



St Josephs RC Primary School

Calculation Policy

This calculation policy has been written in line with the programmes of study taken from the revised National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression. The content is set out in year group blocks (guidance only) under the following headings: addition, subtraction, multiplication and division.

Aims of the Policy:

- To ensure consistency and progression in our approach to calculation
- To ensure that children develop an efficient, reliable, formal written method of calculation for all operations
- To ensure that children can use these methods accurately with confidence and understanding

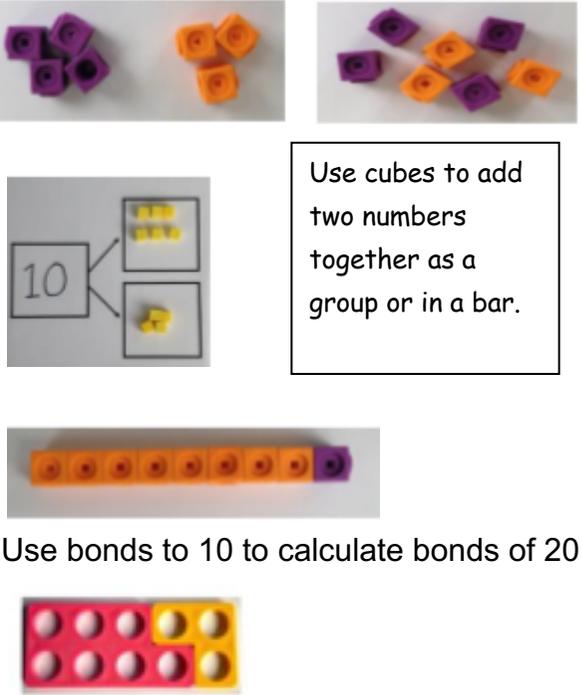
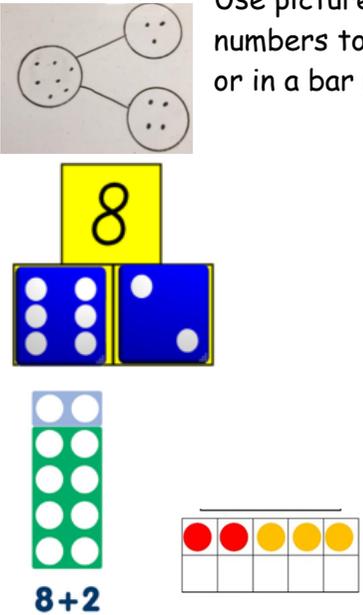
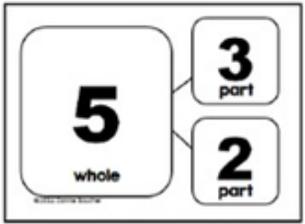
How to Use This Policy:

- Use the policy as the basis of your planning but ensure you use previous or following stages' guidance to allow for personalised learning
- Always use Assessment for learning to identify suitable next steps in calculation for groups of children
- If, at any time, children are making significant errors, return to the previous stage in calculation

- Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate
- Encourage children to make sensible choices about the methods they use when solving problems

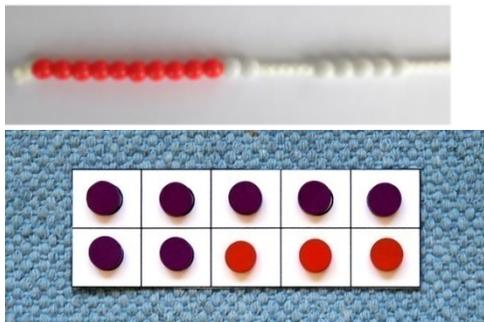
Representations:

The key to successful implementation of a school calculation policy is the consistent use of representations (models and images that support conceptual understanding of the mathematics) and this policy promotes a range of relevant representations, across the primary years. Mathematical understanding is developed through use of representations that are first of all concrete (e.g. Dienes apparatus, cubes), and then pictorial (e.g. array, place value counters) to then facilitate abstract working (e.g. column addition, long multiplication). This policy guides teachers through an appropriate progression of representations, and if at any point a pupil is struggling they should revert to familiar pictorial and/or concrete materials/ representations as appropriate. Whilst a mathematically fluent child will be able to choose the most appropriate representation and procedure to carry out a calculation, whether written or mental, teachers should support pupils with carefully selected representations that underpin calculation methods (as detailed in this policy), and ensure there is consistency across year groups.

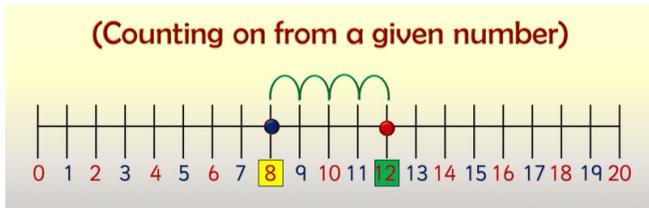
	concrete	pictorial	abstract
<p>Combining two separate amounts to make a whole (EYFS/ rec/yr 1)</p>	 <p>Use cubes to add two numbers together as a group or in a bar.</p> <p>Use bonds to 10 to calculate bonds of 20</p>	 <p>Use pictures to add two numbers together as a group or in a bar model</p> <p>$8+2$</p>	<p>$3+2=5$</p>  <p>3 is a part, 2 is a part and the whole is 5</p> <p>Use the part-part whole diagram as shown above to move into the abstract.</p>

Start at the bigger number and count on (EYFS/rec/yr 1)

Start with the larger number on the bead string or ten frame and then count on the smaller number 1 by 1 to find the answer.



Counting on in jumps of 1 using a number line with numbers on it.



This can also be done in bigger jumps or 1 big jump to find the answer. For $12 + 5 = 17$:

$$2 + 6 = 8$$

Put the larger number in your head and count on the smaller number to find your answer.

It can also be represented in a bar model like this

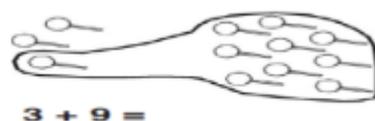


Regrouping to make 10. (This is an essential skill for column addition later.) yr1



Start with the bigger number and use the smaller number to make 10.

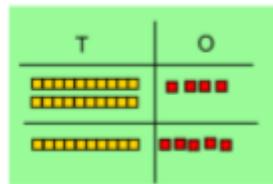
Use pictures or a number line.



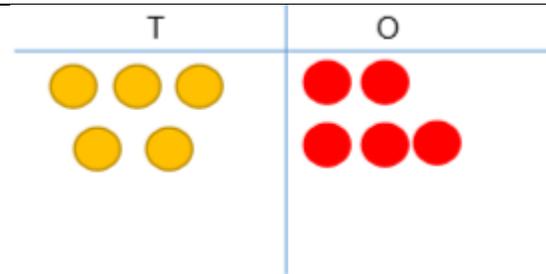
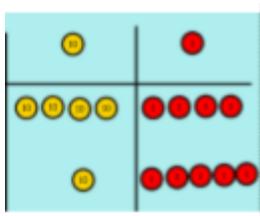
Regroup or partition the smaller number using the part part whole model to make 10.

$$9 + 3 = 12$$

If I am at nine, how many more do I need to make 10? How many more do I add on now?

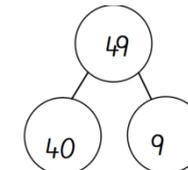


$$44+15=$$



$$41+8=$$

$$40 + 8+1=$$



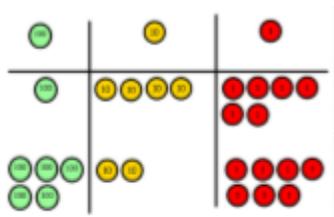
41	
40	1

Column method with regrouping (yr4/5/6)

Make both numbers on a place value grid.

$$146$$

$$+527$$



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.

$$2634$$

$$+4517$$

Start by partitioning the numbers before moving on to clearly show the exchange below the addition.

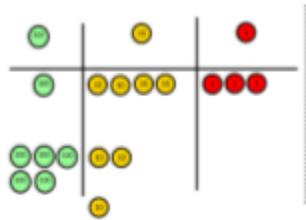
$$20+5$$

$$40+8$$

$$60+ 13= 73$$

$$536$$

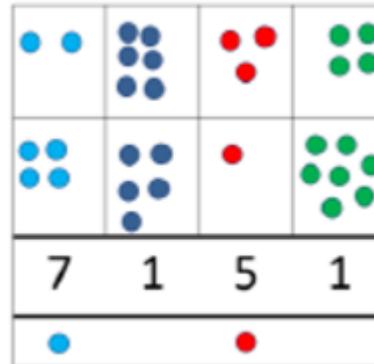
$$+ 85$$



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.



$$\begin{array}{r} 621 \\ 11 \end{array}$$

As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.

$$\begin{array}{r} 72.8 \\ +54.6 \\ \hline 127.4 \\ 11 \end{array}$$

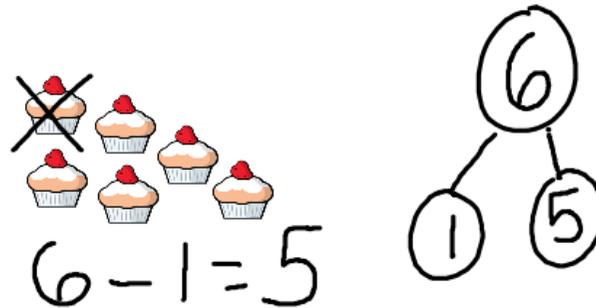
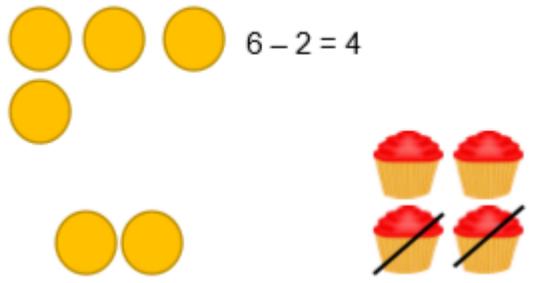
$$\begin{array}{r} \text{£}23.59 \\ \text{£ } 7.55 \\ \hline \text{£ } 31.14 \end{array}$$

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

Add with several numbers of increasing complexity (yr5/6)

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Subtraction			
Objective and strategy	Concrete	Pictorial	Abstract
Taking away ones (EYFS/rec/yr1)	Use physical objects, counters, cubes etc to show how objects can be taken away.	Cross out drawn objects to show what has been taken away.	$8 - 2 = 6$ $18 - 2 = 16$



Counting back
(EYFS/re
c/yr1)

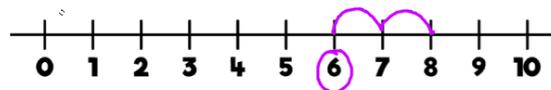
Start with the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.



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



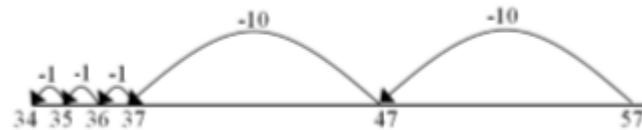
Count back on a number line or number track



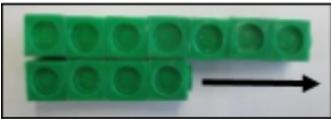
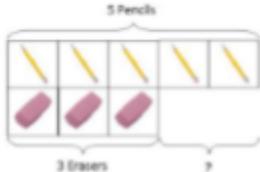
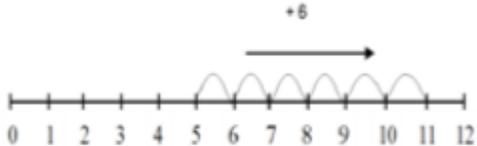
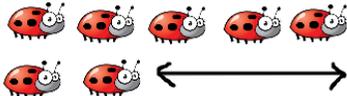
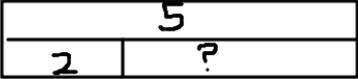
$$8 - 2 = 6$$

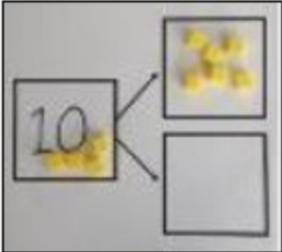
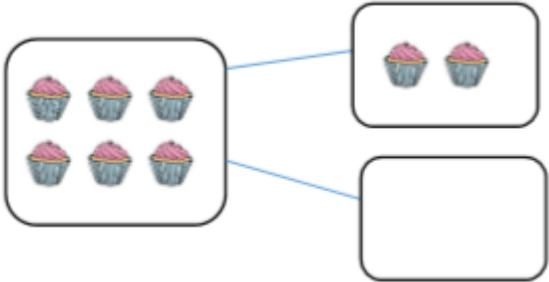
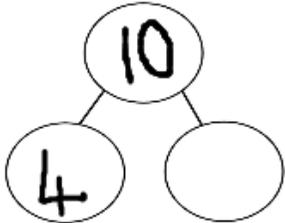
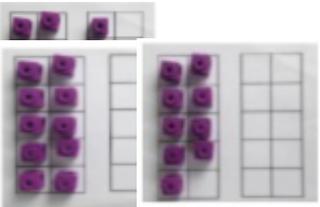
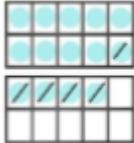
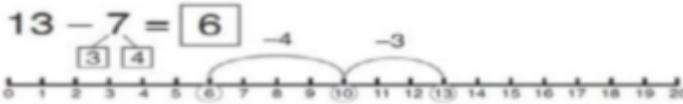
8	
6	2

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



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

		<p>This can progress all the way to counting back using two 2 digit numbers.</p>	
<p>Find the difference e (EYFS/rec/yr1)</p>	<p>Compare amounts and objects to find the difference. Use cubes/beads to build towers or make bars to find the difference.</p>  <p>Use basic bar models with items to find the difference</p> 	<p>Count on to find the difference.</p>  <p>Draw bars to find the difference between 2 numbers.</p>  	<p>Find the difference between 8 and 5. $8 - 5$, the difference is ___</p> <p>Children to explore why $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.</p> <p>Hannah has 23 sandwiches; Helen has 15 sandwiches. Find the difference between the number of sandwiches.</p>

<p>Part part whole model (EYFS/rec/yr1)</p>	<p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p>  <p>If 10 is the whole and 6 is one of the parts. What is the other part? $10 - 6 =$</p>	<p>Use a pictorial representation of objects to show the part part whole model.</p> 	<p>Move to using numbers within the part-part-whole model.</p> 
<p>make 10 (Yr 1/2)</p>	<p>14-5= Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.</p> 	<p>Children to present the ten frame pictorially and discuss what they did to make 10.</p> <p>$14 - 5 =$</p>  <p>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.</p> 	<p>16 - 8= How many do we take off to reach the next 10? How many do we have left to take off?</p>

Column method without regrouping (yr 2/3)

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

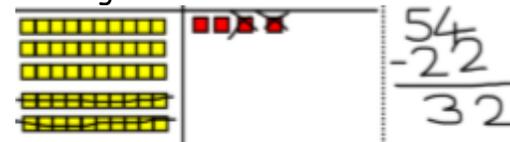
Tens	Ones
	:::

$$\begin{array}{r} 56 \\ -30 \\ \hline \end{array}$$

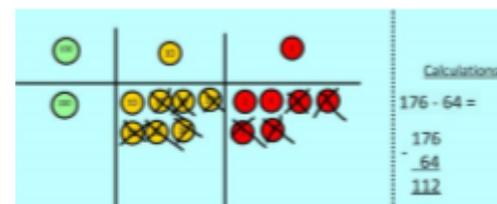
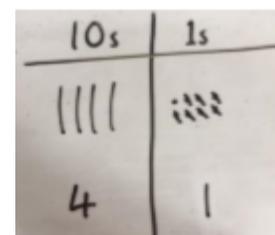
Show how you partition numbers to subtract. Again make the larger number first.



Draw the Base 10 or place value counters alongside the written calculation to help to show working.

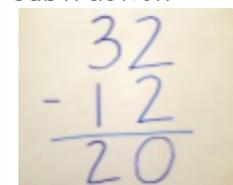


Children to represent pictorially. 48-7=



$$\begin{array}{r} 47 - 24 = 23 \\ \underline{-20+7} \\ 20+3 \end{array}$$

This will lead to a clear written column subtraction



Column method with grouping

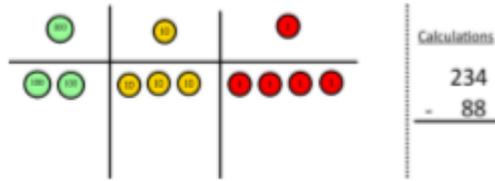
Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

Represent the Base 10 pictorially, remembering to show the exchange. Draw the counters onto a place value grid and show what you have taken away by crossing the

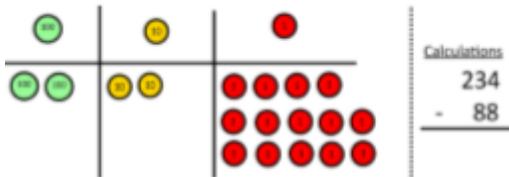
Children can start their formal written method by partitioning the number into clear place

(yr 3/4/5)

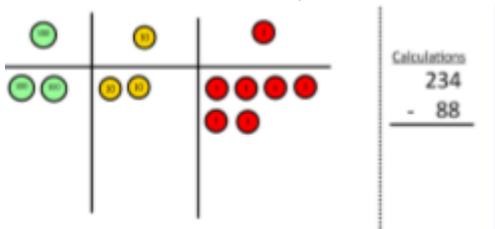
Make the larger number with the place value counters.



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

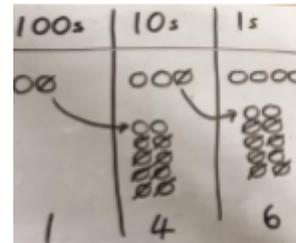


Now I can subtract my ones.

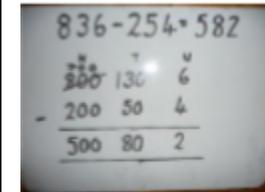


Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.

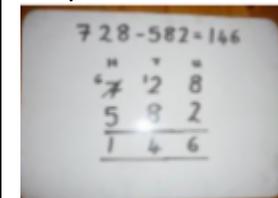
counters out as well as clearly showing the exchanges you make.



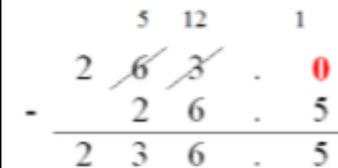
value columns.

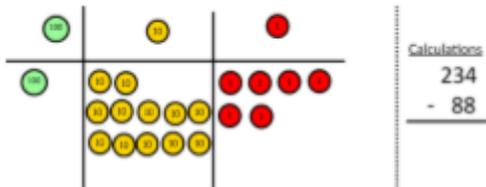


Moving forward the children use a more compact method.



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

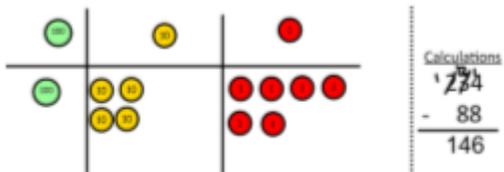




Calculations

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

Now I can take away eight tens and complete my subtraction.

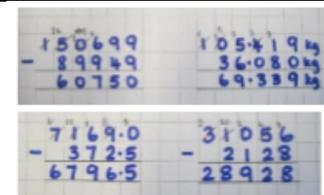


Calculations

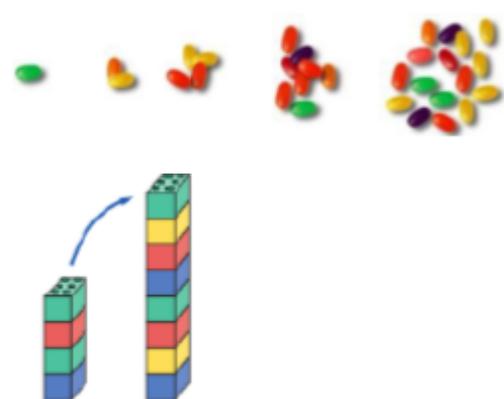
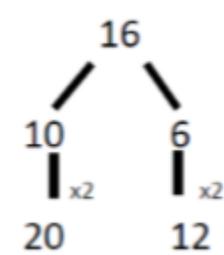
$$\begin{array}{r} 234 \\ - 88 \\ \hline 146 \end{array}$$

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.

Subtract with increasingly large and more complex



numbers and decimal values. (Yr 5/6)			
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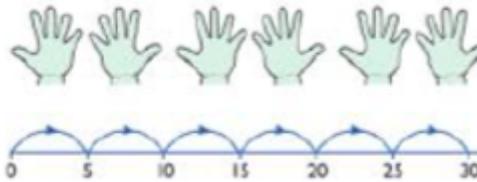
Multiplication			
Strategy	Concrete	Pictorial	Abstract
Doubling (EYFS/ Rec/yr1)	Use practical activities to show how to double a number. 	Draw pictures to show how to double a number. Double 4 is 8 	Partition a number and then double each part before recombining it back together. 
Counting in	Count in multiples supported by	Use a number line or pictures to continue	Count in multiples of a number

multiples
(rec/yr1)

concrete objects in equal parts.



support in counting in multiples.

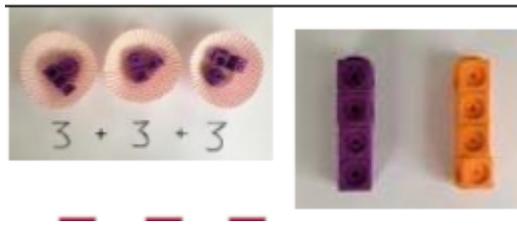
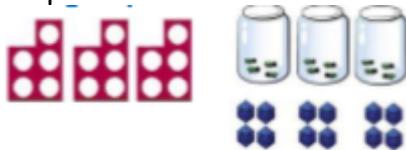


aloud. (Use a counting rod to support this).

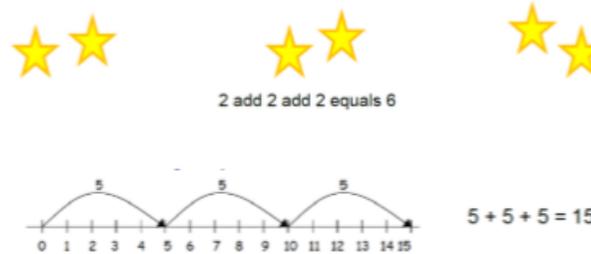
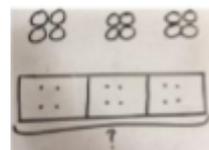
Write sequences with multiples of numbers.
2, 4, 6, 8, 10
5, 10, 15, 20, 25, 30

Repeated addition
(yr1/2)

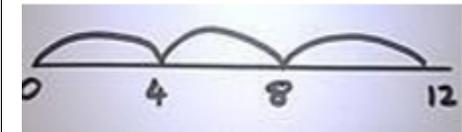
Use different objects to add equal groups.

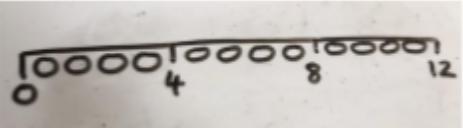
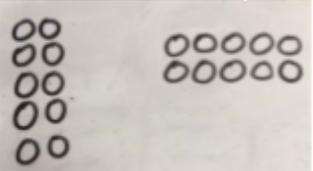


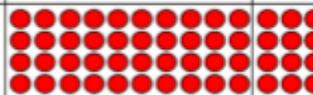
Children to represent in picture and/or use a bar model.



Write addition sentences to describe objects and pictures.



			
<p>Arrays- showing commutative multiplication (yr 2)</p>	<p>Create arrays using counters/ cubes to show multiplication sentences.</p> <p>3 lots of 4</p> <p>4 lots of 3</p>   	<p>Draw arrays in different rotations to find commutative multiplication sentences.</p> 	<p>Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$</p> <p>Use an array to write multiplication sentences and reinforce repeated addition.</p>
<p>Grid method (yr2/3)</p>	<p>Show the link with arrays to first introduce the grid method.</p>	<p>Children can represent the work they have done with place value counters in a way that they understand.</p>	<p>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.</p>

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

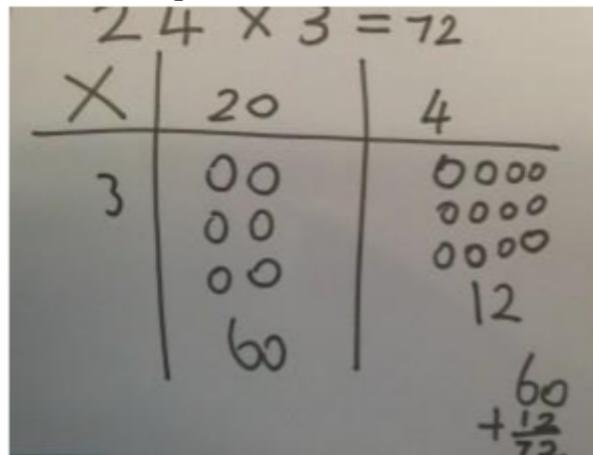
Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.

Calculations
4 x 126

Fill each row with 126.

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.



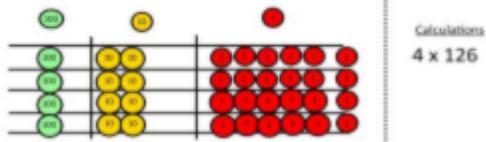
x	30	5
7	210	35

$$210 + 35 = 245$$

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

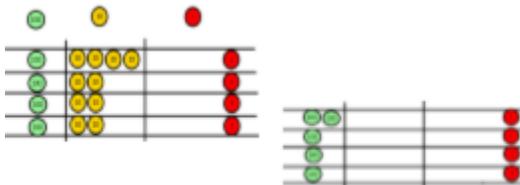
	10	8
10	100	80
3	30	24

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



Calculations
4 x 126

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



Then you have your answer.

$$235.5 \times 26 = ?$$

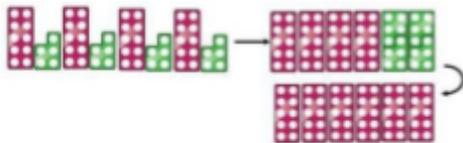
X	200	30	5	0.5	
20	4000	600	100	10.0	= 4710
6	1200	180	30	3.0	= 1413

$$\begin{array}{r} 4710 \\ + 1413 \\ \hline 6123 \end{array}$$

Partition to multiply
(yr 3/ 4)

You can use Numicon, base 10 or Cuisenaire rods.

$$4 \times 15 = \square$$

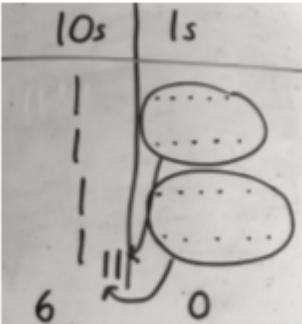
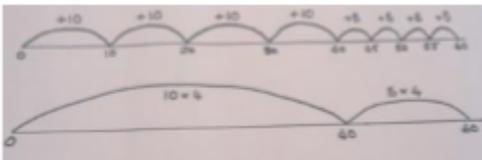
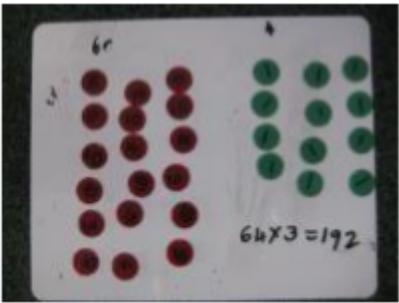
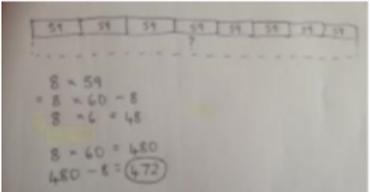
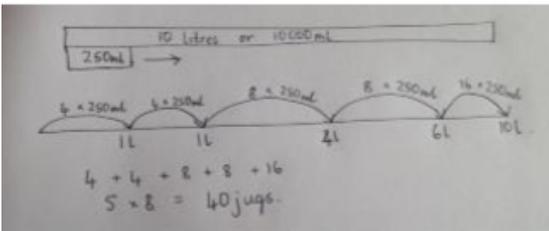


Children to represent the concrete manipulatives pictorially.

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

$$\begin{array}{l} 4 \times 15 \\ \swarrow \searrow \\ 10 \quad 5 \\ \\ 10 \times 4 = 40 \\ 5 \times 4 = 20 \\ 40 + 20 = 60 \end{array}$$

A number line can also be used

			
<p>Column multiplication (yr4/5)</p>	<p>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.</p> 	<p>Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.</p>  	<p>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.</p>

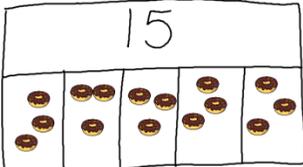
280			
70	70	70	70

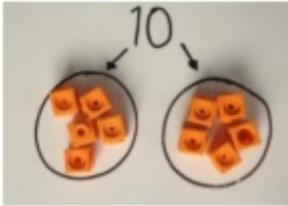
$$\begin{array}{r}
 32 \\
 \times 24 \\
 \hline
 8 \quad (4 \times 2) \\
 120 \quad (4 \times 30) \\
 40 \quad (20 \times 2) \\
 600 \quad (20 \times 30) \\
 \hline
 768
 \end{array}$$

$$\begin{array}{r}
 7 \ 4 \\
 \underline{6} \ 3 \\
 1 \ 2 \\
 2 \ 1 \ 3 \\
 2 \ 4 \ 3 \\
 + 4 \ 2 \ 0 \ 3 \\
 \hline
 4 \ 6 \ 6 \ 2
 \end{array}$$

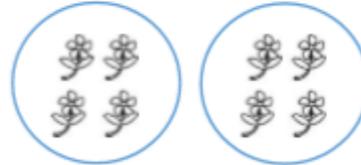
This moves to the more compact method.

			$ \begin{array}{r} 231 \\ 1342 \\ \times 18 \\ \hline 10736 \\ 13420 \\ \hline 24156 \\ 1 \end{array} $																									
Multiply decimals (yr 6)			<table border="1"> <tr> <td></td> <td>3</td> <td>•</td> <td>1</td> <td>9</td> </tr> <tr> <td>X</td> <td>8</td> <td>•</td> <td></td> <td></td> </tr> <tr> <td colspan="5"><hr/></td> </tr> <tr> <td>2</td> <td>5</td> <td>•</td> <td>5</td> <td>2</td> </tr> <tr> <td></td> <td></td> <td>1</td> <td>7</td> <td></td> </tr> </table>		3	•	1	9	X	8	•			<hr/>					2	5	•	5	2			1	7	
	3	•	1	9																								
X	8	•																										
<hr/>																												
2	5	•	5	2																								
		1	7																									

Division			
Sharing objects into groups (EYFS/ Rec/yr1)	I have 10 cubes, can you share them equally in 2 groups?	Children share objects pictorially. 	Share nine buns between three people $9 \div 3 = 3$

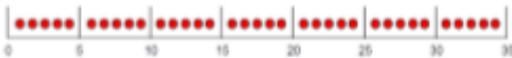
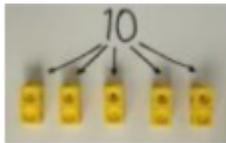


$$8 \div 2 = \square$$



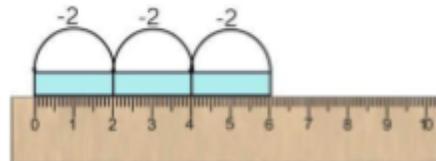
Division as grouping (Yr1/2)

Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.



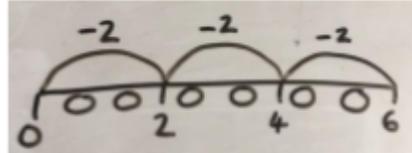
Repeated subtraction using counters.

$$6 \div 2 = \square$$

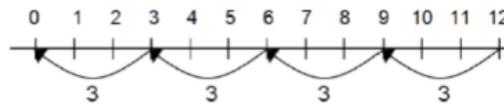


3 groups of 2

Children can represent this pictorially.



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

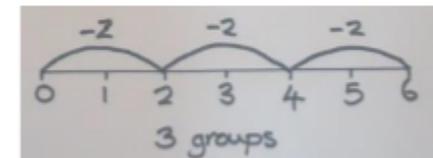
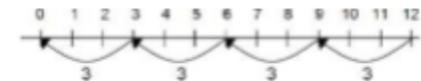


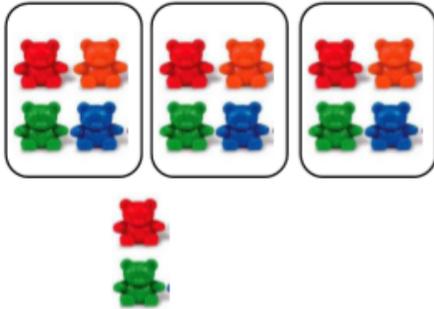
Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.

$$28 \div 7 = 4$$

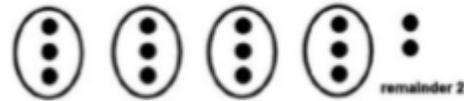
Divide 28 into 7 groups. How many are in each group?

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

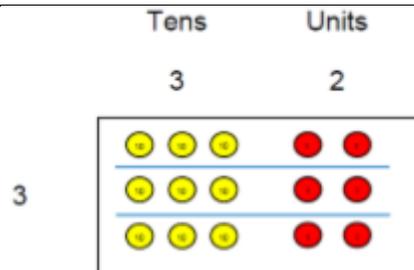




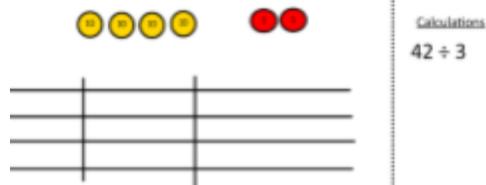
Draw dots and group them to divide an amount and clearly show a remainder.



Short division
(yr 4/5)

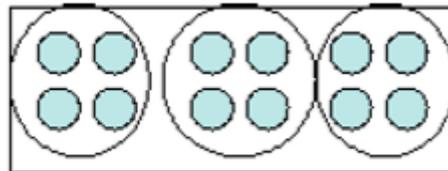


Use place value counters to divide



Start with the biggest place value, we are sharing 40 into three groups. We

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.

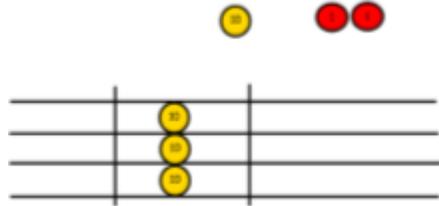
$$\begin{array}{r} 218 \\ 4 \overline{) 872} \end{array}$$

Move onto divisions with a remainder.

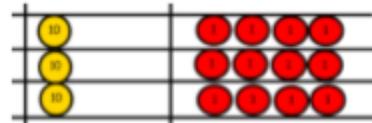
$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \end{array}$$

Finally move into decimal places to divide the total accurately.

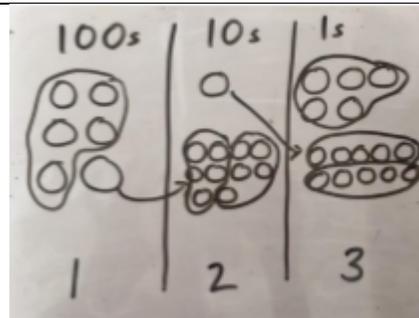
can put 1 ten in each group and we have 1 ten left over.



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



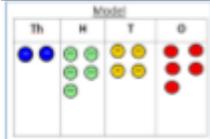
We look how much in 1 group so the answer is 14.



$$\begin{array}{r}
 14.6 \\
 35 \overline{) 511.0} \\
 \underline{35} \\
 16 \\
 \underline{15} \\
 11 \\
 \underline{10} \\
 10 \\
 \underline{10} \\
 0
 \end{array}$$

Long division
(Yr 5/6)

$2544 \div 12$ How many groups of 12 thousands do we have? None

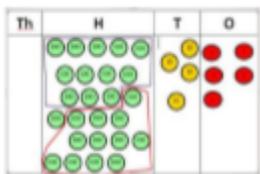


Exchange 2 thousand for 20 hundreds.



$$12 \overline{) 2544} \quad 0$$

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.



$$12 \overline{) 2544} \quad 02$$

$$\underline{24}$$

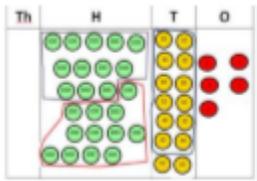
$$1$$

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

Instead of using physical counters, students can draw the counters and circle the groups on a whiteboard or in their books.

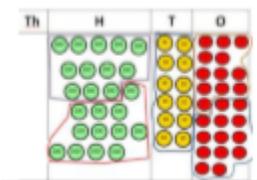
Use this method to explain what is happening and as soon as they have understood what move on to the abstract method as this can be a time consuming process.

$$\begin{array}{r}
 0318 \text{ r}5 \\
 20 \overline{) 6365} \\
 \underline{-60} \\
 36 \\
 \underline{-20} \\
 165 \\
 \underline{-160} \\
 5
 \end{array}$$



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

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



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