

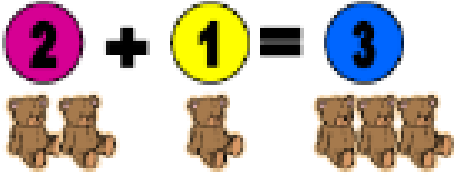
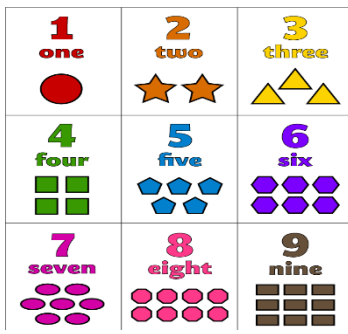
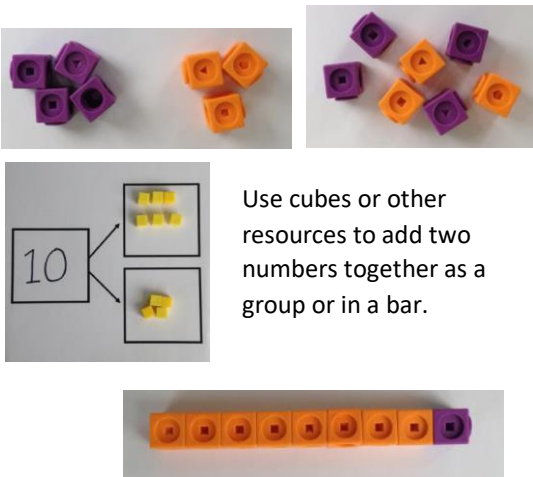
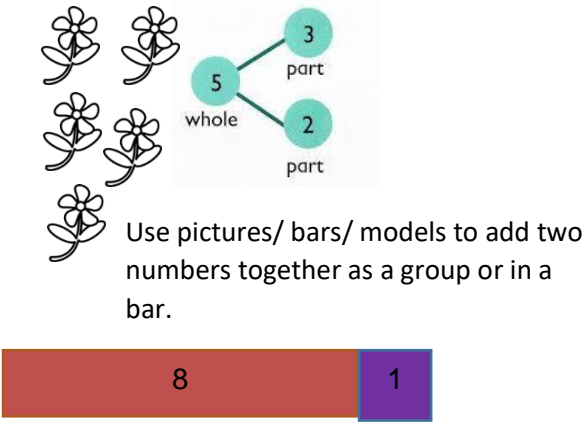
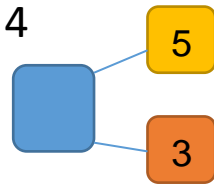
St Mary's Catholic Primary School

Maths Calculation Policy

2020

Progression in: Addition, Subtraction, Multiplication, Division and Fractions  
from Reception to Year 6.

**Addition:** Language: sum, total, parts and wholes, plus, add, altogether, more, exchange, 'is equal to' 'is the same as'

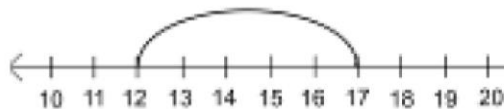
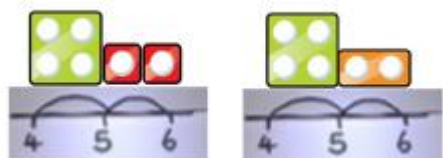
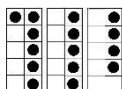
Key skills and strategies to support.	Concrete	Pictorial	Abstract
<p>Early learning goals: Count reliably with numbers from 1 to 20, place them in order. Say which number is one more than a given number. Using quantities and objects, they add two single-digit numbers and count on to find the answer.</p>	<p>Begin to relate addition to combining two groups of objects using practical resources, role play, stories and songs. 10s frames.</p> 		<p>Count on in ones and say which number is one more than a given number using a number line or number track to 20.</p>
Year 1			
<p>Joining two parts to make a whole: part- whole model</p>	 <p>Use cubes or other resources to add two numbers together as a group or in a bar.</p>	 <p>Use pictures/ bars/ models to add two numbers together as a group or in a bar.</p>	<p><math>4 + 3 = 7</math> <math>10 = 6 + 4</math></p>  <p>Use the part-part whole diagram as shown above to move into the abstract.</p>

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.

Ten frames will also support this skill



Start at the larger number on the number line and count on in ones or in one jump to find the answer.

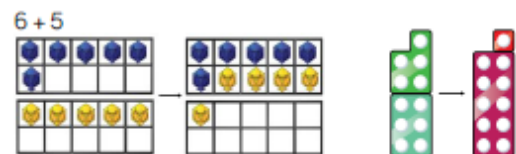
Place the larger number in your head and count on the smaller number to find your answer. (**even if the larger number isn't first**)

$$5 + 12 = 17$$

Making 10.

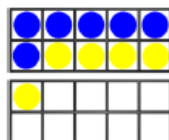
$$6 + 5 = 11$$

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



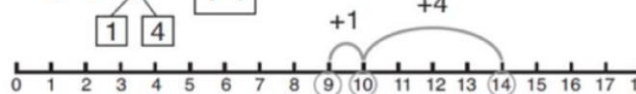
$$3 + 9 =$$

Use pictures or a number line. Regroup or partition the smaller number to make 10.



Draw the tens frame and counters.


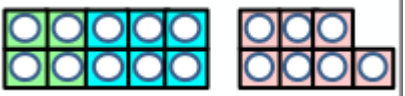
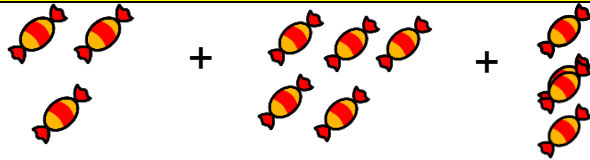
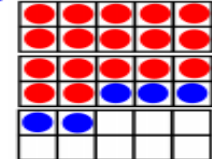
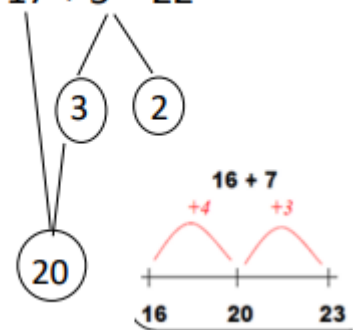
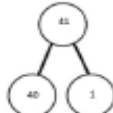
$$9 + 5 = 14$$



$$7 + \underline{\quad} = 10$$

$$10 + \underline{\quad} = \underline{\quad}$$

## Year 2

Adding three single digits.	<p><math>4 + 7 + 6 = 17</math> Use knowledge of number bonds to 10 and 20 to solve quickly.</p>  <p>Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit, e.g. put 4 and 6 together to make 10. Add on 7.</p> 	 <p>Add together three groups of objects. Draw a picture to recombine the groups to make 10.</p>	<p><math>4 + 7 + 6 = 10 + 7</math> <math>= 17</math></p> <p>Combine the two numbers that make 10 and then add on the remainder. Look for ways to make 10 and use this knowledge to solve, e.g. <math>9 + 3 + 4 = 10 + 2 + 4 = 16</math></p>									
Add a two-digit number and ones.	 <p><math>17 + 5 = 22</math> Use ten frame to make 'magic ten'</p> <p>Children explore the pattern.</p> <p><math>17 + 5 = 22</math> <math>27 + 5 = 32</math></p>	<p>Use part part whole and number line to model.</p> <p><math>17 + 5 = 22</math></p> 	<p><math>17 + 5 = 22</math></p> <p>Explore related facts</p> <p><math>17 + 5 = 22</math> <math>5 + 17 = 22</math> <math>22 - 17 = 5</math> <math>22 - 5 = 17</math></p> <table border="1" data-bbox="1776 946 1971 1016"><tr><td colspan="2">22</td></tr><tr><td>17</td><td>5</td></tr></table>	22		17	5					
22												
17	5											
Column method- no exchange <i>Year 2 to also begin to use exchanging when ready.</i>	<p><math>24 + 15 =</math> Use base 10 blocks to represent the numbers. Add the ones together and then add the tens.</p>	<p>Draw the base 10 or counters to help them to solve additions. Sicks for tens and dots for ones. A hundred square and number line can also support this skill. Children will also draw their base 10 equipment (diennes) to support this visually.</p>	<p><math>41 + 8</math></p>  <p><math>1 + 8 = 9</math> <math>40 + 9 = 49</math></p> <table border="1" data-bbox="1776 1249 1926 1377"><tr><td></td><td>4</td><td>1</td></tr><tr><td>+</td><td></td><td>8</td></tr><tr><td></td><td>4</td><td>9</td></tr></table>		4	1	+		8		4	9
	4	1										
+		8										
	4	9										

T	O

Place value  
counters will also  
aid this skill.

10	1
10 10 10 10	1 1 1 1 1
10	1 1 1 1 1

4 0	3
2 0	5



4 3	
2 5	

10s	1s
	.
	.....
4	9

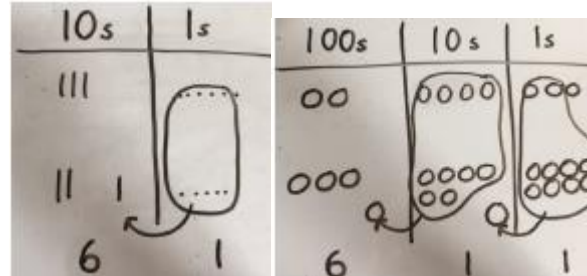
## Year 3- Year 6

Column method with exchanging  
*Year 2 only to two 2-digit numbers.*

Year 3- up to 3digits.  
Year 4- up to 4digits.  
Year 5 and 6 over 4 digits.

Base 10- physically adding and exchanging where needed.

Children can (if needed) draw a pictorial representation of the base 10 to further support their learning and understanding.



Bar model

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

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

Ensure that the abstract column method is shown alongside the base 10 to explicitly link where the exchanging is and why.

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



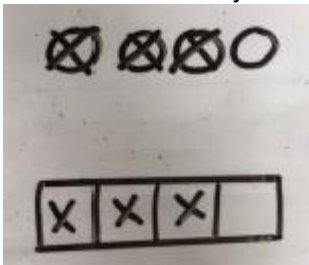
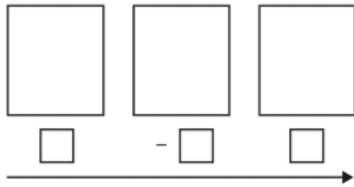
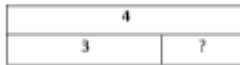
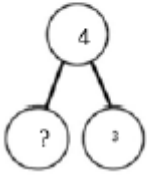
As the children move on, introduce decimals with the same number of decimal places. Money can also be used here.


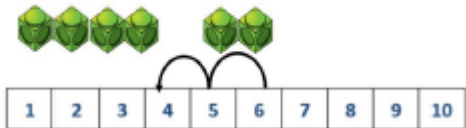

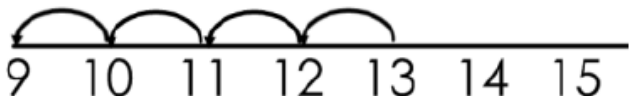
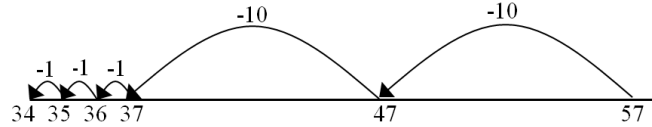

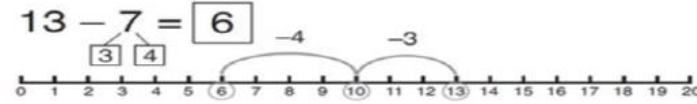
Year 5 and 6 include place holders

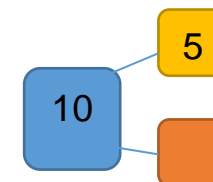
$$\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 11 \end{array}$$

$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \\ 212 \\ \hline £ 23.59 \\ + £ 7.55 \\ \hline £ 31.14 \\ 111 \end{array}$$

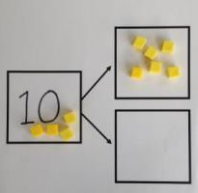
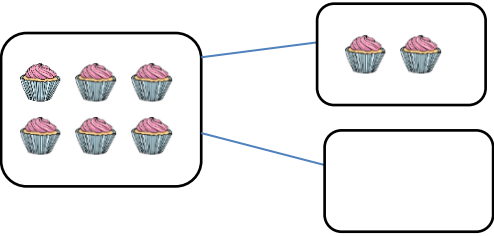
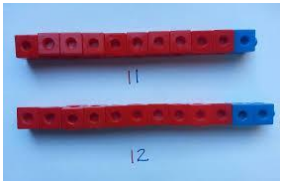
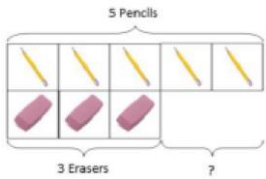
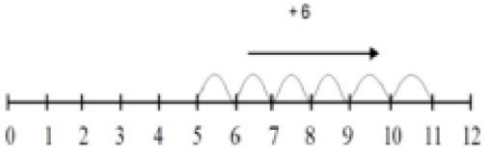
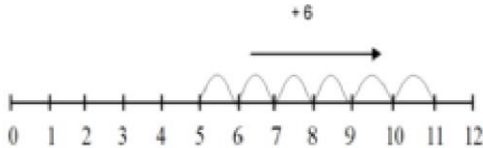
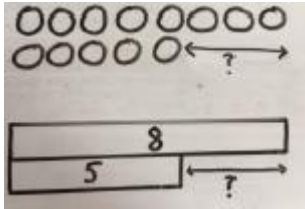
Subtraction: Language: take away, less than, the difference, subtract, minus, fewer, decrease, exchange

Key skills	Concrete	Pictorial	Abstract
<p>Early learning goals: Say which number is one less than a given number. Using quantities and objects, they subtract two single-digit numbers and count back to find the answer.</p>	<p>Songs and rhymes. (10 green bottles, 5 little ducks went swimming one day) Begin to relate subtraction to 'taking away' using concrete objects and role play.</p> 		<p>Count backwards along a number line to 'take away'</p> 
Year 1 and 2			
<p>Taking away ones.</p>	<p>Use physical objects, counters, cubes etc to show how objects can be taken away. Real-life objects will help too if posing a problem.</p>	<p>Cross out drawn objects to show what has been taken away.</p>  <p>Use of picture stories, images and number lines to subtract.</p>	<p>First      Then      Now</p>  <p><math>\square - \square = \square</math></p> <p><math>4 - 3 =</math></p> <p><math>\square = 4 - 3</math></p>  

<p>Counting back</p> <p><i>All year groups should use this approach when using number lines to support subtraction</i></p>	<p>Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.</p>  <p><math>6 - 2 = 4</math></p>  <p><math>13 - 4</math></p> <p>Use counters and move them away from the group as you take them away counting backwards as you go.</p> 	<p>Count back on a number line or number track</p>  <p>Start at the bigger number and count back the smaller number showing the jumps on the number line.</p>  <p>This can progress all the way to counting back using two 2 digit numbers.</p>	<p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p> <p>To progress to: Counting back in multiples in your head, visualising the number line.</p>
<p>Make 10</p>	<p><math>14 - 5 =</math></p>  <p>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><math>13 - 7 = 6</math></p>  <p>To reach the next 10 I need to takeaway 3. 7 can be partitioned into 3 and 4. 13 takeaway 3 is ten. 10 takeaway 4 is 6.</p>	<p><math>16 - 8 =</math></p> <p>How many do we take off to reach the next 10?</p> <p>How many do we have left to take off?</p>

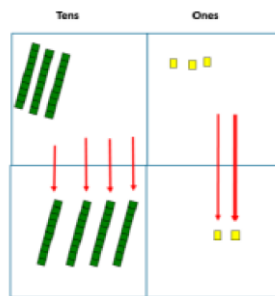




<p>Part / Whole Model</p>	<p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p> <p>If 10 is the whole and 6 is one of the parts. What is the other part?</p> $10 - 6 =$ 	<p>Use a pictorial representation of objects to show the part part whole model.</p> 	<p>Move to using numbers within the part whole model.</p>
<p>Finding the difference.</p>	<p>Compare amounts and objects to find the difference.</p> <p>Use cubes 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>Count on to find the difference.</p>  <p>Draw bars to find the difference between 2 numbers.</p> 	<p>Children progress to the understanding that to find the difference you can simply take away.</p> <p>Children to explore why <math>8-6 = 2</math> <math>7-5 = 2</math> <math>6-4 = 2</math> for example.</p>

Column method without exchanging

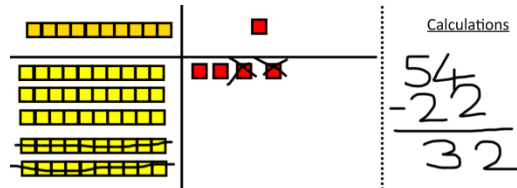
Year 2 (not year 1)



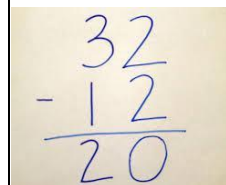
numbers to subtract. Again, make the larger number first.

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

Show how you partition



Draw the Base 10 (dienes) alongside the written calculation to help to show working.



This will lead to a clear written column subtraction.

## Year 3- Year 6

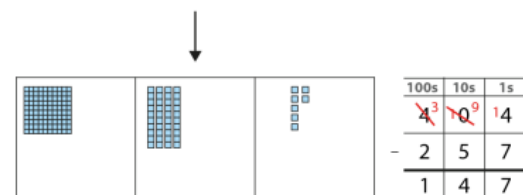
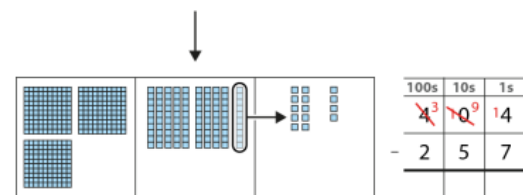
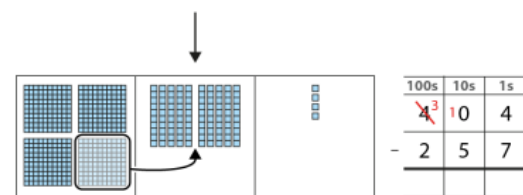
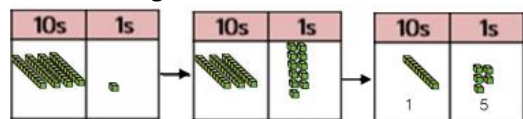
Column method with exchanging.

Year 3 up to 3 digits.

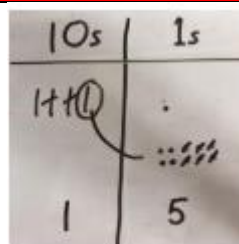
Year 4 up to 4 digits.

Year 5 and 6 4 digits +

Use Base 10 to start with. Start with one exchange before moving onto subtractions that exchange twice.



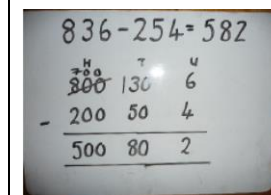
Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.



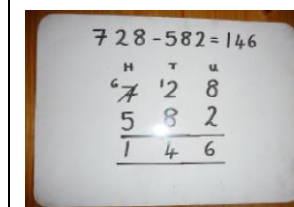
Draw the base 10 and ensure the children can see what is happening when the column to the left has been exchanged.

Bar model as a visual representation (Year 3 from 2019-2020 academic year)

(Year 4 and 5 from 2020-2021 academic year)



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

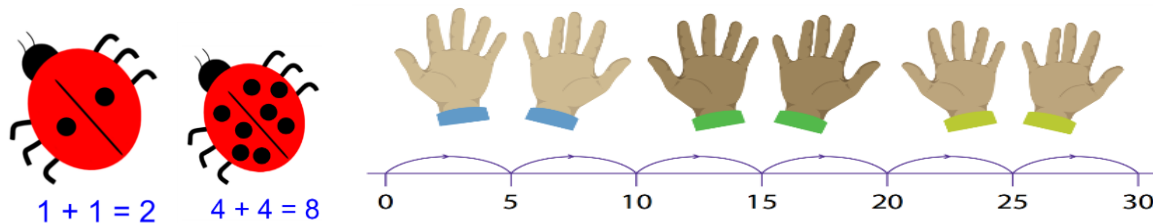





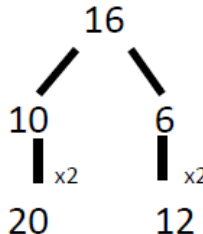


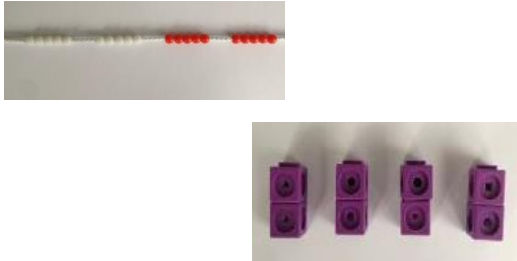
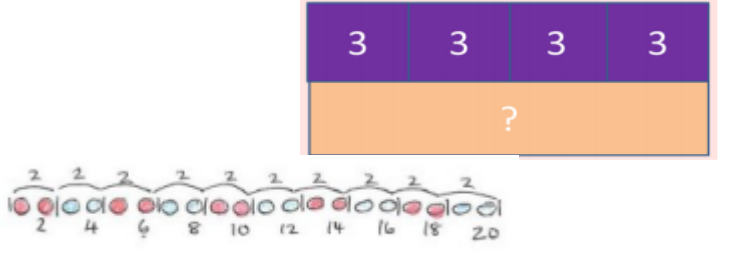
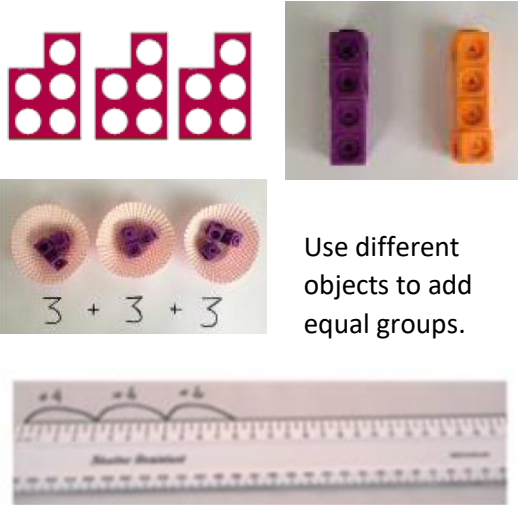
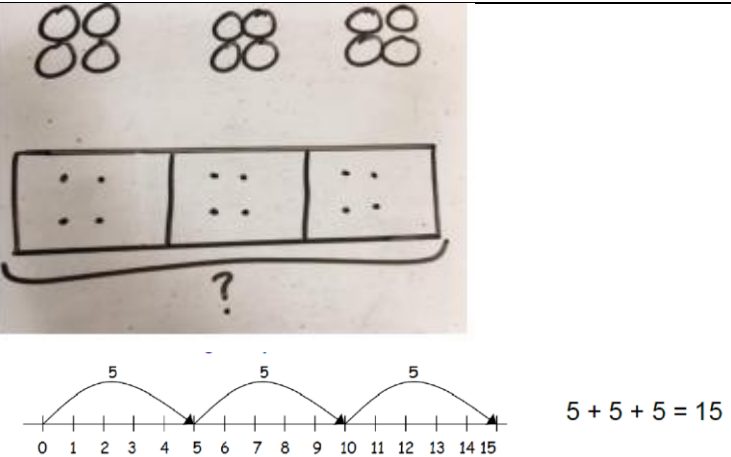

Moving forward the children use a more compact method.

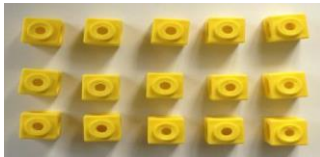
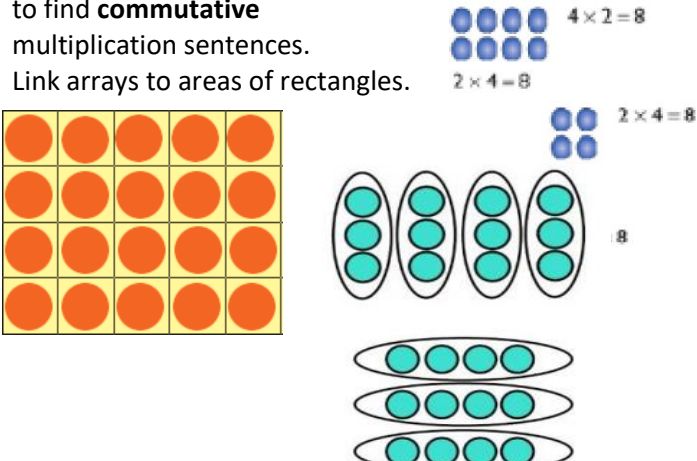

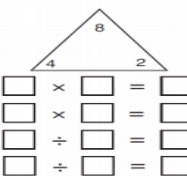
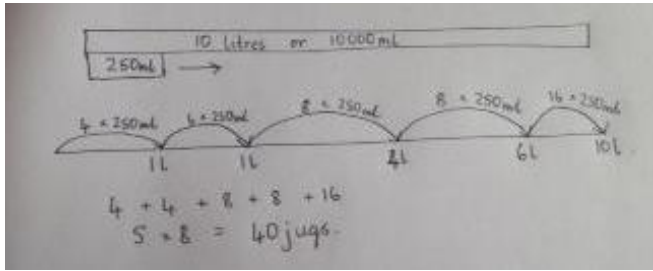
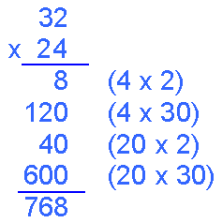
$$\begin{array}{r}
 \begin{array}{ccccccc}
 & 5 & 12 & & 1 & & \\
 2 & \cancel{6} & \cancel{3} & . & 0 & & \\
 - & 2 & 6 & . & 5 & & \\
 \hline
 2 & 3 & 6 & . & 5 & & 
 \end{array}
 \end{array}$$

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

Multiplication Language: double, times, multiplied by, the product of, groups of, lots of, equal groups, exchange

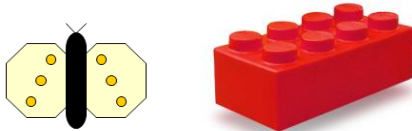
Key Skills	Concrete	Pictorial	Abstract
Early learning goal statutory requirement: They solve problems, including doubling, halving and sharing	Use pictorial representations and concrete resources to double numbers to 10. Use concrete sources, role play, stories and songs to begin counting in twos, fives and tens.		
	 $1 + 1 = 2$ $4 + 4 = 8$		
Year 1			
Doubling	Use practical activities to show how to double a number.  double 4 is 8 $4 \times 2 = 8$   	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.

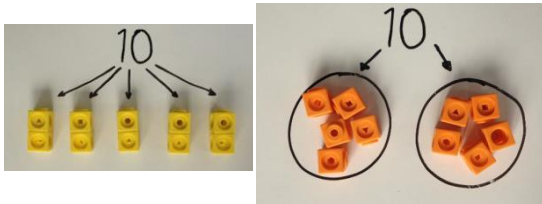

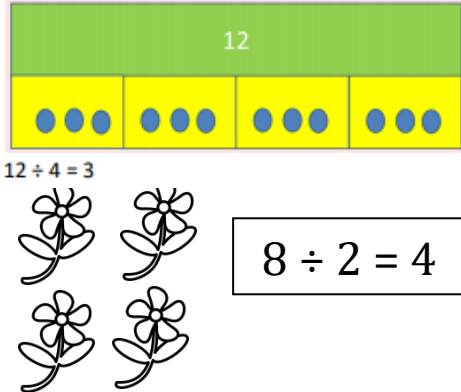
<p>Counting in multiples.</p>	<p>Count in multiples supported by concrete objects in equal groups.</p> 	<p>Use a number line or pictures to continue support in counting in multiples.</p> 	<p>Count in multiples of a number aloud.</p> <p>Skip counting.</p> <p>Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10</p> <p>5, 10, 15, 20, 25, 30</p>
<p>Repeated addition</p>	 <p>Use different objects to add equal groups.</p> <p>Cuisenaire rods can be used too.</p>	 <p><math>5 + 5 + 5 = 15</math></p>	<p>Write addition sentences to describe objects and pictures.</p> <p><math>2 \times 5</math></p>  <p><math>2 + 2 + 2 + 2 + 2 = 10</math></p>

Year 2			
Arrays (commutative law)	Create arrays using counters/ cubes to show multiplication sentences.  	Draw arrays in different rotations to find <b>commutative</b> multiplication sentences. Link arrays to areas of rectangles.  	Use an array to write multiplication sentences and reinforce repeated addition.    5 + 5 + = 15 3 + 3 + 3 + 3 + 3 = 15 3 x 5 = 15 5 x 3 = 15 
Year 3- Year 6			
Year 3: 2digits x 1 digit Year 4: 2/3 digits x 1 digit. Year 5 and 6: 2/3/4 digits x 1 digit and x 2digits.	Show using base 10 or numicon (first without exchanging)  Children to be supported by base 10 with smaller numbers before representing numbers using base 10.  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.  	Children to be encouraged to show the steps they have taken. This may involve looking at the partitioning of the number moving onto a more compact method.  

			<div data-bbox="1798 132 2038 443"> <math display="block">  \begin{array}{r}  74 \\  \times 63 \\  \hline  12 \\  210 \\  240 \\  + 4200 \\  \hline  4662  \end{array}  </math> </div> <div data-bbox="1744 451 2107 547"> <p>This can then be applied to the multiplication of decimals- (money and measures)</p> </div>
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Division Language: share, group, divide, divided by, half, divisor, dividend, quotient, remainder, exchange

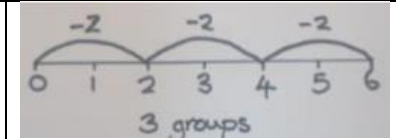
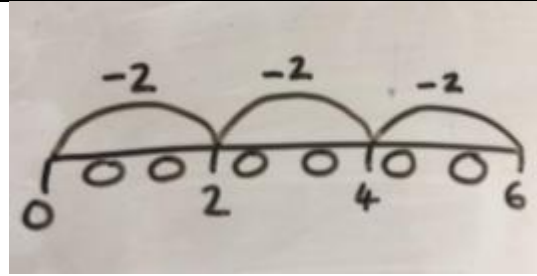
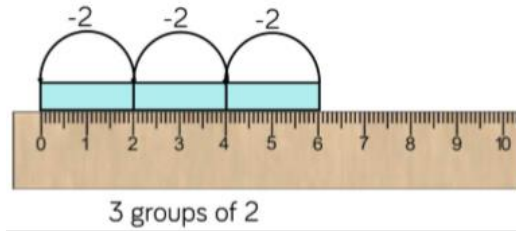
Key skills	Concrete	Pictorial	Abstract
Early learning goal: They solve problems, including halving and sharing.	<div>Begin to share quantities using practical resources, role play, stories and songs. Use pictorial representations and concrete resources to halve numbers to 10.</div> <div></div> <div><i>Role play example:</i> <b>It is the end of the party and the final two teddies are waiting for their party bags. Provide empty party bags and a small collection of items such as gifts, balloons and slices of cake. Ask the children to share the objects between the two bags.</b></div>		

Year 1			
Placing objects into groups.	<div>I have 10 cubes, can you share them equally in 2 groups?</div> <div></div>	<div>Children use pictures or shapes to share quantities.</div> <div></div> <div></div>	<div>Share 9 buns between three people.</div> <div><math>9 \div 3 = 3</math></div>



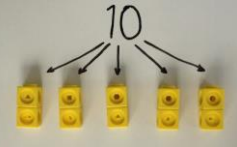
### Repeated Subtraction.

$$6 \div 2$$



Year 2

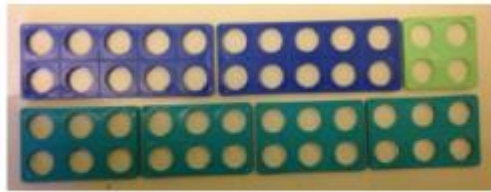
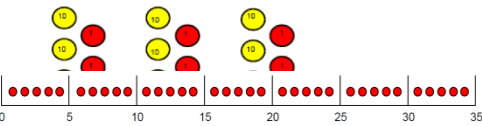
## Division as Grouping.



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

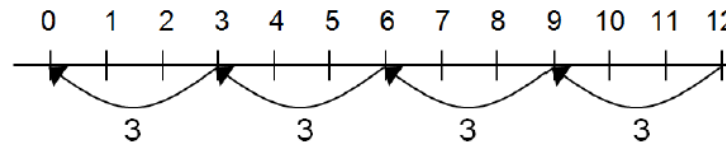
understanding.

$$96 \div 3 = 32$$

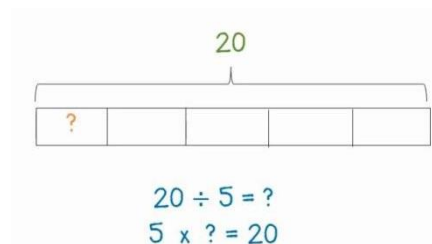


24 divided into groups of 6 = 4

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

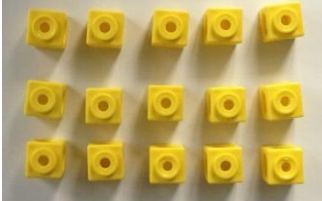
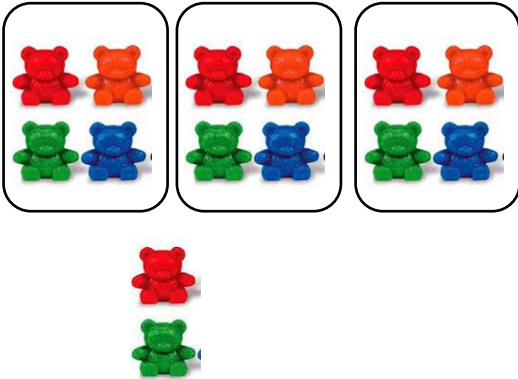
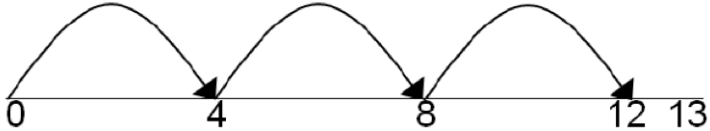

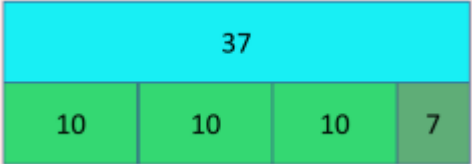


Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.



$$28 \div 7 = 4$$

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

<p>Division with arrays.</p>	 <p>Link division to multiplication by creating an array and thinking about the number sentences that can be created.</p> <p>Eg <math>15 \div 3 = 5</math>    <math>5 \times 3 = 15</math>  <math>15 \div 5 = 3</math>    <math>3 \times 5 = 15</math></p>	<p>Draw an array and use lines to split the array into groups to make multiplication and division sentences.</p>	<p>Find the inverse of multiplication and division sentences by creating four linking number sentences.</p> <p><math>7 \times 4 = 28</math>  <math>4 \times 7 = 28</math>  <math>28 \div 7 = 4</math>  <math>28 \div 4 = 7</math></p>
<p>Division with a remainder.</p>	<p><math>14 \div 3 =</math>          Divide objects between groups and see how much is left over</p>  <p>Cuisenaire can also be used.</p>	<p>Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.</p>  <p>Draw dots and group them to divide an amount and clearly show a remainder.</p>  	<p>Complete written divisions and show the remainder using r.</p> <p><math>29 \div 8 = 3 \text{ r } 5</math></p>

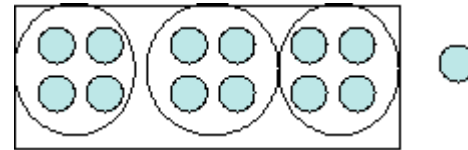
## Year 3-Year 6

Year 3: 2digits by 1 digit  
 Year 4: 2/3 digits by 1 digit.  
 Year 5 and 6: 2/3/4 digits by 1 digit and by 2digits.

Should first be shown using base 10 and shared into groups, to understand the place value.

Use counters to divide using the bus stop method alongside

Children 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.

Start with division without remainders

$$\begin{array}{r} 2 \quad 3 \\ 2 \overline{) 4 \quad 6} \end{array}$$

Move onto divisions with a remainder.

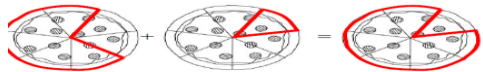
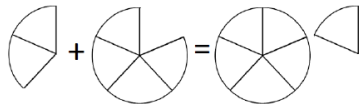
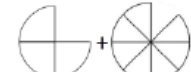
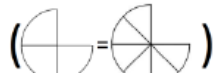
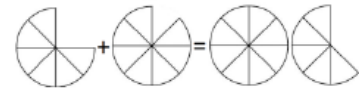
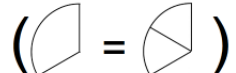
$$\begin{array}{r} 8 \quad 6 \quad r \quad 2 \\ 3 \\ 5 \overline{) 4 \quad 3 \quad 2} \end{array}$$

Finally move into decimal places to divide the total accurately.

$$\begin{array}{r} 1 \quad 4 \quad . \quad 6 \\ 16 \quad 21 \\ 3 \quad 5 \overline{) 5 \quad 1 \quad 1 \quad . \quad 0} \end{array}$$

Long Division- Write out the divisors times table and use these facts to help.

1 x 45 = 45
2 x 45 = 90
3 x 45 = 135
4 x 45 = 180
5 x 45 = 225
6 x 45 = 270
7 x 45 = 315
8 x 45 = 360
9 x 45 = 405
10 x 45 = 450

<b>Fractions:</b> Language: numerator, denominator, fraction, whole, equivalence, improper, mixed number, simplify, reduce, cancelling out.			
Key Skills	Concrete	Pictorial	Abstract
Year 3 - 4			
add and subtract fractions with the same denominator within one whole [for example, $\frac{5}{7} + \frac{1}{7}$ ]	Using objects or fraction shapes to visualise what is happening.	Use of the bar model to visually represent what is happening. $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ 	$\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$
Year 5 - 6			
Add and subtract fractions with the same denominator and denominators that are multiples of the same number.  Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. Divide proper fractions by whole numbers.	Use of objects and or fraction pieces to support the understanding of what is happening- this should not necessarily be needed as will have been shown and explored in Lower Ks2.	Use of the bar model to visually represent what is happening.     $\frac{1}{2} \div 2 =$  $\frac{1}{2} \div 2 =$	