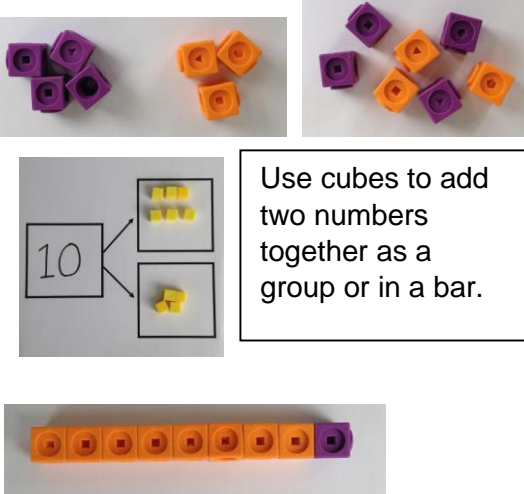
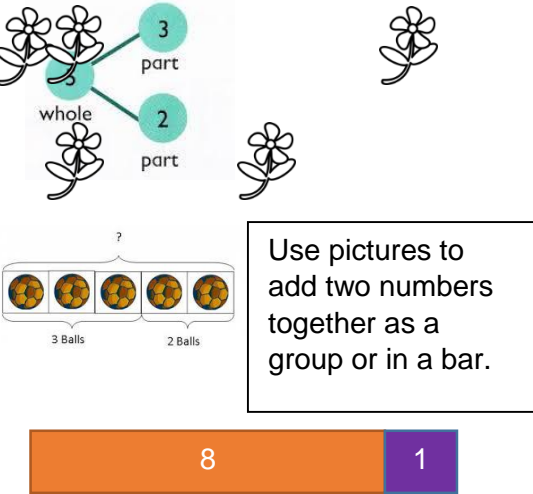
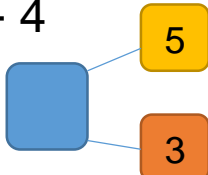

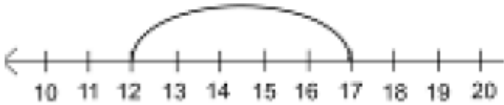


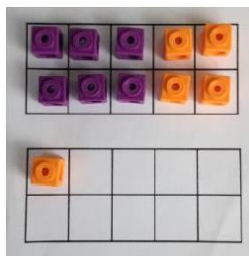
**Progression in Calculations**

**Addition**

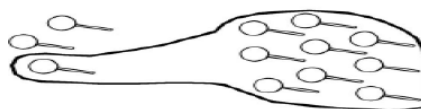
Objective and Strategies	Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole: part-whole model</p>	 <p>Use cubes to add two numbers together as a group or in a bar.</p>	 <p>Use pictures to add two numbers together as a group or in a bar.</p>	<p><math>4 + 3 = 7</math></p> <p><math>10 = 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>

**HOLY REDEEMER CATHOLIC PRIMARY SCHOOL**

Adjusting (*first to make 10*).

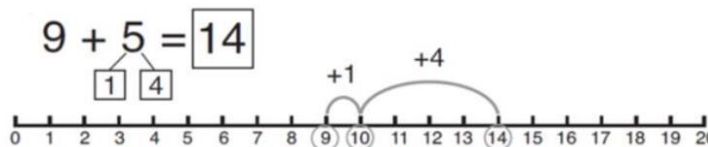


$6 + 5 = 11$   
Start with the bigger number and use the smaller number to make 10.



$3 + 9 =$

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



$7 + 4 = 11$

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

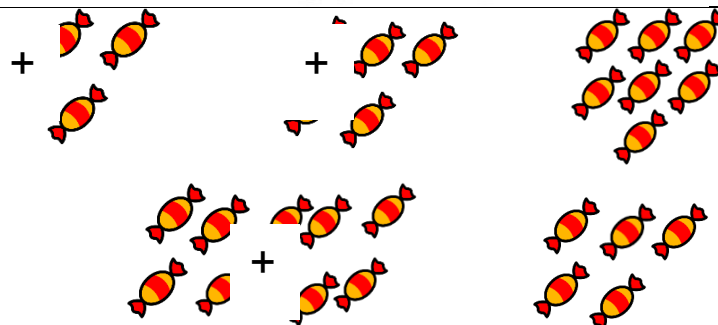
$24 + 9 = \underline{\quad}$   
 $24 + 10 - 1 = \underline{\quad}$

Adding three single digits

$4 + 7 + 6 = 17$   
Put 4 and 6 together to make 10. Add on 7.



Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.



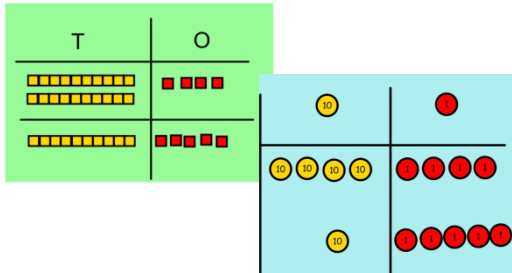
Add together three groups of objects. Draw a picture to recombine the groups to make 10.

$(4) + 7 + (6) = (10) + (7)$   
 $= 17$

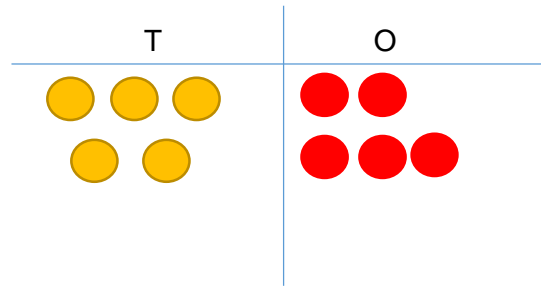
Combine the two numbers that make 10 and then add on the remainder.

Column method- no carrying

$24 + 15 =$   
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.



When the child is ready then can move on to the expanded method of addition (where there is no carrying), using partitioning to help them understand the concept.

Expanded Form

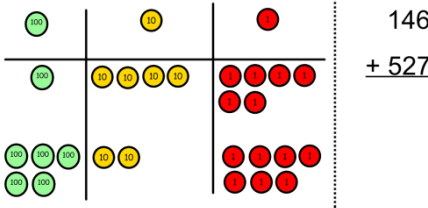
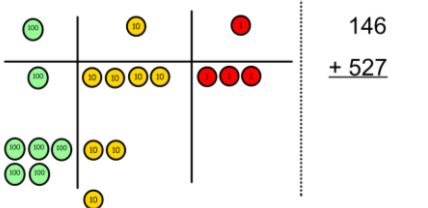
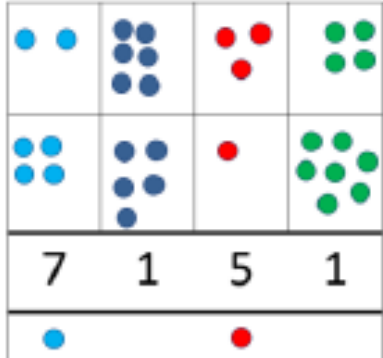
$$\begin{array}{r} 342 \rightarrow 300 + 40 + 2 \\ + 136 \rightarrow 100 + 30 + 6 \\ \hline 478 \quad 400 + 70 + 8 \end{array}$$

They can then move on to the formal method of addition where there is no carrying.

Calculations

$21 + 42 =$

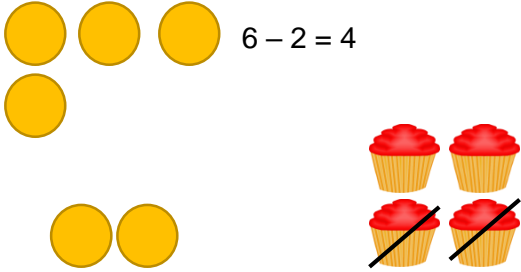
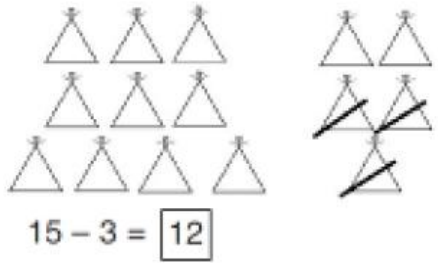


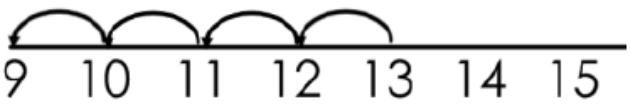
$$\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$$

<p style="color: purple; font-weight: bold;">Column method-carrying</p>	<p>Make both numbers on a place value grid <b>using Dienes Base 10 apparatus.</b></p>  <p style="text-align: right;">146 + 527</p> <p>Add up the units and exchange 10 ones for one 10.</p>  <p style="text-align: right;">146 + 527</p> <p>Add up the rest of the columns, exchanging the 10 cubes from one column for the next place value column until every column has been added.</p> <p>This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.</p>	<p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding. This could also be done using base ten equipment.</p> 	<p>Start by using the expanded method as above but with a carrying figure.</p> $  \begin{array}{r}  20 + 5 \\  40 + 8 \\  \hline  60 + 13 = 73 \\  \phantom{60 + 13} 536 \\  \phantom{60 + 13} + \phantom{536} 85 \\  \hline  \phantom{60 + 13} 110 \\  \phantom{60 + 13} + \phantom{536} 500 \\  \hline  \phantom{60 + 13} 621  \end{array}  $

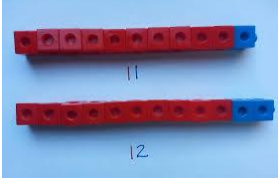
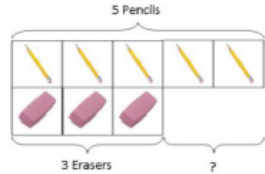
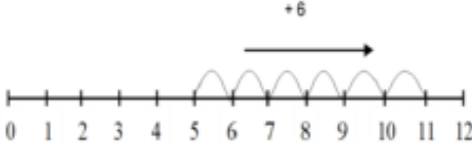
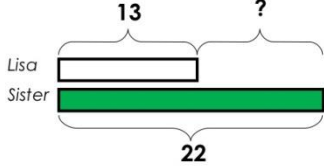
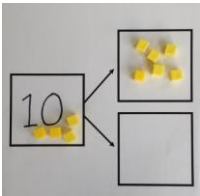
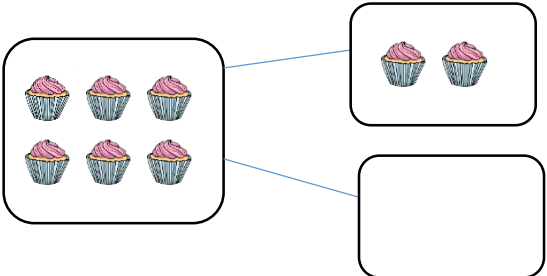
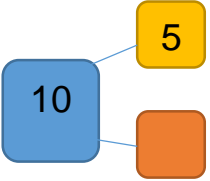
**HOLY REDEEMER CATHOLIC PRIMARY SCHOOL**

	<p>As children move on to decimals, money and decimal place value counters can be used to support learning.</p>		<p>As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.</p> <div style="text-align: right; margin-bottom: 20px;"> <math display="block">  \begin{array}{r}  72.8 \\  + 54.6 \\  \hline  127.4 \\  11  \end{array}  </math> </div> <div style="text-align: right; margin-bottom: 20px;"> <math display="block">  \begin{array}{r}  \pounds 23.59 \\  + \pounds 7.55 \\  \hline  \pounds 31.14 \\  \small 1 \quad 1 \quad 1  \end{array}  </math> </div> <div style="text-align: right;"> <math display="block">  \begin{array}{r}  23.361 \\  9.080 \\  + 1.300 \\  \hline  93.511 \\  2 \quad 1 \quad 2  \end{array}  </math> </div>
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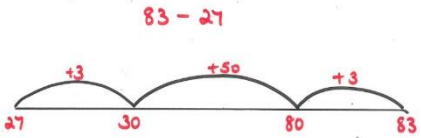
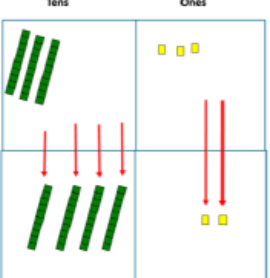

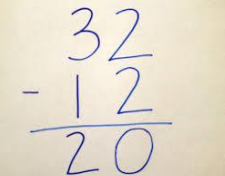
Subtraction

Objective and Strategies	Practical	Pictorial	Abstract
<p><b>Taking away ones</b></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>Cross out drawn objects to show what has been taken away.</p>  <p><math>15 - 3 = 12</math></p>	<p><math>18 - 3 = 15</math></p> <p><math>8 - 2 = 6</math></p>
<p><b>Counting back</b> <i>(when taking a small amount away)</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>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>9 10 11 12 13 14 15</p>	<p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p>

**HOLY REDEEMER CATHOLIC PRIMARY SCHOOL**

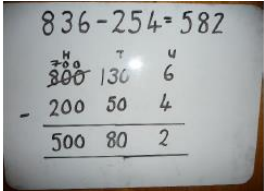
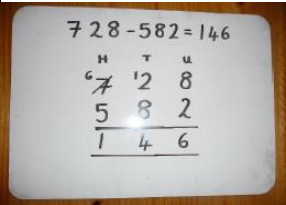
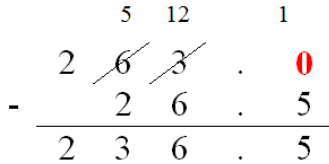
<p><b>Find the difference</b></p>	<p>Compare amounts and objects to find the difference.</p>  <p>Use cubes to build towers or make bars to find the difference</p>  <p>Use basic bar models with items to find the difference</p>	 <p>Count on to find the difference.</p> <p style="text-align: center;"><b>Comparison Bar Models</b></p> <p><i>Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.</i></p>  <p>Draw bars to find the difference between 2 numbers.</p>	<p>Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.</p>
<p><b>Part Part Whole Model</b></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> <p style="text-align: center;"><math>10 - 6 =</math></p>	<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><b>Blank number line for UKS1/KS2</b></p>		<p>Children use the units digit and their knowledge of bonds to ten for their first jump. They then begin by adding leaps of ten until reaching their target tens digit. They then add on the remaining units and count up their hops. Once they can do this, they move on to adding larger</p>	

HOLY REDEEMER CATHOLIC PRIMARY SCHOOL

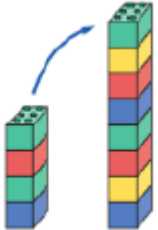

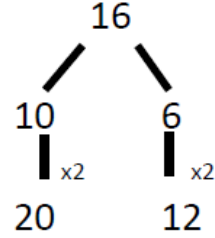
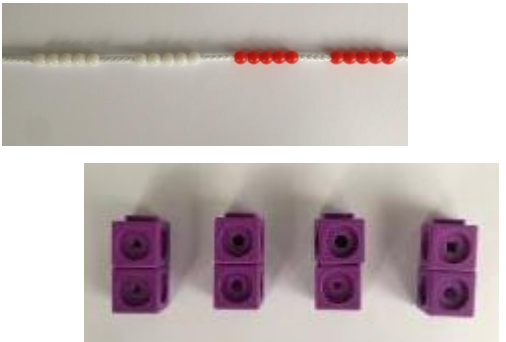
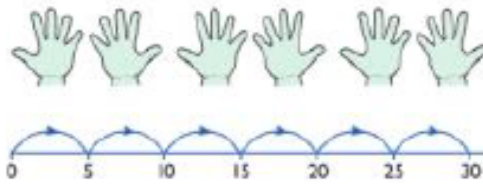
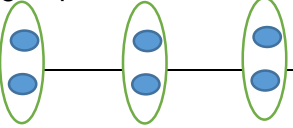
		<p>multiples of ten at a time. Subtraction using a number line to count on</p>  <p style="text-align: center;"><math>83 - 27</math></p> <p style="text-align: center;"><math>50 + 3 + 3 = 56</math> <math>\therefore 83 - 27 = 56</math></p>	
<p>Adjusting for UKS1/KS2 (mental calculation)</p>			<p><math>14 - 9 =</math> <math>14 - 10 + 1 =</math></p>
<p>Column method without regrouping</p>	 <p>Use Base 10 to make the bigger number then take the smaller number away.</p>	 <p>Calculations</p> $\begin{array}{r} 54 \\ - 22 \\ \hline 32 \end{array}$ <p>working.</p> <p>Draw the Base 10 or place value counters alongside the written calculation to help to show</p>	<p>Children will use number lines until their teacher feels they are ready to move on to the formal method of subtraction without regrouping.</p> 







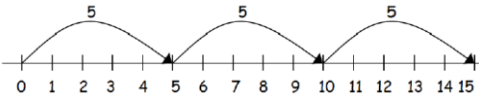







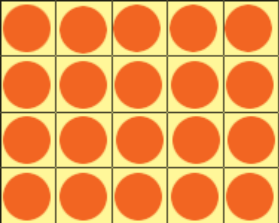

**HOLY REDEEMER CATHOLIC PRIMARY SCHOOL**

<p><b>Column method with regrouping</b></p>	<p>Expanded method can be done practically using base ten equipment and tape on the floor for those children who prefer a practical approach (as above but with exchanging/regrouping).</p>	<p>Expanded column method to help children understand the concept of exchanging/regrouping. This can be drawn as above if needed, or pictures provided by teacher.</p> <div style="text-align: center;">  </div>	<p>Children can start their formal written method by partitioning the number into clear place value columns.</p> <div style="text-align: center;">  </div> <p>Moving forward the children use a more compact method. <b><u>Column subtraction or number line when there are zeros.</u></b></p> <p>This will lead to an understanding of subtracting any number including decimals.</p> <div style="text-align: center;">  </div>
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Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
<p><b>Doubling</b></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 style="text-align: center;">Double 4 is 8</p> 	 <p>Partition a number and then double each part before recombining it back together.</p>
<p><b>Counting in multiples</b></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>
<p><b>Grouping</b></p>	<p>Children may use 'sausages and dots' with practical apparatus such as cubes.</p>	<p>Children use 'sausages and dots' for grouping. <math>3 \times 2 = \underline{\quad}</math></p> <p>They use the vocabulary of lots of/ groups of and draw 3 groups of 2.</p> 	

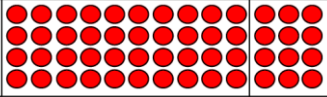

HOLY REDEEMER CATHOLIC PRIMARY SCHOOL

<p>Repeated addition</p>	  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Use different objects to add equal groups.</p> </div>  <p style="text-align: center;"><math>3 + 3 + 3</math></p>	<p>There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?</p>  <p style="text-align: center;"><math>2 + 2 + 2 = 6</math></p>  <p style="text-align: right;"><math>5 + 5 + 5 = 15</math></p>	<p>Write addition sentences to describe objects and pictures.</p>  <p style="text-align: center;"><math>2 + 2 + 2 + 2 + 2 = 10</math></p>
<p>Arrays- showing commutative multiplication</p>	<p>Create arrays using counters/ cubes to show multiplication sentences.</p>  	<p>Draw arrays in different rotations to find <b>commutative</b> multiplication sentences.</p>      <p style="text-align: center;">Link arrays to area of rectangles.</p>	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  <p><math>5 + 5 + 5 = 15</math></p> <p><math>3 + 3 + 3 + 3 + 3 = 15</math></p> <p><math>5 \times 3 = 15</math></p> <p><math>3 \times 5 = 15</math></p>

**HOLY REDEEMER CATHOLIC PRIMARY SCHOOL**



**Grid Method**

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

x	10	3
4		

4 rows of 10  
4 rows of 3

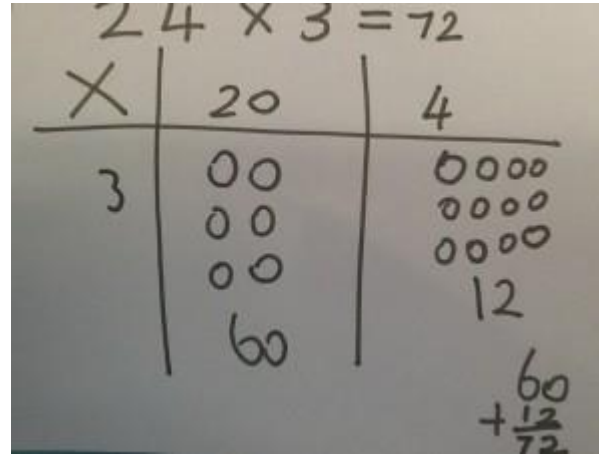
Move on to using Base 10 to move towards a more compact method.

x	T	U
4		

4 rows of 13

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.



Before starting the grid method, children will calculate using partitioning.

$$24 \times 3 = 72$$

$$20 \times 3 = 60$$

$$4 \times 3 = 12$$

$$60 + 12 = 72$$

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

<b>x</b>	<b>30</b>	<b>5</b>
<b>7</b>	<b>210</b>	<b>35</b>

$$210 + 35 = 245$$

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

HOLY REDEEMER CATHOLIC PRIMARY SCHOOL

Column multiplication

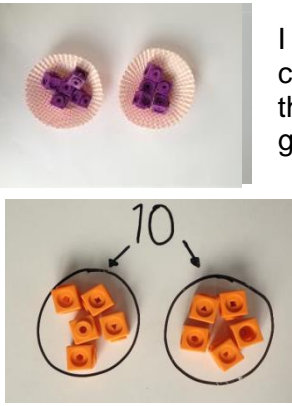
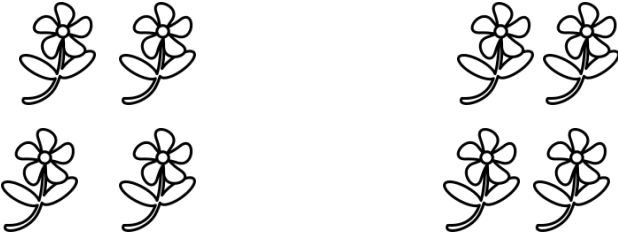

Start with long multiplication, reminding the children about lining up their numbers clearly in columns.

This moves to the formal compact method.

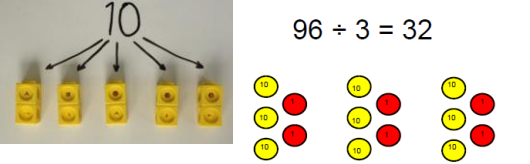
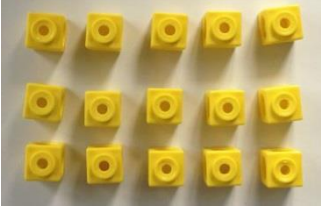
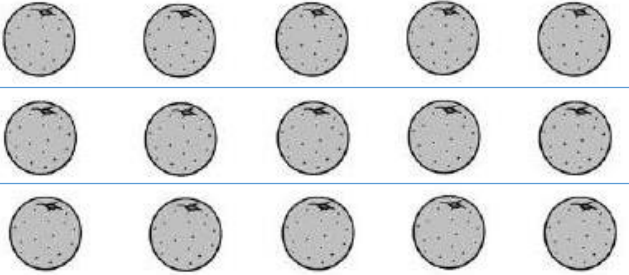
$$\begin{array}{r} \phantom{0}74 \\ \times \phantom{0}63 \\ \hline \phantom{0}12 \\ \phantom{0}210 \\ \phantom{0}240 \\ + \phantom{0}4200 \\ \hline \phantom{0}4662 \end{array}$$

$$\begin{array}{r} 1342 \\ 18 \\ \times \phantom{0}231 \\ \hline 10736 \\ 13420 \\ \hline 24156 \end{array}$$

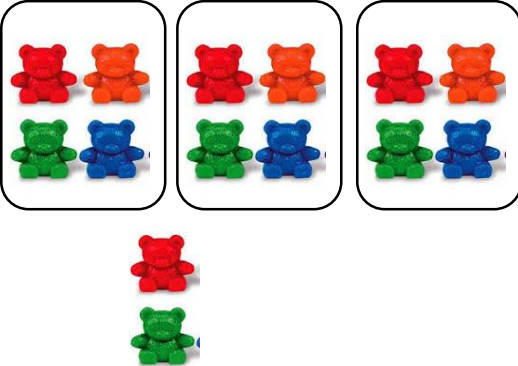
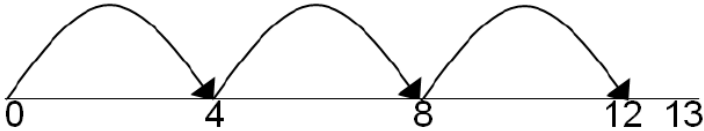

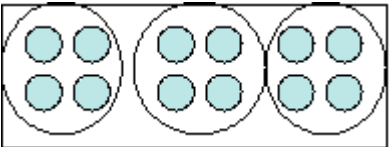
Division

Objective and Strategies	Concrete	Pictorial	Abstract
<p>Sharing objects into groups</p>	 <p>I have 10 cubes, can you share them equally in 2 groups?</p>	<p>Children use pictures or shapes to share quantities.</p>  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <math>8 \div 2 = 4</math> </div>	<p>Share 9 buns between three people.</p> <p style="text-align: center;"><math>9 \div 3 = 3</math></p>
<p>Division as sharing</p>	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p> <p>'Sausages and dots' may be used for sharing equally between groups.</p> 	<p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p> <p>Children count on along the number line in groups according to the divisor.</p>	<p><math>28 \div 7 = 4</math></p> <p>Divide 28 into 7 groups. How many are in each group?</p>

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	 <p><math>96 \div 3 = 32</math></p>		
<p>Division within 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>

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<p><b>Division with a remainder</b></p>	<p><math>14 \div 3 =</math> Divide objects between groups and see how much is left over</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> $\begin{array}{ccccccc} 29 \div 8 = 3 \text{ REMAINDER } 5 \\ \uparrow \quad \uparrow \quad \uparrow \quad \quad \quad \uparrow \\ \text{dividend} \quad \text{divisor} \quad \text{quotient} \quad \quad \quad \text{remainder} \end{array}$
<p><b>Division on a number line using known multiplication facts</b></p>	<p>Using a number line to jump on using known multiplication facts. E.g. <math>44 \div 4 =</math> <math>1 \times 4 =</math> <math>10 \times 4 =</math></p>	<p>Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.</p>  <p>Encourage them to move towards counting in multiples to divide more efficiently.</p> $\begin{array}{r} 218 \\ 4 \overline{) 872} \\ \underline{400} \quad (100 \times 4) \\ 472 \\ \underline{200} \quad (50 \times 4) \\ 272 \\ \underline{200} \quad (50 \times 4) \\ 72 \\ \underline{72} \quad (18 \times 4) \\ 0 \end{array}$	<p>Begin with divisions that divide equally with no remainder.</p> $\begin{array}{r} 218 \\ 4 \overline{) 872} \\ \underline{8} \phantom{0} \\ 7 \phantom{0} \\ \underline{7} \phantom{0} \\ 2 \phantom{0} \\ \underline{2} \\ 0 \end{array}$ <p>Move onto divisions with a remainder.</p> $\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{4} \phantom{0} \\ 3 \phantom{0} \\ \underline{3} \phantom{0} \\ 2 \phantom{0} \\ \underline{2} \\ 0 \end{array}$



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0

Next move into decimal places.

$$\begin{array}{r} 143.83 \\ 6 \overline{) 826^{23}.50^{20}} \end{array}$$

Finally, year 6 move on to long division.

$$\begin{array}{r} 0318 \text{ r}5 \\ 20 \overline{) 6365} \\ \underline{-60} \phantom{0} \\ 36 \phantom{0} \\ \underline{-36} \phantom{0} \\ 20 \phantom{0} \\ \underline{-20} \phantom{0} \\ 165 \\ \underline{-160} \\ 5 \end{array}$$