



## **Progressions in Calculations Policy**

**Written by:** Kerrie Freeman

**Review date:** July 2023

**This policy should be read in conjunction with the following policies:**

- National Curriculum: Programme of Study for Maths
- Maths Curriculum Map
- Whole School Curriculum Overview
- Maths Progression of Skills
- Maths Ideas for Depth cards
- SEN Policy
- Marking Policy

## **Progressions in Calculations**

### **Intent**

#### **Statement of Intent**

At Joydens Wood Infant School Mathematics is taught in a mastery approach with the belief that pupils all have access to the same curriculum and rather than being extended with new learning, they should deepen their understanding of that topic through a problem solving approach. This policy outlines the different calculation strategies that should be taught in Years 1, 2, 3 and 6. In line with the requirements of the 2014 Primary National Curriculum.

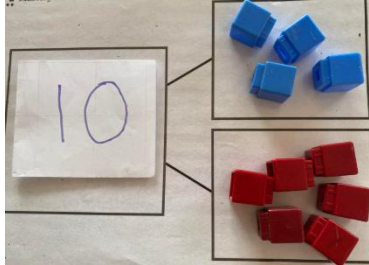

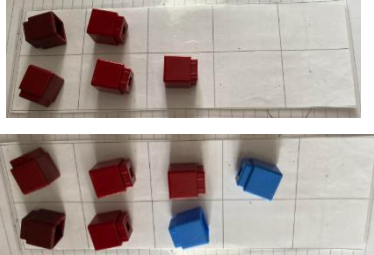

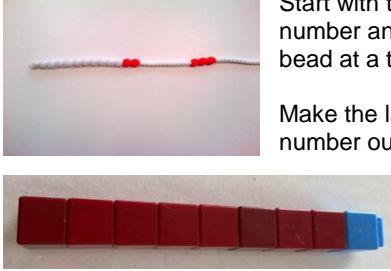

#### **How to use**

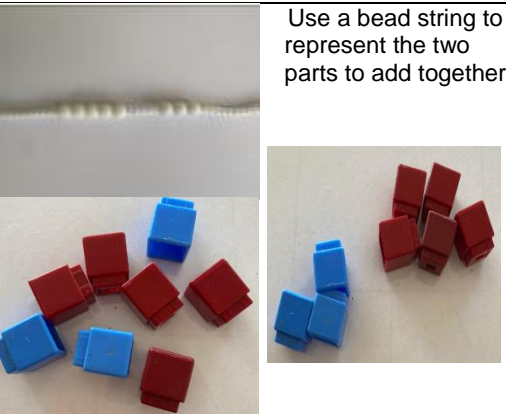
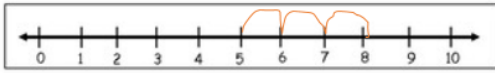

This policy is to be used as guidance for teachers when delivering Mathematics lessons. This policy has been largely adapted from Mathematics Mastery and White Rose Maths Hub with further material added. It is a working document and will be revised and amended as necessary. Teachers must use this as guidance when planning to incorporate and apply these strategies.

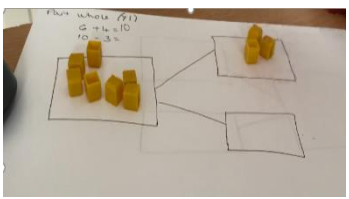
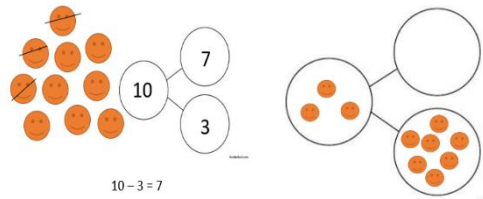
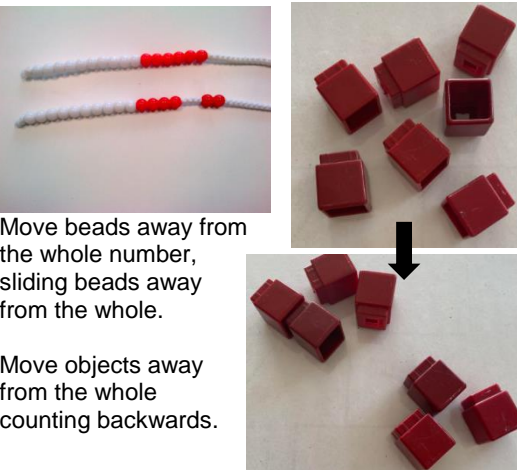
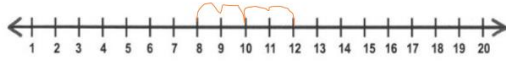
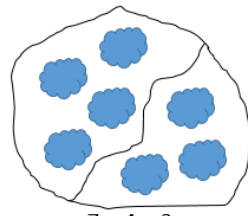


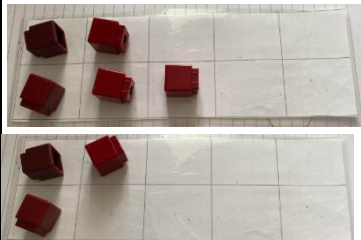

## Year R

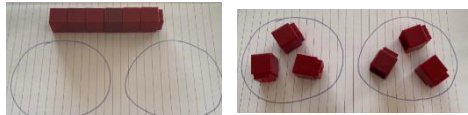
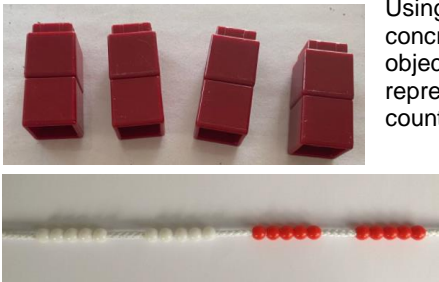
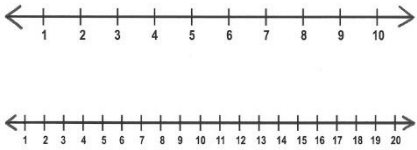
Reception Progressions in Calculations should be tailored to pupils' individual needs and the exploration of early number.

	<b>Objective/Strategy and Guidance</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation).
<b>Addition</b>	Part-part whole model	 <p>Use part whole model to explain two parts which make a whole. Begin by putting cubes in each part and moving them into the whole.</p>	 <p>Use pictures to represent the different quantities.</p>	$6 + 4 = 10$
	Ten frame	 <p>Using a ten frame to add numbers together. Use two different colours.</p>	<p style="text-align: center;"><math>8 + 1 = 9</math></p>  <p>Arrange pictures in form of a ten frame to support children's understanding of addition.</p>	$9 + 1 = 9$
	Counting on	 <p>Start with the larger number and add on 1 bead at a time.</p> <p>Make the largest number out of cubes and add on 1 cube at a time.</p>	 <p>Use a number line to add two numbers together emphasising starting from the larger number is more effective. Begin on largest number and make forward jumps</p>	$8 + 1 = 9$ $12 + 3 = 15$

	<p>Joining two groups and then recounting all objects using one-to-one correspondence</p>	<p>Use a bead string to represent the two parts to add together.</p>  <p>Use cubes to add together two different quantities.</p>	 <p>Use a number line to add two numbers together emphasising starting from the larger number is more effective. Begin on largest number and make forward jumps.</p>  <p>Use pictures to represent different quantities.</p>	$5 + 3 = 8$ $8 = 5 + 3$
--	---	---	--	-------------------------

	Objective/Strategy and Guidance	Concrete	Pictorial	Abstract Using concrete and pictorial strategies to inform the abstract (equation).
	Part part-whole	 <p>Use part-whole model to model the relationship between numbers. Starting in the whole and moving objects into the parts.</p>	 <p>Use pictorial representations for the parts.</p>	$10 - 3 = 7$ $10 - 7 = 3$
Subtraction	Counting back	 <p>Move beads away from the whole number, sliding beads away from the whole.</p> <p>Move objects away from the whole counting backwards.</p>	 <p>Using a number line begin on largest number and jump backwards.</p> 	$7 - 4 = 3$ $12 - 4 = 8$

	Ten frame		Using a ten frame to add numbers together.	Arrange pictures in form of a ten frame to support children's understanding of subtraction. $8 - 1 = 7$ 	$8 - 1 = 7$
--	-----------	---	--	---	-------------

<b>Multiplication</b>	<b>Objective/Strategy and Guidance</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b>
	Equal groups	 <p>Share objects equally.</p>		Using concrete and pictorial strategies to inform the abstract (equation). There are two groups of three.
	Counting on in 2's, 5's and 10's	 <p>Using concrete objects to represent counting.</p>	 <p>Using a number line to show difference in counting up in 2's, 5's and 10's.</p>	$0, 2, 4, 6, 8, 10.$ $0, 5, 10, 15, 20, 25.$ $0, 10, 20, 30, 40, 50.$


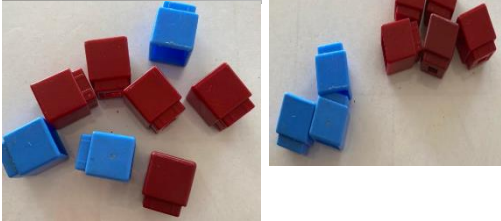
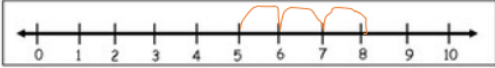



<b>Division</b>	<b>Objective/Strategy and Guidance</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b>
	Sharing	 <p>Share objects equally</p>		Using concrete and pictorial strategies to inform the abstract (equation). There are two groups of three.


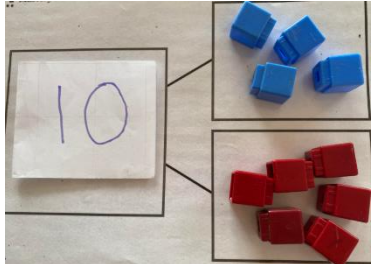

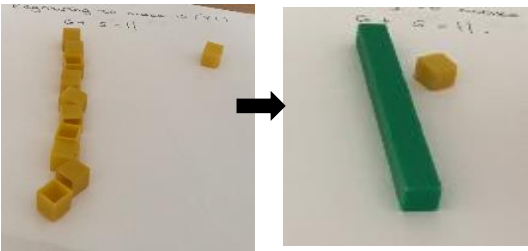
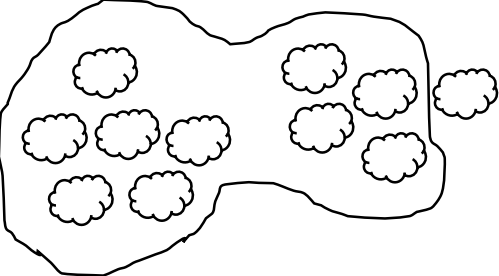

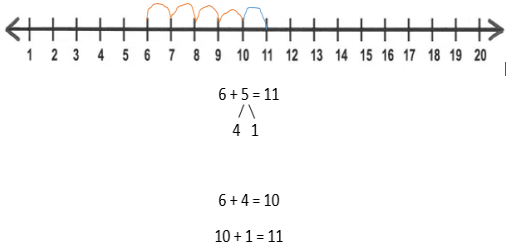


**Year 1**

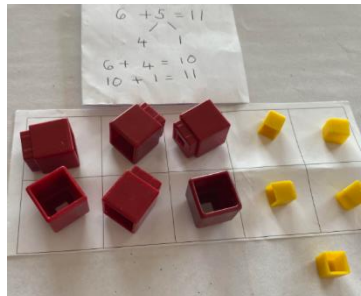
**National Curriculum Programme of Study Objectives - Addition and Subtraction:**

- count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- count, read and write numbers to 100 in numerals; count in multiples of 2s, 5s and 10s
- given a number, identify 1 more and 1 less
- identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least
- read and write numbers from 1 to 20 in numerals and words
- read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including 0
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as  $7 = ? - 9$

	<b>Objective/Strategy and Guidance</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation).
<b>Addition</b>	Joining two groups and then recounting all objects using one-to-one correspondence	  Use a bead string to represent the two parts to add together.  Use cubes to add together two different quantities.	 Use a number line to add two numbers together emphasising starting from the larger number is more effective. Begin on largest number and make forward jumps.   Use pictures to represent different quantities.	$5 + 3 = 8$ $8 = 5 + 3$
	Counting on	 Start with the larger number and add on 1 bead at a time.	 Use a number line to add two numbers together emphasising starting from the larger number is more effective. Begin on largest number and make forward jumps	$8 + 1 = 9$ $12 + 3 = 15$

		<p>Make the largest number out of cubes and add on 1 cube at a time.</p> 		
Part-part-whole		 <p>Use part whole model to explain two parts which make a whole. Begin by putting cubes in each part and moving them into the whole.</p>	 <p>Use pictures to represent the different quantities.</p>	$10 = 6 + 4$ $10 - 6 = 4$ $10 - 4 = 6$ $10 = 4 + 6$
Regrouping ten ones to make ten		 <p>Add quantities together and regroup 10 ones for 1 ten when the number has reached 10.</p>	 <p>Use pictures to represent different quantities. Make 10 first and add on what has been left over.</p>	$6 + 5 = 11$
'Make ten' strategy			 <p>Regroup or partition the smaller number using the part part whole model to make 10.</p>	$6 + 5 = 11$ $4 + 9 = 13$

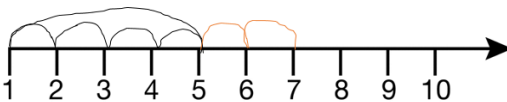
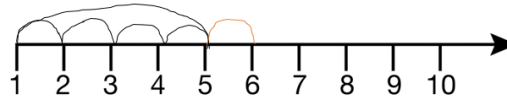
Start with the bigger number and on the smaller number to make 10 using a bead string or a ten frame.



Adding 1, 2, 3.



Use a bead string to represent adding a range of quantities.



Use a number line. Begin by finding the largest quantity and exploring adding 1, 2 or 3.

1 more than 5  $5 + 1 = 6$   
2 more than 5  $5 + 2 = 7$

Adding three single digit numbers (make ten first)



Use a bead string or cubes to represent the 3 different parts of the equation. Make 10 first and then add 3<sup>rd</sup> quantity.

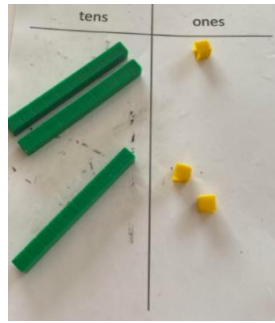


Regroup and draw representation.

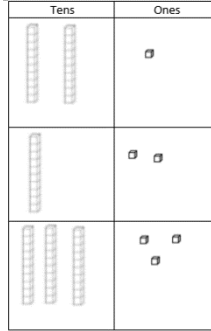
$$\begin{array}{l} \textcircled{4} + 7 + \textcircled{6} = \boxed{10} + \boxed{7} \\ 10 \qquad \qquad \quad = \boxed{17} \end{array}$$



Partitioning to add (no regrouping)



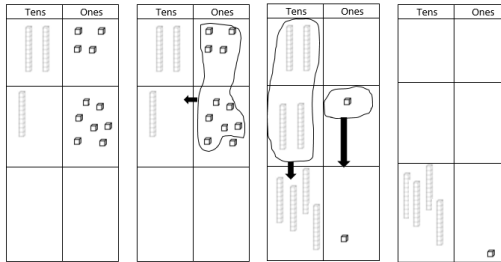
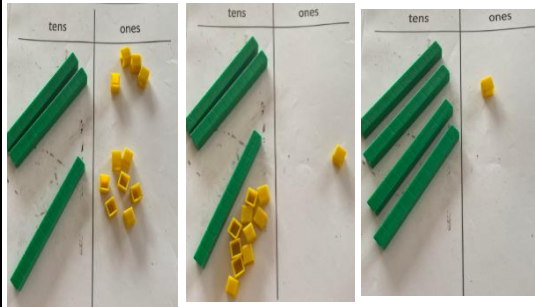
Using a place value chart to add the tens together and ones together.



Using a place value chart to add the tens together and ones together.

$$21 + 12 = 33$$

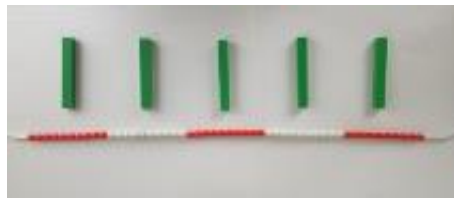
Introducing column method for addition, regrouping only



Using a place value chart to add the tens together and ones together.

$$\begin{array}{r} \text{Tens} \text{ Ones} \\ 24 \\ + 17 \\ \hline 1. \\ 41 \end{array}$$

Adding multiples of ten



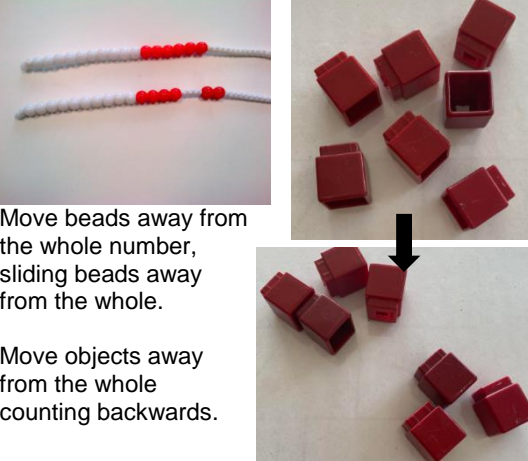
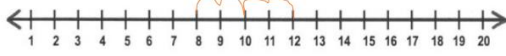
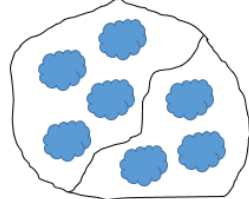
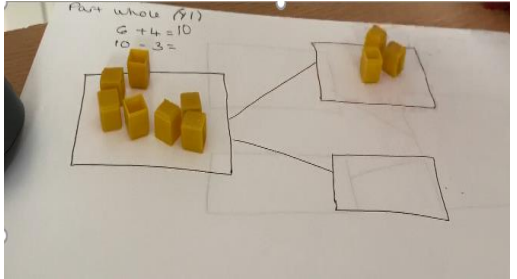
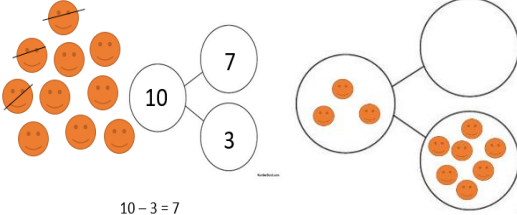


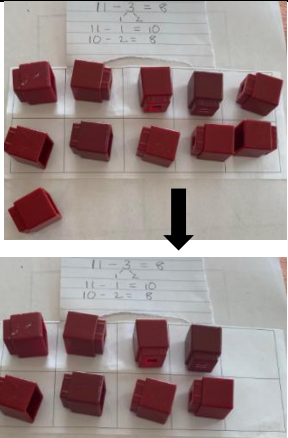
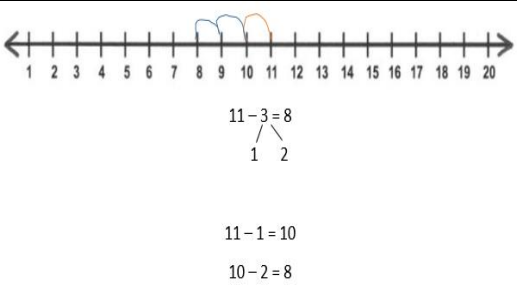
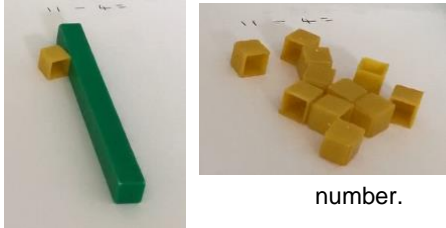



Model using dienes and bead strings.

$$\begin{array}{c} \text{30} \\ + \\ \text{20} \\ \hline \text{50} \end{array} \quad \begin{array}{c} \text{10} \\ + \\ \text{20} \\ \hline \text{30} \end{array}$$

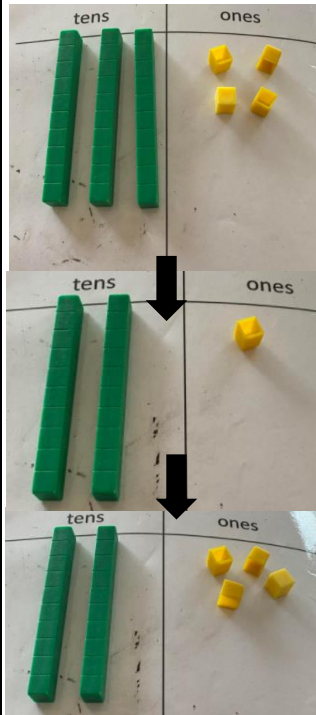
Use pictorial representations of adding tens together.

$$\begin{array}{l} 30 + 20 = 50 \\ 10 + 20 = 30 \end{array}$$

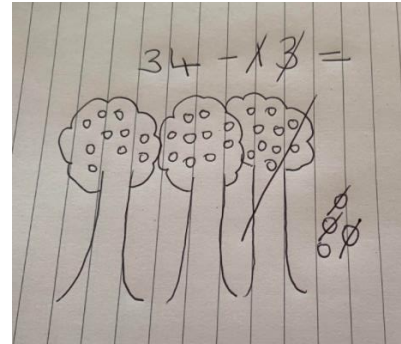
	<b>Objective Strategy</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation ).
<b>Subtraction</b>	Taking away from the ones	 <p>Use physical objects e.g. counters or cubes to show how to subtract different quantities.</p>	 <p><math>7 - 4 = 3</math></p>	$7 - 4 = 3$ $3 = 7 - 4$
	Counting back	 <p>Move beads away from the whole number, sliding beads away from the whole.</p> <p>Move objects away from the whole counting backwards.</p>	 <p>Using a number line begin on largest number and jump backwards.</p>  <p><math>7 - 4 = 3</math></p>	$7 - 4 = 3$ $12 - 4 = 8$
	Part-part-whole	 <p>Link to addition using part whole model to model the inverse.</p>	 <p><math>10 - 3 = 7</math></p> <p>Use pictorial representations for the parts.</p>	$10 - 3 = 7$

<p>Make ten strategy</p>	 <p>Make the larger number on the ten frame. Make 10 first and subtract the rest.</p>	 <p>Use a number line to make 10 first. Jump back to 10 first and then subtract the rest.</p>	$11 - 3 = 8$ $\begin{array}{r} 11 - 3 = 8 \\ 1 \quad 2 \end{array}$ $11 - 1 = 10$ $10 - 2 = 8$
<p>Regroup a ten into 10 ones</p>	<p>Use a place value chart to represent regrouping 1 ten for 10 ones and then subtract the smaller number.</p> 	 $11 - 4 = 7$	$11 - 4 = 7$
<p>Taking away from the tens</p>	 <p>Explore the concept that pupils can subtract from the 10's and still get the same answer.</p>	 $16 - 8 = 8$ <p>Partition the number into tens and ones and then subtract from the ones.</p>	$16 - 8 = 8$

Partitioning to subtract without regrouping



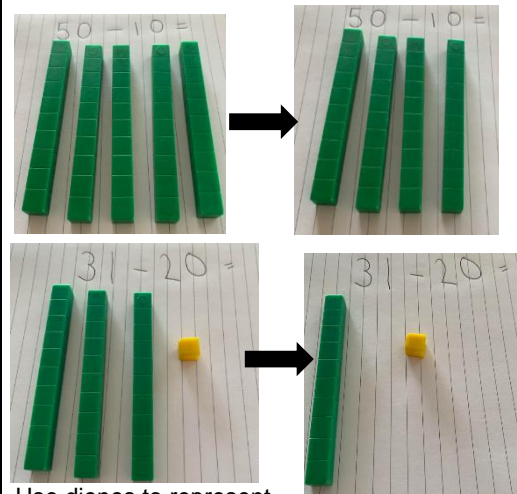
Use a place value chart to represent the tens and ones of the different quantities. Begin by subtracting the ones first.



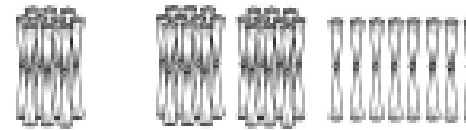
Use pictorial representations for ones and tens. Begin by subtracting ones first.

$$34 - 13 = 21$$

Subtracting multiples of ten



Use dienes to represent groups of ten subtracting 10 at a time.



$$38 - 10 = \square$$

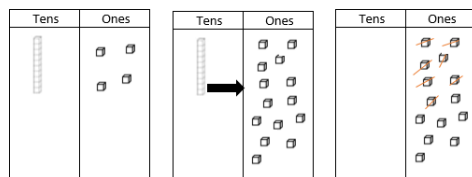
Use pictorial representations.

$$40 = 60 - 20$$

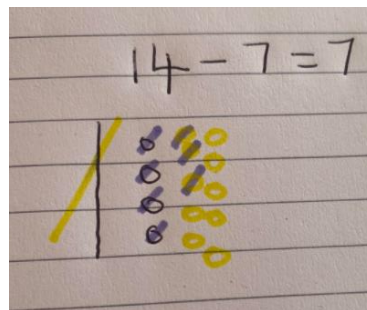
$$38 - 10 = 28$$

Column method  
with regrouping

$$14 - 7 = 7$$



Use a place value chart to represent the number and regroup 1 ten for 10 ones. Then subtract the smaller quantity.



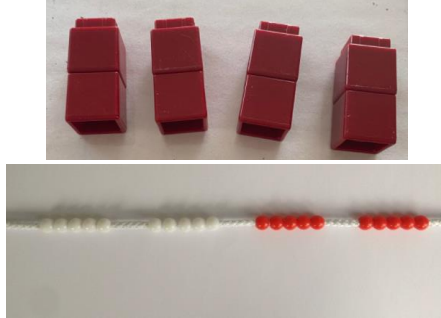



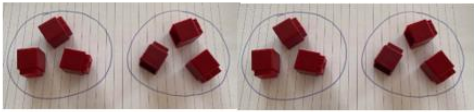

Use own representatives of the tens and ones and regroup in order to calculate the answer.

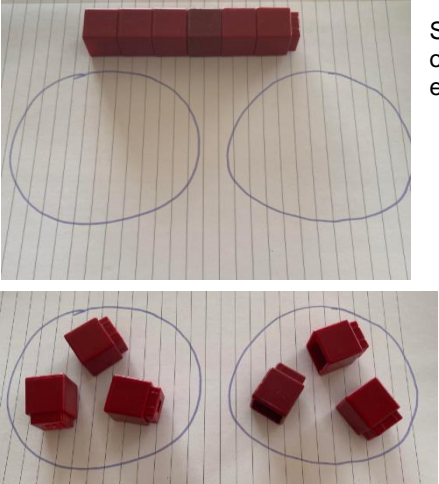

$$14 - 7 = 7$$

## Year 1

### National Curriculum Programme of Study Objectives – Multiplication and Division:

- solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

	<b>Objective Strategy</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation ).
<b>Multiplication</b>	Skip counting in multiples of 2, 5, 10 from zero	 <p style="text-align: center;">Use concrete objects to represent multiples of 2, 5 and 10.</p>	<p>Use pictures to represent multiples of 2, 5 and 10.</p>  <p>10.</p>	$4 \times 5 = 20$ $2 \times 4 = 8$
	Making equal groups and counting the total	 <p style="text-align: center;">Use objects to make equal groups.</p>	<p>Draw ★ to show <math>2 \times 3 =</math></p>  <p>Use pictures to represent their own workings out of different multiplication equations.</p>	$2 \times 3 = 6$
	Solve multiplications using repeated addition	 <p style="text-align: center;"><math>3 + 3 + 3 + 3 = 12</math></p> <p>Use concrete objects to share into a number of groups. Add all of the groups together.</p>	<p>How many groups? How many is there altogether?</p>  <p>Represent repeated addition by finding groups and adding together.</p>	$3 + 3 + 3 + 3 = 12$ $2 + 2 + 2 = 6$


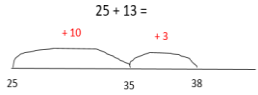

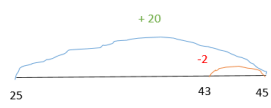
	<b>Objective Strategy</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation ).
<b>Division</b>	Sharing objects into groups	 <p>Share objects equally.</p>	<p>There are 4 smiley faces. Circle two groups.</p>  <p>Use pictures to share into equal groups.</p>	$4 \div 2 = 2$



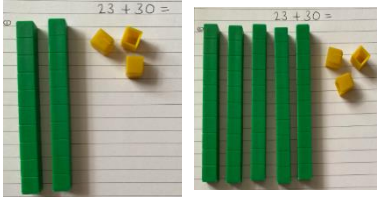
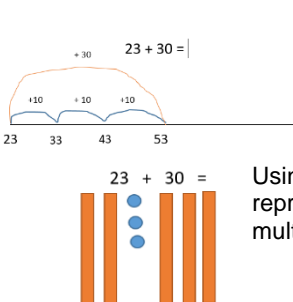
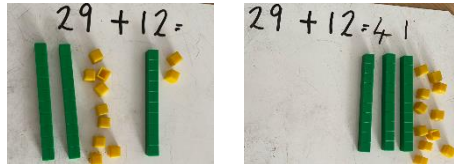
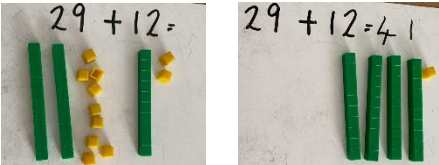
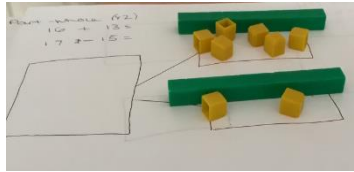
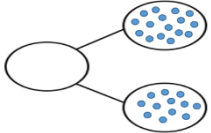

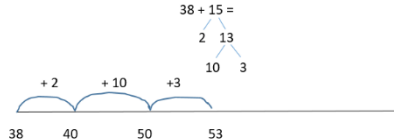
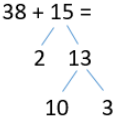
## Year 2

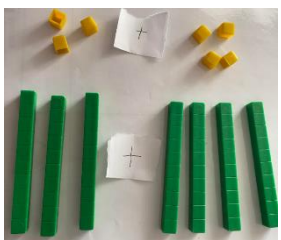
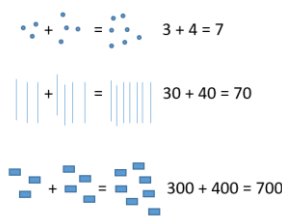
### National Curriculum Programme of Study Objectives – Addition and Subtraction:


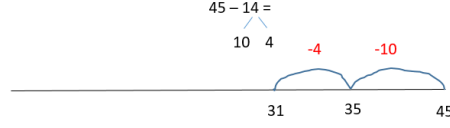
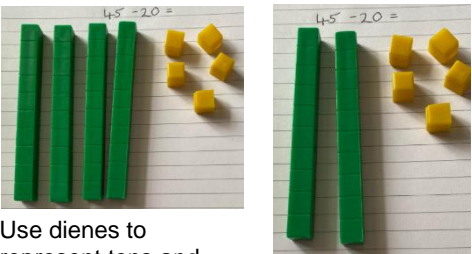
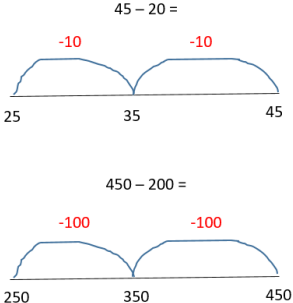

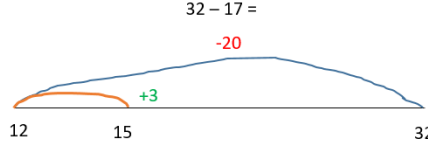
- count in steps of 2, 3, and 5 from 0, and in 10s from any number, forward and backward
- recognise the place value of each digit in a two-digit number (10s, 1s)
- identify, represent and estimate numbers using different representations, including the number line
- compare and order numbers from 0 up to 100; use <, > and = signs
- read and write numbers to at least 100 in numerals and in words
- use place value and number facts to solve problems
- solve problems with addition and subtraction:
- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods
- recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
- a two-digit number and 1s
- a two-digit number and 10s
- 2 two-digit numbers
- adding 3 one-digit numbers
- show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

	<b>Objective Strategy</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b>
<b>Addition</b>	Partitioning one number, then adding tens and ones	 then ones.	Using a blank number line. Begin by partitioning the second number into tens and ones. Add the tens first and then the ones. $25 + 13 =$ 	$25 + 13 =$
	Rounding and adjust	 then adjust.	Use bead string to add on rounded number and $25 + 18 =$ 	$25 + 18 =$

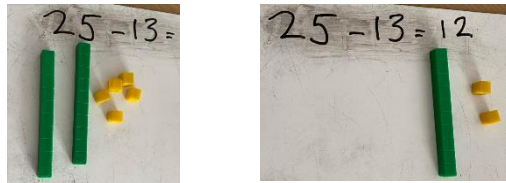


<p>Adding multiples of ten and hundreds</p>	 <p>Using dienes or bead strings to represent 10's.</p>	 <p>Using a blank number line. Make jumps of 10.</p> <p>Using pictorial representations to add multiples of 10.</p>	<p><math>23 + 30 =</math></p>																								
<p>Partitioning to add without regrouping</p>	<p>Use dienes to represent each number.</p> 	<p><math>234 + 102 =</math></p> <table border="1" data-bbox="1077 507 1328 663"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>2</td> <td></td> <td>4</td> </tr> <tr> <td>4</td> <td></td> <td>7</td> </tr> </tbody> </table> <p>Pupils to use as a mental strategy when adding larger numbers. Using pictorial representations that it suitable.</p>	Hundreds	Tens	Ones	2	3	4	2		4	4		7	<p><math>234 + 102 =</math></p> <table border="1" data-bbox="1711 708 2000 932"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td></td> <td>4</td> <td>7</td> </tr> <tr> <td>2</td> <td>8</td> <td>1</td> </tr> </tbody> </table>	Hundreds	Tens	Ones	2	3	4		4	7	2	8	1
Hundreds	Tens	Ones																									
2	3	4																									
2		4																									
4		7																									
Hundreds	Tens	Ones																									
2	3	4																									
	4	7																									
2	8	1																									
<p>Column method with regrouping</p>	 <p>Use dienes to represent each number. Pupils to exchange 10 ones for 1 ten.</p>	<p><math>234 + 47 =</math></p> <table border="1" data-bbox="1126 719 1505 895"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td></td> <td>4</td> <td>7</td> </tr> <tr> <td>2</td> <td>8</td> <td>1</td> </tr> </tbody> </table> <p>Pupils to use pictorial representations alongside concrete objects.</p>	Hundreds	Tens	Ones	2	3	4		4	7	2	8	1	<table border="1" data-bbox="1711 708 2000 932"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td></td> <td>4</td> <td>7</td> </tr> <tr> <td>2</td> <td>8</td> <td>1</td> </tr> </tbody> </table>	Hundreds	Tens	Ones	2	3	4		4	7	2	8	1
Hundreds	Tens	Ones																									
2	3	4																									
	4	7																									
2	8	1																									
Hundreds	Tens	Ones																									
2	3	4																									
	4	7																									
2	8	1																									
<p>Part-part-whole linked to commutativity.</p>	 <p>Using part-whole model to explore addition with larger numbers.</p>	<p><math>16 + 12 = 28</math></p>  <p>Using pictorial representations to explore different equations taken from part-whole model.</p>	<p> <math>16 + 12 = 28</math>  <math>12 + 16 = 28</math>  <math>28 - 16 = 12</math>  <math>28 - 12 = 16</math> </p>																								
<p>Make ten strategy Focus on children's choice of strategy that is most efficient.</p>	 <p>Use bead string to partition and add numbers together.</p>	<p><math>38 + 15 =</math></p>  <p>Begin by partitioning the second number in making ten first and then adding on the rest. Pupils can experiment with partitioning numbers in different ways to make multiples of 10.</p>	<p><math>38 + 15 =</math></p> 																								

	Using known facts	 <p>Using concrete objects to understand the relations between ones, tens and hundreds.</p>	 <p>Pupils to understand the relationship between numbers using pictorial representations.</p>	$3 + 4 = 7$ $30 + 40 = 70$ $300 + 400 = 700$
--	-------------------	--	---	--

	<b>Objective Strategy</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation).
<b>Subtraction</b>	Subtracting tens and ones <i>Pupils to partition the second number only.</i>	 <p>Pupils to use a bead string to subtract tens and ones through partitioning.</p>	 <p>Pupils to start on right side of number line when subtracting. Partition second number into tens and ones, subtracting tens first.</p>	$45 - 14 =$ $\begin{array}{r} 10 \\ 4 \end{array}$
	Counting back in multiples of ten and one hundred	 <p>Use dienes to represent tens and ones.</p>	 <p>Pupils to use empty number line to subtract multiples of 10.</p>	$45 - 20 =$
	Round and adjust	 <p>Pupils to use a bead string to subtract tens and ones through rounding and adjusting.</p>	 <p>Pupils to use as a more efficient method for addition. Round second number and adjust.</p>	$32 - 17 =$

Partitioning to subtract without regrouping



Use dienes to represent the partitioning of numbers and subtracting tens and ones separately.

Pupils to use pictorial representations for this strategy. Supporting mental maths.

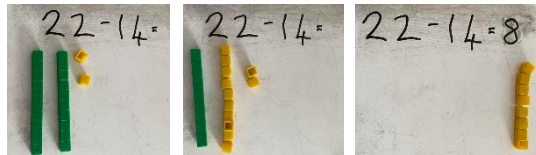
$$237 - 102 =$$

Hundreds	Tens	Ones

$$237 - 142 =$$

Column method with regrouping

Pupils to use dienes to exchange 1 ten for 10 ones in order to subtract numbers.



$$153 - 15 =$$

Hundreds	Tens	Ones

$$153 - 15 =$$

	Hundreds	Tens	Ones
	1	4	3
		1	5
	1	3	8

Pupils to use pictorial representations alongside concrete objects.

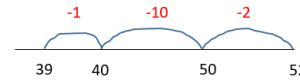
Make ten

Use bead string to partition and add numbers together. Use bead string alongside pictorial representation.



$$52 - 13 =$$

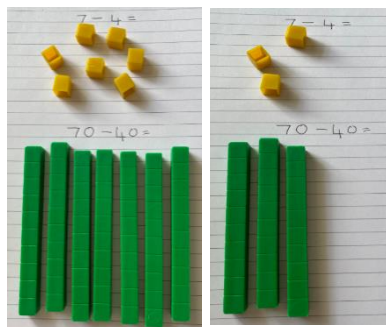
$$\begin{array}{r} 2 \\ 11 \\ 1 \end{array} 10$$



Use a number line to count on to next ten and then add the rest.

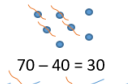
$$52 - 13 = 39$$

Using known number facts



Using concrete objects to understand the relations between ones, tens and hundreds.

$$7 - 4 = 3$$



$$70 - 40 = 30$$

$$700 - 400 = 300$$

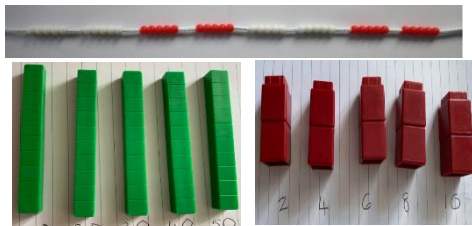
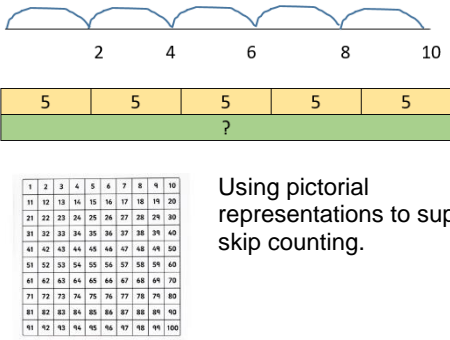

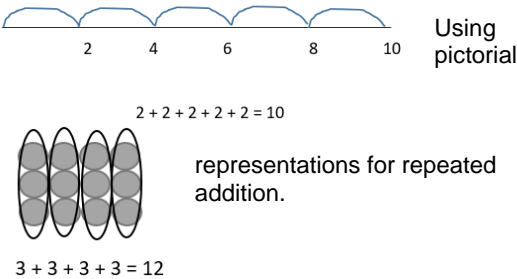
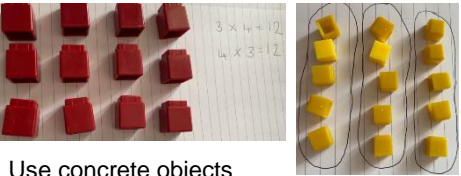
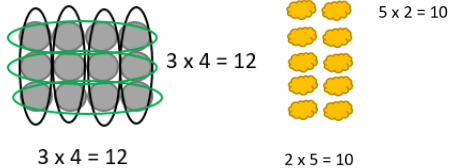


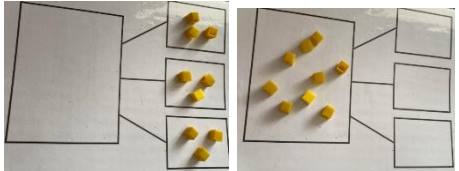
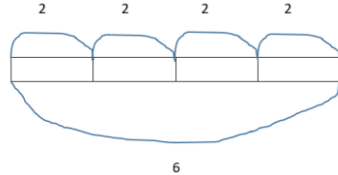
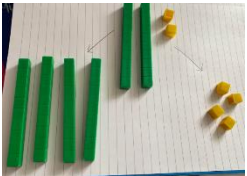
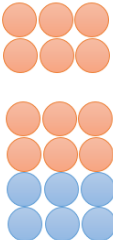
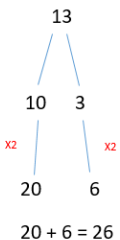
Pupils to understand the relationship between numbers using pictorial representations.

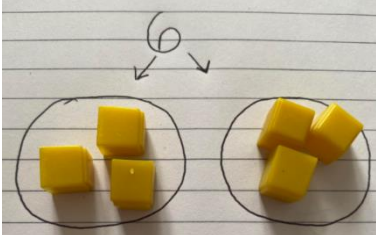
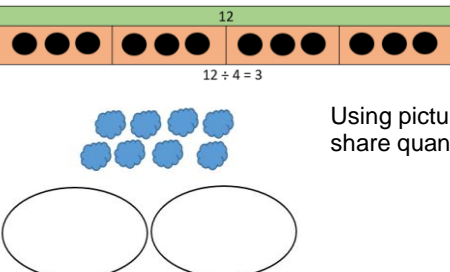
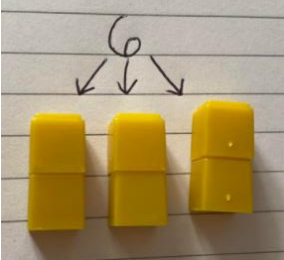
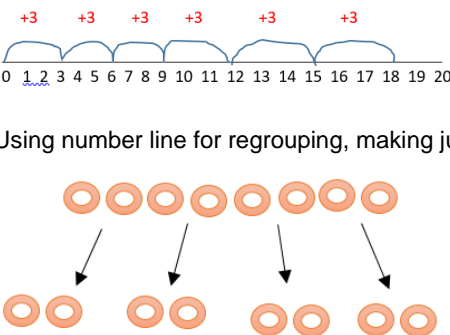
$$\begin{array}{l} 7 - 4 = 3 \\ 70 - 40 = 30 \\ 700 - 400 = 300 \end{array}$$

## National Curriculum Programme of Study Objectives – Multiplication and Division:

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs
- show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

	<b>Objective Strategy</b>	<b>Concrete</b>	<b>Pictorial</b>	<b>Abstract</b> Using concrete and pictorial strategies to inform the abstract (equation).
<b>Multiplication</b>	Skip counting in multiples of 2, 3, 4, 5, 10 from 0	 <p>Using concrete materials to ensure secure foundation of multiples.</p>	 <p>Using pictorial representations to support skip counting.</p>	0, 2, 4, 6, 8, 10 0, 5, 10, 15, 20 0, 3, 6, 9, 12, 15 0, 10, 20, 30, 40, 50  $2 \times 5 = ?$
	Multiplication as repeated addition	 <p>Use a bead string to support repeated addition.</p>	 <p>Using pictorial representations for repeated addition.</p>	$2 + 2 + 2 + 2 = 10$
	Multiplication is commutative Arrays	 <p>Use concrete objects and arrays to explore commutativity.</p>	 <p>Use representations of arrays to show different calculations and how multiplication is commutative.</p>	$5 \times 2 = 10$

	Part – part whole model	 <p>Use part whole model to explore the inverse of multiplication equations.</p>	 <p>Use bar model to explore related equations.</p>	$3 \times 3 = 9$ $9 \div 3 = 3$
	Doubling to derive new multiplication facts	 <p>Use dienes to double.</p>	 <p>Using pictorial representations to explore doubling.</p>	

	Objective Strategy	Concrete	Pictorial	Abstract Using concrete and pictorial strategies to inform the abstract (equation).
<b>Division</b>	Division as sharing	 <p>Sharing objects to calculate division equations.</p>	 <p>Using pictures to share quantities.</p>	$6 \div 2 = 3$
	Division as grouping	 <p>Dividing quantities into equal groups.</p>	 <p>Using number line for regrouping, making jumps of equal groups. Using pictorial representations to share into equal groups.</p>	$21 \div 3 = 7$ <p>3 groups of 7 is equal to 21.</p>



### Year 3

#### National Curriculum Programme of Study Objectives – Addition and Subtraction:

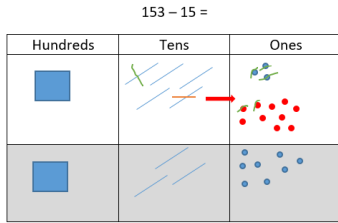
- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- recognise the place value of each digit in a 3-digit number (100s, 10s, 1s)
- compare and order numbers up to 1,000
- identify, represent and estimate numbers using different representations
- read and write numbers up to 1,000 in numerals and in words
- solve number problems and practical problems involving these ideas
- add and subtract numbers mentally, including:
  - a three-digit number and 1s
  - a three-digit number and 10s
  - a three-digit number and 100s
- add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

#### National Curriculum Programme of Study Objectives – Multiplication and Division:

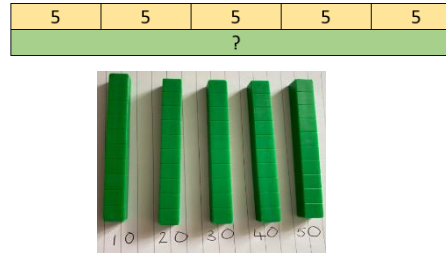
- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

	<b>Addition &amp; Subtraction</b>	<b>Multiplication</b>	<b>Division</b>
<b>Year 3</b>	Add and subtract numbers mentally, including: <ul style="list-style-type: none"> <li>• a three-digit number and ones;</li> <li>• a three-digit number and tens;</li> <li>• a three-digit number and hundreds</li> </ul>	Doubling to derive new multiplication facts  $3 \times 2 = 6$ $3 \times 4 = 12$	Dividing multiples of 10, 100 and 1000 by 10, 100 and 1000 using scaling down  $3 \times 10 = 30$ $30 \div 10 = 3$

Written column method for calculations that require regrouping with up to 4-digits



Skip counting in multiples of 2, 3, 4, 5, 6, 8 and 10

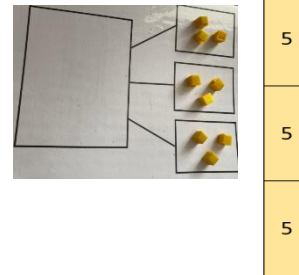


Dividing multiples of 10, 100 and 1000 by 10, 100 and 1000 using grouping

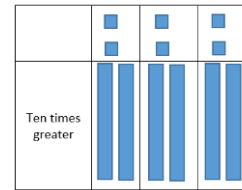
Find 10, 100 more or less than a given number.

1	2	3	4	5	6	7	8	9	10	10 more than 20.
11	12	13	14	15	16	17	18	19	20	
21	22	23	24	25	26	27	28	29	30	
31	32	33	34	35	36	37	38	39	40	
41	42	43	44	45	46	47	48	49	50	
51	52	53	54	55	56	57	58	59	60	
61	62	63	64	65	66	67	68	69	70	
71	72	73	74	75	76	77	78	79	80	
81	82	83	84	85	86	87	88	89	90	
91	92	93	94	95	96	97	98	99	100	

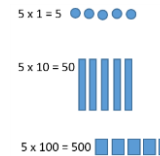
Use of part-part-whole model with arrays and bar models to establish commutativity and inverse relationship between multiplication and division



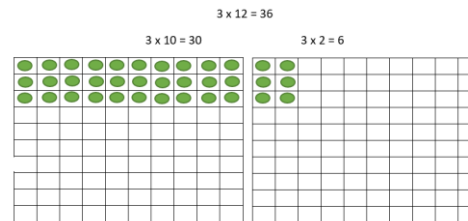
Ten times greater



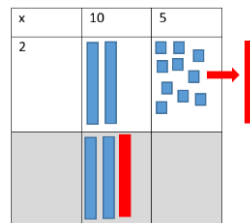
Multiplying by 10 and 100



Multiplication of 2-digit numbers with partitioning (no regrouping)



Multiplication of 2-digit numbers with partitioning (regrouping)



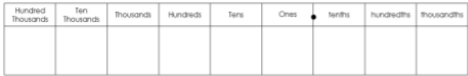

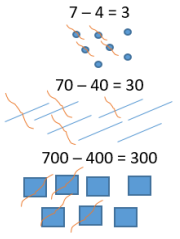
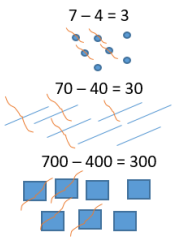
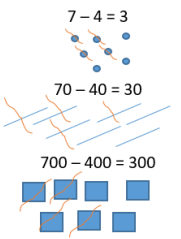
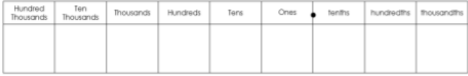


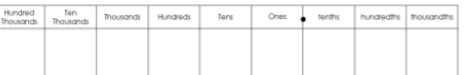
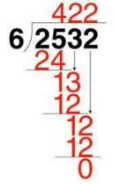
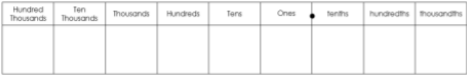




## Year 6

### National Curriculum Programme of Study Objectives – Addition and Subtraction/ Multiplication and Division:

- read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
- round any whole number to a required degree of accuracy
- use negative numbers in context, and calculate intervals across 0
- solve number and practical problems that involve all of the above
- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

	<b>Addition &amp; Subtraction</b>	<b>Multiplication</b>	<b>Division</b>
	Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 	Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 	Deriving facts from known facts
	Using known facts and understanding of place value to derive $7 - 4 = 3$ $70 - 40 = 30$ $700 - 400 = 300$ 	Using known facts and place value to derive multiplication facts $7 - 4 = 3$ $70 - 40 = 30$ $700 - 400 = 300$ 	Using knowledge of multiples to divide $7 - 4 = 3$ $70 - 40 = 30$ $700 - 400 = 300$ 
	Partitioning one number and applying known facts to add 	Multiply by partitioning one number and multiplying each part <b>Distributive law</b> $a \times (b + c) = a \times b + a \times c$	Using knowledge of factors to divide
Year 6	Subtraction by partitioning and applying known facts. 	Using knowledge of factors <b>Commutative law</b> $a \times b = b \times a$ <b>Associative law</b> $a \times b \times c = (a \times b) \times c = a \times (b \times c)$	Short division Dividing a 4-digit numbers by 1-digit numbers 
	Calculate difference by "counting back" 	Formal written method of short multiplication $\begin{array}{r} 325 \\ \times 2 \\ \hline 650 \end{array}$	Long division Dividing a 4-digit number by a 2-digit number 
	Calculate difference by "counting on" 	Multiplying by a 2-digit number Formal written method of long multiplication $\begin{array}{r} 34 \\ \times 12 \\ \hline 68 \\ 340 \\ \hline 408 \end{array}$	
	Round and adjust $7306 + 2310 =$ <hr/>		
	Near doubles $160 + 170 = \text{double } 150 + 10 + 20$ $160 + 170 = \text{double } 160 + 10 \text{ or}$		

$$160 + 170 = \text{double } 170 - 10$$
$$2.5 + 2.6 = \text{double } 2.5 + 0.1$$

Partition both numbers and  
combine the parts

$$7306 + 2310 =$$

$$7000 + 2000 = 9000$$

$$300 + 300 = 600$$

$$10 + 6 = 16$$

Written column methods for addition

789 + 642 becomes

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline 11 \end{array}$$

Written column methods for  
subtraction

874 - 523 becomes

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$$