

St Anne's Catholic Primary School

Calculation Policy

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. Progression within each area of calculation is in line with the programme of study in the 2014 National Curriculum.

This calculation policy should be used to support children to develop a deep understanding of number and calculation. This policy has been designed to teach children through the use of concrete, pictorial and abstract (CPA) representations.

Maths Mastery

At the centre of the mastery approach to the teaching of maths is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used across the school, which is in line with the requirements of the 2014 Primary National Curriculum.

Intent

Maths is a journey and long-term goal, achieved through exploration, clarification, practice and application over time. At each stage of learning, children should be able to demonstrate a deep, conceptual understanding of the topic and be able to build on this over time. Our overall aims for when children leave St Anne's Catholic Primary School, are:

- develop a positive attitude to mathematics as a subject in which all children gain success and pleasure.
- have access to a high-quality maths curriculum that is both challenging and enjoyable, and builds upon previous learning.
- be provided with a variety of mathematical opportunities, which will enable them to make relevant connections.
- ensuring children are confident mathematicians who are not afraid to take risks.
- develop an ability to express themselves fluently, to talk about the subject with assurance, using correct mathematical language and vocabulary.
- develop mathematical skills and knowledge and recall of basic number facts and the four operations
- be able to use this knowledge and understanding to carry out calculations mentally
- make use of pictorial representations and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads
- have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally. They will do this by always asking themselves: Can I do this in my head? Can I do this in my head using pictorial representations? Do I need to use a pencil and paper procedure of a formal written method?

Implementation

Our school has adopted the White Rose Hub's calculation documents, who are leaders in the field of Mastery in Mathematics. We adapted the policy to match with our school's approach. This policy is a statement of the aims, principles and strategies for teaching and learning of calculation strategies in Mathematics. It is designed to help teachers and staff at St Anne's Catholic Primary School ensure that calculation is taught consistently across the school and to aid them in helping children who may need extra support or challenges. This policy is also designed to help parents, carers and other family members support children's learning by providing an explanation of the methods used in our school.

The policy is set out in subjects, addition, subtraction, multiplication and division. Within each specific area there is a progression of skills, knowledge and layout for written methods. The calculation strategies which will be used will reflect this ideology – moving from concrete to pictorial and then abstract recording, leading to more formal written methods. Mental methods and strategies will work in partnership with these methods. A variety of mental calculation methods will be taught and that recall of facts will be taught in school and tested regularly. The progression of mental methods and expectations will comply with the New National Curriculum Statements from July 2014.

At St Anne's Catholic Primary School, it is important that staff always use correct mathematical language and encourage this from every pupil. This mathematical language may be individual words or 'Mantras' which when used by the pupil will develop confidence in their mathematical processes. This will take place in class discussions as well as through oral and written feedback, next steps and target setting. The basis of our maths calculation policy is that written methods are complementary to mental methods and should not be seen as separate from them. Children should use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. This document identifies progression in calculation strategies rather than specifying which method should be taught in a particular year group. According to Mastery in Mathematics, children should not be made to go onto the next stage of their development if they are not ready and they are not confident. This will lead to misconceptions and poor mathematical foundations and eventually, in later years, pupils will not be able to make the required progress. Eventually we aim to enable pupils to make informed choices about the methods they use both mental and written that are the most efficient and this includes recognised compact methods.

Concrete, Pictorial and Abstract (CPA) approach

At St Anne's, we recognise that the Concrete Pictorial Abstract (CPA) approach is highly effective in the teaching of Maths to develop conceptual understanding. This approach will vary between year groups and the individual abilities of children within each class.

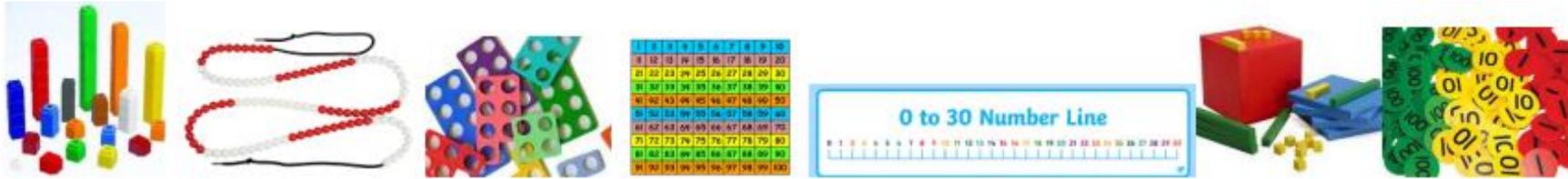
Manipulatives (objects), pictorial representations, words, numbers and symbols are everywhere. The mastery approach incorporates all of these to help children explore and demonstrate mathematical ideas, enrich their learning experience and deepen understanding. Together, these elements help cement knowledge so pupils truly understand what they've learnt.

All pupils, when introduced to a key new concept, should have the opportunity to build competency in this topic by taking this approach. Pupils are encouraged to physically represent mathematical concepts. Objects (manipulatives) and pictures are used to demonstrate and visualise abstract ideas, alongside numbers and symbols.

Concrete – The doing stage

There is a clear focus on the use of manipulatives and visual images to support understanding in every year group. Each new concept or calculation strategy will be introduced using appropriate manipulatives, giving the children a clear picture of the theoretical mathematics, they are learning. It is important that children have access to a wide range of manipulatives in every year group and, consequently, we encourage children to be independent in their use of manipulatives throughout the school and access resources as they see fit. This is the foundation for conceptual understanding.

Concrete resources that may be found in classrooms will include:



These resources will vary depending on year group and individual needs. At home, pupils very well may not have access to these school resources; however, they are just a vehicle to support a pupil's understanding of a topic. Any objects can be used at home to replace counters, cubes etc.

Pictorial – The seeing stage

A child has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or a picture of the problem.

Abstract- The symbolic stage

A child is now capable of representing problems by using mathematical notation, for example $10 \div 2 = 5$.

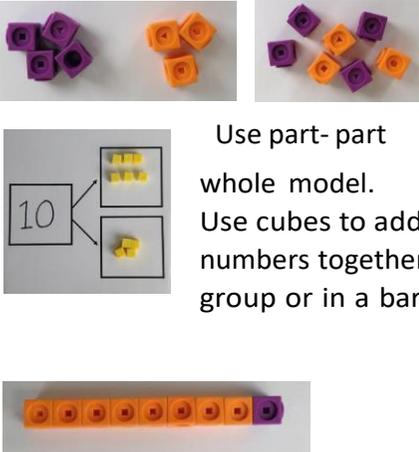
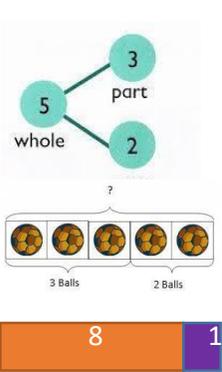
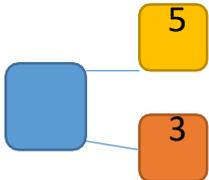
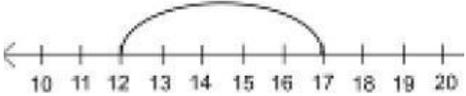
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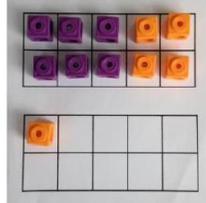
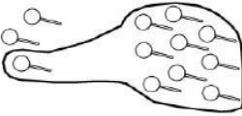
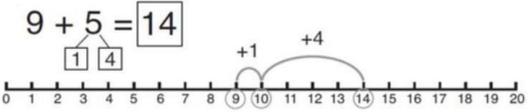
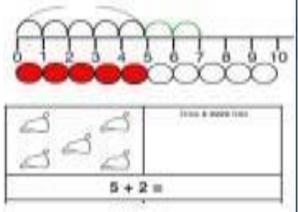
Pupils will leave us prepared for the next stage in their lives with:

- Quick recall of facts and procedures
- The flexibility and fluidity to move between different contexts and representations of mathematics
- The ability to recognise relationships and make connections in mathematics
- Confidence and belief that they can achieve
- The knowledge that maths underpins most of our daily lives
- Skills and concepts that have been mastered
- Have a positive and inquisitive attitude to mathematics as an interesting and attractive subject in which all children gain success and pleasure.

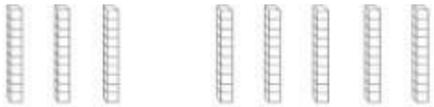
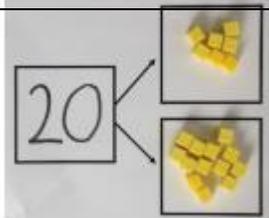
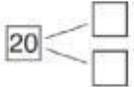
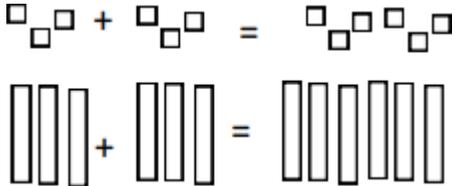
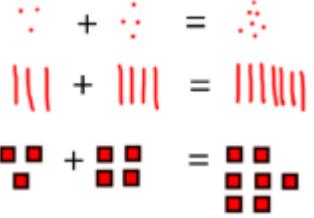
A mathematical concept or skill has been mastered when a child can show it in multiple ways, using the mathematical language to explain their ideas, and can independently apply the concept to new problems in unfamiliar situations and this is the goal for our children.

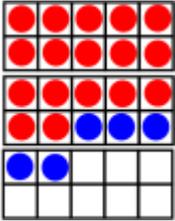
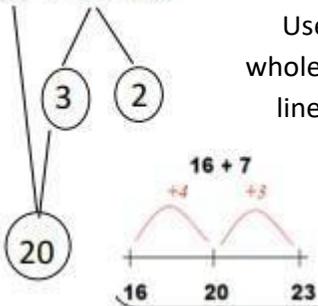
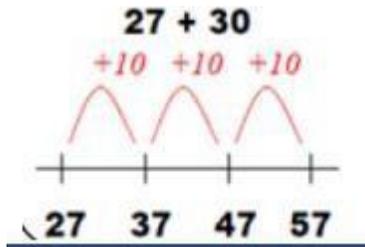
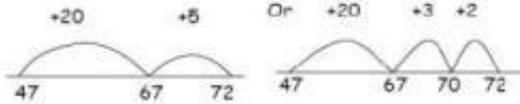
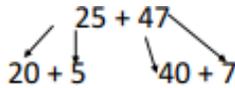
Year 1 - Addition

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole: part-whole model.</p>	 <p>Use part-part whole model. Use cubes to add two numbers together as a group or in a bar.</p>	 <p>Use pictures to add two numbers together as a group or in a bar.</p>	<p>$4 + 3 = 7$ $10 = 6 + 4$</p>  <p>Use the part-part whole diagram as shown above to move into the abstract.</p>
<p>Starting at the bigger number and counting on.</p>	 <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p>	<p>$12 + 5 = 17$</p>  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p>	<p>$12 + 5 = 17$</p> <p>Place the larger number in your head and count on the smaller number to find your answer.</p>

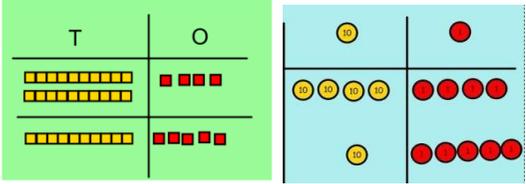
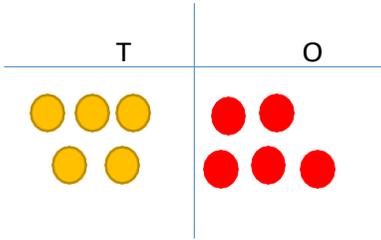
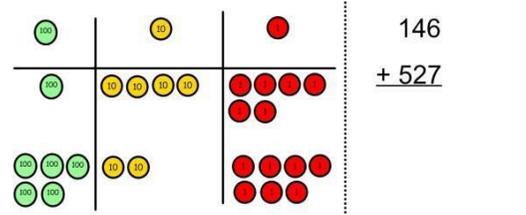
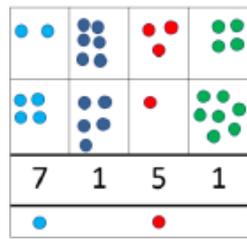
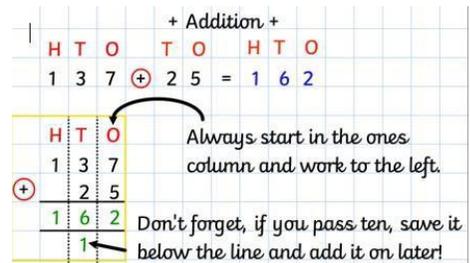
<p>Regrouping to make 10.</p>	 <p>$6 + 5 = 11$</p>  <p>Start with the bigger number and use the smaller number to make 10.</p>	 <p>Use pictures or a number line. Regroup or partition the smaller number to make 10.</p> <p>$3 + 9 =$</p> <p>$9 + 5 = 14$</p> 	<p>$7 + 4 = 11$</p> <p>“If I am at seven, how many more do I need to make 10? How many more do I add on now?”</p>
<p>Represent & use number bonds and related subtraction facts within 20.</p>	 <p>2 more than 5.</p>		<p>Emphasis should be on the language:</p> <p>“1 more than 5 is equal to 6”</p> <p>“2 more than 5 is 7”</p> <p>“8 is 3 more than 5”</p>

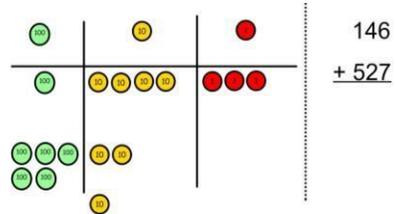
Year 2 - Addition

Objective & Strategy	Concrete	Pictorial	Abstract
Adding multiples of ten.	<p style="text-align: center;">$50 = 30 + 20$</p>  <p style="text-align: center;">Model using dienes and bead strings.</p>	 <p style="text-align: center;">3 tens + 5 tens = _____ tens $30 + 50 = \underline{\quad}$</p> <p style="text-align: center;">Use representations for base ten.</p>	<p style="text-align: center;">$20 + 30 = 50$</p> <p style="text-align: center;">$70 = 50 + 20$</p> <p style="text-align: center;">$40 + \underline{\quad} = 60$</p>
Use known number facts including different combinations of tens & ones of any 2 digit number. (Part part whole)	 <p style="text-align: center;">Children explore ways of making numbers.</p>	 <p style="text-align: center;">$\square + \square = 20$ $20 - \square = \square$</p> <p style="text-align: center;">$\square + \square = 20$ $20 - \square = \square$</p>	Include teaching of the inverse of addition and subtraction:
Use known facts.		 <p style="text-align: center;">Children draw representations of H, T & O.</p>	<p style="text-align: center;">$3 + 4 = 7$</p> <p style="text-align: center;"><i>Leads to</i></p> <p style="text-align: center;">$30 + 40 = 70$</p> <p style="text-align: center;"><i>Leads to</i></p> <p style="text-align: center;">$300 + 400 = 700$</p>

Use bar models.	 $3 + 4 = 7$	 $7 + 3 = 10$	<table border="1" data-bbox="1671 220 2040 328"> <tr> <td>23</td> <td>25</td> </tr> <tr> <td colspan="2">?</td> </tr> </table> $23 + 25 = 48$	23	25	?	
23	25						
?							
Add a two digit number and ones.	 <p>Use ten frame to make 'magic ten'.</p> <p>Children explore the patterns:</p> $17 + 5 = 22$ $27 + 5 = 32$	$17 + 5 = 22$  <p>Use part part whole and number line to model.</p>	$17 + 5 = 22$ $5 + 17 = 22$ $22 - 17 = 5$ $22 - 5 = 17$ <table border="1" data-bbox="1839 563 2080 651"> <tr> <td colspan="2">22</td> </tr> <tr> <td>17</td> <td>5</td> </tr> </table> <p>Explore related facts:</p>	22		17	5
22							
17	5						
Add 2 digit numbers and tens.	 $25 + 10 = 35$ <p>Explore that the ones digit does not change.</p>	$27 + 30$ 	$27 + 10 = 37$ $27 + 20 = 47$ $27 + \underline{\quad} = 57$				
Add two 2-digit numbers.	 <p>Model using dienes, place value counters and numicon.</p>	 <p>Use number line and bridge ten using part whole if necessary.</p>	$25 + 47$  $20 + 40 = 60$ $5 + 7 = 12$ $60 + 12 = 72$				

Year 3 - Addition

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Column Addition – no regrouping (friendly numbers)</p> <p>Add 2 or 3 digit numbers.</p>	<p style="text-align: center;">$24 + 15 =$</p>  <p>Add together the ones first then add the tens. Use the 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>Add the ones first, then the tens, then the hundreds:</p> $\begin{array}{r} 223 \\ + 114 \\ \hline 337 \end{array}$ <p>Children use the 'steps to success' to format their calculation:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;"><i>*Steps for Success*</i></p> <ol style="list-style-type: none"> 1. Write your calculation, label your digits and circle the operation. 2. Check your operation, choose your method and set it up below. Remember to leave plenty of room for working out! 3. Use the method to calculate the answer. 4. Write the answer at the end of the calculation. </div>
<p>Column Addition – with regrouping.</p>	<p>Make both numbers on a place value grid.</p>  <p style="text-align: right;">146 $+ 527$</p> <p>Add up the units and exchange 10 ones for one 10.</p>	<p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.</p> 	<p>Children follow the 'Steps to Success' to regroup and form the calculation correctly:</p> 



Add up the rest of the columns, exchanging the 10 counters from one column for the next place value 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 tens equal 100.

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

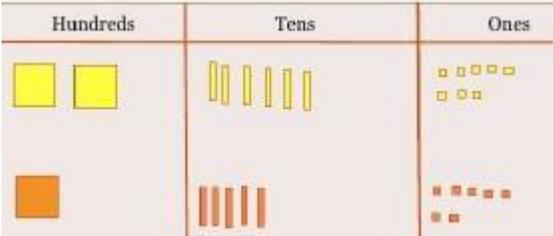
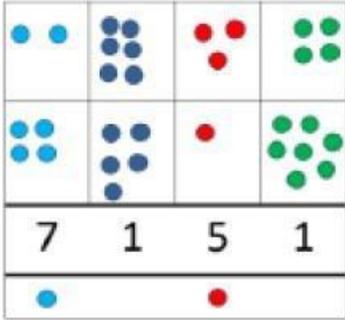
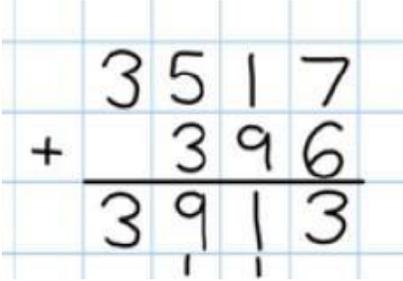
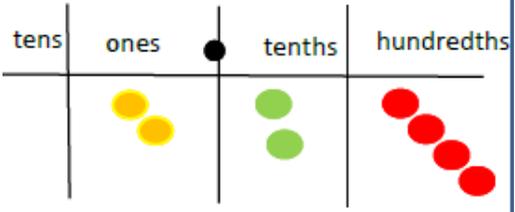
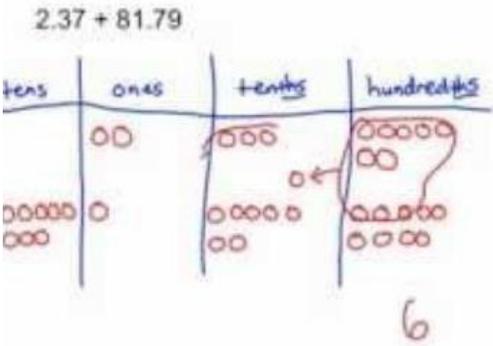
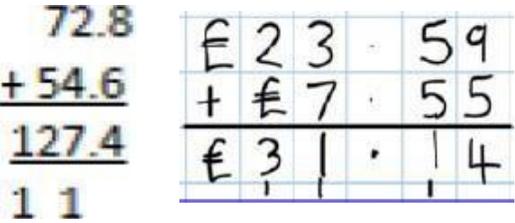
As the children move on, introduce decimals with the same number of decimal places and different. Money is used for context.

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

$$\begin{array}{r}
 \pounds 23.59 \\
 + \pounds 7.55 \\
 \hline
 \pounds 31.14
 \end{array}$$

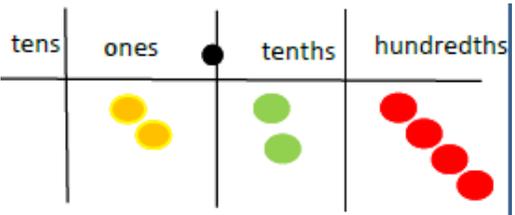
$$\begin{array}{r}
 23.361 \\
 9.080 \\
 + 1.300 \\
 \hline
 33.741
 \end{array}$$

Years 4-6 - Addition

Objective & Strategy	Concrete	Pictoria I	Abstract
<p><u>Year 4</u> Add numbers with up to 4 digits</p>	<p>Children continue to use dienes or place value counters to add, exchanging ten ones for a ten, ten tens for a hundred and ten hundreds for a thousand.</p> 	<p>Draw representations using place value grid.</p> 	<p>Continue from previous work to carry hundreds as well as tens.</p> <p>Relate to money and measures.</p> 
<p><u>Year 5</u> Add numbers with more than 4 digits. Add decimals with 2 decimal places, including money.</p>	<p>(As year 4)</p> <p>Introduce decimal place value counters and model exchange for addition.</p> 	<p>(As year 4)</p> <p>2.37 + 81.79</p> 	<p>(As year 4)</p> 

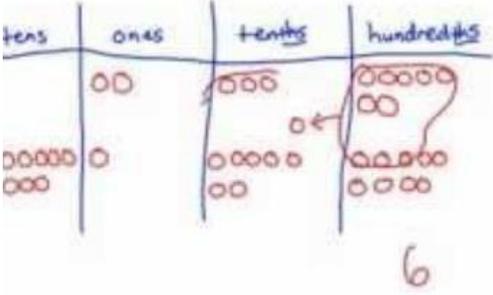
Year 6
Add several numbers of increasing complexity.
Include adding money, measure and decimals with different numbers of decimal points.

(As year 5)
Introduce decimal place value counters and model exchange for addition.



(As year 5)

$2.37 + 81.79$



Insert zeros for place holders.

8	1	0	5	9	
	3	6	6	8	
	1	5	3	0	1
+	2	0	5	5	1
<hr/>					
1	2	0	5	7	9
	1	1	1	1	

2	3	.	3	6	1	
	9	.	0	8	0	
	5	9	.	7	7	0
+		1	.	3	0	0
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9	3	.	5	1	1	
2	1		2			

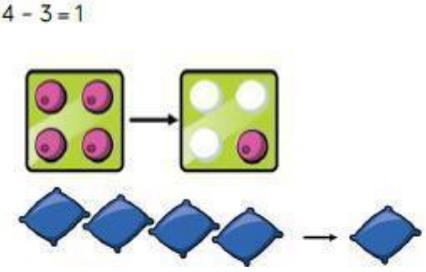
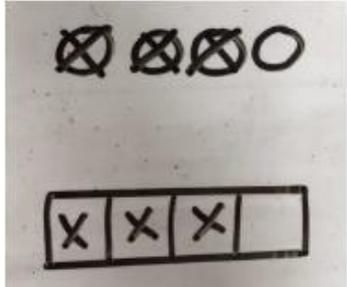
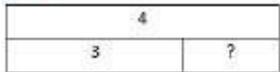
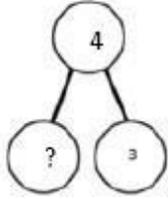
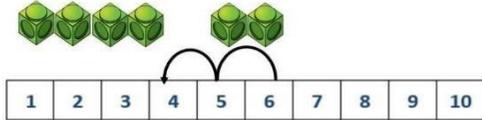
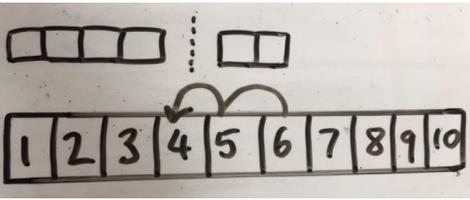
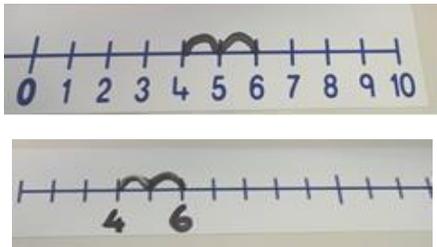
Year 4
Rapid Recall (addition and subtraction)

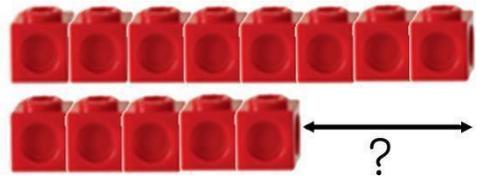
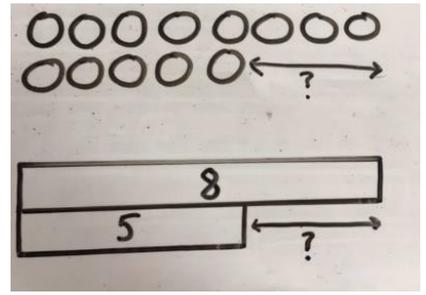
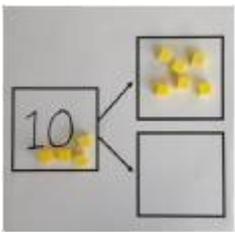
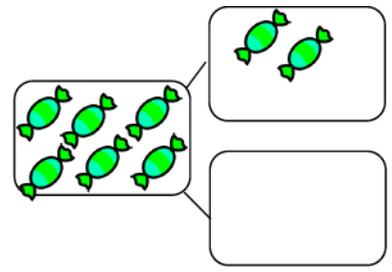
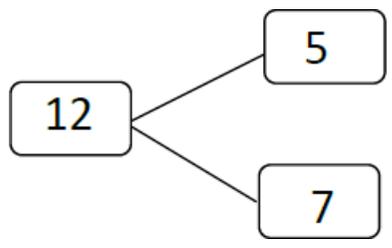
- Sums/differences – multiples of 10/100/1000
- Doubles – within 100
- Add/subtract multiples of 10/100/1000

Strategies

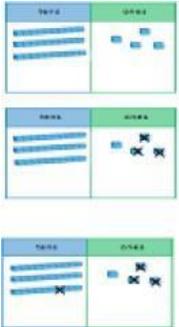
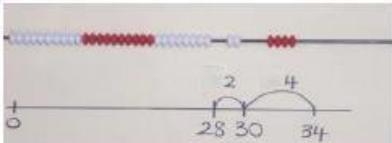
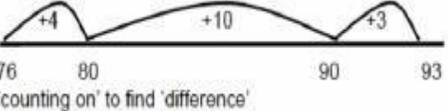
- Partition
- Small difference
- Bridging
- Round & adjust

Year 1 - Subtraction

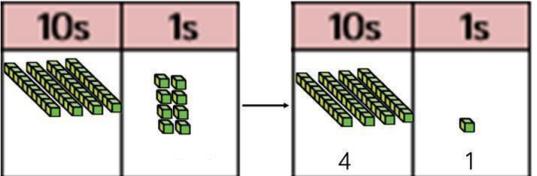
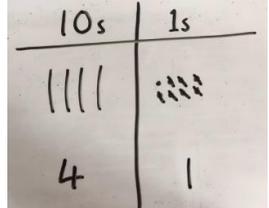
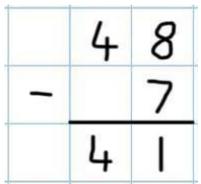
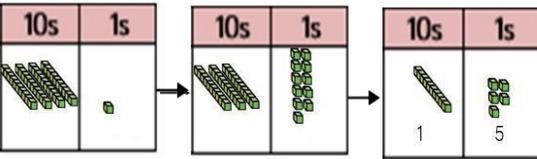
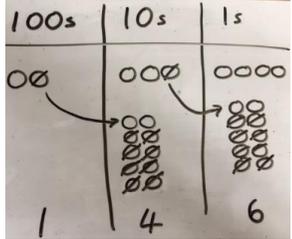
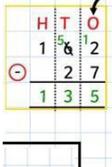
Objective & Strategy	Concrete	Pictorial	Abstract
<p>Taking away ones from a whole.</p>	<p>Use physical objects, counters, cubes etc. to show how objects can be taken away.</p> <p>$4 - 3 = 1$</p> 	<p>Cross out drawn objects to show how many has been taken away. The bar model can also be used.</p> 	<p>$4 - 3 =$</p> <p></p> <p></p> <p></p>
<p>Counting back.</p>	<p>Counting back (using number lines or number tracks) children start with 6 and count back 2.</p> <p>$6 - 2 = 4$</p> 	<p>Children to represent what they see pictorially e.g.</p> 	<p>Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line.</p> 

<p>Finding the difference.</p>	<p>Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used).</p> <p>Calculate the difference between 8 and 5:</p> 	<p>Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.</p> 	<p>Find the difference between 8 and 5. $8 - 5$, the difference is...</p> <p>Children to explore why $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.</p>
<p>Represent and use number bonds and related subtraction facts within 20.</p> <p>(Part part whole model)</p>	<p>Link to addition – use the PPW model to model the inverse.</p>  <p>If 10 is the whole and 6 is one of the parts, what is the other part?</p> $10 - 6 = 4$	<p>Use pictorial representations to show the parts.</p> 	<p>Move to using numbers within the part whole model.</p> 

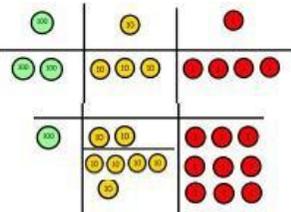
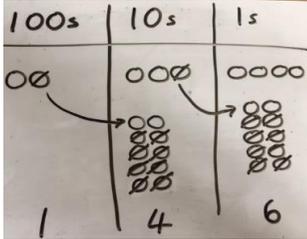
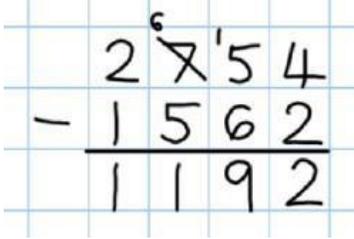
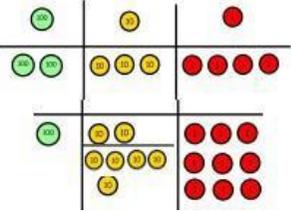
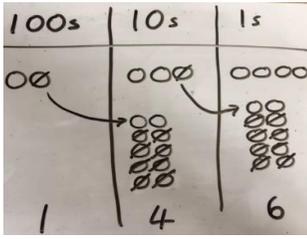
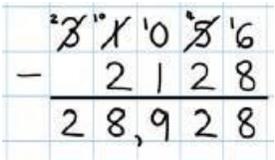
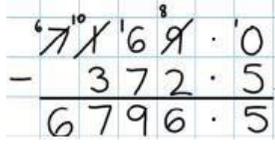
Year 2 - Subtraction

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Partitioning to subtract – without regrouping.</p> <p>(friendly numbers)</p>	<p>Use dienes to show how to partition the number when subtracting without regrouping.</p> <p>$34 - 13 = 21$</p> 	<p>Children draw representations of dienes and cross off.</p> <p>$43 - 21 = 22$</p> 	<p>$43 - 21 = 22$</p>
<p>Making ten.</p> <p>(crossing one ten, crossing more than one ten, crossing the hundreds)</p>	<p>Use a bead string to model counting to the next ten and the rest.</p> <p>$34 - 28 =$</p> 	<p>Use a number line to count on to the next ten and then the rest.</p> 	<p>$93 - 76 = 17$</p>

Year 3 - Subtraction

Objective & Strategy	Concrete	Pictorial	Abstract																	
<p>Column subtraction without regrouping. (friendly numbers)</p>	<p>Column method using base ten.</p> 	<p>Children to represent the base 10 pictorially.</p> 	<p>Column method or children could count back 7.</p>  <p>Children use their 'Steps to Success' to format the question correctly:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">*Steps for Success*</p> <ol style="list-style-type: none"> 1. Write your calculation, label your digits and circle the operation. 2. Check your operation, choose your method and set it up below. Remember to leave plenty of room for working out! 3. Use the method to calculate the answer. 4. Write the answer at the end of the calculation. </div>																	
<p>Column subtraction with regrouping.</p>	<p>Column method using base 10 and having to exchange.</p> <p style="text-align: center;">$41 - 26 =$</p> 	<p>Represent the place value counters pictorially; remembering to show what has been exchanged.</p> 	<p>Formal column method using 'Steps to Success'. Children must understand what has happened when they have crossed out digits.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p style="text-align: center;">- Subtraction -</p> <table style="border-collapse: collapse; margin: 0 auto;"> <tr> <td style="padding: 0 5px;">H</td><td style="padding: 0 5px;">T</td><td style="padding: 0 5px;">O</td> <td style="padding: 0 5px;">T</td><td style="padding: 0 5px;">O</td> <td style="padding: 0 5px;">H</td><td style="padding: 0 5px;">T</td><td style="padding: 0 5px;">O</td> </tr> <tr> <td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">6</td><td style="padding: 0 5px;">2</td> <td style="padding: 0 5px;">2</td><td style="padding: 0 5px;">7</td> <td style="padding: 0 5px;">=</td> <td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">3</td><td style="padding: 0 5px;">5</td> </tr> </table> </div> <div> <p style="font-size: small;">Start in your ones. If you can't do it, exchange 10 or 100 across.</p> <p style="font-size: small;">Remember to keep your exchanges small and tidy so you don't get confused!</p> </div> </div> 	H	T	O	T	O	H	T	O	1	6	2	2	7	=	1	3	5
H	T	O	T	O	H	T	O													
1	6	2	2	7	=	1	3	5												

Years 4-6 - Subtraction

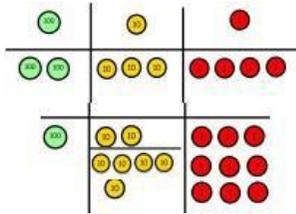
Objective & Strategy	Concrete	Pictorial	Abstract
<p style="text-align: center;"><u>Year 4</u></p> <p>Subtracting tens and ones – up to 4 digits.</p> <p>(introduce decimal subtraction through context of money)</p>	<p>Model process of exchange using numicon, base ten and then move to place value counters.</p> <p style="text-align: center;">$234 - 179 =$</p> 	<p>Represent the place value counters pictorially; remembering to show what has been exchanged.</p> 	<p>Formal column method. Children must understand what has happened when they have crossed out digits.</p> 
<p style="text-align: center;"><u>Year 5</u></p> <p>Subtract with at least 4 digits, including money and measures.</p> <p>(subtract with decimal values, including mixtures of integers and decimals and aligning the decimal)</p>	<p>Model process of exchange using numicon, base ten and then move to place value counters.</p> <p style="text-align: center;">$234 - 179 =$</p> 	<p>Represent the place value counters pictorially; remembering to show what has been exchanged.</p> 	<p>Formal column method. Children must understand what has happened when they have crossed out digits. Use zeros for place holders.</p>  

Year 6

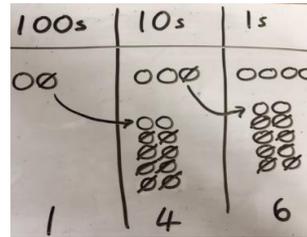
Subtract with increasingly large, more complex, numbers and decimal values.

Model process of exchange using numicon, base ten and then move to place value counters.

$$234 - 179 =$$



Represent the place value counters pictorially; remembering to show what has been exchanged.

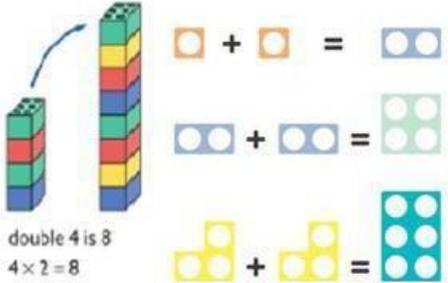
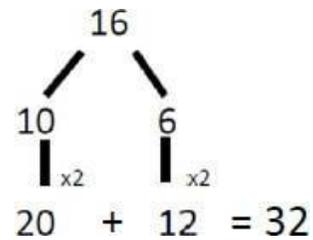
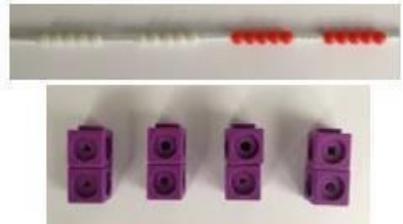
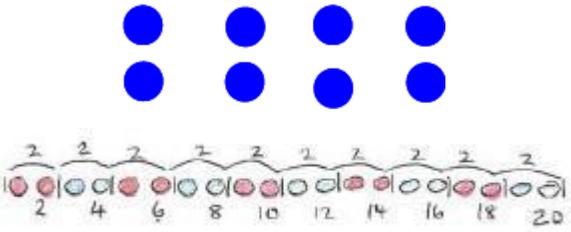


Increasingly large and more complex numbers.

$$\begin{array}{r} \cancel{1} \cancel{0} \cancel{0}, 699 \\ - 89,949 \\ \hline 60,750 \end{array}$$

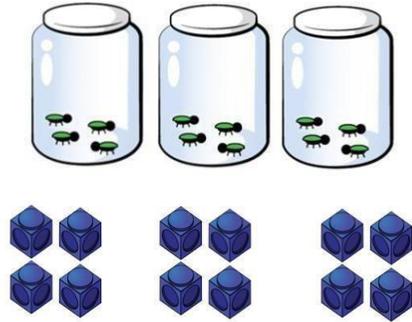
$$\begin{array}{r} \cancel{1} \cancel{0} 5 \cdot \cancel{4} 19 \text{ kg} \\ - 36 \cdot 080 \text{ kg} \\ \hline 69 \cdot 339 \text{ kg} \end{array}$$

Year 1 - Multiplication

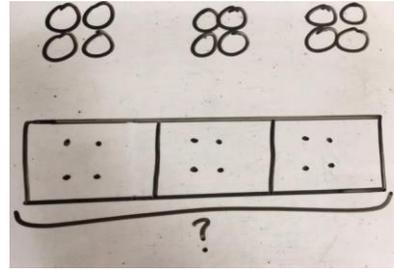
Objective & Strategy	Concrete	Pictorial	Abstract
<p>Doubling numbers.</p>	<p>Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling.</p>  <p>The image shows a stack of 4 cubes being doubled to a stack of 8 cubes. Below this, there are three Numicon blocks: two orange blocks (value 1 each) equal to one blue block (value 2); two blue blocks (value 2 each) equal to one green block (value 4); and two yellow blocks (value 2 each) equal to one teal block (value 4). The text 'double 4 is 8' and '4 x 2 = 8' is written below the cubes.</p>	<p>Draw pictures to show how to double numbers.</p> <p>Double 4 is 8</p>  <p>The image shows two groups of 4 purple squares each, illustrating that 4 + 4 = 8.</p>	<p>Partition a number and then double each part before recombining it back together.</p>  <p>A tree diagram shows the number 16 at the top, branching down to 10 and 6. Below 10 is 'x2' leading to 20. Below 6 is 'x2' leading to 12. The final equation is 20 + 12 = 32.</p>
<p>Counting in multiples.</p>	<p>Count the group as children are skip counting, children may use their fingers to help.</p>  <p>The image shows a number line with red dots at intervals of 2, and four purple Numicon blocks representing the number 8.</p>	<p>Children make representations to show counting in multiples.</p>  <p>The image shows two rows of four blue dots each. Below is a number line starting at 0 and ending at 20, with numbers 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. Brackets above the line group the numbers in pairs of 2, with a '2' written above each bracket.</p>	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10</p> <p>5, 10, 15, 20, 25, 30</p>

Repeated grouping/repeated addition.

$3 \times 4 =$
 $4 + 4 + 4 =$
There are 3 equal groups, with 4 in each group.



Children to represent the practical resources in a picture and use a bar model.

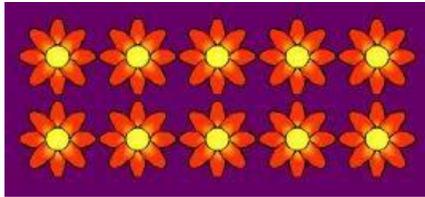


$$3 \times 4 = 12$$

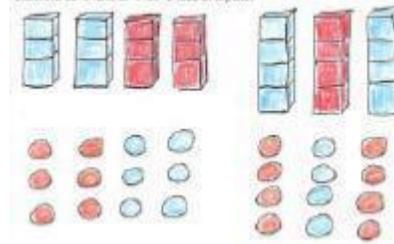
$$4 + 4 + 4 = 12$$

Understanding arrays.

Use objects laid out in arrays to find the answers to 2 lots of 5, 3 lots of 2s.



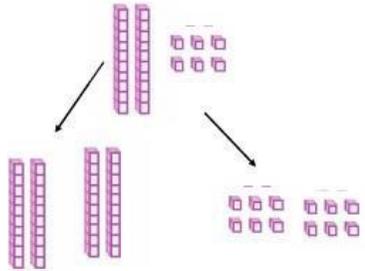
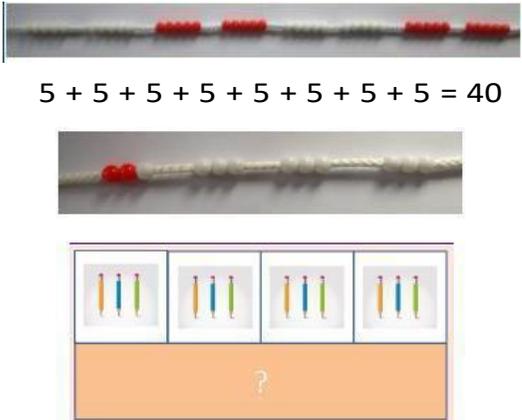
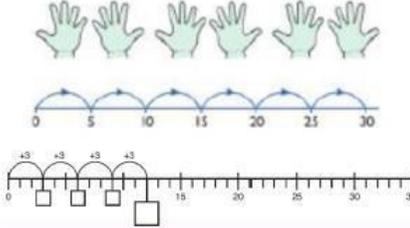
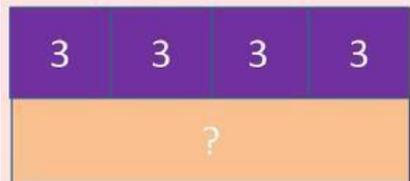
Draw representations of arrays to demonstrate understanding.



$$3 \times 2 = 6$$

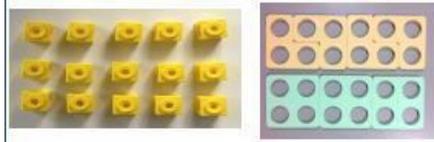
$$2 \times 5 = 10$$

Year 2 - Multiplication

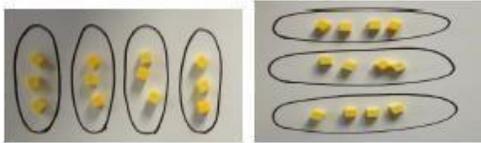
Objective & Strategy	Concrete	Pictoria 	Abstract
<p>Doubling numbers.</p>	<p>Model doubling using dienes and place value counters.</p> <p style="text-align: center;">Doubling 26</p> 	<p>Draw pictures and representations to demonstrate how to double numbers</p>	<p>Partition a number and then double each part before recombining it back together.</p> <div style="text-align: center;"> $\begin{array}{c} 16 \\ \swarrow \quad \searrow \\ 10 \quad 6 \\ \quad \\ \times 2 \quad \times 2 \\ 20 \quad + \quad 12 = 32 \end{array}$ </div>
<p>Counting in multiples of 2, 5 and 10 from 0.</p> <p>(repeated addition)</p>	<p>Count the groups as children are skip counting, children may use their fingers to help. Progress onto bar models.</p> 	<p>Number lines, counting sticks and bar models should be used to show representation of counting in multiples.</p>  	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>0, 2, 4, 6, 8, 10</p> <p>0, 3, 6, 9, 12, 15</p> <p>0, 5, 10, 15, 20, 25, 30</p> <p style="text-align: center;">$4 \times 3 = \underline{\quad}$</p>

Multiplication is commutative.

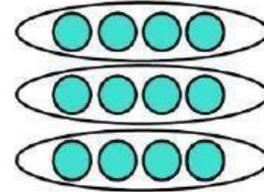
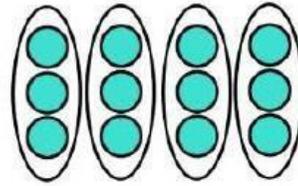
Create arrays using counters, cubes and numicon.



Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not change the answer.



Use representations of arrays to show different calculations and explore commutativity.



$$12 = 3 \times 4$$

$$12 = 4 \times 3$$

Use an array to write multiplication sentences and reinforce repeated addition.



$$5 + 5 + 5 = 15$$

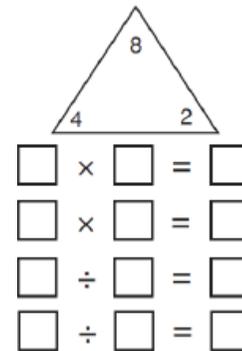
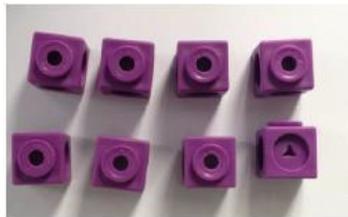
$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

Using the inverse.

(this should be taught alongside division, so pupils learn how the two operations work alongside each other)



$$2 \times 4 = 8$$

$$4 \times 2 = 8$$

$$8 \div 2 = 4$$

$$8 \div 4 = 2$$

$$8 = 2 \times 4$$

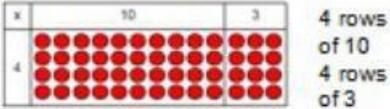
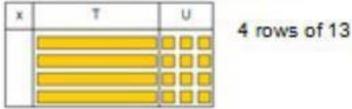
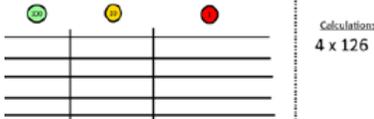
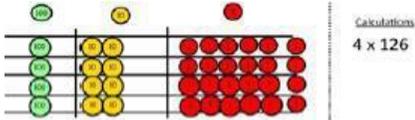
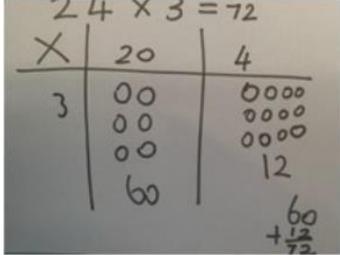
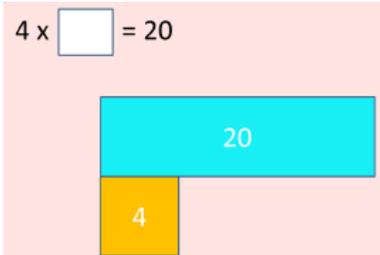
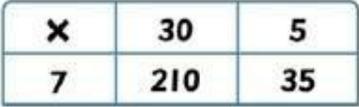
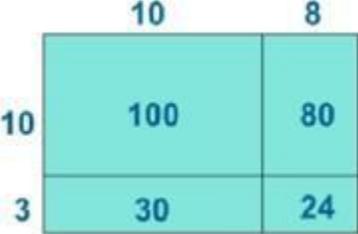
$$8 = 4 \times 2$$

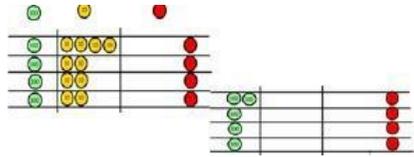
$$2 = 8 \div 4$$

$$4 = 8 \div 2$$

Show all 8 related fact family sentences.

Year 3 - Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract
<p>The grid method.</p>	<p>Show the links with arrays to first introduce the grid method.</p>  <p>4 rows of 10 4 rows of 3</p> <p>Move onto base ten to move towards a more compact method.</p>  <p>4 rows of 13</p> <p>Move onto place value counters to show how we are finding groups of a number. We are multiplying by 4, so we need 4 rows...</p>  <p>Calculations 4 x 126</p> <p>Fill each row with 126...</p>  <p>Calculations 4 x 126</p> <p>Add up each column, starting with the ones making any exchanges needed.</p>	<p>Children can represent their work with place value counters in a way that they understand.</p> <p>They can draw the counters using colour to show different amounts or just use the circles in the different columns to show their thinking.</p>  <p>Bar models are used to explore missing numbers.</p> 	<p>Begin with multiplying by one digit numbers and showing the clear addition alongside.</p>  <p>210 + 35 = 245</p> <p>Moving forward, multiply by a 2 digit number, showing the different rows within the grid method.</p> 



Then you have your answer.

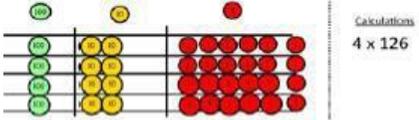
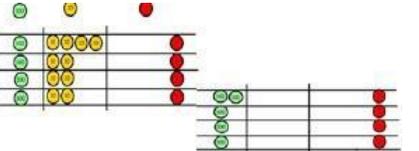
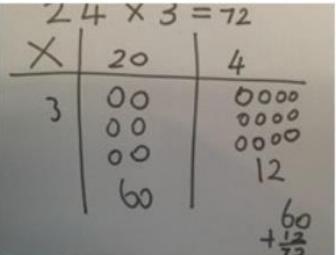
Rapid Recall
(multiplication and
division)

- Multiplication and division facts for 2, 5, 10, 3, 4 and 8 times tables.

Strategies

- 'Double-double'/'half-half' links within the listed times tables.
- Associativity (pushing numbers around)
- Using what I already know

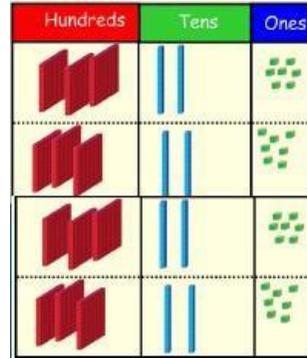
Year 4 - Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract								
<p>The grid method (recap from Year 3 for 2 digit x 1 digit).</p> <p>Children progress to multiplying 3 digit numbers by 1 digit (Year 4 expectation).</p>	<p>Use place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.</p>  <p>Fill each row with 126.</p>  <p>Add up each column, starting with the ones making any exchanges needed.</p>	<p>Children can represent their work with place value counters in a way that they understand.</p> <p>They can draw the counters using colour to show different amounts or just use the circles in the different columns to show their thinking.</p> 	<p>Multiply 3 digit by 1 digit numbers using the grid method.</p> <table border="1" data-bbox="1653 598 2105 710"> <tr> <td>x</td> <td>300</td> <td>20</td> <td>7</td> </tr> <tr> <td>4</td> <td>1200</td> <td>80</td> <td>28</td> </tr> </table> <p>$1200 + 80 + 28 = 1,308$</p>	x	300	20	7	4	1200	80	28
x	300	20	7								
4	1200	80	28								

Column Multiplication.

Children can continue to be supported by place value counters at this stage of multiplication. This is initially done where there is no regrouping.

$$321 \times 2 = 642$$



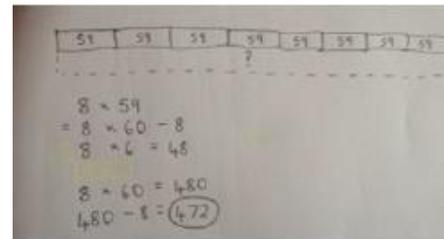
It is important at this stage that they always multiply the ones column first.

The corresponding long multiplication is modelled alongside this method.

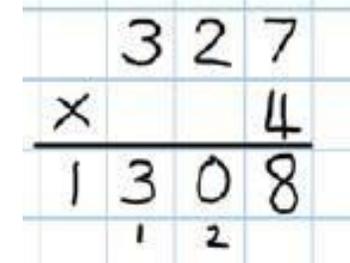
The grid method may be used to show how this relates to a formal written method (see abstract column).

x	300	20	7
4	1200	80	28

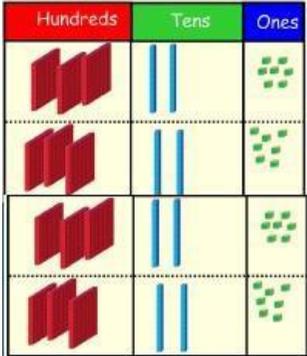
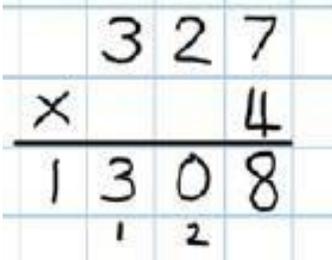
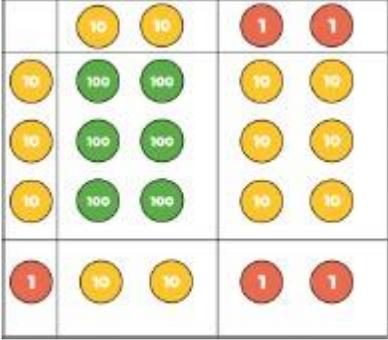
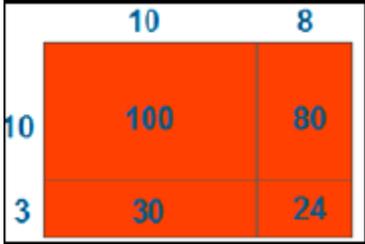
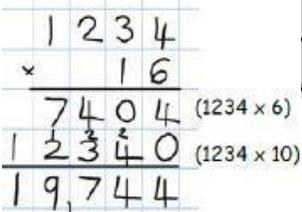
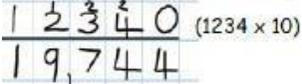
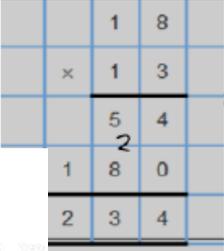
Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.



The grid method can then be progressed onto the compact method.



Year 5 - Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract								
<p>Column Multiplication (3 and 4 digits x 1 digit).</p>	<p>Children can continue to be supported by place value counters at this stage of multiplication. This is initially done where there is no regrouping.</p> 	<p>The grid method may be used to show how this relates to a formal written method (see abstract column).</p> <table border="1" data-bbox="1032 584 1565 715"> <tr> <td>x</td> <td>300</td> <td>20</td> <td>7</td> </tr> <tr> <td>4</td> <td>1200</td> <td>80</td> <td>28</td> </tr> </table>	x	300	20	7	4	1200	80	28	<p>The grid method can then be progressed onto the compact method.</p> 
x	300	20	7								
4	1200	80	28								
<p>Column Multiplication – Long multiplication.</p>	<p>Manipulatives may still be used with the corresponding long multiplication modelled alongside. (22 x 31)</p> 	 <p>Continue to use bar modelling to support problem solving.</p>	<p>Progress to using the column method for long multiplication.</p>   								

Rapid Recall

(multiplication and division)

- Square numbers to 144
- Establish whether a number is prime
- Recall all prime numbers up to 19

Strategies

- X by 9
- $X \div$ by 10/100/1000
– including decimals
- Use what you know to...
- $x \div$ by 5/50/25
- x by $\frac{1}{2}$
- Use factor pairs – 24 x 16

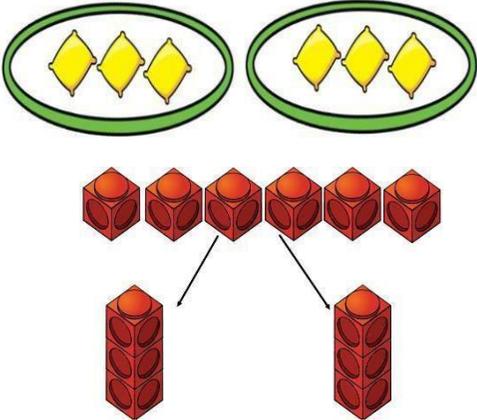
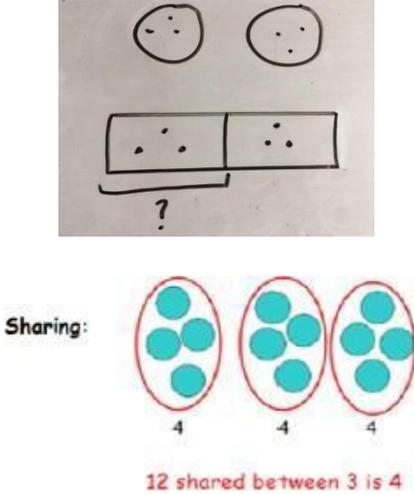
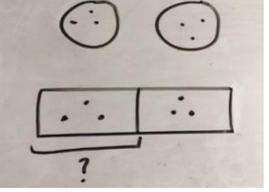
Year 6 - Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Column Multiplication – Long multiplication.</p>	<p>Manipulatives may still be used with the corresponding long multiplication modelled alongside.</p>	<div data-bbox="1115 424 1482 671" data-label="Figure"> </div> <p>Continue to use bar modelling to support problem solving.</p>	<p>Progress to using the column method for long multiplication.</p> <div data-bbox="1865 438 2092 687" data-label="Figure"> </div>
<p>Multiplying decimals up to 2 decimal places by a single digit.</p>			<p>Remind children that the single digit belongs in the ones column. Line up the decimal points in the question and answer.</p> <div data-bbox="1709 1225 2033 1458" data-label="Figure"> </div>

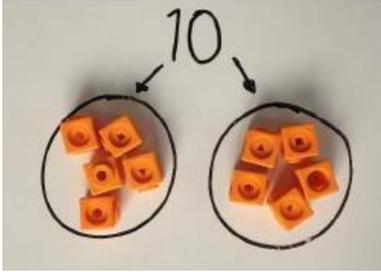
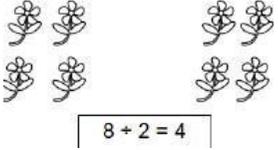
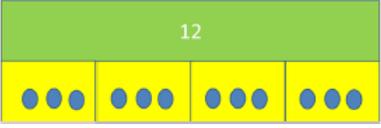
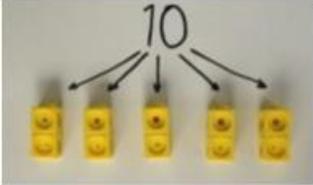
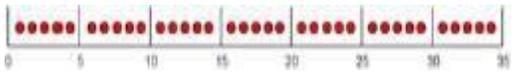
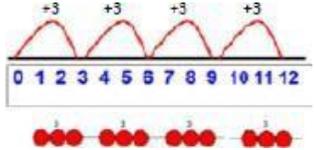
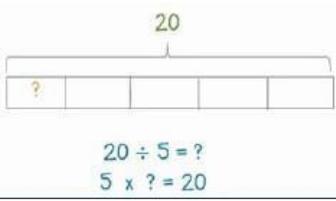
When appropriate, children can use their place value knowledge to make the number being multiplied 10, 100 or 1000 times bigger and then multiply and make the answer 10, 100 or 1000 times smaller.

$$\begin{array}{r} 319^{(x100)} \\ \times 8 \\ \hline 2552^{(+100)} \end{array} = 25.52$$

Year 1 - Division

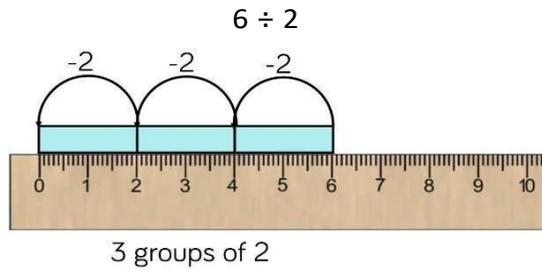
Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing	<p>Sharing using a range of objects: $6 \div 2 =$</p> 	<p>Use pictures or shapes to share quantities:</p> 	<p>Children continue with pictorial method until fully secure. Children should also be encouraged to use their 2 times tables facts.</p>  <p>To progress further, children can then be moved onto:</p> <p>'6 shared between 2 is 3'</p>

Year 2 - Division

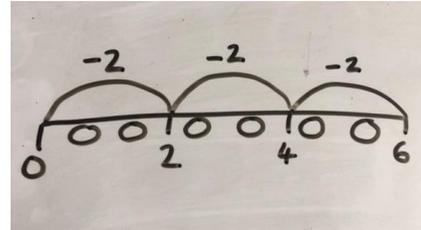
Objective & Strategy	Concrete	Pictorial	Abstract
<p>Division as sharing</p>	<p>I have 10 cubes, can you share them into 2 equal groups?</p> 	<p>Children use pictures or shapes to share quantities:</p>  <p>Children use bar modelling to show and support understanding:</p> <p style="text-align: center;">$12 \div 4 = 3$</p> 	<p style="text-align: center;">$12 \div 3 = 4$</p>
<p>Division as grouping</p>	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>  	<p>Use number lines for grouping:</p>  <p>Use bar model to support with division:</p> 	<p style="text-align: center;">$28 \div 7 = 4$</p> <p>Divide 28 into 7 groups. How many are in each group?</p>

Division using repeated subtraction

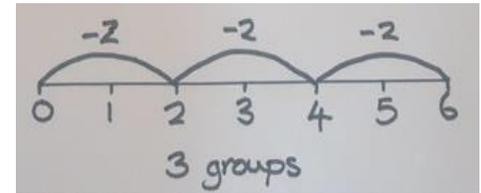
Repeated subtraction using Cuisenaire rods above a ruler:



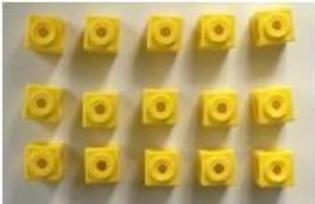
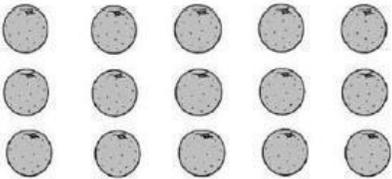
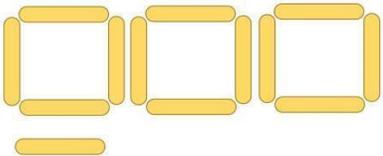
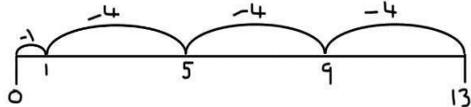
Children to represent repeated subtraction pictorially:



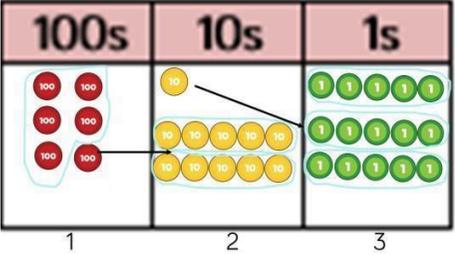
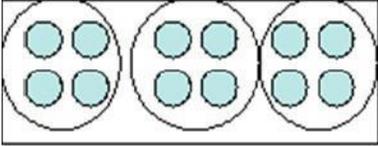
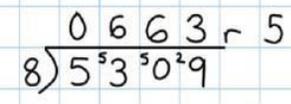
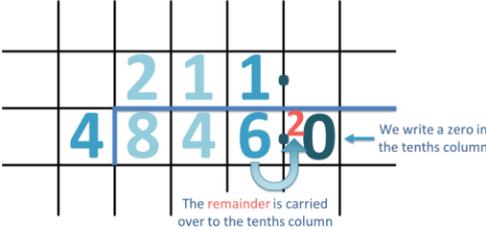
Abstract number line to represent the equal groups that have been subtracted:



Year 3 - Division

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Division with arrays</p>	<p>Link division to multiplication by creating an array and thinking about the number sentences that can be created:</p>  <p style="text-align: center;"> $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$ </p>	<p>Draw an array and use lines to split the array into groups to make multiplication and division sentences:</p>  <p style="text-align: center;"> $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$ </p>	<p>Find the inverse of multiplication and division sentences by creating eight linking number sentences:</p> <p style="text-align: center;"> $7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$ $28 = 7 \times 4$ $28 = 4 \times 7$ $4 = 28 \div 7$ $7 = 28 \div 4$ </p>
<p>Division with remainders</p>	<p>This can be done with lollipop sticks or Cuisenaire rods:</p> <p style="text-align: center;">$13 \div 4$</p>  <p>Use of lollipop sticks to form wholes-squares are made because we are dividing by 4.</p> <p>There are 3 whole squares, with 1 left over.</p>	<p>Children to represent the lollipop sticks pictorially:</p>  <p>There are 3 whole squares, with 1 left over.</p>	<p style="text-align: center;">$13 \div 4 = 3$ remainder 1</p> <p>Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line:</p>  <p style="text-align: center;">‘3 groups of 4, with 1 left over’</p>

Year 4-6 - Division

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Short division with a remainder</p> <p><u>Year 4</u> Up to 3 digits by 1 digit</p> <p><u>Year 5</u> Up to 4 digits by a 1 digit with remainders</p> <p><u>Year 6</u> Up to 4 digits by a 1 digit and then progress to long division (next objective)</p>	<p>Short division using place value counters to group:</p> <p style="text-align: center;">$615 \div 5$</p>  <ol style="list-style-type: none"> 1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones? 	<p>Children can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups:</p>  <p>However, children should be encouraged to move towards counting in multiples to divide more efficiently.</p>	<p>Begin with divisions that divide equally with no remainders:</p> $\begin{array}{r} 218 \\ 4 \overline{) 872} \\ \underline{8} \\ 0 \\ \underline{0} \\ 0 \end{array}$ <p>Move onto divisions with a remainder:</p> $\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{5} \\ 0 \\ \underline{0} \\ 0 \end{array}$  <p><u>Year 5/6</u></p> <p>Children can then progress onto expressing the remainder as fractions (e.g. $\frac{5}{8}$) and decimals (e.g. 663.625).</p> <p style="text-align: center;">$846 \div 4$</p> 

Long division with remainder

Year 6 - Division

Begin by modelling method with a 1-digit divisor.

Long Division	<p>Divide :</p> $\begin{array}{r} 2 \rightarrow \\ 3 \overline{)74} \\ \underline{0} \\ 4 \end{array}$ <p>Dividing 7 tens by 3, we get 2 tens, and some extra.</p>
	<p>Multiply :</p> $\begin{array}{r} 2 \\ 3 \overline{)74} \\ \underline{6} \\ 4 \end{array}$ <p>$3 \times 2 \text{ tens} = 60 \text{ tens.}$</p>
	<p>Subtract :</p> $\begin{array}{r} 2 \\ 3 \overline{)74} \\ \underline{-6} \\ 14 \end{array}$ <p>Subtracting 6 tens from 7 tens</p>
	<p>Bring down :</p> $\begin{array}{r} 2 \\ 3 \overline{)74} \\ \underline{-6} \\ 14 \end{array}$ <p>$1 \text{ ten } 4 \text{ ones} = 14 \text{ ones}$</p>
	<p>Repeat or find the Remainder :</p> $\begin{array}{r} 24 \rightarrow \\ 3 \overline{)74} \\ \underline{-6} \\ 14 \\ \underline{-12} \\ 2 \end{array}$ <p>Dividing 14 ones by 3, we get 4 ones and some extra. $3 \times 4 \text{ ones} = 12 \text{ ones.}$ Remainder</p>
	<p>Check :</p> <p>Check your answer: Dividend = Divisor \times Quotient + Remainder</p>

Divide- the number inside the house with the number outside of the house. Put the answer on top.

Multiply –the number outside of the house by the number on top of the house. Put this answer below the number inside the house.

Subtract- the number inside the house from the number below the inside number.

Bring down- the next number in the dividend.

Repeat- all the steps repeated as many times as needed until you get down to 0.
 If there is a leftover this is your remainder.

When moving onto using long division with a 2-digit divisor, children can write out multiples first:

2	2	6	7	1	0

22, 44, 66, 88, 110 etc

Long division with decimal remainders

$$\begin{array}{r} 25.2 \\ 5 \overline{) 126.0} \\ \underline{-10} \\ 26 \\ \underline{-25} \\ 10 \\ \underline{-10} \\ 0 \end{array}$$

When there is a remainder which you need to write as a decimal, bring down the 0 in the from then tenths column, and repeat the process as before.

Date agreed by governing body on 21/06/2022	Signature of Chair or Vice Chair
Date agreed for review Summer 2025	Frequency of Review Three-year cycle
Responsibility for Review A&C Committee /Headteacher	