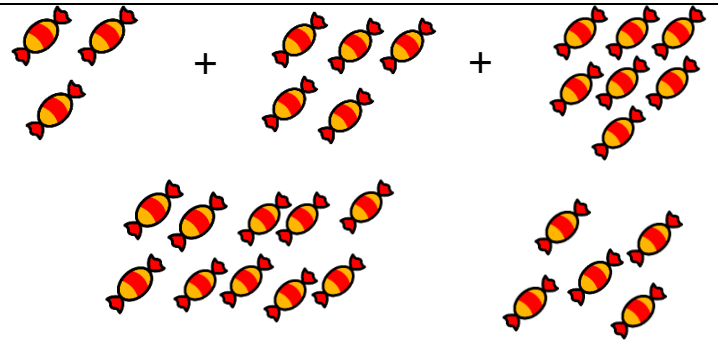
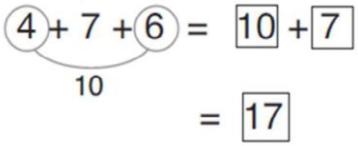
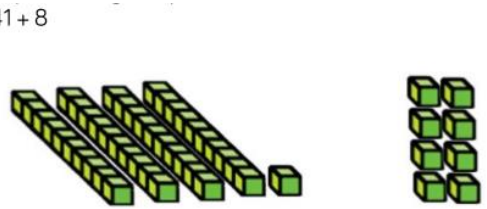
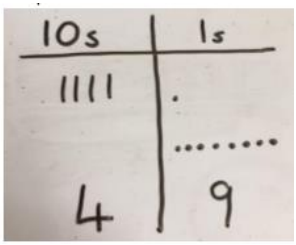
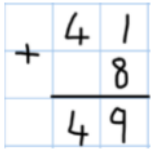
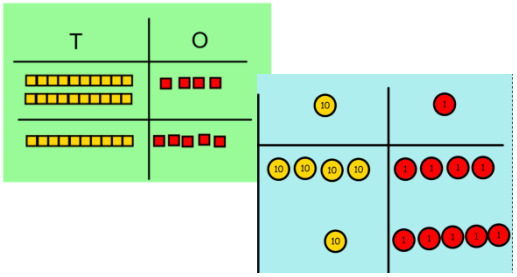
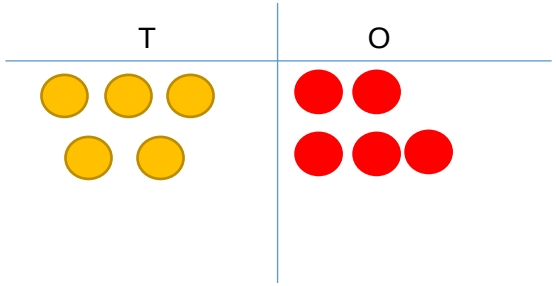
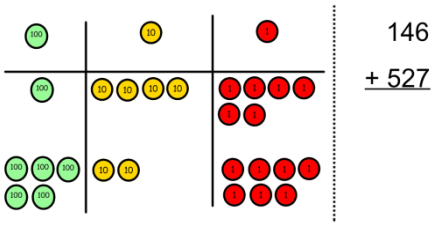
Calculations Policy

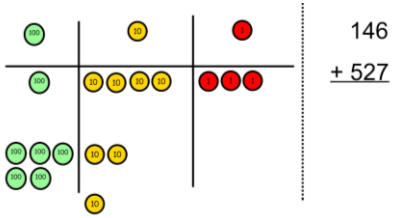
Addition

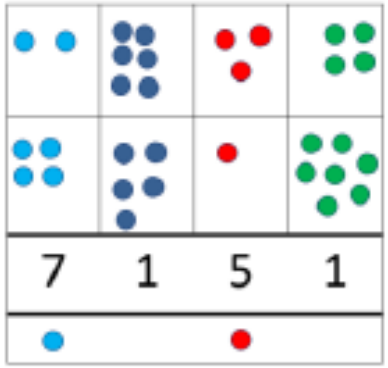
Key vocabulary- sum, total, parts and wholes, plus, add, all together, more, ‘is equal to’ ‘is the same as’

Objective and Methods	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	 Use cubes (can use other resources such as shells and bears) to add two numbers together as a group or in a bar.	 Children now represent the cubes or objects using dots or crosses. They can put each part on a part part whole model.	4 + 3 = 7 7= 3 + 4  Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.

Regrouping to make 10.	6 + 5  Use ten frames/ counters/ Numicon. 6 + 5 = 11 Start with the bigger number and use the smaller number to make 10.	 Children to draw the ten frame and counters.	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?
Adding three single digits	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	 Combine the two numbers that make 10 and then add on the remainder.
Continue to develop an understanding of place value by adding a single digit and double-digit number.	41+8  Add the ones first and then add the tens.	 Children to add the double digit and single digit number using a place value chart. EG: lines for 10s and dots for 1s.	41+8 1 + 8 = 9 40 + 9 = 49 

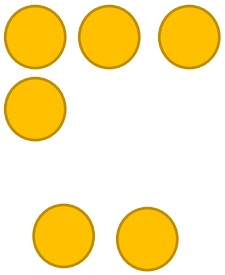
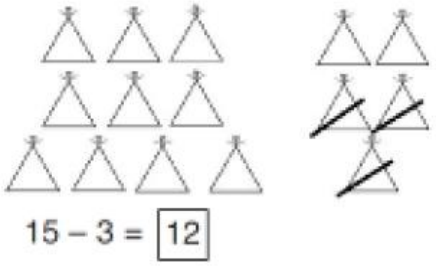
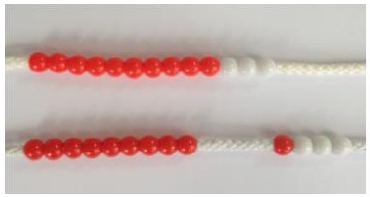
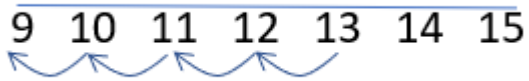
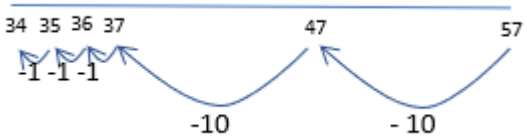
<table>
<tr>
<td>Column method- no regrouping</td>
<td>24 + 15=
Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.
 
</td>
<td>After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.
 
</td>
<td><u>Calculations</u>
21 + 42 =
21
+ <u>42</u></td>
</tr>
<tr>
<td>Column method- regrouping</td>
<td>Make both numbers on a place value grid.
 

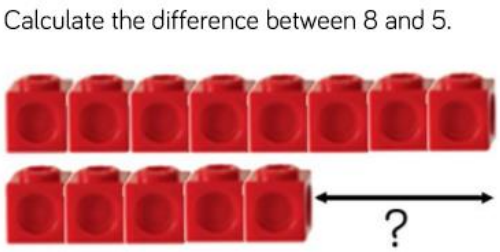
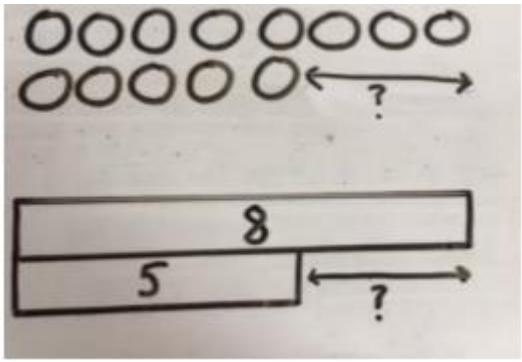
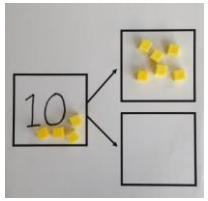
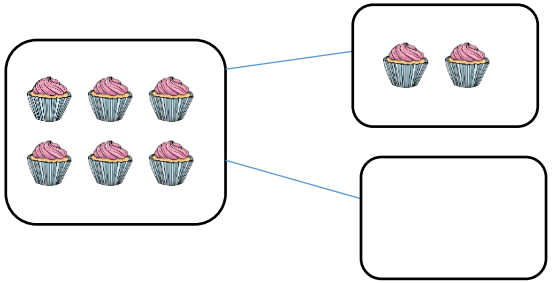
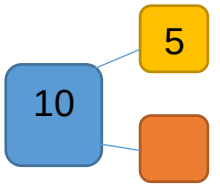
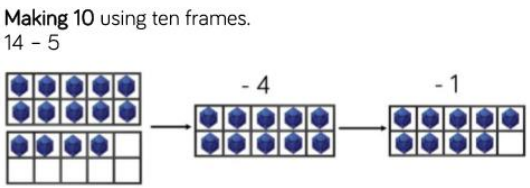
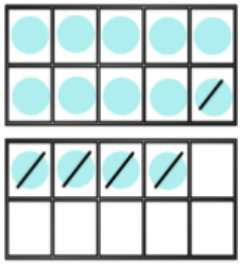
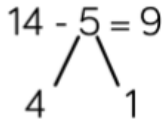
Add up the ones and exchange 10 ones for one 10.
 

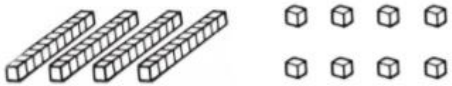
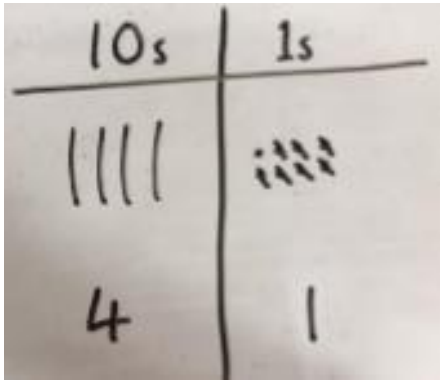
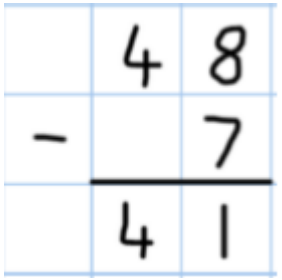
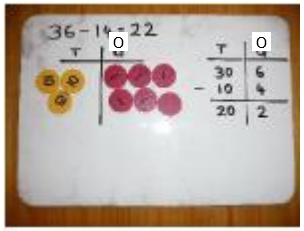
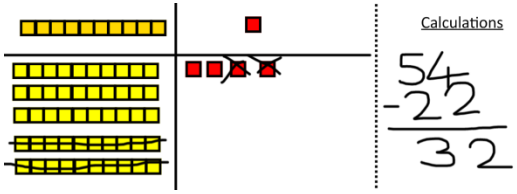
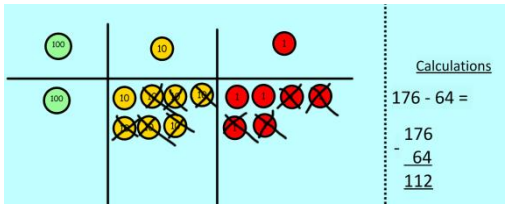
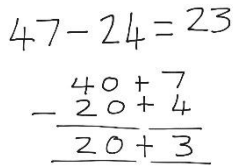
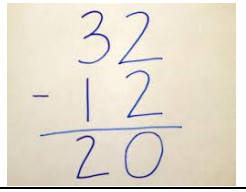
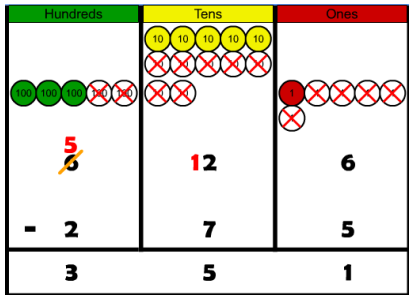
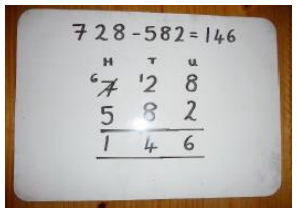
Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.</td>
<td>Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.
2,634+4,517= 7,151
 
</td>
<td>536
+ 85
621
1 1</td>
</tr>
</table>

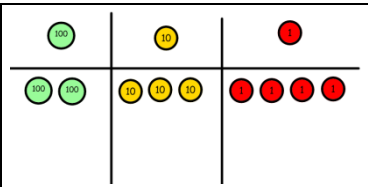
	This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. As children move on to decimals, money and decimal place value counters can be used to support learning.		As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here. 72.8 + 54.6 127.4 1 1 £ 2 3 . 5 9 + £ 7 . 5 5 £ 3 1 . 1 4 1 1 1 2 3 . 3 6 1 9 . 0 8 0 5 9 . 7 7 0 + 1 . 3 0 0 9 3 . 5 1 1 2 1 2

Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away.  6 – 2 = 4	Cross out drawn objects to show what has been taken away.  15 – 3 = 12	18 - 3= 15 8 – 2 = 6
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4  Use counters and move them away from the group as you take them away counting backwards as you go. 	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.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

Find the difference	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.
Part Part Whole Model	 Link to addition- use the part whole model to help explain the inverse between addition and subtraction. If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6 =	Use a pictorial representation of objects to show the part part whole model. 	 Move to using numbers within the part whole model.
Make 10		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

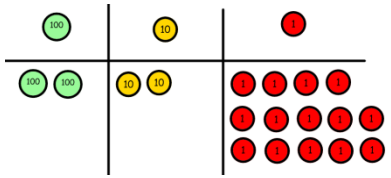
Column method using base 10	Using base 10- 48-7= Model taking the 7 ones away. 	Children to represent the base 10 pictorially. 	Column method or children could count back 7. 
Column method without regrouping	Use Base 10 to make the bigger number then take the smaller number away. Show how you partition numbers to subtract. Again make the larger number first. 	  Draw the Base 10 or place value counters alongside the written calculation to help to show working.	 This will lead to a clear written column subtraction. 
Column method with regrouping	Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.	



Calculations

234
- 88

Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.



Calculations

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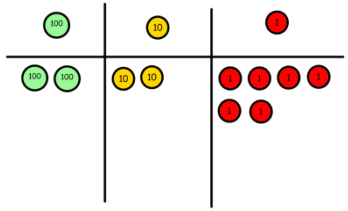
- 88

Now I can subtract my ones.



Calculations

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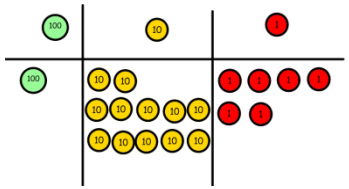
- 88

Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.



Calculations

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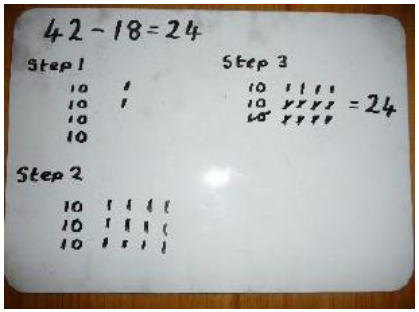
- 88

Now I can take away eight tens and complete my subtraction

When confident, children can find their own way to record the exchange/regrouping.

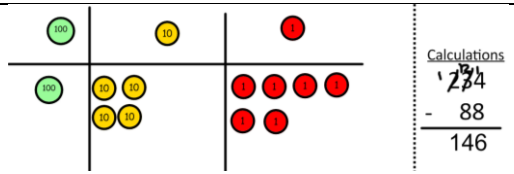
Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.



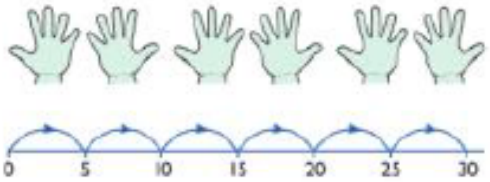
Moving forward, the children use a more compact method.

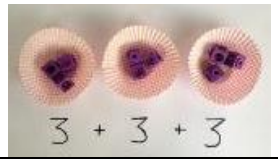
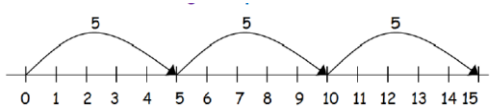
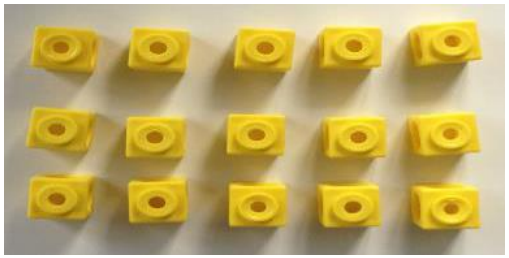
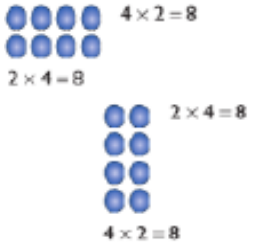
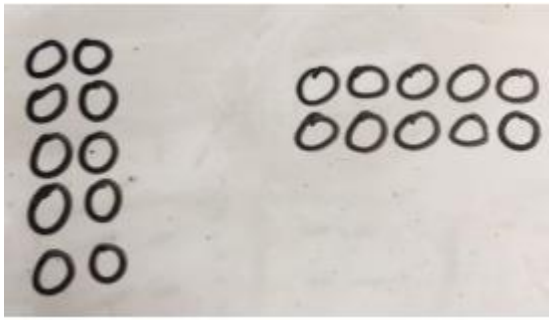
This will lead to an understanding of subtracting any number including decimals.

$$\begin{array}{r} {\scriptstyle 5\ \ 12\ \ \ \ 1} \\ 2\ \cancel{6}\ \cancel{3}\ .\ \mathbf{0} \\ -\quad 2\ 6\ .\ 5 \\ \hline 2\ 3\ 6\ .\ 5 \end{array}$$

	 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.		

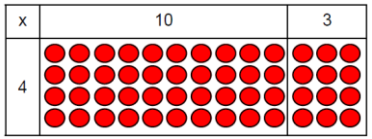
Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
Counting in multiples	  Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30

Repeated addition	  Use different objects to add equal groups. 	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?  2 add 2 add 2 equals 6  5 + 5 + 5 = 15	Write addition sentences to describe objects and pictures. 
Arrays- showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences. 	Draw arrays in different rotations to find **commutative** multiplication sentences.  	Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$

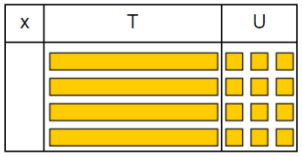
Grid Method (Year 2 and 3 only)

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



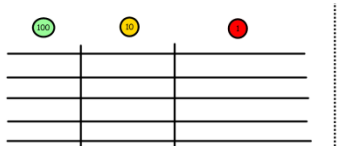
4 rows of 10
4 rows of 3

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



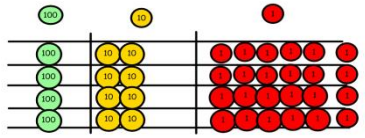
4 rows of 13

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.



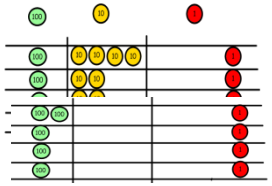
Calculations
4 x 126

Fill each row with 126.



Calculations
4 x 126

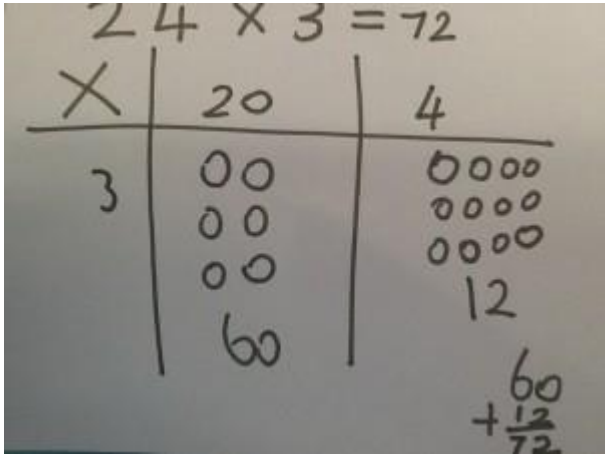
Add up each column, starting with the ones making any exchanges needed.



Then you have your answer.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

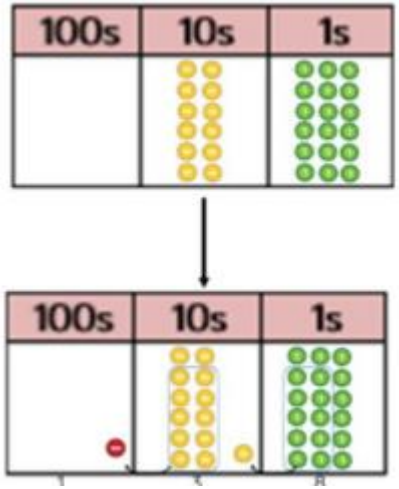
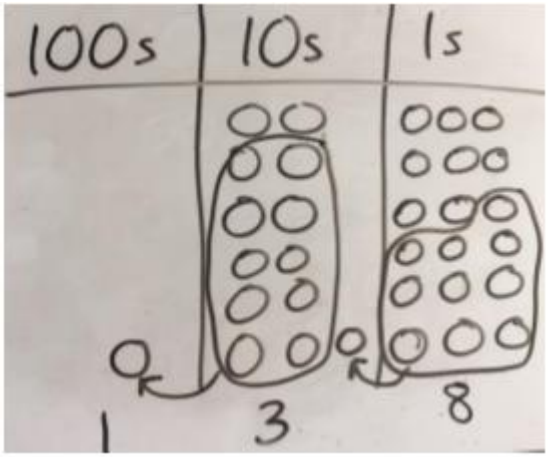
×	30	5
7	210	35

210 + 35 = 245

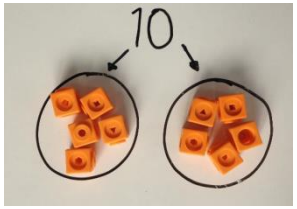
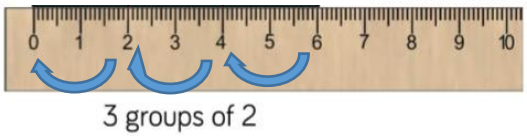
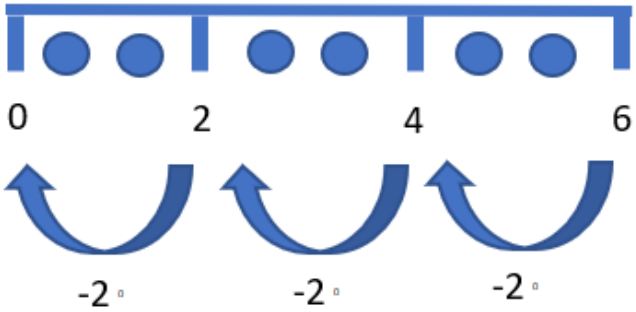
Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

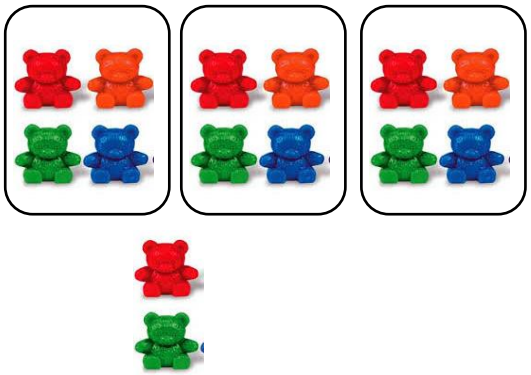
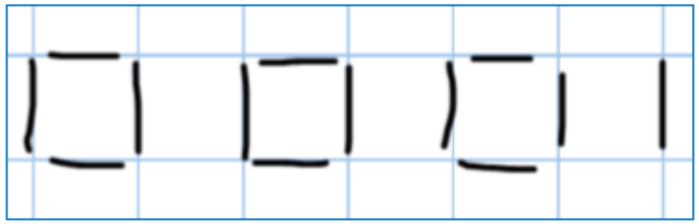
	10	8
10	100	80
3	30	24

X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

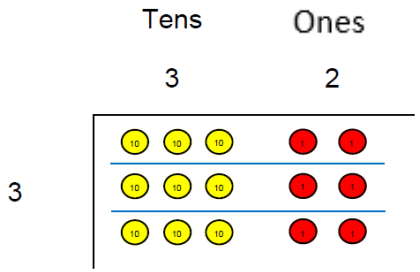
Column multiplication	Formal column method with place value counters. 6 x 23 	Children to represent the counters/base 10, pictorially e.g. the image below. 	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer. Expanded formal method 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768 This moves to the formal method. 1342 X 18 10736 x8 13420 x10 24156

Division

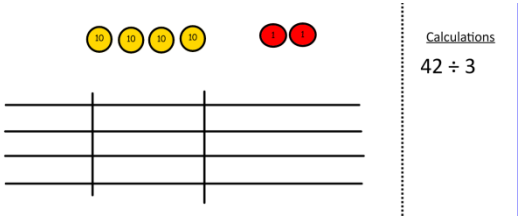
Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	 I have 10 cubes, can you share them equally in 2 groups? 	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4	Share 9 buns between three people. 9 ÷ 3 = 3 3= 9÷3
Repeated Subtraction	 3 groups of 2 6÷2=	Children to represent repeated subtraction pictorially. 	6 ÷ 2 = 3

Division with a remainder	14 ÷ 3 = Divide objects between groups and see how much is left ove  **2d ÷ 1d with remainders** using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 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 ÷ 4 = 3 remainder 1 Children should be encouraged to use their times table facts.

Short division

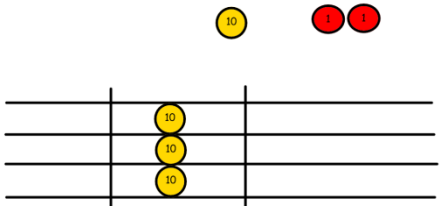


Use place value counters to divide using the bus stop method alongside

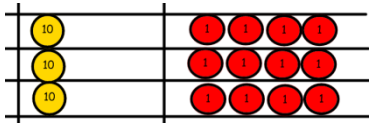


42 ÷ 3=

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.

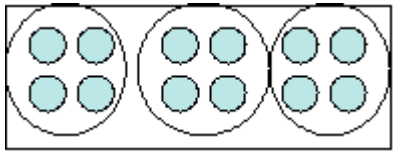


We exchange this ten for ten ones and then share the ones equally among the groups.



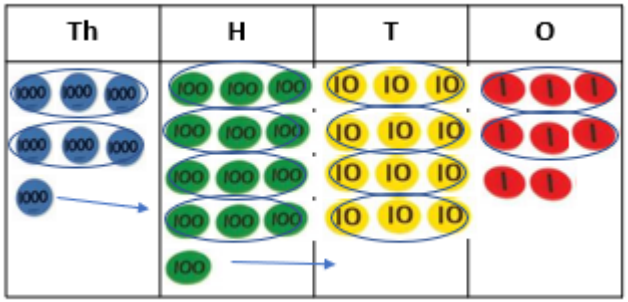
We look how much in 1 group so the answer is 14.

Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.



Encourage them to move towards counting in multiples to divide more efficiently.

Models to show how carrying looks when the digits are exchanged



$$\begin{array}{r} 2442r2 \\ 3\overline{)7^{1}3^{1}28} \end{array}$$

Begin with divisions that divide equally with no remainder.

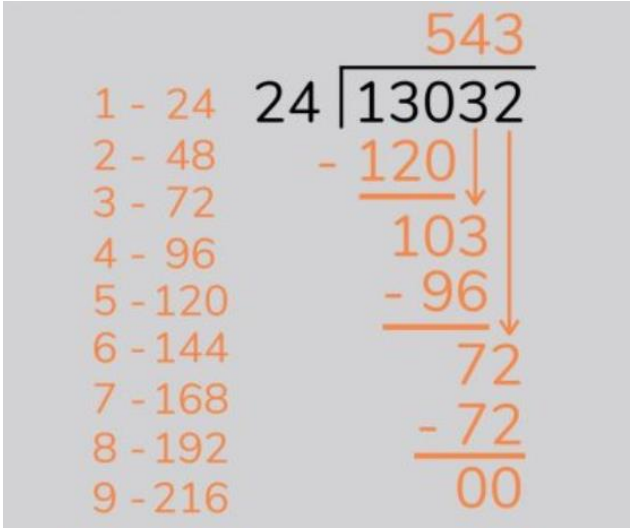
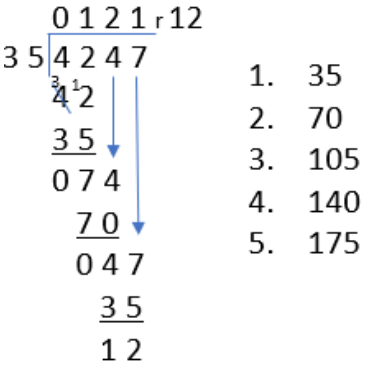
$$\begin{array}{r} 218 \\ 4\overline{)872} \end{array}$$

Move onto divisions with a remainder.

$$\begin{array}{r} 86\ r\ 2 \\ 5\overline{)432} \end{array}$$

Finally move into decimal places to divide the total accurately.

$$\begin{array}{r} 086.4 \\ 5\overline{)4^{4}3^{3}2.^{2}0} \end{array}$$

Long division			Long division through bus stop. Writing part of the times tables out initially and then using subtraction and chunking to complete the division  1. 35 2. 70 3. 105 4. 140 5. 175