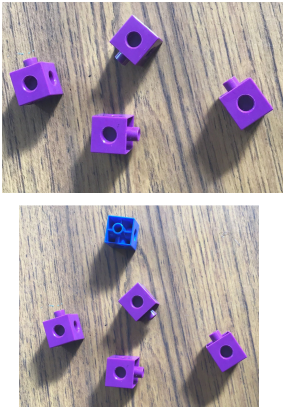
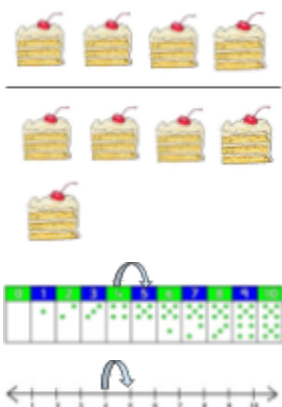


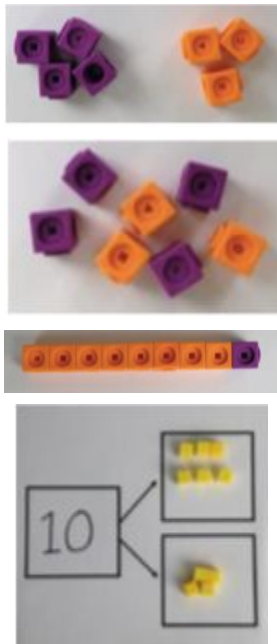
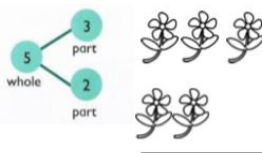
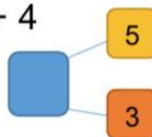
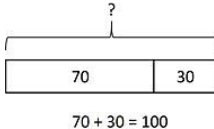
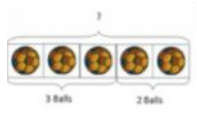





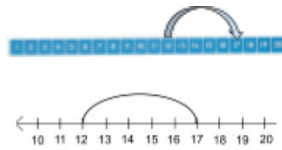
Preston Grange Primary School
Calculation Guidance Policy

This document outlines the range of strategies we use to ensure that each child has the opportunity to become fluent in the four operations (addition, subtraction, multiplication and division). This document is a working document and provided the most common calculation methods we use across school and the format we expect for certain calculations e.g. column method of addition. The use of certain methods are used at a teacher's discretion as they know the children well and know the most appropriate method to be used to ensure a strong mathematical understanding of the concept.

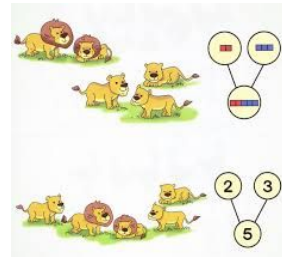
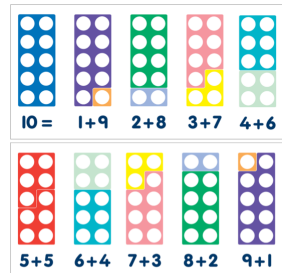
Addition

<u>Objective/ Strategy</u>	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>	<u>Models</u>	<u>Vocab</u>
<u>One more</u>			$4+1=5$		add, more, and make, sum, total altogether score double one more, two more, ten more... how many more to make... ? one more, ten more add, addition, more, plus, increase sum, total, altogether double, near
<u>Combining two parts to make a whole: part</u>	Use objects to add two numbers together	Use pictures to add two numbers together as a group.	Use the part-part whole model to move into the abstract	Both the part part whole model and the bar model can be used to	

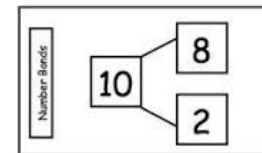
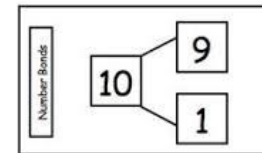
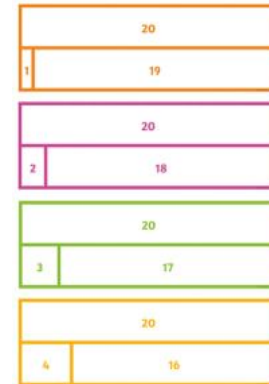
<u>whole model</u>	 <table data-bbox="515 873 790 963"><tr><td>10</td></tr><tr><td>6 4</td></tr></table>	10	6 4		$4 + 3 = 7$ $10 = 6 + 4$   $70 + 30 = 100$	show/explain addition.   	double how many more to make...? tens boundary, hundreds boundary units boundary, tenths boundary inverse Altogether both combined how many increase join plus together total
10							
6 4							
<u>Starting at the bigger number and counting on</u>	Start with the larger number of objects then count on the smaller number 1 by 1 using objects. 	Start at the larger number on the number line/track and count on in ones or in one jump to find the answer. $12 + 5 = 17$	Place the larger number in your head and count on the smaller number to find your answer. $5 + 12 = 17$				


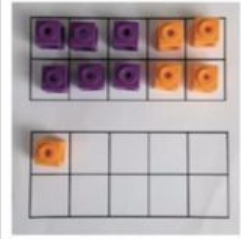

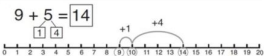

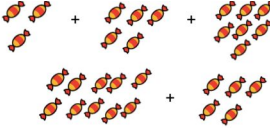
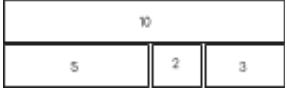


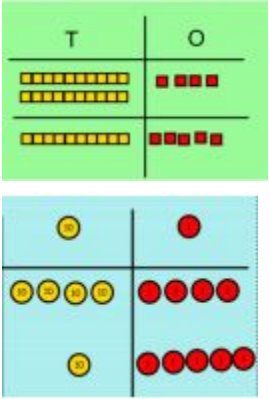
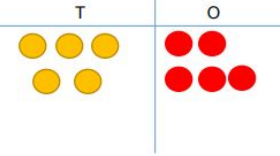
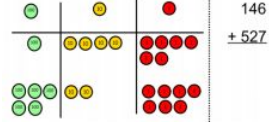
Use number
facts

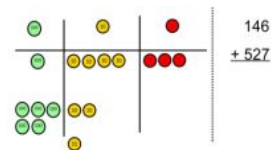


0	+	10	=	10
1	+	9	=	10
2	+	8	=	10
3	+	7	=	10
4	+	6	=	10
5	+	5	=	10
6	+	4	=	10
7	+	3	=	10
8	+	2	=	10
9	+	1	=	10
10	+	0	=	10



<p><u>Regrouping to make 10</u></p>	<p>Start with the bigger number and use the smaller number to make 10.</p>  <p>$6 + 5 = 11$</p> 	<p>Use pictures or a number line. Regroup or partition the smaller number to make 10.</p>  <p>$3 + 9 =$</p> 	<p>$7 + 4 = 11$</p> <p>If I am at 7, how many more do I need to make 10. How many more do I add on now?</p>		
<p><u>Adding three single digits</u></p>	<p>$4 + 7 + 6 = 17$ Put 4 and 6 together to make 10. Add on 7.</p>  <p>Following on from making 10, make 10 with two of the digits (if possible) then add on the third digit.</p>	<p>Add together three groups of objects. Draw a picture to recombine the groups to make 10.</p> 	<p>Combine the two numbers that make 10 and then add on the remainder.</p> <p>$4 + 7 + 6 = 10 + 7 = 17$</p>		

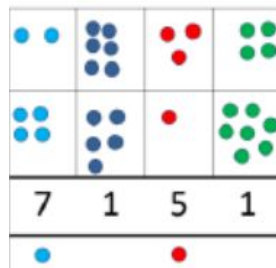
<p><u>Column method- no regrouping</u></p>	<p>24+15=</p> <p>Add together the ones first then add the tens. Use Base 10 blocks first before moving onto place value counters.</p> 	<p>After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.</p> 	<p>Column method-formal written</p> <p>21+42=</p> $\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$		
<p><u>Column method- regrouping</u></p>	<p>Make both numbers on a place value grid.</p>  <p>Add up the units and exchange 10 ones for one ten.</p>	<p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.</p>	<p>Start by partitioning the numbers before moving on to clearly show the exchange below the addition.</p> $\begin{array}{r} 20 + 5 \\ 40 + 8 \\ \hline 60 + 13 = 73 \end{array}$		



Add the rest of the columns exchanging the 10 counters from one 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 equal 100.

As children move onto decimals, money and decimal place value counters can be used to support learning.



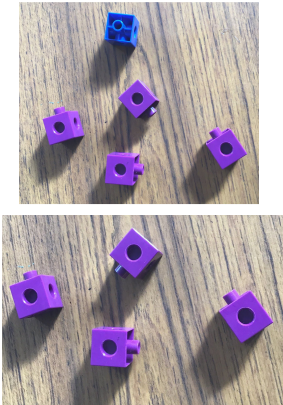
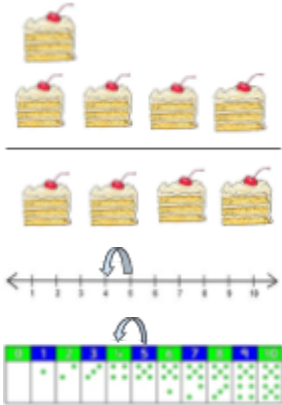

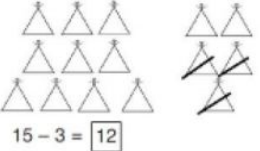
$$\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$$

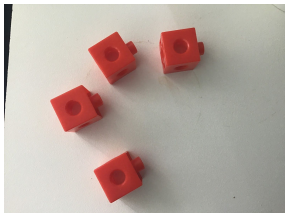

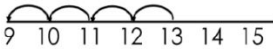
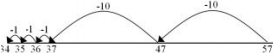

As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.


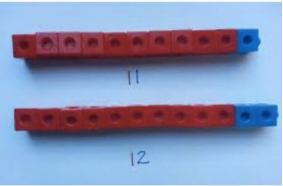
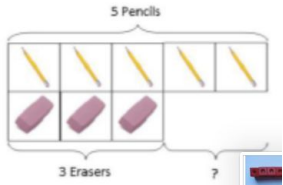
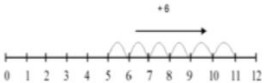
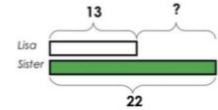
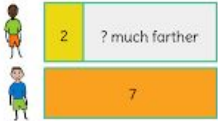
$$\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 11 \end{array}$$

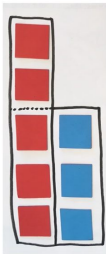
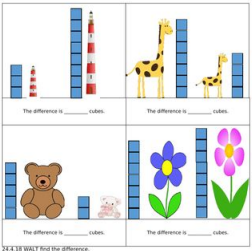
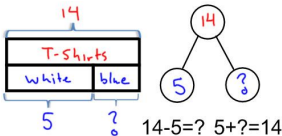
$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \\ 212 \end{array}$$

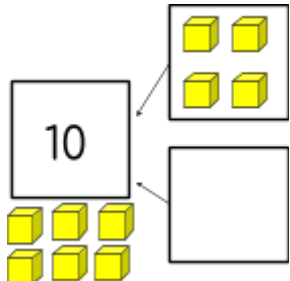

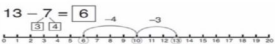
Subtraction

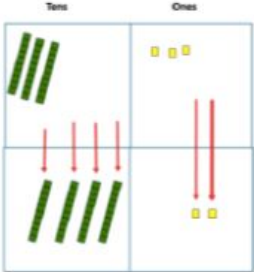
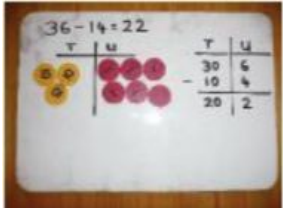
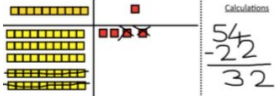
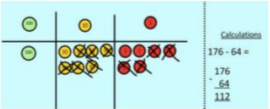
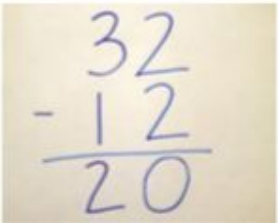
<u>Objective/ Strategy</u>	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>	<u>Models</u>	<u>Vocab</u>
<u>One less</u>			$5 - 1 = 4$		subtract, subtraction, take (away), minus, decrease leave, how many are left/left over? difference between half, halve how many more/fewer is... than...? how much more/less is...?
<u>Taking in ones</u>	Use physical objects, counters, cubes, playdough etc. To show how objects can be taken away. $6 - 2 = 4$ 	Cross out drawn objects to show what has been taken away. 	$18 - 3 = 15$ $8 - 2 = 6$		equals, sign, is the same as tens boundary, hundreds boundary units boundary, tenths boundary inverse

					
<u>Counting back</u>	<p>Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.</p> <p>13 – 4</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><u>Find the difference</u></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>Draw bars to find the difference between 2 numbers.</p> <p>Comparison Bar Models</p> <p><i>Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.</i></p> 	<p>Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.</p>		

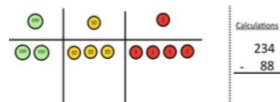
	 				
<u>Part Part Whole Model</u>	<p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p>				

	 <p>If 10 is the whole and 6 is one of the parts. What is the other part?</p> $10 - 6 =$				
<u>Make 10</u>	$14 - 9 =$  <p>Make 14 on the ten frame. Take away the four first to make 10 and then take away one more so you have taken away 5. You are left with the answer of 9.</p>	$13 - 7 = 6$  <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>	$16 - 8 =$ <p>How many do we take off to reach the next 10? How many do we have left to take off?</p>		
<u>Column Method without</u>	Use Base 10 to make the bigger	Draw the Base 10 or place value			

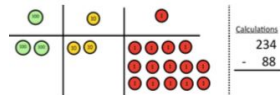
<p><u>regrouping</u></p>	<p>number then take the smaller number away.</p>  <p>Show how you partition numbers to subtract. Again make the larger number first.</p> 	<p>counters alongside the written calculation to help to show working.</p>  	$47 - 24 = 23$ $\begin{array}{r} 40 + 7 \\ - 20 + 4 \\ \hline 20 + 3 \end{array}$ <p>This will lead to a clear written column subtraction.</p> 		
<p><u>Column Method with regrouping</u></p>	<p>Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with</p>	<p>Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the</p>	<p>Children can start their formal written method by partitioning the number into clear place value columns.</p>		

2 exchanges.

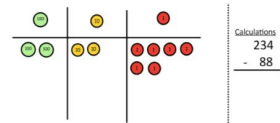
Make the larger number with the place value counters



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

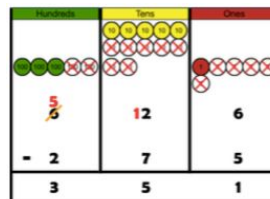


Now I can subtract my ones.



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

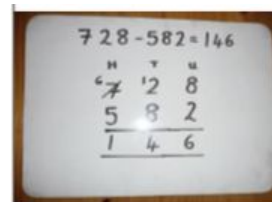
exchanges you make.



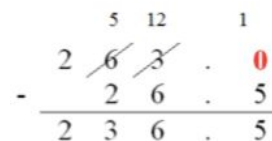
When confident, children can find their own way to record the exchange/ regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/ regroup.

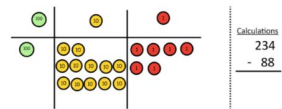


Moving forward the children use a more compact method.



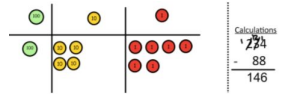
This will lead to an understanding of subtracting any number including decimals.





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

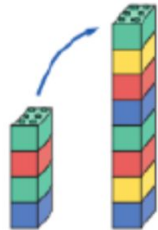

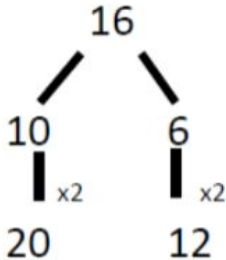

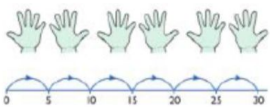
Now I can take away eight tens and complete my subtraction.


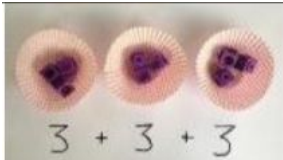



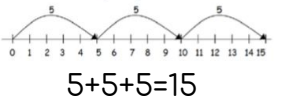



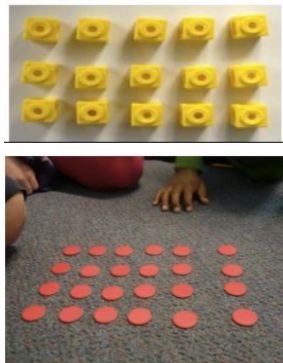
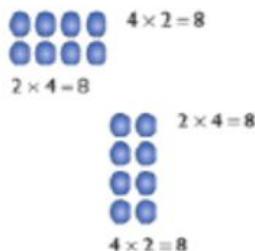
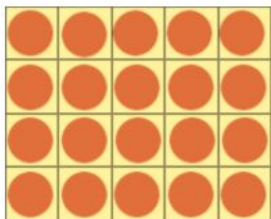

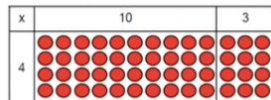
$$\begin{array}{r} \text{Calculations} \\ 234 \\ - 88 \\ \hline 146 \end{array}$$

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.

Multiplication

<u>Objective/ Strategy</u>	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>	<u>Models</u>	<u>Vocab</u>
<u>Doubling</u>	<p>Use practical activities to show how to double a number.</p>  <p>double 4 is 8 $4 \times 2 = 8$</p>	<p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p> 	<p>Partition a number and then double each part before recombining it back together.</p> 		<p>lots of, groups of times, multiply, multiplication, multiplied by multiple of, product once, twice, three times... ten times... times as (big, long, wide... and so on) repeated addition array, row, column double, halve</p>
<u>Counting in multiples</u>	<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. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30</p>		

					
<u>Repeated addition</u>	<p>Use different objects to add equal groups.</p>   	<p>There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?</p>  	<p>Write addition sentences to describe objects and pictures.</p>  <p>Move onto the equivalence between repeated addition and multiplication. $2+2+2=6$ is the same as $2 \times 3 = 6$</p>		
<u>Arrays-showing commutative multiplication</u>	<p>Create arrays using counters/ cubes to show multiplication sentences.</p>	<p>Draw arrays in different rotations to find commutative multiplication sentences.</p>	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>		

		 <p>Link arrays to area of rectangles.</p> 	 <p>$5+5+5=15$ $3+3+3+3+3=15$ $5 \times 3=15$ $3 \times 5=15$</p>								
<u>Grid Method</u>	<p>Show the link with arrays to first introduce the grid method.</p>  <p>4 rows of 10 4 rows of 3</p> <p>Move on to using</p>	<p>Children can represent the work they have done with place value counters in a way that they understand.</p> <p>They can draw the counters, using colours to show different amounts</p>	<p>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.</p> <table border="1" data-bbox="1140 1219 1402 1299"><tr><td>x</td><td>30</td><td>5</td></tr><tr><td>7</td><td>210</td><td>35</td></tr></table> <p>$210 + 35 = 245$</p>	x	30	5	7	210	35		
x	30	5									
7	210	35									

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.

Fill each row with 126.

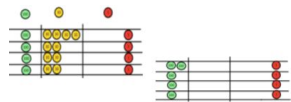
Add up each column, starting with the ones making any exchanges needed.

or just use circles in the different columns to show their thinking as shown below.

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

	10	8
10	100	80
3	30	24

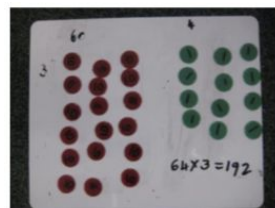
X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16



Then you have
your answer.

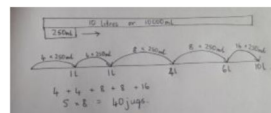
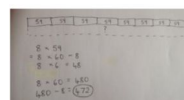
Column multiplication

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



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

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



Start with long
multiplication,
reminding the
children about
lining up their
numbers clearly
in columns.
Children write out
what they are
solving next to
their answer.

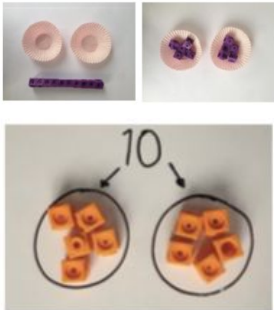
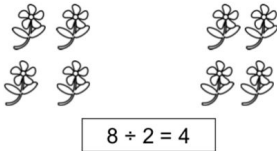
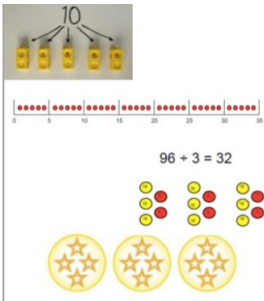
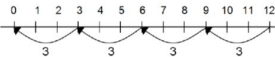
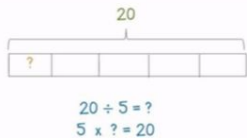
$$\begin{array}{r} 32 \\ \times 24 \\ \hline 128 \quad (32 \times 4) \\ 640 \quad (32 \times 20) \\ \hline 768 \end{array}$$


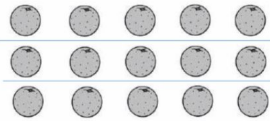
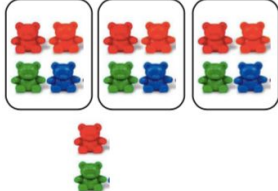
This moves to a
more compact
method and can


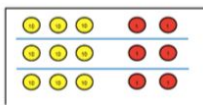


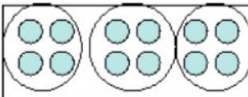
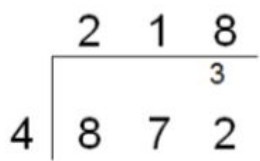
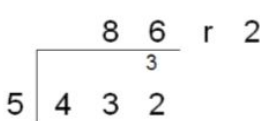
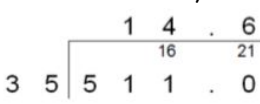
			involve carrying. $ \begin{array}{r} 32 \\ \times 46 \\ \hline 182 \\ 1280 \\ \hline 1462 \\ \hline \end{array} $		
--	--	--	---	--	--

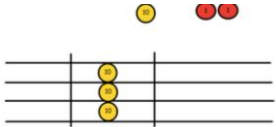
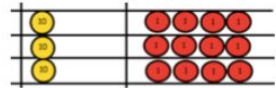
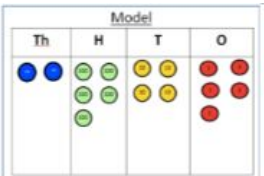
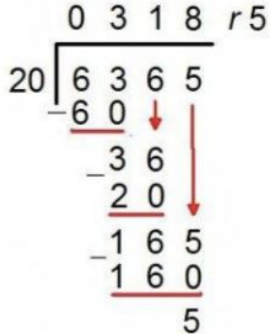
Division

<u>Objective/ Strategy</u>	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>	<u>Models</u>	<u>Vocab</u>
<u>Sharing into groups</u>	I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.	Share 9 buns between three people. $9 \div 3 = 3$		share, share equally one each, two each, three each... group in pairs, threes... tens equal

					groups of divide, division, divided by, divided into remainder factor, quotient, divisible by inverse
<u>Division as grouping</u>	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p> 	<p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p>  <p>Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.</p>	$28 \div 7 = 4$ <p>Divide 28 into 7 groups. How many are in each group?</p>		

<p><u>Division within arrays</u></p>	<p>Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$</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> $7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$		
<p><u>Division with a remainder</u></p>	<p>$14 \div 3 =$ 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</p>	<p>Complete written divisions and show the remainder using r.</p> $\begin{array}{ccccccc} 29 & \div & 8 & = & 3 & \text{REMAINDER } 5 \\ \uparrow & & \uparrow & & \uparrow & & \uparrow \\ \text{dividend} & & \text{divisor} & & \text{quotient} & & \text{remainder} \end{array}$		

		<p>a remainder.</p> 			
<p><u>Short division</u></p>	<div> <div> <div>Tens</div> <div>Units</div> </div> <div> <div>3</div> <div>2</div> </div> <div>  </div> <div> <div>Use place value counters to divide using the bus stop method alongside</div> <div>  <div> <div>Calculations</div> <div>42 ÷ 3</div> </div> </div> <div>  </div> </div> <div> <div>42 ÷ 3 =</div> <div>Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.</div> </div> </div>	<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>	<p>Begin with divisions that divide equally with no remainder.</p>  <p>Move onto divisions with a remainder.</p>  <p>Finally move into decimal places to divide the total accurately.</p> 		

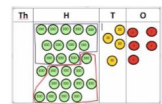
	 <p>We exchange this ten for ten ones and then share the ones equally among the groups.</p>  <p>We look how much in 1 group so the answer is 14.</p>				
<u>Long division</u>	<p>$2544 \div 12$ How many groups of 12 thousands do we have? None</p>  <p>Exchange 2 thousand for 20 hundreds.</p>	<p>Instead of using physical counters, students can draw the counters and circle the groups on a whiteboard or in their books.</p> <p>Use this method to explain what is happening and as</p>			



$$12 \overline{) 2544} \begin{array}{r} 0 \\ 2544 \end{array}$$

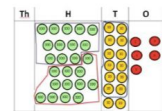
How many groups of 12 are in 25 hundreds? 2 groups. Circle them.

We have grouped 24 hundreds so can take them off and we are left with one.



$$12 \overline{) 2544} \begin{array}{r} 02 \\ 24 \\ \hline 1 \end{array}$$

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



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

Exchange the two tens for twenty ones so now we

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

	have 24 ones. How many groups of 12 are in 24? 2				
--	--	--	--	--	--