

Maths Calculation Guidance

St. Paul's C.E Primary School


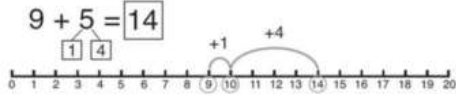

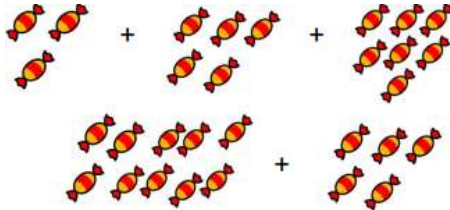
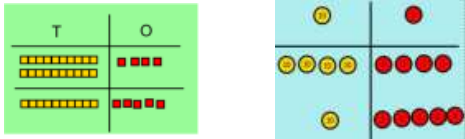
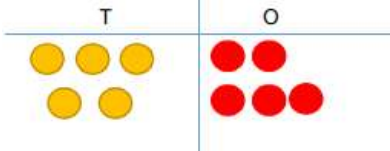
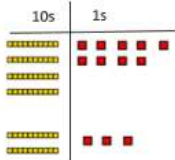

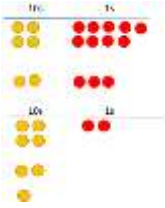


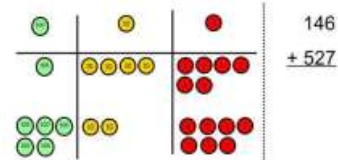
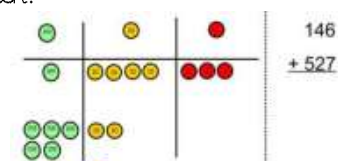
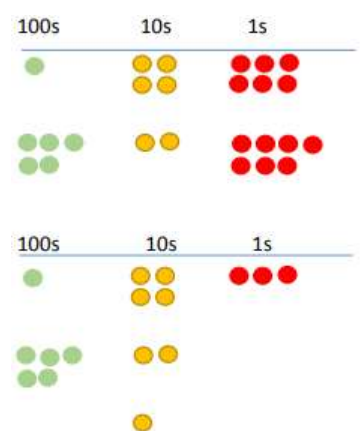
**St. Paul's
C.E. Primary School**
Together on life's great adventure

This policy has been largely adapted from the White Rose Maths Hub Calculation Policy with further material added. It is a working document and will be revised and amended as necessary. The year groups are mainly a guide and teachers will adapt methods where appropriate.

Addition

Year	Objective	Concrete	Pictorial	Abstract
Reception	Frequent and varied opportunities to build and apply understanding of numbers ± 10 - such as using manipulatives, including small pebbles and tens frames for organising counting - children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built.			
1	Combining two parts to make a larger number	<p>Use cubes to add two numbers together as a group or in a bar.</p>	<p>Use pictures to add two numbers in a group or in a bar.</p>	$2 + 3 = 5$ $3 + 2 = 5$ $5 = 3 + 2$ $5 = 2 + 3$ <p>Use part part whole model as shown above to move into the abstract.</p>
1	Counting on	<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>Use a number line to count on in ones.</p>	$5 + 3 = 8$
1	Regrouping to make 10	<p>Start with the bigger number and use the smaller number to make 10.</p>	<p>Use pictures or a number line. Regroup or partition the smaller number to make 10.</p> <p>$3 + 9 =$</p>	$7 + 4 = 11$ If I am at seven, how many more do I need to make 10. How many more do I add on now?

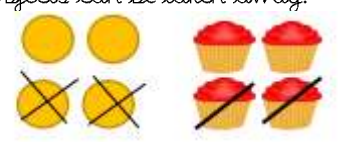
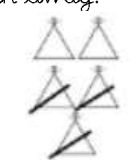

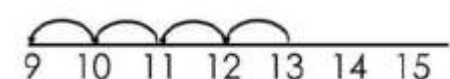
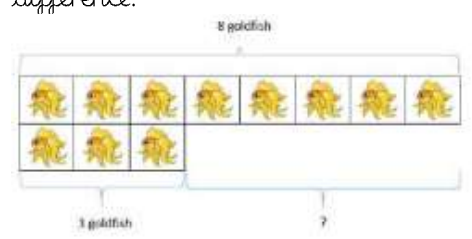
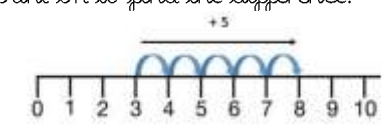
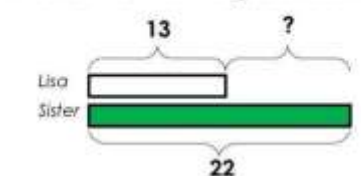
		$6 + 5 = 11$ 	$9 + 5 = 14$ 	
2	Adding three single digit numbers	$4 + 7 + 6 = 17$ Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	Add together three groups of objects. Draw a picture to recombine the groups to make 10. 	Combine the two numbers that make 10 and then add on the remainder. $4 + 7 + 6 = 10 + 7 = 17$
2	Column method without regrouping	Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters. $24 + 15 =$ $44 + 15 =$ 	After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions. 	$24 + 15 = 39$ $\begin{array}{r} 24 \\ + 15 \\ \hline 39 \end{array}$
2	Column method with regrouping	Make both numbers on a place value grid.  Add up the units and exchange 10 ones for 1 ten. 	Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding. 	$40 + 9$ $20 + 3$ $60 + 12 = 72$

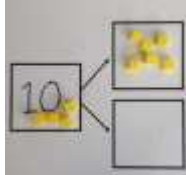
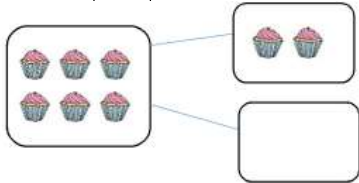
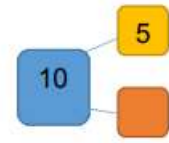






<p>3 and 4</p>	<p>Column method with regrouping</p>	<p>Make both numbers on a place value grid.</p>  <p>Add up the units and exchange 10 ones for 1 ten.</p>  <p>As children move on to decimals, money and decimal place value counters can be used to support learning. NB By Year 4 children will progress on to adding four digit numbers.</p>	 <p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding. NB Addition of money needs to have £ and p added separately.</p>	<p>Start by partitioning the numbers before moving on to clearly show the exchange below the addition.</p> $\begin{array}{r} 20 + 5 \\ 40 + 8 \\ \hline 60 + 13 = 73 \end{array}$ <p>As the children progress, they will move from the expanded to the compacted method.</p> $\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$ <p>As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.</p>
<p>5 and 6</p>	<p>Column method with regrouping</p>	<p>Consolidate understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places.</p>		

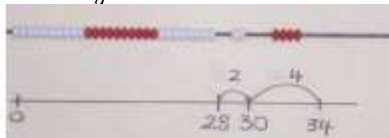
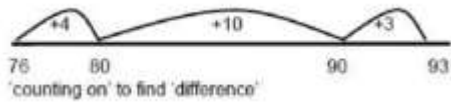
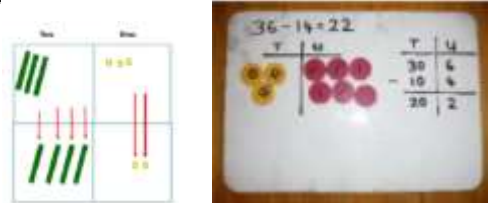
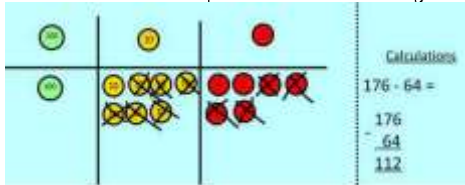
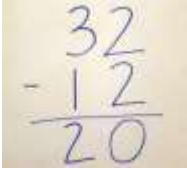
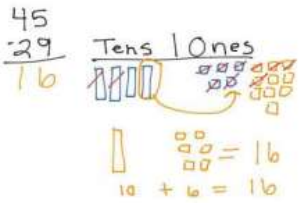

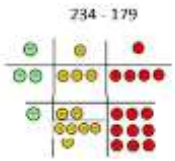
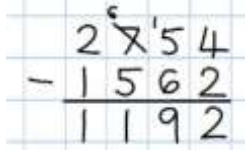
St. Paul's C.E Primary School

Subtraction

Calculation Guidance

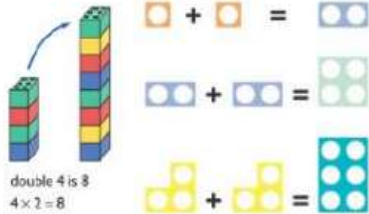

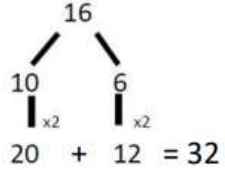
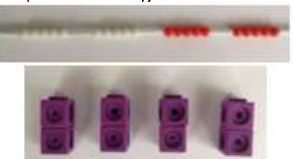



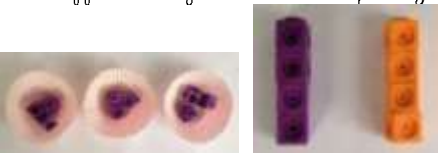
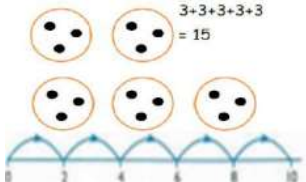

Year	Objective	Concrete	Pictorial	Abstract
Reception	Frequent and varied opportunities to build and apply understanding of numbers ± 10 - such as using manipulatives, including small pebbles and tens frames for organising counting - children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built.			
1	Taking ones	Use physical objects, counters, cubes etc to show how objects can be taken away. $4 - 2 = 2$ 	Cross out drawn objects to show what has been taken away. 	$4 - 2 = 2$
1	Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. $13 - 4 = 9$ 	Count back on a number line or number track.  Start at the bigger number and count back the smaller number, showing the jumps on the number line.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.
1	Find the difference	Compare amounts and objects to find the difference.  Use cubes to build towers or make bars to find the difference. Use basic bar models with items to find the difference.	Count on to find the difference.  Draw bars to find the difference between 2 numbers. Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them. 	Hannah has 8 oranges. Helen has 3 oranges. Find the difference between the number of oranges the girls have.


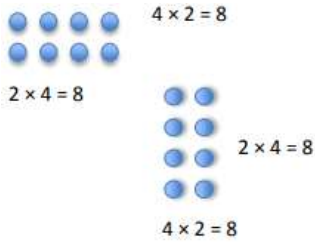
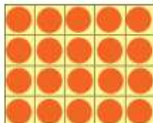


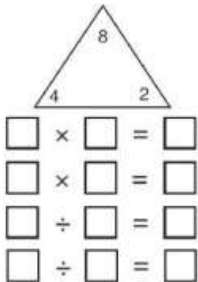
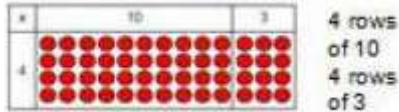
1	<p>Represent and use number bonds and related subtraction facts within 20.</p>	<p>Link to addition. Use part part whole model to model the inverse. If 10 is the whole and 6 is one of the parts, what is the other part?</p> 	<p>Use a pictorial representation of objects to show the part part whole model.</p> 	<p>Move to using numbers within the part whole model.</p> 
1	<p>Make 10</p>	<p>$14 - 9 =$</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.</p>	<p>Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.</p> <p>$13 - 7$</p> 	<p>$16 - 8 =$ How many do we take off to reach the next 10? How many do we have left to take off?</p>
2	<p>Regroup a ten into ten ones</p>	<p>Use a place value chart to show how to change a ten into ten ones.</p> 	 <p>$20 - 4 =$</p>	<p>$20 - 4 = 16$</p>
2	<p>Partitioning to subtract without regrouping.</p>	<p>Use dienes to show how to partition the number when subtracting without regrouping. $34 - 13 = 21$</p> 	<p>Children draw representations of dienes and cross off. $43 - 21 = 22$</p> 	<p>$43 - 21 = 22$</p>

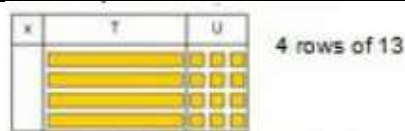
2	<p>Make ten strategy</p>	<p>Use a bead bar or bead strings to model counting to next ten and the rest.</p> 	<p>Use a number line to count on to next ten and then the rest.</p> 	<p>$93 - 76 = 17$</p>
3	<p>Column method without regrouping</p>	<p>Use Base 10 to make the bigger number then take the smaller number away. Show how you partition numbers to subtract. Again make the larger number first..</p> 	<p>Draw the Base 10 or place value counters alongside the written calculation to help to show working.</p> 	<p>This will lead to a clear written column subtraction.</p> 
3	<p>Column method with regrouping</p>	<p>Use Base 10 to start with before moving on to place value counters. Start with one exchange. Make the larger number with the place value counters.</p>	<p>Children may draw base ten or place value counters and cross off.</p> 	<p>Children can start their formal written method by partitioning the number into clear place value columns.</p> 
4	<p>Subtracting tens and ones Year 4 subtract with up to 4 digits. (Introduce decimal subtraction through context of money)</p>	<p>Model process of exchange using Numicon, base ten and then move to place value counters..</p> 	<p>Children to draw base ten and show their exchange—see year 3</p>	

5	Subtract with at least 4 digits, including money and measures. Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal	As year 4	Children to draw base ten and show their exchange—see Y3	<p>Use zeros for placeholders.</p> $\begin{array}{r} \cancel{8}^1 \cancel{1}^0 \cancel{8}^1 6 \\ - \quad 2128 \\ \hline 28,928 \end{array}$ $\begin{array}{r} \cancel{7}^1 \cancel{6}^1 \cancel{9}^1 \cdot 0 \\ - \quad 372 \cdot 5 \\ \hline 6796 \cdot 5 \end{array}$
6	Subtract with increasingly large and more complex numbers and decimal values.			$\begin{array}{r} \cancel{1}^1 \cancel{8}^1 \cancel{10}^1,699 \\ - \quad 89,949 \\ \hline 60,750 \end{array}$ $\begin{array}{r} \cancel{1}^1 \cancel{10}^1 5 \cdot \cancel{1}^1 \cancel{1}^1 9 \text{ kg} \\ - \quad 36 \cdot 080 \text{ kg} \\ \hline 69 \cdot 339 \text{ kg} \end{array}$

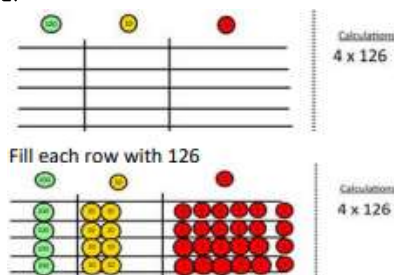
Multiplication

Year	Objective	Concrete	Pictorial	Abstract
1	Doubling	<p>Use practical activities to show how to double a number.</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> 
1	Counting in multiples	<p>Count the groups as children are skip counting, children may use their fingers as they are skip counting.</p> 	<p>Children make representations to show 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>
1	Making equal groups and counting the total	<p>Use objects to create equal groups.</p> 	<p>Draw and make representations.</p> 	
2	Repeated addition	<p>Use different objects to add equal groups.</p> 	<p>Use pictorial representations including number lines.</p> 	<p>Write addition sentences to describe objects and pictures.</p> 

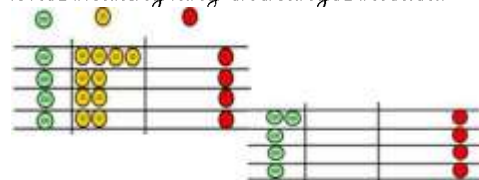
<p>2</p>	<p>Arrays showing commutative multiplication</p>	<p>Create arrays using counters/cubes to show multiplication sentences.</p> 	<p>Draw arrays in different rotations to find commutative multiplication sentences.</p>  <p>Link arrays to area of rectangles.</p> 	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  <p> $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$ </p>						
<p>2</p>	<p>Using the Inverse</p> <p>This should be taught alongside division, so pupils learn how they work alongside each other.</p>	<p>Create arrays using counters/cubes to show multiplication sentences.</p> 		<p> $2 \times 4 = 8$ $4 \times 2 = 8$ $8 \div 2 = 4$ $8 \div 4 = 2$ $8 = 2 \times 4$ $8 = 4 \times 2$ $2 = 8 \div 4$ $4 = 8 \div 2$ </p> <p>Show all 8 related fact family sentences.</p>						
<p>3</p>	<p>Grid Method</p>	<p>Show the links with arrays to first introduce the grid method.</p>  <p>Move onto base ten to move towards a more compact method.</p>	<p>Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.</p>	<p>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.</p> <table border="1" data-bbox="1765 1225 2051 1313"> <tbody> <tr> <td>x</td> <td>30</td> <td>5</td> </tr> <tr> <td>7</td> <td>210</td> <td>35</td> </tr> </tbody> </table> <p>$210 + 35 = 245$</p>	x	30	5	7	210	35
x	30	5								
7	210	35								



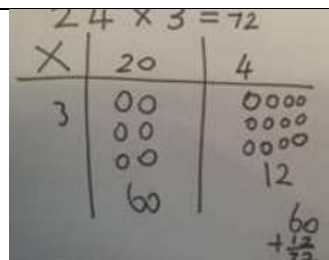
Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.



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



Then you have your answer.



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

	10	8
10	100	80
3	30	24

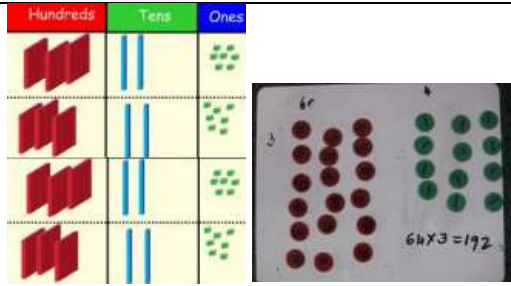
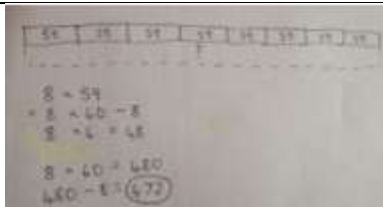
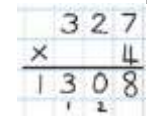
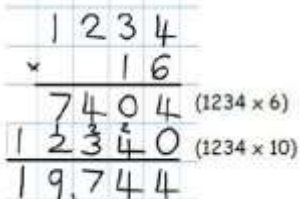
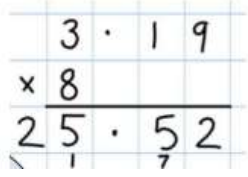
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Column Multiplication
(Multiply two-digit and three-digit numbers by a one-digit number)



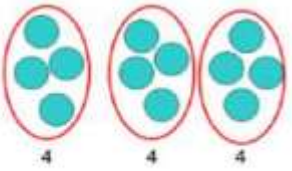
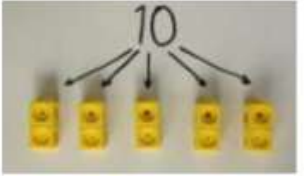
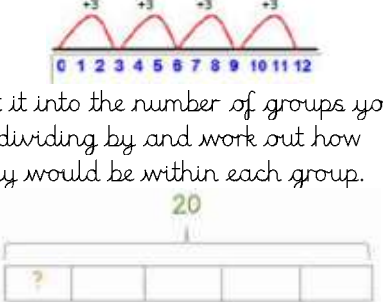
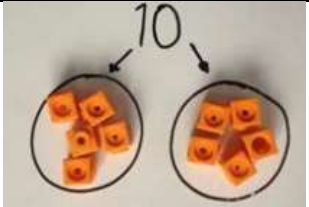

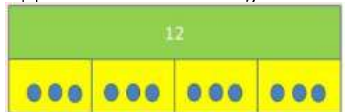
Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. $321 \times 2 = 642$


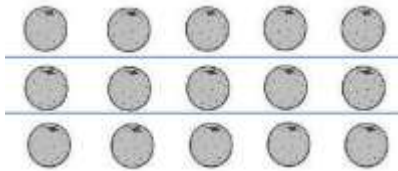
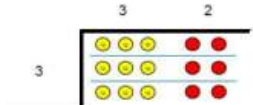


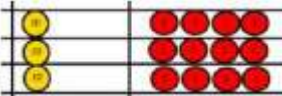
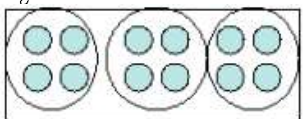
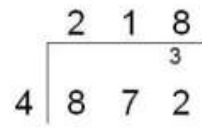

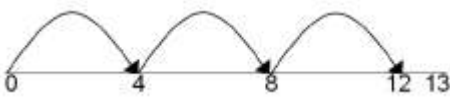
The grid method may be used to show how this relates to a formal written method. Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.

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

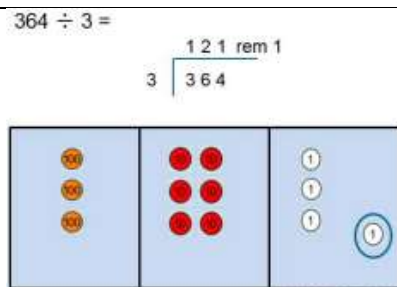
				$\begin{array}{r} 327 \\ \times 4 \\ \hline 28 \\ 80 \\ 1200 \\ \hline 1308 \end{array}$ <p>This may lead to a compact method.</p> 
5	<p>Column Multiplication (multiply numbers up to 4 digits by a one- or two-digit number)</p>	<p>Manipulatives may still be used with the corresponding long multiplication modelled alongside.</p>	<p>Continue to use bar modelling to support problem solving.</p>	
6	<p>Column Multiplication (multiply multi-digit numbers up to 4 digits by a two-digit whole number and multiply one-digit numbers with up to two decimal places by whole numbers)</p>	<p>Manipulatives may still be used with the corresponding long multiplication modelled alongside.</p>		<p>Remind children that the single digit belongs in the units column. Line up the decimal points in the question and the answer.</p> 

Division

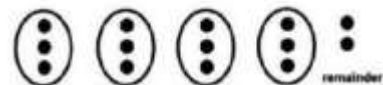
Year	Objective	Concrete	Pictorial	Abstract
1	Sharing objects into groups	 <p>I have 10 cubes, can you share them equally in 2 groups?</p> 	<p>Children use pictures or shapes to share quantities.</p> <p>Sharing:</p>  <p>12 shared between 3 is 4</p>	12 shared between 3 is 4
1 and 2	Division as grouping	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding..</p> 	<p>Use number lines for grouping. Think of the bar as a whole.</p>  <p>Split it into the number of groups you are dividing by and work out how many would be within each group.</p>	Divide 10 into 2 groups. How many are in each group?
2	Sharing objects into groups (calculate mathematical statements for division within the multiplication tables and write them using the division (\div) and equals (=) signs)		<p>Children use pictures or shapes to share quantities.</p>  <p>8 \div 2 = 4</p> <p>Children use bar modelling to show and support understanding. 12 \div 4 = 3</p> 	$15 \div 5 = 3$

<p>3</p>	<p>Division with arrays</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> <p>$5 \times 3 = 15$ $3 \times 5 = 15$ $15 \div 5 = 3$ $15 \div 3 = 5$</p>
<p>3 and 4</p>	<p>Short Division</p>	<p>Use place value counters to divide using the short division method alongside.</p> <p>$96 \div 3$</p>  <p>$42 \div 3$</p> <p>Start with the biggest place value. We are sharing 40 into three groups.</p>   <p>We can put 1 ten in each group and we have 1 ten left over. We exchange this ten for 10 ones and then share the ones equally among the groups. We look at how many are in each group.</p> 	<p>Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups. Encourage them to move towards counting in multiples to divide more efficiently.</p> 	<p>Begin with divisions that divide equally with no remainder.</p> 
<p>5 and 6</p>	<p>Division with remainders</p> <p>5 - divide numbers up to 4 digits by a one-digit number using the formal written method of short</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>Complete written divisions and show the remainder using r.</p> <p>$29 \div 8 = 3$ REMAINDER 5</p> <p>↑ ↑ ↑ ↑ dividend divisor quotient remainder</p>

division and interpret remainders appropriately for the context
 6 - divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context



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



Move onto divisions with a remainder (1). Once children understand remainders, begin to express as a fraction (2) or decimal according to the context (3).

1.
$$\begin{array}{r} 86 \text{ r } 2 \\ 3 \overline{) 432} \\ 5 \end{array}$$
2.
$$\begin{array}{r} 186 \frac{1}{5} \\ 5 \overline{) 931} \end{array}$$
3.
$$\begin{array}{r} 14.6 \\ 35 \overline{) 511.0} \\ 16 \quad 21 \end{array}$$