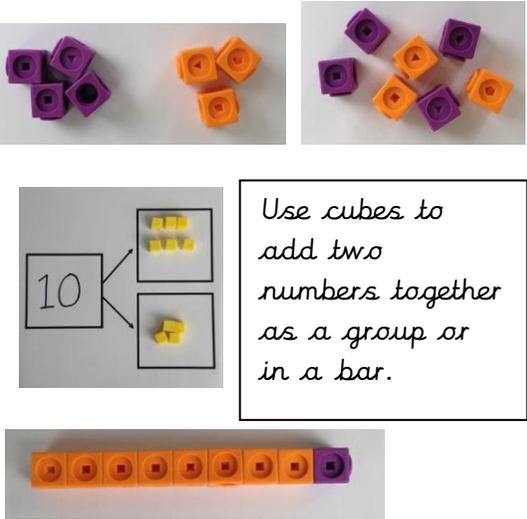
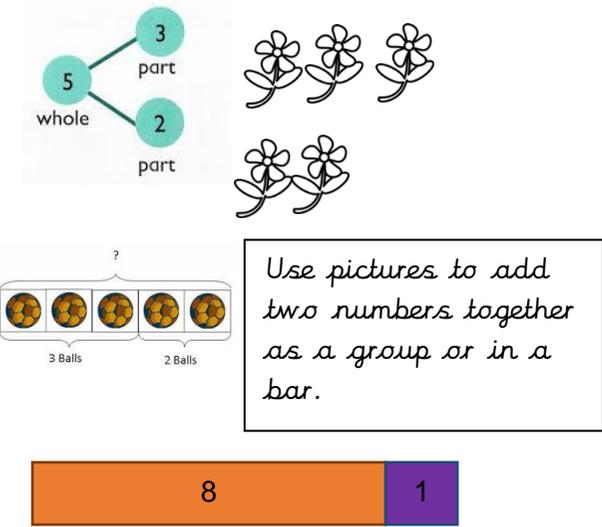
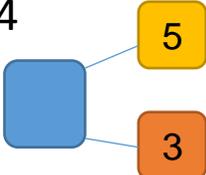
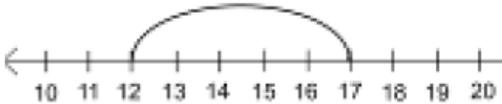


# *Calculations Policy - September 2021 (Review: 18<sup>th</sup> November 2021)*

# Addition

<p><b>EYFS/YEAR 1</b> Objective and Strategies</p>	<p>Concrete</p>	<p>Pictorial</p>	<p>Abstract</p>
<p>Combining two parts to make a whole: part-whole model</p>	 <p>Use cubes to add two numbers together as a group or in a bar.</p>	 <p>Use pictures to add two numbers together as a group or in a bar.</p>	<p><math>4 + 3 = 7</math></p> <p><math>10 = 6 + 4</math></p>  <p>Use the part-part whole diagram as shown above to move into the abstract.</p>
<p>Starting at the bigger number and counting on</p>	 <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p>	<p><math>12 + 5 = 17</math></p>  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p>	<p><math>5 + 12 = 17</math></p> <p>Place the larger number in your head and count on the smaller number to find your answer.</p>

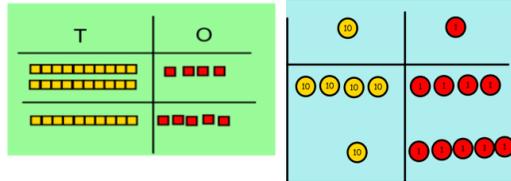


**Year 2**

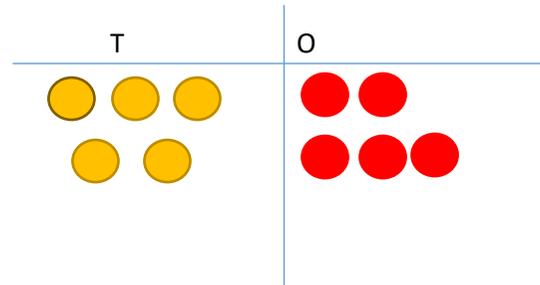
Column method - no regrouping

T+0

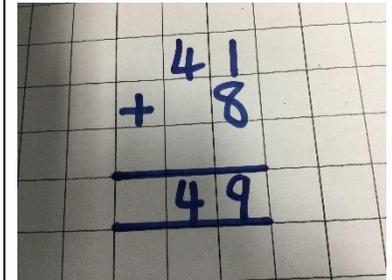
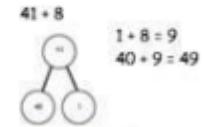
$24 + 15 =$   
Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.



After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.



$40 + 9$   
 $20 + 3$   
 $60 + 12 = 72$

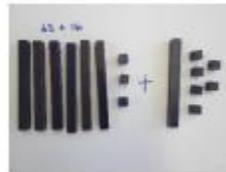


**Year 3**

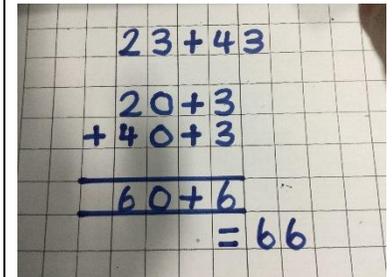
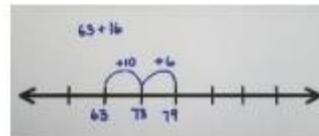
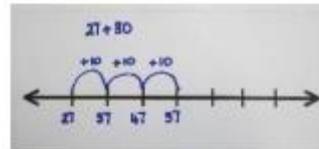
Column method - no regrouping.

T0 + T0

Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters. Continue to develop understanding of partitioning and place value and use this to support addition. Begin with no exchanging.



This could be done in a number of ways:

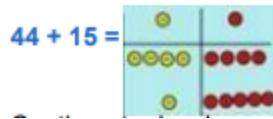
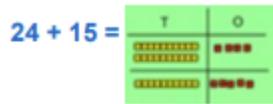


Year 3/4

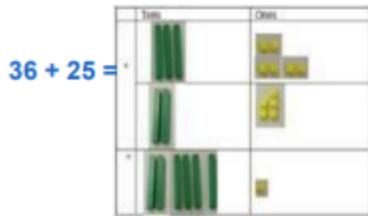
Column method with regrouping

TO+TO

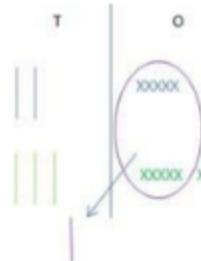
With exchanging:



Continue to develop understanding of partitioning and place value and use this to support addition. Begin with no exchanging.



$25 + 36 =$



$36 + 25 =$

$36 + 25 =$   
 $30 + 20 = 50$   
 $6 + 5 = 11$   
 $50 + 11 = 61$

$36$   
 $+25$

---

61

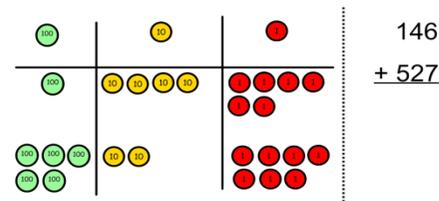
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Year 4/5/6

Column method-regrouping

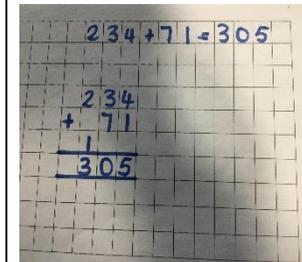
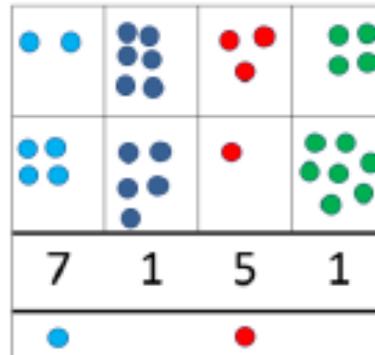
HTO+HTO

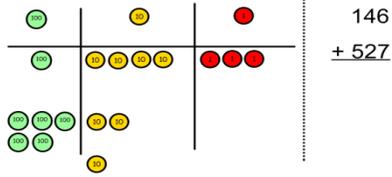
Make both numbers on a place value grid.



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

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





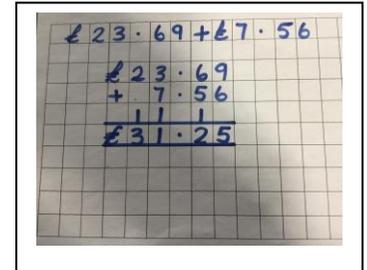
$$\begin{array}{r} 146 \\ + 527 \\ \hline \end{array}$$

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.

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.



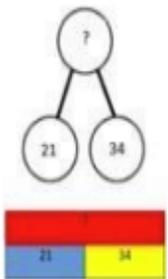
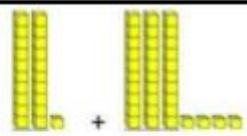
Year 5/6

Add with several numbers of increasing complexity

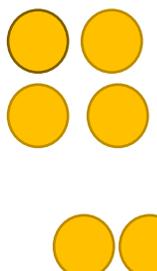
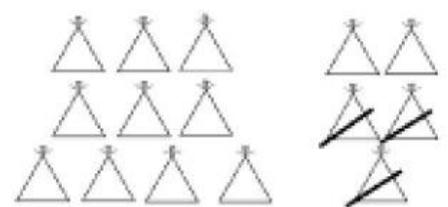
Add 'zeros' where needed to show the place value of decimals.



# Fluency variation, different ways to ask children to solve $21+34$

	<p>Sam saved £21 one week and £34 another. How much did he save in total?</p> <p><math>21+34=55</math>. Prove it! (Reasoning but the children need to be fluent in representing this)</p>	$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$ <p><math>21 + 34 =</math></p> <p><input type="text"/> = <math>21 + 34</math></p> <p>What's the sum of twenty one and thirty four?</p>	 <p>Always use missing digit problems too:</p> <table border="1" data-bbox="1769 478 2038 630"> <thead> <tr> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>● ●</td> <td>●</td> </tr> <tr> <td>● ● ●</td> <td>?</td> </tr> <tr> <td>?</td> <td>4</td> </tr> </tbody> </table>	Tens	Ones	● ●	●	● ● ●	?	?	4
Tens	Ones										
● ●	●										
● ● ●	?										
?	4										

## Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
<p>EYFS Year 1/2 Taking away ones</p>	<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p> <p> <math>6 - 2 = 4</math></p> <p></p>	<p>Cross out drawn objects to show what has been taken away.</p> <p></p> <p><math>15 - 3 = \boxed{12}</math></p>	<p><math>18 - 3 = 15</math></p> <p><math>8 - 2 = 6</math></p>

EYFS  
Year 1/2  
Counting  
back

Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.

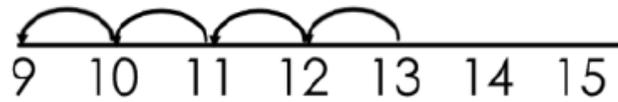


13 - 4

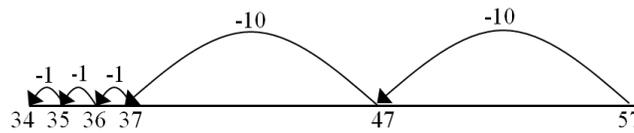
Use counters and move them away from the group as you take them away counting backwards as you go.



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.

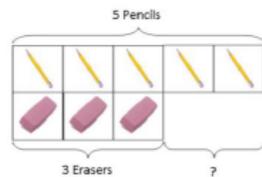
Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

Find the  
difference

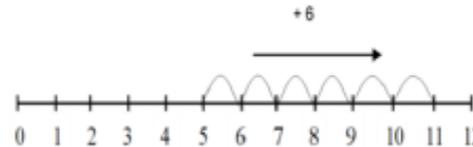
Compare amounts and objects to find the difference.



Use cubes to build towers or make bars to find the difference



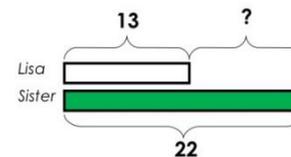
Use basic bar models with items to find the difference



Count on to find the difference.

Comparison Bar Models

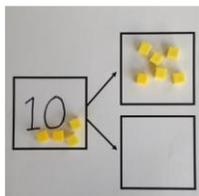
Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.



Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.

Draw bars to find the difference between 2 numbers.

## Part-Whole Model

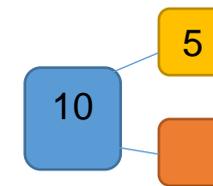
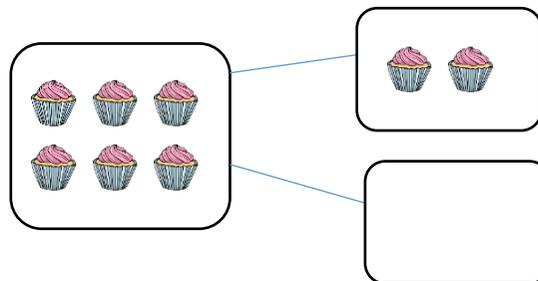


Link to addition- use the part whole model to help explain the inverse between addition and subtraction.

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 whole model.



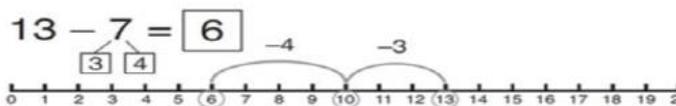
Move to using numbers within the part whole model.

## Year 1/2 Make 10

$$14 - 9 =$$



Make 14 on the ten frame. Take away the four first to make 10 and then take away one more so you have taken away 5. You are left with the answer of 9.



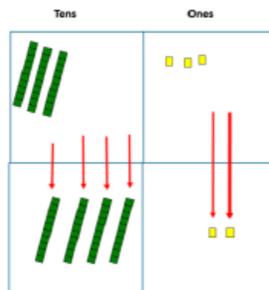
Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.

$$16 - 8 =$$

How many do we take off to reach the next 10?

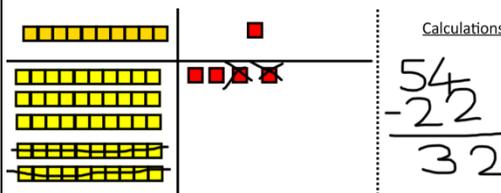
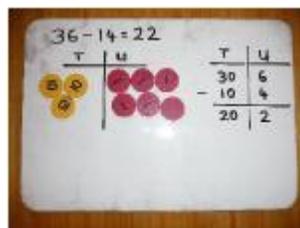
How many do we have left to take off?

## Year 2/3 Column method without regrouping (Incorporating Base 10)

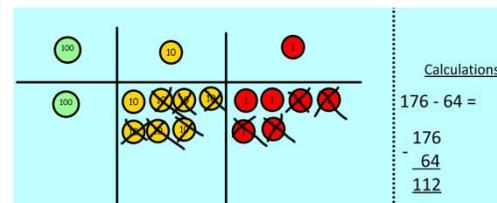


Use Base 10 to make the bigger number then take the smaller number away.

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.



$$47 - 24 = 23$$

$$\begin{array}{r} 40 + 7 \\ - 20 + 4 \\ \hline 20 + 3 \end{array}$$

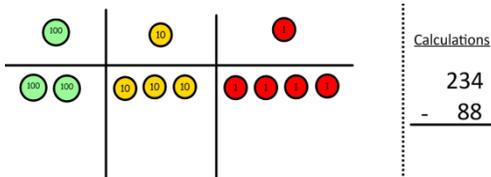
This will lead to a clear written column subtraction.

# Year 3/4/5

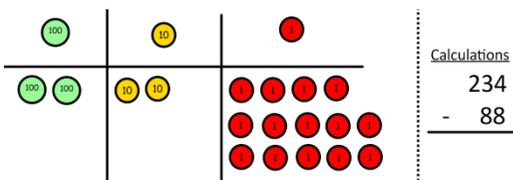
## Column method with regrouping (Incorporating base 10)

Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

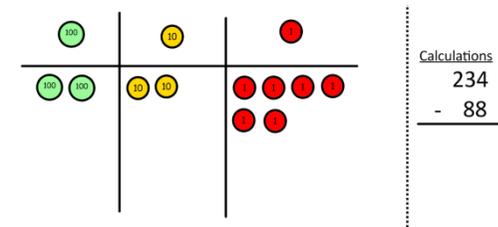
Make the larger number with the place value counters



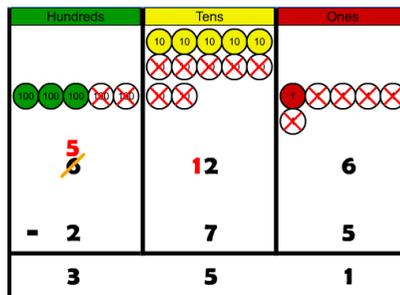
Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.



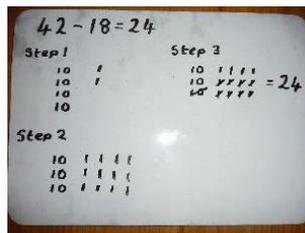
Now I can subtract my ones.



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



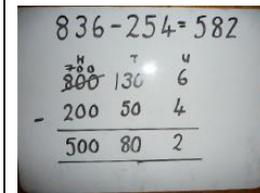
Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.



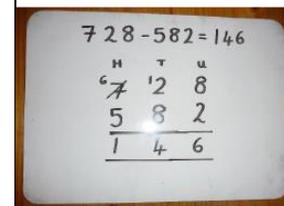
When confident, children can find their own way to record the exchange/regrouping.

Just writing the numbers as shown here shows that the child understands the method

and knows when to exchange/regroup.



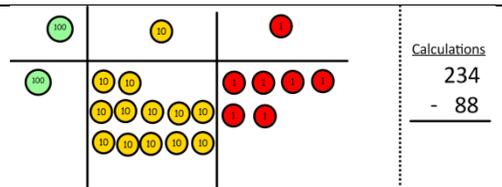
Children can start their formal written method by partitioning the number into clear place value columns.



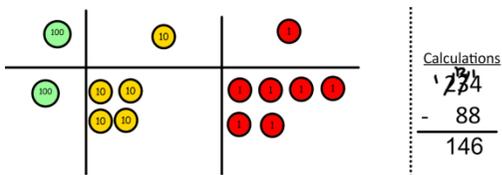
Moving forward the children use a more compact method.

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

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



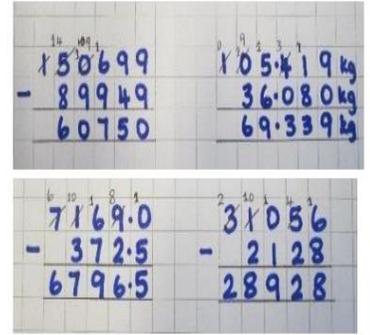
Now I can take away eight tens and complete my subtraction



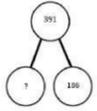
Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

**Year 5/6**

Subtract with increasingly large and more complex numbers and decimal values.



Fluency variation, different ways to ask children to solve  $391 - 186$



391	
186	?

Raj spent £391, Timmy spent £186. How much more did Raj spend? Calculate the difference between 391 and 186.

$$\square = 391 - 186$$

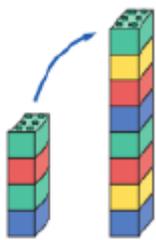
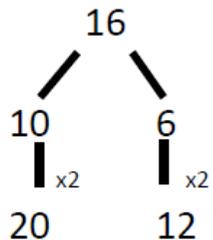
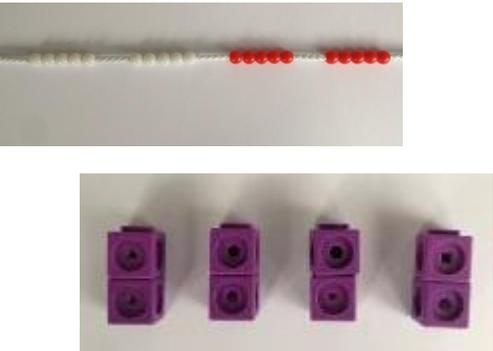
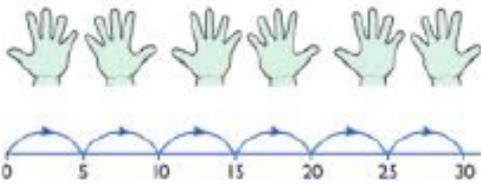
$$\begin{array}{r} 391 \\ -186 \\ \hline \end{array}$$

What is 186 less than 391?

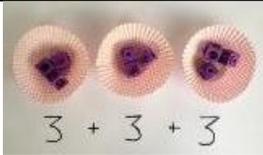
$$\begin{array}{r} 39\square \\ -\square\square6 \\ \hline \square05 \end{array}$$

Missing number calculations

## Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
<p>EYFS/Year 1</p> <p>Doubling</p>	<p>Use practical activities to show how to double a number.</p>  <p>double 4 is 8 <math>4 \times 2 = 8</math></p>	<p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p> 	 <p>Partition a number and then double each part before recombining it back together.</p>
<p>Counting in multiples</p>	 <p>Count in multiples supported by concrete objects in equal groups.</p>	 <p>Use a number line or pictures to continue support in counting in multiples.</p>	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10</p> <p>5, 10, 15, 20, 25, 30</p>

## Repeated addition

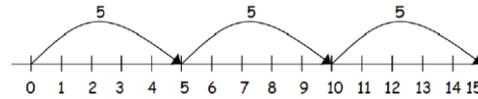


Use different objects to add equal groups.

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.

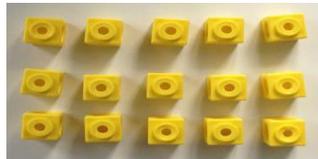


$$2 + 2 + 2 + 2 + 2 = 10$$

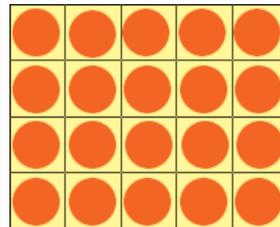
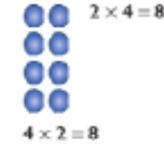
## Year 2

## Arrays showing commutative multiplication

Create arrays using counters/ cubes to show multiplication sentences.



Draw arrays in different rotations to find commutative multiplication sentences.



Link arrays to area of rectangles.

Use an array to write multiplication sentences and reinforce repeated addition.



$$5 + 5 + 5 = 15$$

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

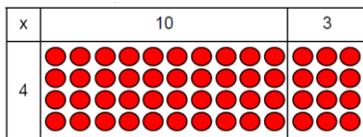
$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

# Year 2/3

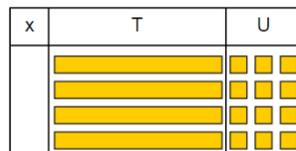
## Grid Method

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



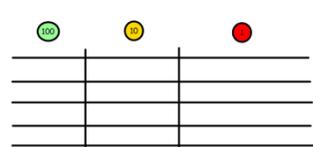
4 rows of 10  
4 rows of 3

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



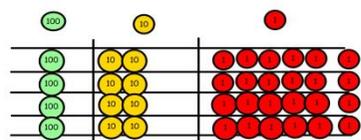
4 rows of 13

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.



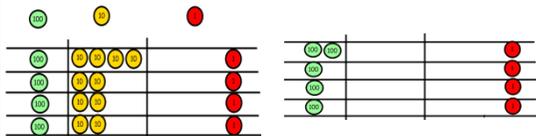
Calculations  
4 x 126

Fill each row with 126.



Calculations  
4 x 126

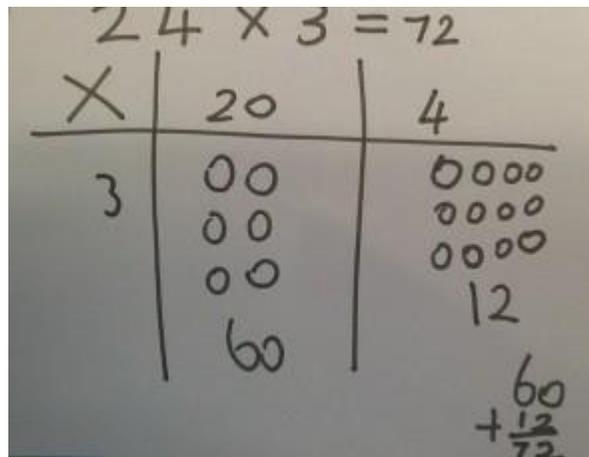
Add up each column, starting with the ones making any exchanges needed.



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.

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.

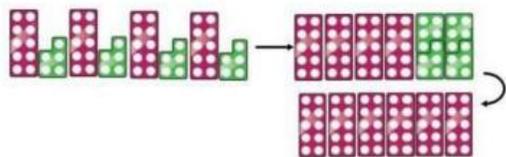
	10	8
10	100	80
3	30	24

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

Year 3/4

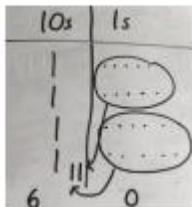
Partition to multiply

$$4 \times 15 = \square$$



You can use Numicon, base 10 or Cuisenaire rods.

Children to represent the concrete manipulatives pictorially.



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

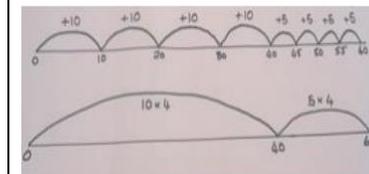
$$\begin{array}{r} 4 \times 15 \\ \swarrow \quad \searrow \\ 10 \quad 5 \end{array}$$

$$10 \times 4 = 40$$

$$5 \times 4 = 20$$

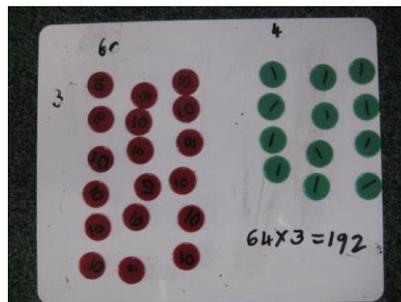
$$40 + 20 = 60$$

A number line can also be used.



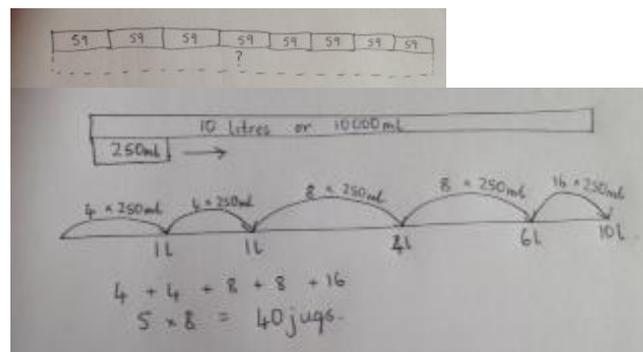
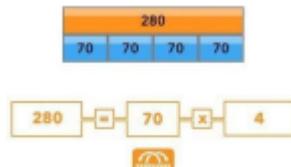
**Year 4/5**  
Column  
multiplication

Children can continue to be supported by place value counters at the stage of multiplication.



It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.

Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.



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.

$$\begin{array}{r}
 32 \\
 \times 24 \\
 \hline
 8 \quad (4 \times 2) \\
 120 \quad (4 \times 30) \\
 40 \quad (20 \times 2) \\
 600 \quad (20 \times 30) \\
 \hline
 768
 \end{array}$$

This moves to the more compact method.

$$\begin{array}{r}
 \phantom{0}2 \phantom{0}3 \phantom{0}1 \\
 1342 \\
 \times 18 \\
 \hline
 10736 \\
 13420 \\
 \hline
 24156 \\
 \hline
 1
 \end{array}$$

			<p>This moves to the more compact method</p> $  \begin{array}{r}  \phantom{00}74 \\  \times \phantom{00}63 \\  \hline  \phantom{000}12 \\  \phantom{00}210 \\  \phantom{0}240 \\  + 4200 \\  \hline  4662  \end{array}  $																				
<p>Year 6 Multiply Decimals</p>			<table border="1" style="border-collapse: collapse; text-align: center; width: 100px; height: 100px;"> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;">3</td> <td style="width: 25px; height: 25px;">.</td> <td style="width: 25px; height: 25px;">1</td> <td style="width: 25px; height: 25px;">9</td> </tr> <tr> <td style="width: 25px; height: 25px;">X</td> <td style="width: 25px; height: 25px;">8</td> <td style="width: 25px; height: 25px;">.</td> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr style="border-top: 2px solid black;"> <td style="width: 25px; height: 25px;">2</td> <td style="width: 25px; height: 25px;">5</td> <td style="width: 25px; height: 25px;">.</td> <td style="width: 25px; height: 25px;">5</td> <td style="width: 25px; height: 25px;">2</td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;">,</td> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> </table>		3	.	1	9	X	8	.			2	5	.	5	2			,		
	3	.	1	9																			
X	8	.																					
2	5	.	5	2																			
		,																					

# Fluency variation, different ways to as children to solve $6 \times 23$

23	23	23	23	23	23
----	----	----	----	----	----

?

Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week? With the counters, prove that  $6 \times 23 = 138$

Find the product of 6 and 23

$$6 \times 23 =$$

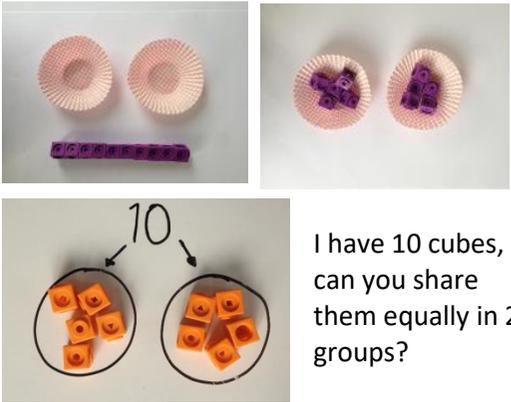
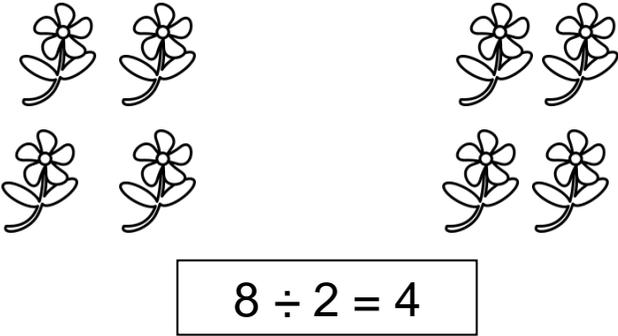
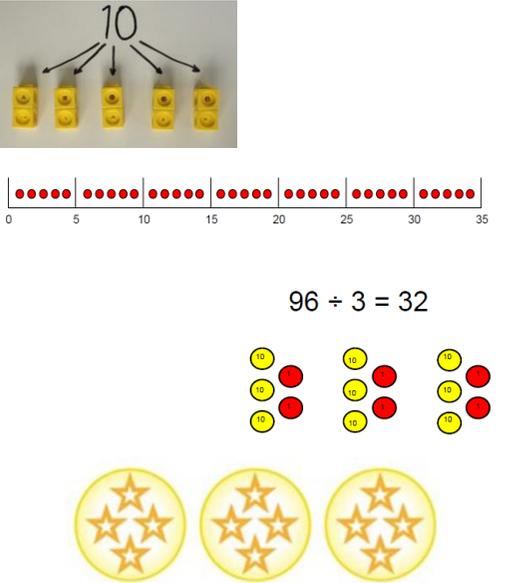
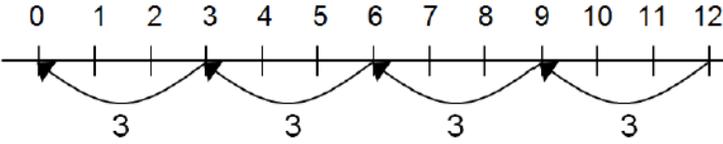
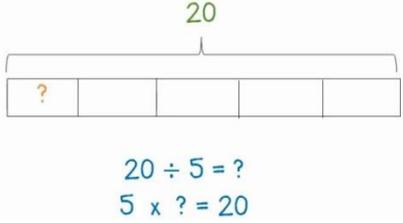
$$\square = 6 \times 23$$

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

What is the calculation? What is the product?

100s	10s	1s
		

# Division

Objective and Strategies	Concrete	Pictorial	Abstract
<p><b>EYFS</b> <b>Year 1</b></p> <p><i>Sharing objects into groups</i></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>Share 9 buns between three people.</p> $9 \div 3 = 3$
<p><b>EYFS</b> <b>Year 1/2</b></p> <p><i>Division as grouping/Related subtraction</i></p>	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>  <p><math>96 \div 3 = 32</math></p>	<p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p>  <p>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.</p> 	<p><math>28 \div 7 = 4</math></p> <p>Divide 28 into 7 groups. How many are in each group?</p>

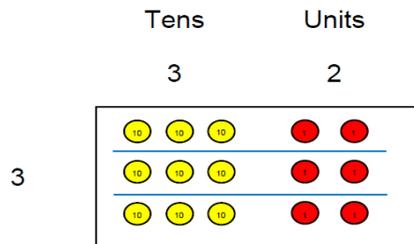


Children to represent the lollipop sticks pictorially.



There are 3 whole squares, with 1 left over.

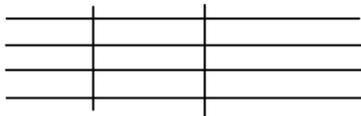
**Year 4/5**  
Short  
division



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



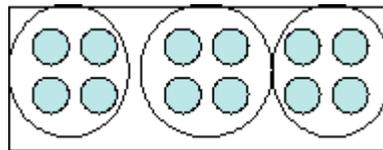
Calculations  
 $42 \div 3$



$42 \div 3 =$

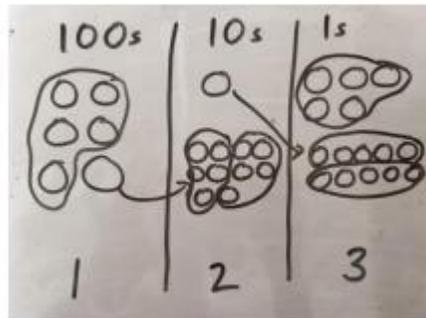
Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.

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.

Represent the place value counters pictorially.



Begin with divisions that divide equally with no remainder.

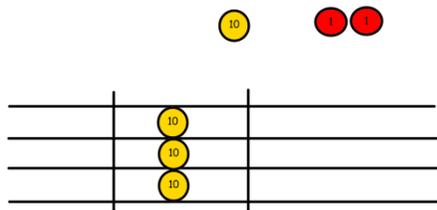
$$\begin{array}{r} 218 \\ 3 \overline{) 872} \end{array}$$

Move onto divisions with a remainder.

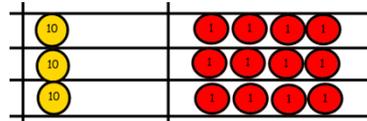
$$\begin{array}{r} 86 \text{ r } 2 \\ 3 \overline{) 432} \end{array}$$

Finally move into decimal places to divide the total accurately.

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

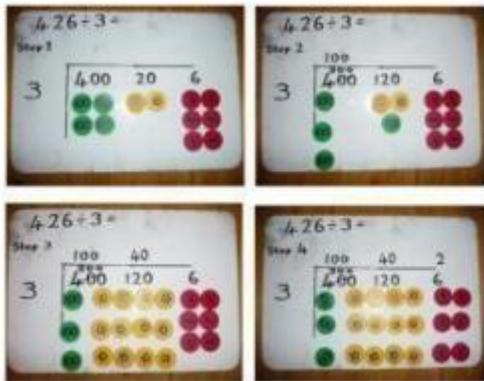


We exchange this ten for ten ones and then share the ones equally among the groups.

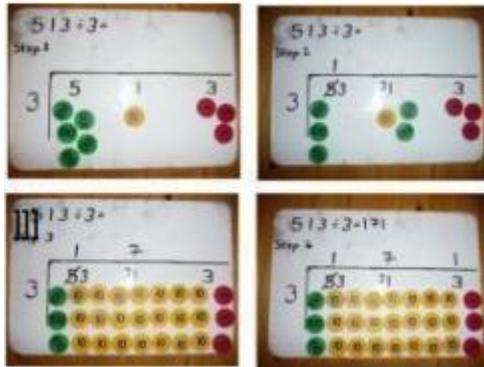


We look how much in 1 group so the answer is 14.

Divide a three-digit number, then moving to a four-digit number, by a one-digit number by using partitioning and place value counters.



Divide a three-digit number, then moving to a four-digit number, by a one-digit number without partitioning but using place value counters.



Year 5/6  
Long  
division



Conceptual variation; different ways to ask children to solve  $615 \div 5$

Using the part whole model below, how can you divide 615 by 5 without using short division?

I have £615 and share it equally between 5 bank accounts. How much will be in each account? 615 pupils need to be put into 5 groups. How many will be in each group?

$$5 \overline{)615}$$

$$615 \div 5 =$$

$$= 615 \div 5$$

What is the calculation?  
What is the answer?

