

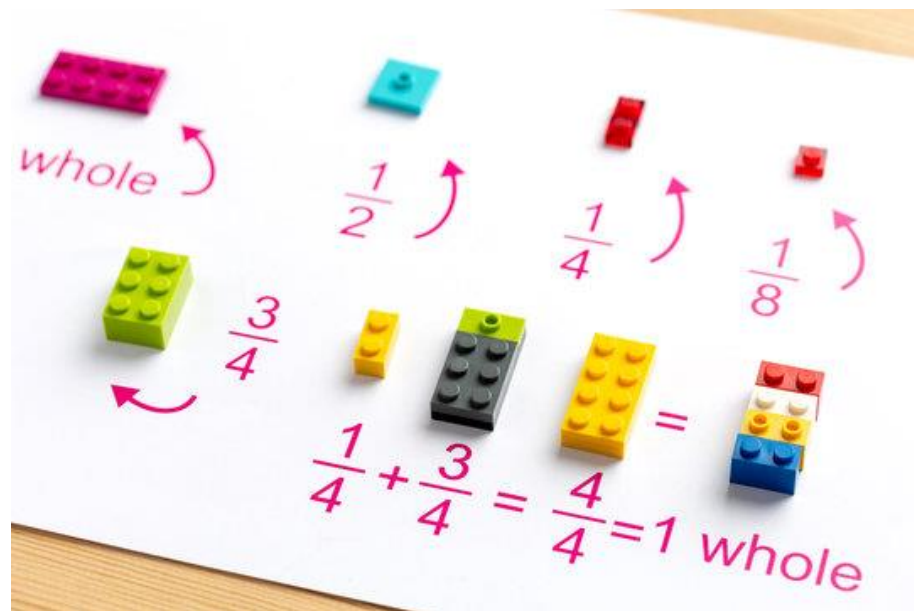
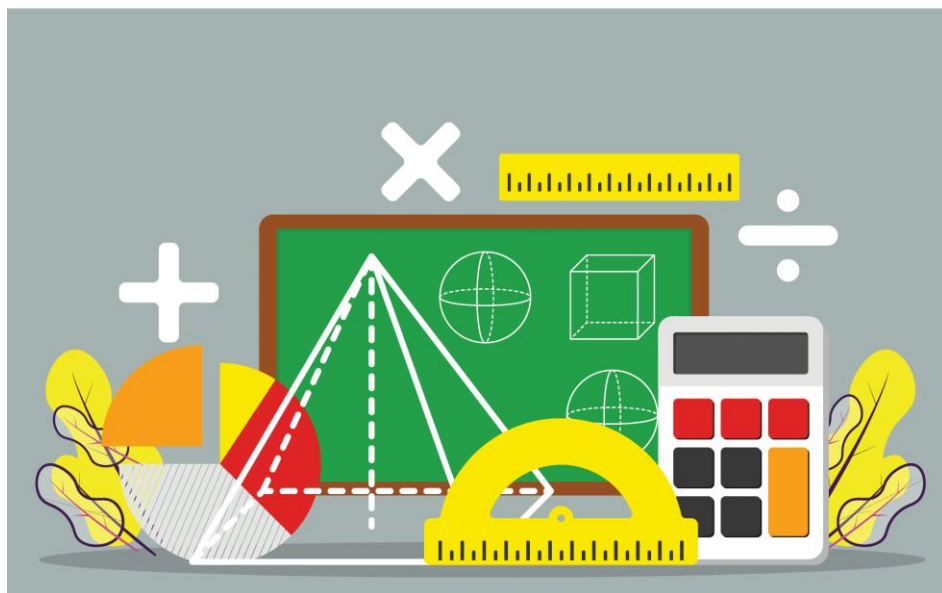




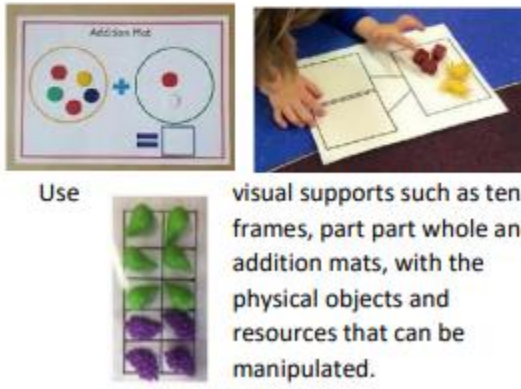

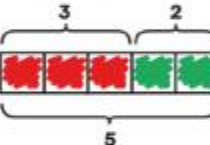

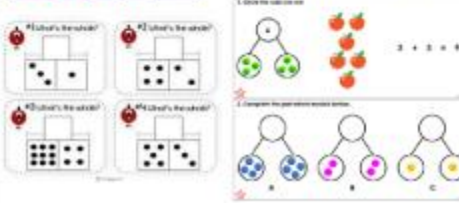
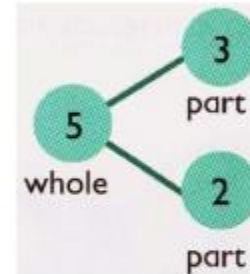

# Kildwick CE VC Primary School

Learning to Live - Living to Love - Loving to Learn

## PROGRESSION THROUGH CALCULATION GUIDANCE

This guidance has been developed from the White Rose Calculation Policy: working document, which was written as a guide to indicate the progression through Addition, Subtraction, Multiplication and Division



Addition- EYFS			
Objectives	Concrete	Pictorial	Abstract
<p>Knows that a group of things change in quantity when something is added.</p> <p>Find the total number of items in two groups by counting all of them.</p> <p>Says the number that is one more than a given number.</p> <p>Finds one more from a group of up to five objects, then ten objects.</p> <p>In practical activities and discussion, beginning to use the vocabulary involved in adding.</p> <p>Using quantities and objects, they add two single digit numbers and count on to find the answer.</p> <p>Solve problems including doubling.</p>	 <p>Use toys and general classroom resources for children to physically manipulate, group/regroup.</p>  <p>Use specific maths resources such as counters, snap cubes, Numicon etc.</p>  <p>Use visual supports such as ten frames, part part whole and addition mats, with the physical objects and resources that can be manipulated.</p>	 <p>Two groups of pictures so children are able to count the total.</p>  <p>Bar model using visuals, pictures/icons or colours.</p>  <p>Use visual supports such as ten frames, part part whole and addition mats with pictures/icons.</p> 	<p>A focus on symbols and numbers to form a calculation.</p> $5 + 2 = 7$   <p>No expectation for children to be able to record a number sentence/addition calculation.</p>

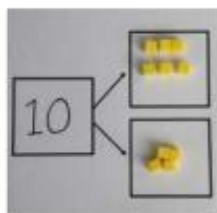
## Objective

## Concrete

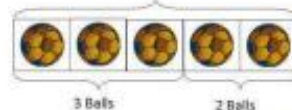
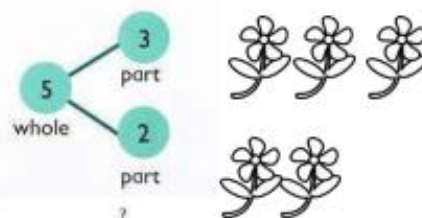
## Pictorial

## Abstract

Number bonds of 5, 6, 7, 8, 9 and 10



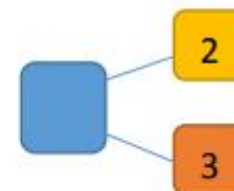
Use cubes to add two numbers together as a group or in a bar.



Use pictures to add two numbers together as a group or in a bar.



$$\begin{aligned} 2 + 3 &= 5 \\ 3 + 2 &= 5 \\ 5 &= 3 + 2 \\ 5 &= 2 + 3 \end{aligned}$$

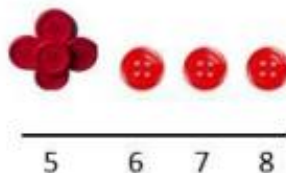


Use the part-part-whole diagram as shown above to move into the abstract.

Counting



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





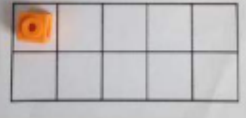

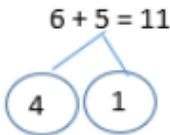

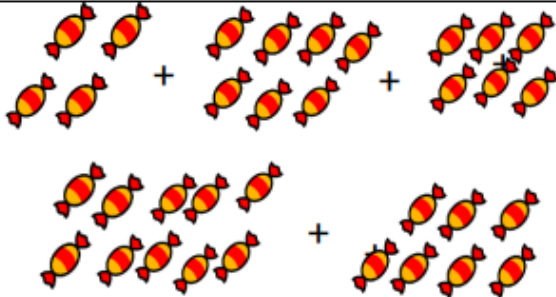
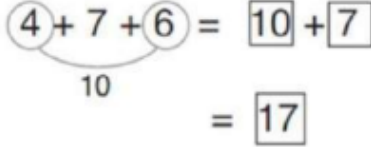
Use a number line to count on in ones.

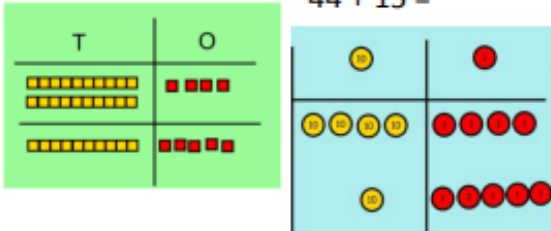
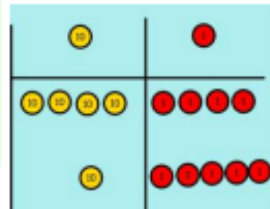
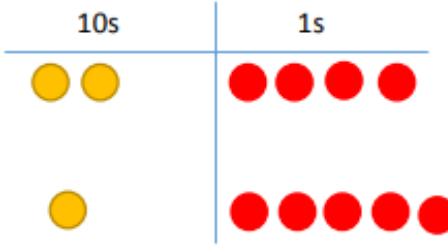
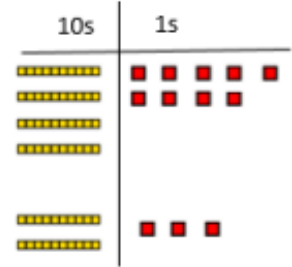
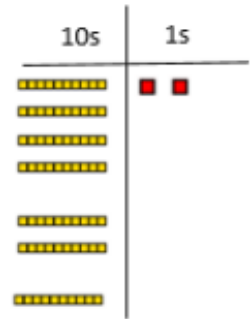
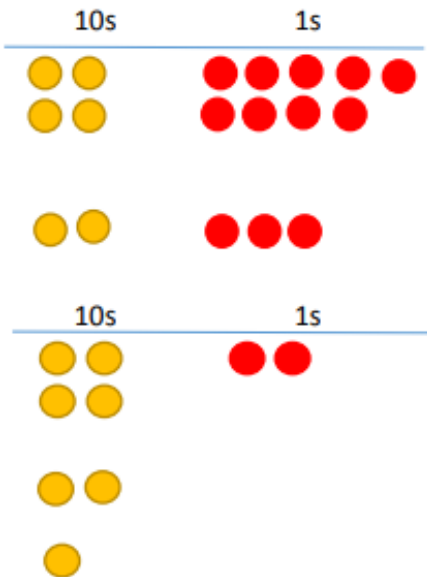


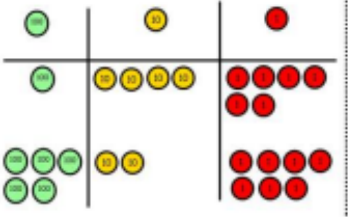
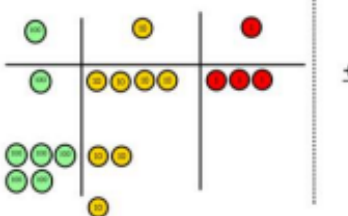
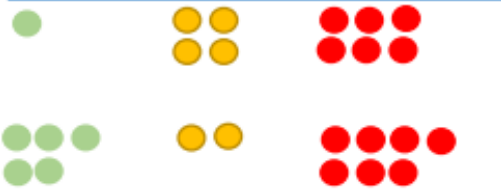

$$5 + 3 = 8$$



## CALCULATION GUIDANCE: Addition

	Objective	Concrete	Pictorial	Abstract
Year 1	Regrouping to make 10	   <p><math>6 + 5 = 11</math></p> <p>Start with the bigger number and use the smaller number to make 10.</p>	  <p><math>6 + 5 = 11</math></p> <p><math>6 + 4 = 10</math></p> <p><math>10 + 1 = 11</math></p>	$6 + 5 = 11$
Year 2	Adding 3 single digit numbers	<p><math>4 + 7 + 6 = 17</math></p> <p>Put 4 and 6 together to make 10. Add on 7.</p>  <p>Following on from making 10, make 10 with 2 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>

	Objective	Concrete	Pictorial	Abstract
Year 2	Column method without regrouping	<p>Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters.</p> <p><math>24 + 15 =</math></p>  <p><math>44 + 15 =</math></p> 	<p>After physically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.</p> 	<p><math>24 + 15 = 39</math></p> $\begin{array}{r} 24 \\ + 15 \\ \hline 39 \end{array}$
	Column method with regrouping	<p>Make both numbers on a place value grid.</p>  <p>Add up the units and exchange 10 ones for 1 ten.</p> 	<p>Using place value counters, children can draw the counters to help them to solve additions.</p> 	<p><math>40 + 9</math></p> <p><math>20 + 3</math></p> <p><math>60 + 12 = 72</math></p>

	Objective	Concrete	Pictorial	Abstract
Year 3/4	Column method with regrouping	<p>Make both numbers on a place value grid.</p>  $\begin{array}{r} 146 \\ + 527 \\ \hline \end{array}$ <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.</p> <p><b>NB</b> By Year 4 children will progress on to adding four digit numbers.</p>	<p>100s      10s      1s</p>  <p>100s      10s      1s</p>  <p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.</p> <p><b>NB</b> Addition of money needs to have £ and p added separately.</p>	$\begin{array}{r} 100 + 40 + 6 \\ 500 + 20 + 7 \\ 600 + 70 + 3 = 673 \end{array}$ <p>As the children progress, they will move from the expanded to the compacted method.</p> $\begin{array}{r} 146 \\ + 527 \\ \hline 673 \\ 1 \end{array}$ <p>As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.</p>
Year 5/6	Column method with regrouping	Consolidate understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places.		



## Subtraction- EYFS

### Objectives

Knows that a group of things change in quantity when something is taken away

Find one less from a group of five objects, then ten objects.

In practical activities and discussion, beginning to use the vocabulary involved in subtracting.

Using quantities and objects, they subtract two single digit numbers and count back to find the answer.

### Concrete



Use toys and general classroom resources for children to physically manipulate, group/regroup.



Use specific maths resources such as snap cubes, Numicon, bead strings etc.



Use visual supports such as ten frames, part part whole and subtraction mats, with the physical objects and resources that can be manipulated.

### Pictorial



$$6 - 4 =$$



$$5 - 3 =$$

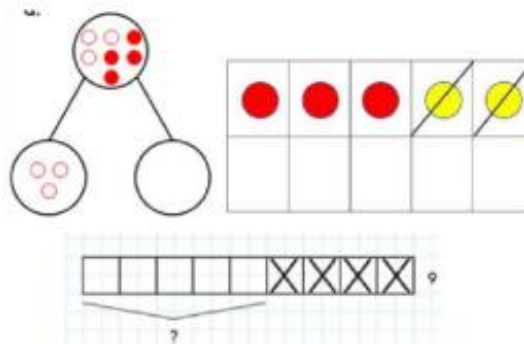


$$3 - 1 =$$



$$7 - 2 =$$

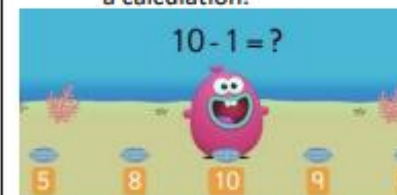
A group of pictures for children to cross out or cover quantities to support subtraction.



Use visual supports such as ten frames, part part whole and bar model with pictures/icons.

### Abstract

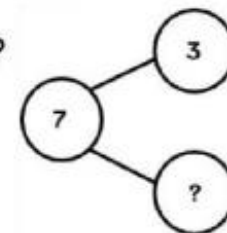
A focus on symbols and numbers to form a calculation.



$$10 - 6 = 4$$

3	?
7	


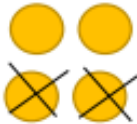

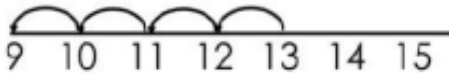
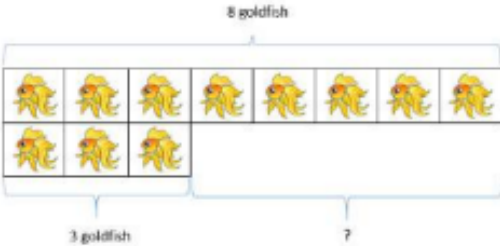
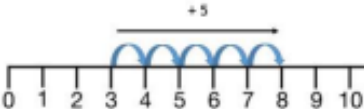
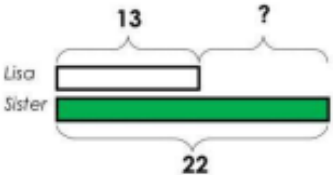
$$7 - 3 = ?$$



\* No expectation for children to be able to record a number sentence/addition calculation.

# CALCULATION GUIDANCE: Subtraction

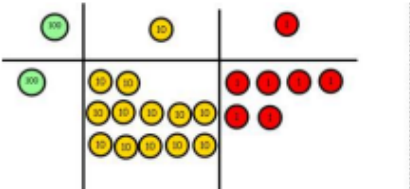
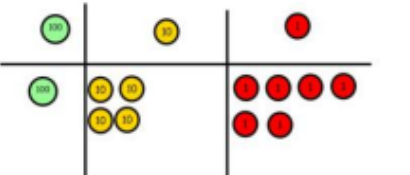


	Objective	Concrete	Pictorial	Abstract
Year 1	Taking away ones	<p>Use physical objects, counters, cubes etc. to show how objects can be taken away.</p> <p><math>4 - 2 = 2</math></p> 	<p>Cross out drawn objects to show what has been taken away.</p> <p><math>4 - 2 = 2</math></p> 	$4 - 2 = 2$
	Counting back	<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 = 9</math></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>Put 13 in your head, count back 4. What number are you at?</p> <p>Use your fingers to help.</p>
	Find the difference	<p>Compare amounts and objects to find the difference.</p>  <p>Use cubes to build towers or make bars to find the difference. Use basic bar models with items to find the difference.</p>	<p>Count on to find the difference.</p>  <p>Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.</p>  <p>Draw bars to find the difference between 2 numbers.</p>	<p>Hannah has 8 goldfish. Helen has 3 goldfish. Find the difference between the number of goldfish the girls have.</p>



	Objective	Concrete	Pictorial	Abstract
Year 2	Column method without regrouping	<p><math>75 - 42 = 33</math></p> <p>Use Base 10 to make the bigger number then take the smaller number away.</p> <p>Show how you partition numbers to subtract.</p> <p>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>Calculations</p> $\begin{array}{r} 54 \\ - 22 \\ \hline 32 \end{array}$ <p><math>47 - 24 = 23</math></p> $\begin{array}{r} 40 + 7 \\ - 20 + 4 \\ \hline 20 + 3 \end{array}$ <p>This will lead to a clear written column subtraction.</p>

	Objective	Concrete	Pictorial	Abstract
Year 3 onwards	Column method with regrouping	<p>Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.</p> <p>Make the larger number with the place value counters</p> <div><div><div><div>100</div><div>10</div><div>1</div></div><div><div>100</div><div>10</div><div>1</div></div><div><div>100</div><div>10</div><div>1</div></div></div><div><div>100</div><div>10</div><div>1</div></div><div><div>100</div><div>10</div><div>1</div></div><div><div>100</div><div>10</div><div>1</div></div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> <div><div>100</div><div>10</div><div>1</div></div> 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	Objective	Concrete	Pictorial	Abstract
Year 3 up	Column method with regrouping	<p>Now look at the tens, can I take away 8 tens easily? I need to exchange 1 hundred for 10 tens.</p>  <p>Calculations</p> $\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$ <p>Now I can take away 8 tens and complete my subtraction.</p>  <p>Calculations</p> $\begin{array}{r} 234 \\ - 88 \\ \hline 146 \end{array}$ <p>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.</p>		



## Multiplication-EYFS

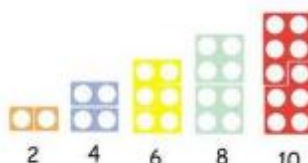
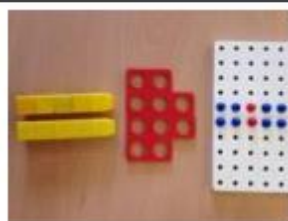
### Objectives

### Concrete

### Pictorial

### Abstract

Solve problems including doubling



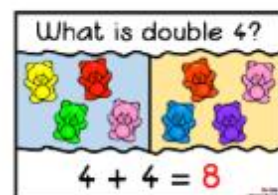
Counting and other maths resources for children to make 2 equal groups.



Physical and real life examples that encourage



children to see concept of doubling as adding two equal groups.







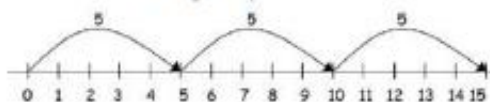






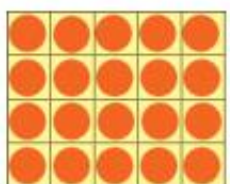

Pictures and icons that encourage children to see concept of doubling as adding two equal groups.

1+1=	7+7=
2+2=	8+8=
3+3=	9+9=
4+4=	10+10=
5+5=	11+11=
6+6=	12+12=

Addition calculations to model adding two equal groups.

# CALCULATION GUIDANCE: Multiplication



	Objective	Concrete	Pictorial	Abstract
Year 1/2	Repeated addition	   <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>  $2 + 2 + 2 = 6$  $5 + 5 + 5 = 15$	<p>Write addition sentences to describe objects and pictures.</p>  $2 + 2 + 2 = 6$
	Arrays- showing commutative multiplication	<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>  $4 \times 2 = 8$  $2 \times 4 = 8$  $4 \times 2 = 8$ <p>Link arrays to area of rectangles.</p> 	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$

# CALCULATION GUIDANCE: Multiplication



	Objective	Concrete	Pictorial	Abstract																																																																																																																																																							
Year 3/4	Grid method	<p>Show the link with arrays to first introduce the grid method.</p> <div><table><tr><td>x</td><td>10</td><td>3</td></tr><tr><td>4</td><td></td><td></td></tr></table></div> <p>4 rows of 10 4 rows of 3</p> <p>Move on to using Base 10 to move towards a more compact method.</p> <div><table><tr><td>x</td><td>T</td><td>U</td></tr><tr><td>4</td><td></td><td></td></tr></table></div> <p>4 rows of 13</p> <p>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.</p> <div><table><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table></div> <p>Calculations <math>4 \times 126</math></p> <p>Fill each row with 126.</p> <div><table><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table></div> <p>Calculations <math>4 \times 126</math></p> <p>Add up each column, starting with the ones making any exchanges needed.</p> <div><table><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table><table><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table></div> <p><math>4 \times 126 = 504</math></p>	x	10	3	4			x	T	U	4																																																																			<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 or just use circles in the different columns to show their thinking as shown below.</p> <div><table><tr><td>24</td><td>x</td><td>3</td><td>=</td><td>72</td></tr><tr><td>x</td><td>20</td><td>4</td><td></td><td></td></tr><tr><td>3</td><td>00</td><td>0000</td><td></td><td></td></tr><tr><td></td><td>00</td><td>0000</td><td></td><td></td></tr><tr><td></td><td>00</td><td>0000</td><td></td><td></td></tr><tr><td></td><td>60</td><td>12</td><td></td><td></td></tr><tr><td></td><td></td><td>60</td><td></td><td></td></tr><tr><td></td><td></td><td>+ 12</td><td></td><td></td></tr><tr><td></td><td></td><td>72</td><td></td><td></td></tr></table></div>	24	x	3	=	72	x	20	4			3	00	0000				00	0000				00	0000				60	12					60					+ 12					72			<p>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.</p> <div><table><tr><td>x</td><td>30</td><td>5</td></tr><tr><td>7</td><td>210</td><td>35</td></tr></table></div> <p><math>210 + 35 = 245</math></p> <p>Moving forward, multiply by a 2 digit number showing the different rows within the grid method.</p> <div><table><tr><td></td><td>10</td><td>8</td></tr><tr><td>10</td><td>100</td><td>80</td></tr><tr><td>3</td><td>30</td><td>24</td></tr></table></div> <div><table><tr><td>x</td><td>1000</td><td>300</td><td>40</td><td>2</td></tr><tr><td>10</td><td>10000</td><td>3000</td><td>400</td><td>20</td></tr><tr><td>8</td><td>8000</td><td>2400</td><td>320</td><td>16</td></tr></table></div>	x	30	5	7	210	35		10	8	10	100	80	3	30	24	x	1000	300	40	2	10	10000	3000	400	20	8	8000	2400	320	16
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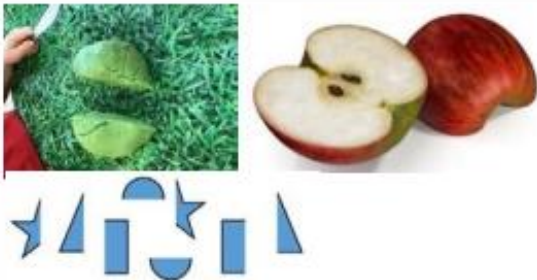
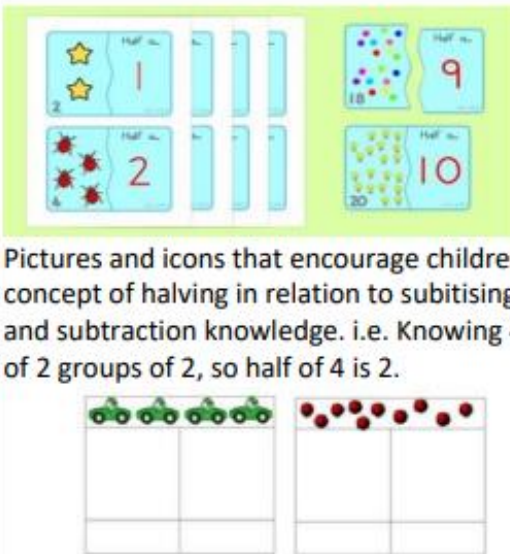

# CALCULATION GUIDANCE: Multiplication



	Objective	Concrete	Pictorial	Abstract
	Expanded method	<p>Show the link with arrays to first introduce the expanded method.</p>		<p>Start with long multiplication, reminding the children about lining up their numbers clearly in columns.</p> $\begin{array}{r} 18 \\ \times 13 \\ \hline 24 \quad (3 \times 8) \\ 30 \quad (3 \times 10) \\ \hline 80 \quad (10 \times 8) \\ 100 \quad (10 \times 10) \\ \hline 234 \end{array}$
Year 5/6	Compact method	<p>Children can continue to be supported by place value counters at the stage of multiplication.</p> <p>It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.</p>	<p>Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.</p>	<p>Start with long multiplication, reminding the children about lining up their numbers clearly in columns.</p> <p>If it helps, children can write out what they are solving next to their answer.</p> $\begin{array}{r} 7 \quad 4 \\ \times 6 \quad 3 \\ \hline 1 \quad 2 \\ 2 \quad 1 \quad 0 \\ 2 \quad 4 \quad 0 \\ + 4 \quad 2 \quad 0 \quad 0 \\ \hline 4 \quad 6 \quad 6 \quad 2 \end{array}$ <p>This moves to the more compact method.</p> $\begin{array}{r} 1342 \\ \times 18 \\ \hline 13420 \\ 10736 \\ \hline 24156 \end{array}$

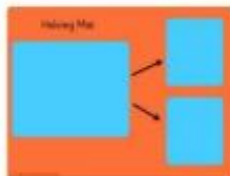
# CALCULATION GUIDANCE: Division



Division- EYFS			
Objectives	Concrete	Pictorial	Abstract
<p>Solve problems including halving and sharing.</p> <p>Halving a whole, halving a quantity of objects.</p> <p>Sharing a quantity of objects.</p>	 <p>Children have the opportunity to physically cut objects, food or shapes in half.</p>	 <p>Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge. i.e. Knowing 4 is made of 2 groups of 2, so half of 4 is 2.</p> <p>Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.</p> 	
		<p>Pictures for children to create and visualise 3 or more</p>	




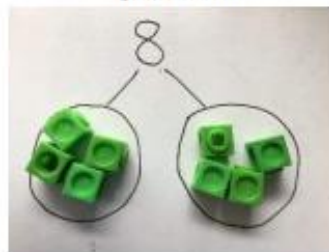

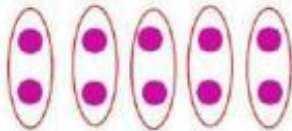
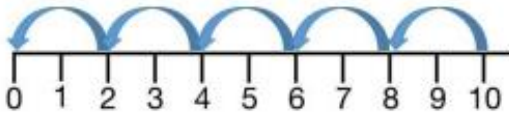
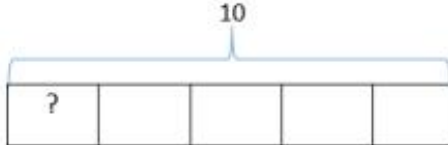
Use visual supports such as halving mats and part part whole with the physical objects and resources that can be manipulated



Counting and other maths resources for children to explore sharing between 3 or more


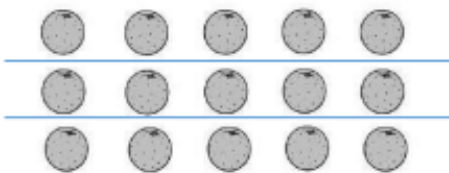
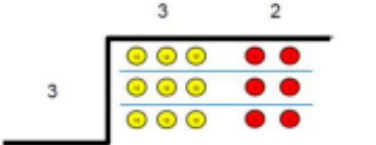

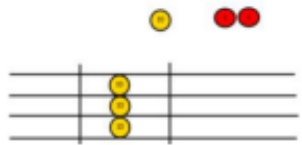
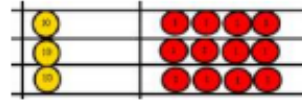
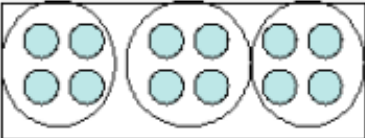
Counting and other maths resources for children to share into two equal groups.

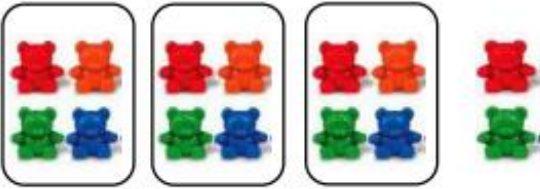


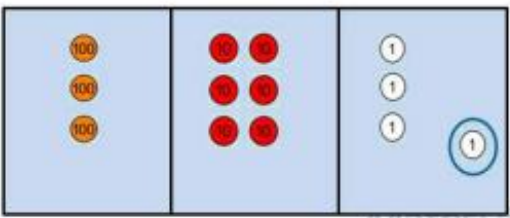


	Objective	Concrete	Pictorial	Abstract
Year 1/2	Sharing	<p>I have 8 cubes, can you share them equally between two people?</p>	<p>Children use pictures or shapes to share quantities.</p>  <p><math>8 \div 2 = 4</math></p>	<p>Share 8 buns between two people.</p> <p><math>8 \div 2 = 4</math></p> 
	Grouping	<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>  <p><math>10 \div 5 = ?</math></p> <p><math>5 \times ? = 10</math></p>	<p><math>10 \div 5 = 2</math></p> <p>Divide 10 into 5 groups. How many are in each group?</p>

# CALCULATION GUIDANCE: Division



	Objective	Concrete	Pictorial	Abstract
Year 3/4	Division with arrays	<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>5 \times 3 = 15</math>  <math>3 \times 5 = 15</math>  <math>15 \div 5 = 3</math>  <math>15 \div 3 = 5</math></p>
	Short division	<p>Use place value counters to divide using the short division method alongside.</p> <p><math>96 \div 3</math></p>  <p><math>42 \div 3</math></p> <p>Start with the biggest place value.</p>  <p>We are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.</p>  <p>We exchange this ten for 10 ones and then share the ones equally among the groups.</p>  <p>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.</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> $\begin{array}{r} 218 \\ 3 \overline{) 872} \end{array}$

	Objective	Concrete	Pictorial	Abstract
Year 5/6	Division with remainders	$14 \div 3 =$ Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. $29 \div 8 = 3 \text{ REMAINDER } 5$ <div style="display: flex; justify-content: space-around; font-size: small;"> <span>↑ dividend</span> <span>↑ divisor</span> <span>↑ quotient</span> <span>↑ remainder</span> </div>
	Short division with remainders	$364 \div 3 =$ $\begin{array}{r} 121 \text{ rem } 1 \\ 3 \overline{) 364} \end{array}$ 		Move onto divisions with a remainder. Once children understand remainders, begin to express as a fraction or decimal according to the context. $\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \end{array}$ $\begin{array}{r} 186 \frac{1}{5} \\ 5 \overline{) 931} \end{array}$ $\begin{array}{r} 14.6 \\ 35 \overline{) 511.0} \end{array}$



	Objective	Concrete	Pictorial	Abstract
Year 6	Long division			<p>Children will use long division to divide numbers with up to 4 digits by 2 digit numbers.</p> <div> <div> <div>015</div> <div>32</div> <div> <div>487</div> <div>-0</div> <div>48</div> <div>-32</div> <div>167</div> <div>-160</div> <div>7</div> </div> </div> <div> <div>17 r 19</div> <div>31</div> <div> <div>546</div> <div>31</div> <div>236</div> <div>217</div> <div>19</div> </div> </div> </div>