



# **Moorgate Primary Academy**

## **Calculations Policy: A Parent's Guide**

# Numicon

At Moorgate Primary Academy, Numicon is used as a teaching resource throughout the school, along with number tracks and lines, beads and base 10 materials. Numicon is a quality first teaching approach designed to give children the understanding of number ideas and number relationships that is essential for success in maths. It uses a series of structured patterns - Numicon shapes - to represent numbers, as part of a progressive teaching programme.

## Mental Methods of Calculation

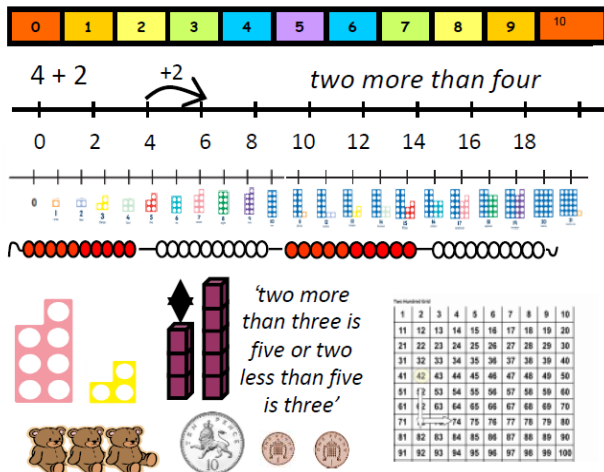





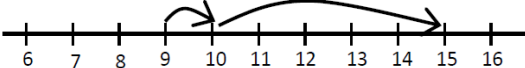
At Moorgate Primary Academy, we believe that oral and mental mathematics is essential, particularly so in calculation. Early practical, oral and mental work lays the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images (in particular Numicon) and the application of acquired number knowledge and skills. Secure mental calculation requires the ability to:

- understand
  - the different **structures** of all four operations e.g. to understand subtraction as take away, decrease, difference and the inverse;
  - the **relationship** between operations - that subtraction 'undoes' addition, how multiplication and division relate to one another
  - how the **rules and laws** of arithmetic are used and applied - for example, to add or subtract mentally combinations of one-digit and two-digit numbers (Year 3), and to calculate mentally with whole numbers and decimals (Year 6).
- recall key number facts instantly - for example, all addition and subtraction facts for each number to at least 10 (Year 1), sums and differences of multiples of 10 (Year 2)
- recall all times tables up to 12 x 12 by then end of year 4. Learnt as follows:
  - **Foundation** – by end of year begin counting sequences
  - **Year 1** – counting sequences (which lays down the foundation for later times tables e.g. counting in multiples of 2 will lead into learning the 2 times table. By the end of year 1, children can begin to use their knowledge of counting in

multiples of 2, 5 and 10 to solve simple practical problems involving multiplication and division.

- **Year 2** – Refine 2, 10, 5 times tables. Learn 3 and 4 times tables.
  - **Year 3** – Refine 2, 10, 5, 3, 4 times tables. Learn 11, 6 and 7 times tables.
  - **Year 4**- Refine 2, 10, 5, 3, 4, 11, 6, 7 times tables. Learn 8, 9, 12 times tables.
  - **Year 5/6** – continue practice of all times tables up to 12 x 12, use these to inform division and to work out other times tables higher than 12 (e.g. double 12 times tables to generated 24 times tables).
- use taught strategies to work out the calculation - for example, recognise that addition can be done in any order and use this to add mentally a one digit number or a multiple of 10 to a one-digit or two-digit number (Year 1), partition two-digit numbers in different ways including into multiples of ten and one and add the tens and ones separately and then recombine (Year 2), when applying mental methods in special cases (Year 5).

# Addition

Moorgate Primary Academy Addition Calculation: Year 1	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>Read, write and interpret mathematical statements involving addition (+) and equals (=) signs</li> <li>Represent and use number bonds and related subtraction facts within 20</li> <li>Add one-digit and two-digit numbers to 20, including zero</li> <li>Solve one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems such as <math>7 = ? - 9</math>.</li> <li>Given a number, identify one more and one less</li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>Begin to compare the commutative sums e.g. <math>3 + 7 = 7 + 3</math>.</li> <li>Memorise and reason with numbers bonds 10 and 20 in several forms.</li> <li>Add using objects (Numicon, number tracks, cubes etc.</li> <li>Check using everyday objects.</li> <li>Ensure pre-calculation steps are understood, including;               <ul style="list-style-type: none"> <li>Counting objects (involving solving simple concrete problems)</li> <li>Conservation of number</li> <li>Recognise place value in numbers beyond 20.</li> <li>Counting as reciting and as enumerating.</li> </ul> </li> </ul>
Possible Concrete and Visual Representations	Teacher Modelling/Children's Recordings
 <p style="margin-left: 20px;">Use practical resources such as bears, counters, cubes and number lines/hundred grids and progress to a resource such as Numicon to encourage counting in groups rather than ones</p>	<p>If using Numicon, children could use printed Numicon icons and stick these in - progressing to recording number sentences alongside</p> <div style="text-align: center; margin: 10px 0;">  +  =  </div> <p style="text-align: center; margin: 5px 0;"><b>1 + 2 = 3</b></p> <p style="text-align: center; margin: 5px 0;"><i>Example</i></p> <div style="text-align: center; margin: 10px 0;">  </div> <p style="text-align: center; margin: 5px 0;">9 and 6</p> <div style="text-align: center; margin: 10px 0;">  </div> <p style="margin-left: 20px;">9 + 6</p> <div style="text-align: center; margin: 10px 0;">  </div>
<b>Fluency</b>	<ul style="list-style-type: none"> <li>Count forwards, to and across 100, beginning with 0 or 1 or from any given number</li> <li>Switch count between tens and ones e.g. 10, 20, 30, 31, 32, 33 ...</li> <li>Represent and use number bonds up to 20 (establish addition and subtraction as related operations)</li> <li>Find one more than a number</li> <li>Find ten more than a number</li> <li>Count in multiples of 2s, 5s and 10s starting on multiples to highlight pattern recognition</li> </ul>

**Moorgate Primary Academy Addition Calculation: Year 2**

<p><b>Mental Calculation</b></p>	<ul style="list-style-type: none"> <li>• Add numbers using concrete objects, pictorial representations, and mentally, including:             <ul style="list-style-type: none"> <li>➤ a two-digit number and ones</li> <li>➤ a two-digit number and tens</li> <li>➤ two two-digit numbers</li> <li>➤ adding three one-digit numbers</li> </ul> </li> <li>• Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100</li> </ul>																					
<p><b>Written Calculation</b></p>	<ul style="list-style-type: none"> <li>• Show that addition of two numbers can be done in any order (commutative).</li> <li>• Re-partition numbers</li> <li>• Use a hundred square</li> <li>• Check calculations using the inverse by adding numbers in a different order.</li> <li>• Begin to record addition in columns to begin to support place value and prepare for formal written methods with larger numbers.</li> </ul>																					
<p align="center"><b>Possible Concrete and Visual Representations</b>                      <b>Teacher Modelling/Children's Recordings</b></p>																						
<p><b>Cuisenaire</b></p> <p><b>Bar Model</b></p> <p><b>Numbered and partially numbered number lines</b></p> <p>Use Numicon, number grids, place value apparatus/Dienes, place value grids, place value cards, Encourage children to partition numbers rather than counting in ones.</p>	<p>Children apply, develop and secure their understanding of place value</p> <p>Use jottings and record number sentences</p> <table border="1"> <thead> <tr> <th>Tens 10s</th> <th>Units/Ones 1s</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>41</td> </tr> <tr> <td></td> <td></td> <td>+</td> </tr> <tr> <td></td> <td></td> <td>28</td> </tr> <tr> <td>40</td> <td>1</td> <td></td> </tr> <tr> <td>+ 20</td> <td>+ 8</td> <td></td> </tr> <tr> <td>= 60</td> <td>= 9</td> <td>60 + 9 = 69</td> </tr> </tbody> </table>	Tens 10s	Units/Ones 1s				41			+			28	40	1		+ 20	+ 8		= 60	= 9	60 + 9 = 69
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<p><b>Fluency</b></p>	<ul style="list-style-type: none"> <li>◆ Show increasing fluency in deriving pairs of numbers up to 10 and then up to 20</li> <li>◆ Use knowledge to derive and use number facts up to 100</li> <li>◆ Add numbers mentally including TU + U, TU + tens, TU + TU, U + U + U</li> </ul>																					

**Moorgate Primary Academy Addition Calculation: Year 3**

<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• Add 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> </li> <li>• Partition all numbers and recombine, start with TU +TU the HTU +TU</li> <li>• Use straws, dienes, place value counters, number lines, Numicon etc.</li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>• Add numbers with up to three digits, using formal written methods of columnar addition.</li> <li>• Add to three digit numbers using physical and abstract representations (straws, dienes, Numicon etc.).</li> </ul> <p align="center"><i>Revert to expanded methods if the children find formal columnar method difficult.</i></p>

<p><b>Possible Concrete and Visual Representations</b></p>	<p><b>Teacher Modelling/Children's Recordings</b></p> <p>Children apply, develop and secure their understanding of place value and begin to record in columns</p> <p align="center"><i>Manipulatives SHOULD be used alongside algorithms</i></p> <p>Column addition (no exchanging) with up to three-digits</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} 40 + 1 \\ + 20 + 8 \\ \hline 60 + 9 = 69 \end{array}</math> </td> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} 40 + 3 \\ 20 + 8 \\ \hline 70 + 1 = 71 \\ 10 \end{array}</math> </td> </tr> </table> <p><i>Expanded recording without exchange</i>                      <i>Expanded recording with exchange</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} 100 + 40 + 1 \\ + 100 + 20 + 8 \\ \hline 200 + 60 + 9 = 269 \end{array}</math> </td> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} \text{HTU} \\ 141 \\ + 128 \\ \hline 269 \end{array}</math> </td> </tr> </table> <p><i>Expanded recording</i>                      <i>Compact (column) recording</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} 143 \\ + 128 \\ \hline 271 \\ 1 \end{array}</math> </td> <td style="text-align: center; padding: 5px;"> <p>Column addition (with exchanging)</p> </td> </tr> </table> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} \text{HTU} \\ 789 \\ + 642 \\ \hline 1431 \\ 11 \end{array}</math> </td> <td style="text-align: center; padding: 5px;"> <math display="block">\begin{array}{r} \text{£ } 7.89 \\ + \text{£ } 6.42 \\ \hline \text{£ } 14.31 \\ 11 \end{array}</math> </td> <td style="text-align: right; padding: 5px;"> <p><i>Add decimals in the context of money</i></p> </td> </tr> </table> <p align="center"><i>Compact (column) recording</i></p>	$\begin{array}{r} 40 + 1 \\ + 20 + 8 \\ \hline 60 + 9 = 69 \end{array}$	$\begin{array}{r} 40 + 3 \\ 20 + 8 \\ \hline 70 + 1 = 71 \\ 10 \end{array}$	$\begin{array}{r} 100 + 40 + 1 \\ + 100 + 20 + 8 \\ \hline 200 + 60 + 9 = 269 \end{array}$	$\begin{array}{r} \text{HTU} \\ 141 \\ + 128 \\ \hline 269 \end{array}$	$\begin{array}{r} 143 \\ + 128 \\ \hline 271 \\ 1 \end{array}$	<p>Column addition (with exchanging)</p>	$\begin{array}{r} \text{HTU} \\ 789 \\ + 642 \\ \hline 1431 \\ 11 \end{array}$	$\begin{array}{r} \text{£ } 7.89 \\ + \text{£ } 6.42 \\ \hline \text{£ } 14.31 \\ 11 \end{array}$	<p><i>Add decimals in the context of money</i></p>
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<b>Fluency</b>	<ul style="list-style-type: none"> <li>• Count in ones, tens and hundreds maintaining fluency through varied and frequent practice.</li> <li>• Count from 0 in multiples of 4, 8, 50 and 100</li> <li>• Find 10 or 100 more than a number</li> <li>• Mentally add HTU + ones, HTU + tens, HTU + hundreds</li> <li>• Perform mental calculations with two-digit numbers.</li> </ul>
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Moorgate Primary Academy Addition Calculation: Year 4	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>Practice mental methods with increasingly large numbers.</li> <li>Consolidate partitioning and re-partitioning</li> <li>Use compensating for adding too much/little and adjusting</li> </ul> <p><b>Common mental calculation strategies:</b>            Partitioning and recombining            Doubles and near doubles            Use number pairs to 10 and 100            Adding near multiples of ten and adjusting            Using patterns of similar calculations            Using known number facts            Bridging though ten, hundred            Complementary addition</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto;"> <p>I know that <math>63 + 29</math>              is the same as <math>63 +</math>  <math>30 - 1</math></p> </div>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li><b>Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate</b></li> <li>Include decimal addition for money.</li> </ul> <p style="background-color: yellow; text-align: center;"><i>Revert to expanded methods if the children find formal columnar method difficult.</i></p>
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
<p><i>Children apply, develop and secure their understanding of columnar addition which has been taught in year 3. (see table above). The aim is for the children to be using the compact column method of recording by the end of year 4.</i></p>	
<b>Fluency</b>	<ul style="list-style-type: none"> <li>Perform mental calculations with increasingly large numbers to aid fluency</li> <li>Find 1000 more than a number</li> <li>Count in 6s, 7s, 9s, 25s and 100s</li> </ul>

Moorgate Primary Academy Addition Calculation: Year 5

<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• Add numbers mentally with increasingly large numbers</li> <li>• Mentally add tenths, and one-digit numbers and tenths.</li> <li>• Add decimals, including a mix of whole numbers and decimals, decimals with different number of places and complements of 1 (e.g. <math>0.83 + 0.17 = 1</math>)</li> </ul> <p style="text-align: center; background-color: yellow;"><i>Refer back to pictorial and physical representations when needed.</i></p>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>• Add whole numbers with more than 4 digits, including using formal written methods (columnar addition).</li> <li>• Include decimal addition for money.</li> </ul>

Possible Concrete and Visual Representations	Teacher Modelling/Children's Recordings
<p>0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 2 3 4 5 6 7 8 9</p> <p>u   1/10   1/100</p> <p>1   0.1   0.01</p> <p>Cuisenaire</p> <p>Bar Model</p> <p>0 0.1 0.2 0.3 0.4 0.5</p> <p>Partially numbered and blank number lines</p>	<p style="text-align: center;"><i>Manipulatives could be used alongside algorithms</i></p> $\begin{array}{r} 2141 \\ + 1128 \\ \hline 3269 \end{array}$ $\begin{array}{r} 21.41 \\ + 1.12 \\ + 0.35 \\ \hline 22.88 \end{array}$ <p style="text-align: center;">Column addition (no exchanging)</p> $\begin{array}{r} 5189 \\ + 3128 \\ \hline 8317 \\ 11 \end{array}$ $\begin{array}{r} 51.89 \\ + 3.128 \\ \hline 55.018 \\ 11 \end{array}$ <p style="text-align: center;">Column addition (with exchanging)</p> <p style="text-align: center;"><i>Addition with decimals up to three decimal places including in different contexts e.g. money and measures</i></p>



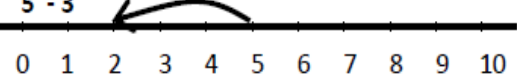
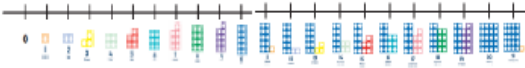
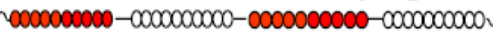
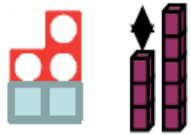


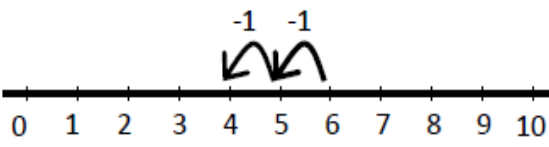
<b>Fluency</b>	<ul style="list-style-type: none"> <li>• Count forwards in powers of ten up to 100000</li> <li>• Count forwards in positive and negative whole numbers through zero</li> <li>• Practise mental calculations with increasingly large numbers</li> <li>• Practise fluency of written methods</li> </ul>
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**Moorgate Primary Academy Addition Calculation: Year 6**

<p><b>Mental Calculation</b></p>	<ul style="list-style-type: none"> <li>• <b>Perform mental calculations, including with mixed operations and large numbers.</b></li> <li>• Children use representation of choice.</li> <li>• Consolidate partitioning and re-partitioning.</li> <li>• Use compensating for adding too much/little and adjusting</li> </ul> <div style="border: 1px solid black; background-color: #e0f7fa; padding: 5px; margin: 10px 0;"> <p><b>Common mental calculation strategies:</b>                      Partitioning and recombining                      Doubles and near doubles                      Use number pairs to 10 and 100                      Adding near multiples of ten and adjusting                      Using patterns of similar calculations                      Using known number facts                      Bridging through ten, hundred                      Complementary addition</p> </div> <div style="background-color: yellow; text-align: center; padding: 2px;"> <p><i>Refer back to pictorial and physical representations when needed.</i></p> </div>
<p><b>Written Calculation</b></p>	<ul style="list-style-type: none"> <li>• <b>Add larger numbers using the formal written (columnar) method.</b></li> <li>• Include decimal addition for money.</li> </ul> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <math display="block">\begin{array}{r} \pounds 563.14 \\ + \pounds 207.88 \\ \hline \pounds 771.02 \\ \hline 111 \end{array}</math> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>789 + 642 becomes</p> <math display="block">\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline \text{Answer: 1431} \end{array}</math> </div> </div>
<p><b>Possible Concrete and Visual Representations</b></p>	<p><b>Teacher Modelling/Children's Recordings</b></p>
<p align="center"><i>Children apply, consolidate and secure their understanding of columnar addition within the context of new mathematical concepts taught within year 6. (see year 5 table for guidance)</i></p>	
<p><b>Fluency</b></p>	<ul style="list-style-type: none"> <li>• Count in tens and hundreds increasing fluency of order and place value</li> <li>• Perform increasingly complex mental calculations and those with increasingly large numbers to aid fluency</li> </ul>


# Subtraction

Moorgate Primary Academy Subtraction Calculation: Year 1	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• Subtract one digit and two-digit numbers to 20, including zero.</li> <li>• Read, write and interpret mathematical statements using symbols (+, -, =) signs.</li> <li>• Represent and use number bonds and related addition facts within 20.</li> <li>• Solve one-step problems using concrete objects and pictorial representations, and missing number problems such as <math>7 = ? - 9</math>.</li> <li>• Memorise and reason with number bonds.</li> <li>• Subtract using objects, Numicon, cubes and number lines and tracks.</li> <li>• Check with everyday objects.</li> <li>• Ensure pre-calculation steps are understood, including:               <ul style="list-style-type: none"> <li>➢ Counting objects,</li> <li>➢ Conservation of number</li> </ul> </li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>• Subtract one-digit and two-digit numbers to 20, including zero</li> <li>• Read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs.</li> <li>• Represent and use number bonds and related subtraction facts within 20.</li> </ul> 
Possible Concrete and Visual Representations	Teacher Modelling/Children's Recordings
 $5 - 3$     <p><i>'two less than five is three'</i></p>  <p>Use practical resources such as bears, counters, cubes and number lines/hundred grids and progress to a resource such as Numicon to encourage counting back in groups rather than ones</p>	<p>Children may begin recording pictorially progressing to recording number sentences alongside</p>   <p>Children could use printed Numicon icons and stick these in, again progressing to recording number sentences alongside</p>
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count backwards (including crossing 100) any given number</li> <li>◆ Switch count between ones and tens e.g. 33, 32, 31, 30, 20, 10</li> <li>◆ Represent and use subtraction facts linked to number bonds up to 20 (establish addition and subtraction as related operations)</li> <li>◆ Find one/ten less than a number</li> <li>◆ Count back in multiples of 2s, 5s and 10s</li> </ul>

**Moorgate Primary Academy Subtraction Calculation: Year 2**

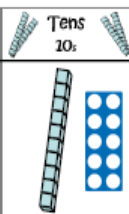
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>Subtract numbers using concrete objects, pictorial representations, and mentally, including:                     <ul style="list-style-type: none"> <li>a two-digit number and ones</li> <li>a two-digit number and tens</li> <li>two two-digit numbers</li> </ul> </li> <li>Jottings to support informal methods</li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>Written recording using a column method.</li> </ul>

<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
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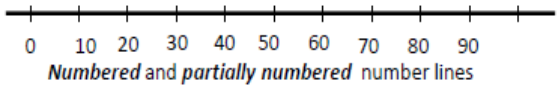
**10 - 4**

Tens  
10s




Units/Ones  
1s






Numbered and partially numbered number lines




20      2



Cuisenaire      Bar Model

10	
7	?

**Finding the difference**





Children should use concrete materials and pictorial representations, and use numbers in different contexts e.g. money and measures.

Encourage children to partition numbers rather than counting in ones.



Children apply, develop and secure their understanding of place value and begin to record using jottings and number sentences

**16 - 3**

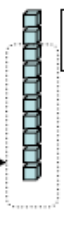
T	U
	

*no exchanging*

**26 - 8**

T	U
	

exchange ten for ten ones



*exchanging*

<b>Fluency</b>	<ul style="list-style-type: none"> <li>Practise addition and subtraction facts to 20</li> <li>Show increasing fluency in deriving subtraction facts for numbers up to 10 and then up to 20</li> <li>Use known facts to 20 to derive new facts e.g. <math>3 + 7 = 30 + 70</math></li> <li>Use knowledge to derive and use subtraction number facts up to 100</li> </ul>
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**Moorgate Primary Academy Subtraction Calculation: Year 3**

**Mental Calculation**

- Subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds.

*Use a number line, dienes, hundred squares, two-hundred squares, and similar representations, to support mental calculations.*

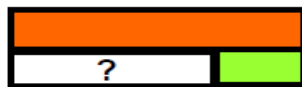
**Written Calculation**

- Subtract numbers with up to three digits, using formal written methods of columnar subtraction.

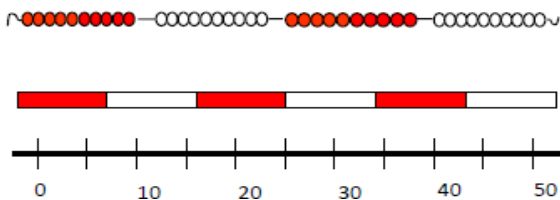
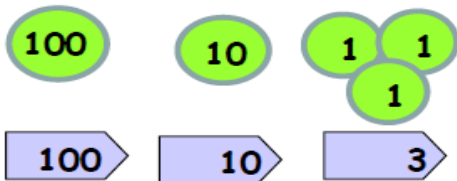
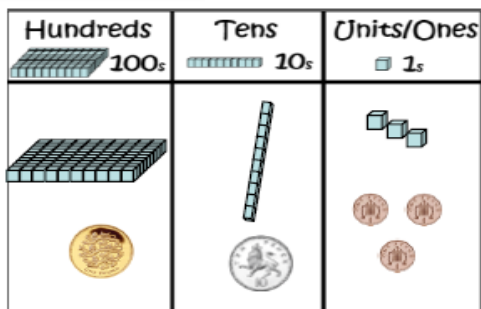
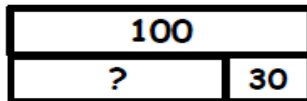
**Possible Concrete and Visual Representations**

1	2	3	4	5	6	7	8	9	10
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
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

**Cuisenaire**



**Bar Model**



**Teacher Modelling/Children's Recordings**

*Children SHOULD use manipulatives alongside algorithms to transition between practical and abstract*

*no exchange*

$$68 - 23$$

$$\begin{array}{r} 60 & 8 \\ - 20 & 3 \\ \hline 40 & + 5 = 45 \end{array}$$

*with exchange*

$$63 - 28$$

$$\begin{array}{r} 50 & 60 & 10 + 3 \\ - 20 & 8 \\ \hline 30 & + 5 = 35 \end{array}$$

$$148 - 121$$

$$\begin{array}{r} 100 & 40 & 8 \\ - 100 & 20 & 1 \\ \hline 0 & + 20 & + 7 = 27 \end{array}$$

*Column subtraction (no exchange)*

$$\begin{array}{r} 148 \\ - 121 \\ \hline 27 \end{array}$$

*Column subtraction (with exchange)*

$$723 - 317$$

$$\begin{array}{r} 7 & 2 & 3 \\ - 3 & 1 & 7 \\ \hline 4 & 0 & 6 \end{array}$$

$$723 - 367$$

$$\begin{array}{r} 6 & 7 & 11 & 1 & 3 \\ - 3 & 6 & 7 \\ \hline 3 & 5 & 6 \end{array}$$

$$\begin{array}{r} 6 & 11 & 1 & 3 \\ - 3 & 6 & 7 \\ \hline 3 & 5 & 6 \end{array}$$

*Ensure children can solve calculations where zero is a place holder*

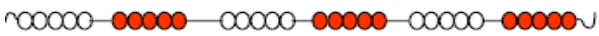



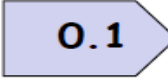

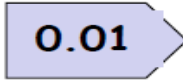

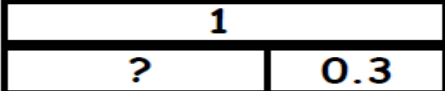
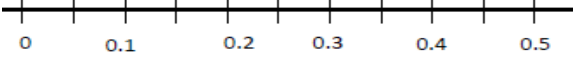

**Fluency**

- ◆ Count back in ones, tens and hundreds maintaining fluency through varied and frequent practice
- ◆ Switch count between hundreds, tens and ones e.g. 500, 400, 300, 290, 280, 270, 269, 268, 267
- ◆ Mentally subtract HTU + ones, HTU + tens, HTU + hundreds
- ◆ Perform mental calculations with two-digit numbers
- ◆ Find ten and a hundred less than a number with up to three-digits

<b>Moorgate Primary Academy Subtraction Calculation: Year 4</b>	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• <b>Continue to practise mental methods with increasingly large numbers to aid fluency</b></li> <li>• Methods to support fluent calculation and encourage efficiency of method: <ul style="list-style-type: none"> <li>➤ Find a small difference by counting up e.g. 5003—4996</li> <li>➤ Subtract nearest multiple of ten and adjust.</li> <li>➤ Partition larger numbers</li> </ul> </li> </ul> <p style="background-color: yellow; padding: 2px;"><i>Whenever possible, children should be encouraged to visualise number lines and other basic, supporting representations to promote fluent work without jottings.</i></p>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>• <b>Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate.</b></li> <li>• Build on formal, extended method (See Year 3) using exchange wherever necessary.</li> <li>• Continue to use representations and manipulatives to develop understanding of place value.</li> </ul>
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
<i>The children build upon their learning in year 3 by continuing to practice columnar subtraction with increasingly larger numbers. (see year 3 subtraction methods)</i>	
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count back in 6, 7, 9, 25 and 1000</li> <li>◆ Count back through zero to include negative numbers</li> <li>◆ Find 1000 less than a number</li> <li>◆ Continue to practise mental calculations with increasingly large numbers to aid fluency</li> </ul>

**Moorgate Primary Academy Subtraction Calculation: Year 5**

<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>Subtract numbers mentally with increasingly large number e.g. <math>12\ 462 - 2300 = 10\ 162</math></li> <li>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.</li> <li><i>Pupils practise subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, <math>1 \square 0.17 = 0.83</math>).</i></li> <li><i>Pupils mentally subtract tenths, and one-digit whole numbers and tenths.</i></li> </ul>
<b>Written Calculation</b>	<p>Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction).</p> <ul style="list-style-type: none"> <li>(Pupils) practise subtracting decimals.</li> <li>Begin with three-digit numbers using formal, columnar method; then move into four-digit numbers.</li> </ul> <div style="background-color: yellow; padding: 5px; border: 1px solid black;"> <p><i>As in Year 4, compare physical and / or pictorial representations and expanded algorithms alongside columnar methods. Ask: What is the same? What's different? Compare and discuss the suitability of different methods, (mental or written), in context. Revert to expanded methods whenever difficulties arise</i></p> </div>

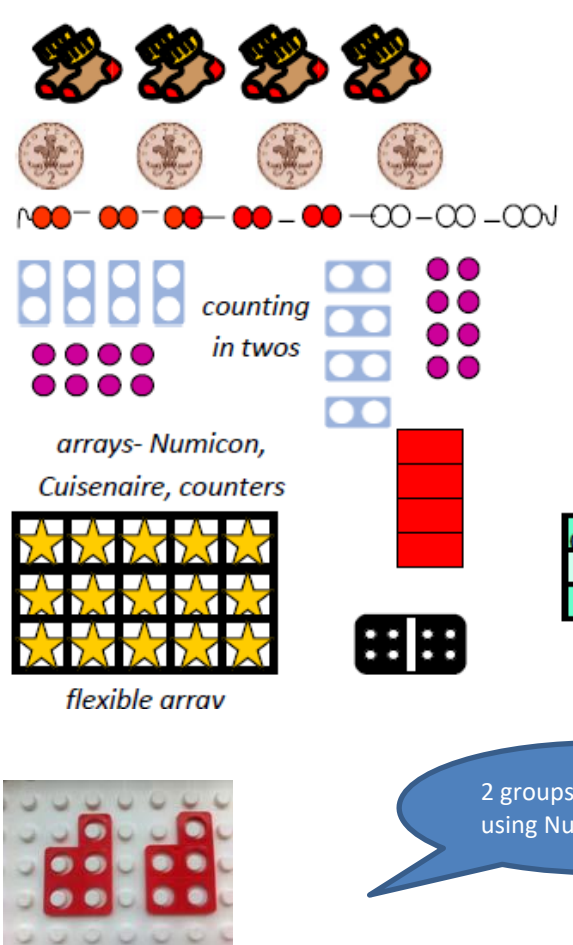
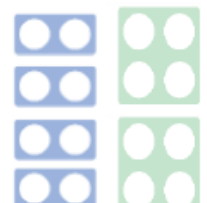
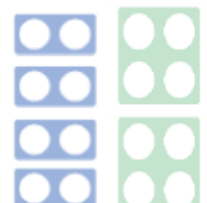
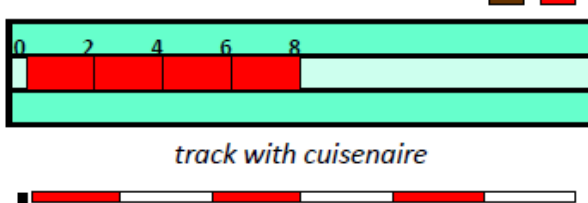
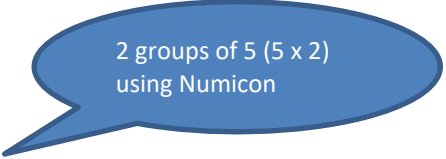
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>																											
<table border="1" style="font-size: small; margin-bottom: 10px;"> <tr><td>0.01</td><td>0.02</td><td>0.03</td><td>0.04</td><td>0.05</td><td>0.06</td><td>0.07</td><td>0.08</td><td>0.09</td></tr> <tr><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td><td>0.6</td><td>0.7</td><td>0.8</td><td>0.9</td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> </table>  <div style="display: flex; justify-content: space-around; align-items: center; margin: 10px 0;"> <div style="text-align: center;"> <p>u</p>  <p><b>1</b></p>  </div> <div style="text-align: center;"> <p>1/10</p>  <p><b>0.1</b></p>  </div> <div style="text-align: center;"> <p>1/100</p>  <p><b>0.01</b></p>  </div> </div> <p align="center">Cuisenaire</p> <div style="margin: 10px 0;">  </div> <div style="margin: 10px 0;">  <p align="center">Bar Model</p> </div>  	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	2	3	4	5	6	7	8	9	<p><i>Children might use manipulatives alongside algorithms</i></p> <p>Column subtraction (no exchanging)</p> $\begin{array}{r} 1\ 3\ 5\ 4\ 8 \\ - 1\ 2\ 1\ 2\ 8 \\ \hline 1\ 4\ 2\ 0 \end{array}$ <p>Column subtraction (with exchanging)</p> $\begin{array}{r} \overset{2}{1}\overset{13}{4}\overset{11}{2}\overset{1}{3} \\ - 1\ 2\ 6\ 7\ 8 \\ \hline 7\ 4\ 5 \end{array}$ <p align="center"><i>Ensure children can solve calculations where zero is a place holder</i></p> <p>Column subtraction (no exchanging)</p> $\begin{array}{r} 1\ 4\ 8 \\ - 1\ 2\ 1 \\ \hline 0\ 2\ 7 \end{array}$ <p>Column subtraction (with exchanging)</p> $\begin{array}{r} \overset{6}{7}\overset{11}{.}\overset{1}{2}\overset{3}{3} \\ - 3\ 6\ 7 \\ \hline 3\ 5\ 6 \end{array}$ <p align="center"><i>Subtraction with decimals up to three decimal places including in different contexts e.g. money and measures</i></p>
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09																				
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9																				
1	2	3	4	5	6	7	8	9																				

<b>Fluency</b>	<ul style="list-style-type: none"> <li>Count backwards in powers of ten up to one million</li> <li>Count backwards in positive and negative whole numbers through zero</li> <li>Practise mental calculations with increasingly large number</li> </ul>
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**Moorgate Primary Academy Subtraction Calculation: Year 6**

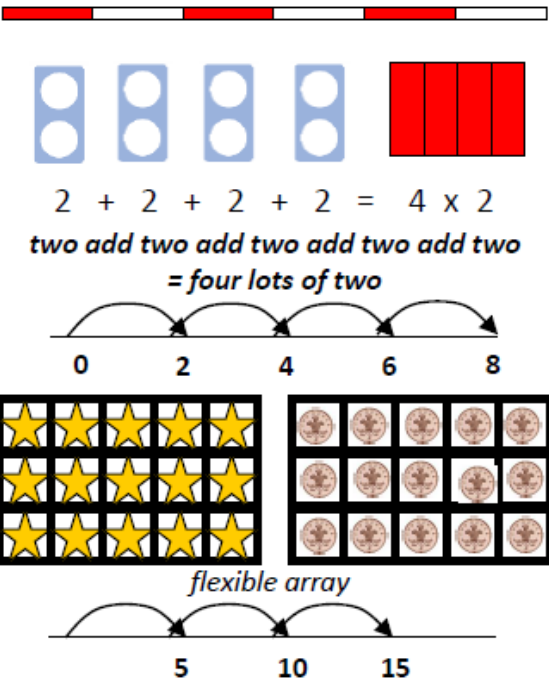
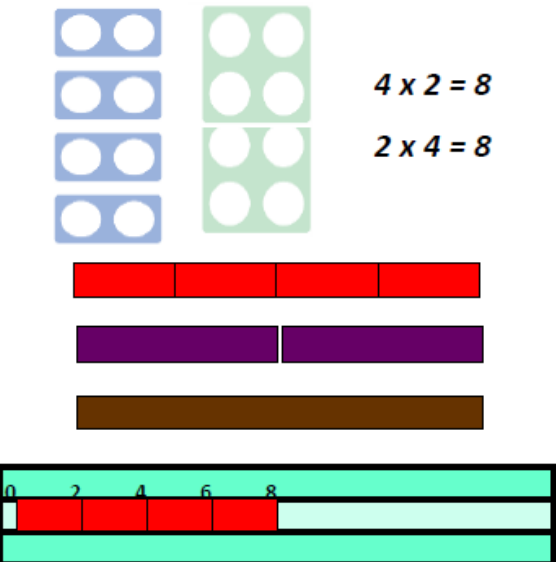
<p><b>Mental Calculation</b></p>	<ul style="list-style-type: none"> <li>• Perform mental calculations, including with mixed operations and large numbers.</li> <li>• Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</li> <li>• <i>They undertake mental calculations with increasingly large numbers and more complex calculations.</i></li> </ul> <p align="center"><i>Children draw on basic, Mental subtraction Strategies, (See Year 5.) Children use, or visualise, representation of choice. Refer back to physical representations as required.</i></p>
<p><b>Written Calculation</b></p>	<ul style="list-style-type: none"> <li>◆ Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction). Solve problems involving the calculation and conversions of units of measure, using decimal notation of up to three decimal places where appropriate. (MEASURES)</li> </ul>
<p align="center"><b>Possible Concrete and Visual Representations</b></p>	<p align="center"><b>Teacher Modelling/Children's Recordings</b></p>
<p align="center"><i>Children apply, consolidate and secure their understanding of columnar subtraction within the context of new mathematical concepts taught within year 6. (see year 5 table for guidance)</i></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div data-bbox="239 940 558 1176"> <math display="block">  \begin{array}{r}  1\ 7\ 8\ .\ 9\ 0\ 1\ 1 \\  -\ 5\ .\ 4\ 5\ 6 \\  \hline  1\ 2\ .\ 5\ 5\ 5  \end{array}  </math> </div> <div data-bbox="810 913 1295 1164" style="background-color: #4a7ebb; color: white; padding: 10px; border-radius: 10px; width: 300px;"> <p align="center">Consolidate columnar methods, paying particular attention to the occurrence of zeros as place holders</p> </div> </div>	
<p><b>Fluency</b></p>	<ul style="list-style-type: none"> <li>◆ Undertake mental calculations with increasingly large numbers and more complex calculations</li> </ul>

# Multiplication

<b>Moorgate Primary Academy Multiplication Calculation: Year 1</b>	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Count in multiples of twos, fives and tens with equipment, songs &amp; rhythms, and including by rote.</li> <li>• Doubles up to 10.</li> <li>• Recognising odd and even numbers.</li> <li>• Write as a number pattern (e.g. 5, 10, 15...; 2, 4, 6...; 10, 20, 30...)</li> </ul>
<b>Written Calculation</b>	<p><i>Although there is no statutory requirement for written multiplication in Year 1, it may be helpful to encourage children to begin to write it as a repeated addition sentence in preparation for Year 2. E.g. <math>2 + 2 + 2 + 2 = 8</math></i></p>
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  <p style="text-align: center;"><i>counting in twos</i></p> <p style="text-align: center;"><i>arrays- Numicon, Cuisenaire, counters</i></p> <p style="text-align: center;"><i>flexible array</i></p> </div> <div style="width: 50%;"> <p style="text-align: center;">Practical only e.g. link to small world</p> <p style="text-align: center;">Using concrete objects, pictorial representations and arrays with the support of an adult – take photographs/draw pictures – if using Numicon small icons could be stuck in</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p><i>four lots of two is eight</i></p> </div> <div style="text-align: center;">  <p><i>two lots of four is eight</i></p> </div> </div> <div style="text-align: center; margin-top: 10px;">  <p style="text-align: center;"><i>track with cuisenaire</i></p> </div> <div style="text-align: center; margin-top: 10px;">  <p style="text-align: center;">2 groups of 5 (<math>5 \times 2</math>) using Numicon</p> </div> </div> </div>	
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count in twos, fives and tens from different multiples</li> <li>◆ e.g. 6, 8, 10, 12 etc.</li> <li>◆ Emphasise number patterns</li> <li>◆ Double number and quantities</li> </ul>



**Moorgate Primary Academy Multiplication Calculation: Year 2**

<p><b>Mental Calculation</b></p>	<ul style="list-style-type: none"> <li>• <b>Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables,</b> connecting the 2, 5 and 10 multiplication tables to each other.</li> <li>• Connect the 10 multiplication table to place value.</li> <li>• <b>Recognise odd and even numbers.</b></li> <li>• <b>Show that multiplication of two numbers can be done in any order (commutative).</b></li> <li>• <i>Use a variety of language to describe multiplication and division.</i></li> <li>• Apply doubling of numbers up to ten to doubling larger numbers.</li> </ul>
<p><b>Written Calculation</b></p>	<ul style="list-style-type: none"> <li>◆ <b>Calculate mathematical statements for multiplication and division within the multiplication tables and</b></li> <li>◆ <b>Write them using the multiplication (×), division (÷) and equals (=) signs</b></li> <li>◆ <i>Begin to use other multiplication tables and recall facts to perform written calculations</i></li> <li>◆ <i>Use a range of materials and contexts ... including arrays and repeated addition</i></li> </ul>
<p><b>Possible Concrete and Visual Representations</b></p>	<p><b>Teacher Modelling/Children's Recordings</b></p>
 <p> <math>2 + 2 + 2 + 2 = 4 \times 2</math>  <i>two add two add two add two add two</i>  <i>= four lots of two</i> </p> <p>flexible array</p>	<p>Record practical work as number sentences</p>  <p> <math>4 \times 2 = 8</math>  <math>2 \times 4 = 8</math> </p> <p> <math>7 \times 2 = \square</math>  <math>7 \times \square = 14</math>  <math>\square \times 2 = 14</math>  <math>\triangle \times \square = 14</math> </p>
<p><b>Fluency</b></p>	<ul style="list-style-type: none"> <li>◆ Count in twos, threes, fives from zero and tens from any number</li> <li>◆ e.g. 6, 8, 10, 12 etc.</li> <li>◆ Emphasise number patterns</li> </ul>

	<ul style="list-style-type: none"> <li>◆ Introduction to multiplication tables. Practise to become fluent in multiplication facts for 2, 5 and 10</li> <li>◆ Solve multiplication problems mentally</li> </ul>
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**Moorgate Primary Academy Multiplication Calculation: Year 3**

<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• <b>Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables</b> (and 2, 5 and 10 multiplication tables from Y2)</li> <li>• Use doubling to connect 2, 4 and 8 multiplication tables</li> <li>• Develop efficient mental methods using commutativity and associativity</li> <li>• Derive related multiplication and division facts</li> <li>• <b>Calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental methods</b></li> <li>• Partitioning: multiply the tens first and then multiply the units, e.g. <math>57 \times 6 = (50 \times 6) + (7 \times 6) = 300 + 42 = 342</math></li> <li>• Include missing number statements e.g. 72 divided by <math>\_ = 8</math></li> </ul> <p align="center"><i>Ensure opportunities to learn multiplication tables through use of visual models, images and also rote learning.</i></p>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ <b>Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, progressing to formal written methods.</b></li> <li>◆ Estimate before calculating</li> <li>◆ Ensure written methods build on/relate to mental methods</li> </ul>

<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
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*Cuisenaire to represent scaling*  
*Statue is 3 times as tall: 3 metres*  
*I am 1 metre tall*

*flexible array*

*arrays*  
 $4 \times 13$

*place value counters*

*bar models*

*Children must use manipulatives alongside algorithms*  
 $4 \times 13$  'four lots of thirteen'

*Expanded methods – grid and area*

*Progressing to developing fluency in short multiplication*

$\begin{array}{r} 13 \\ \times 4 \\ \hline 52 \end{array}$	$\begin{array}{r} 133 \\ \times 4 \\ \hline 532 \end{array}$
--	--

*Start with digits that are below five so children can practise method without encountering difficulty with multiplication tables*

<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count from 0 in multiples of 4, 8, 50 and 100</li> <li>◆ Use multiples of 2, 3, 4, 5, 8, 10, 50 and 100</li> <li>◆ Practise mental recall of multiplication tables – 3, 4 and 8x times tables</li> <li>◆ Connect the 2, 4 and 8 times tables using doubling</li> <li>◆ Develop efficient mental methods using commutativity and multiplication facts to derive related facts e.g. <math>4 \times 4 \times 12 = 12 \times 4 \times 5 = 12 \times 2</math></li> </ul>
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Moorgate Primary Academy Multiplication Calculation: Year 4	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• Recall multiplication and division facts for multiplication tables up to <math>12 \times 12</math></li> <li>• Use place value, known and derived facts to multiply and divide mentally, including:               <ul style="list-style-type: none"> <li>➤ multiplying by 0 and 1;</li> <li>➤ dividing by 1;</li> <li>➤ multiplying together three numbers</li> </ul> </li> <li>• Recognise and use factor pairs and commutativity in mental calculations</li> <li>• Practise mental methods and extend this to three-digit numbers to derive facts, (for example <math>600 \div 3 = 200</math> can be derived from <math>2 \times 3 = 6</math>)</li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ Multiply two-digit and three-digit numbers by a one-digit number</li> <li>◆ using formal written layout</li> <li>◆ Estimate before calculating</li> <li>◆ Ensure written methods build on/relate to mental methods (e.g. grid method)</li> <li>◆ Introduce alongside grid and expanded column methods</li> </ul> <div style="background-color: yellow; padding: 5px; margin-top: 10px;"> <p><u>Key skills to support:</u></p> <ul style="list-style-type: none"> <li>❖ know or quickly recall multiplication facts up to <math>12 \times 12</math></li> <li>❖ understand the effect of multiplying numbers by 10, 100 or 1000</li> <li>❖ multiply multiples of 10, for example, <math>20 \times 40</math>;</li> <li>❖ approximate, e.g. recognise that <math>72 \times 38</math> is approximately <math>70 \times 40 = 2800</math> and use this information to check whether their answer appears sensible</li> </ul> </div>
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
<p><i>The children build upon their learning in year 3 by continuing to practice columnar multiplication with increasingly larger numbers. (see year 3 multiplication methods)</i></p>	
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count in multiples of 6, 7, 9, 25 and 1000</li> <li>◆ Recall and use multiplication facts up to <math>12 \times 12</math> with increasing fluency</li> <li>◆ Derive multiplication facts with up to three-digits</li> <li>◆ Recognise and use factor pairs and commutativity in mental calculations</li> <li>◆ Use the distributive law</li> <li>◆ Combine knowledge of number facts and rules of arithmetic to solve mental and written calculations e.g. <math>2 \times 6 \times 5 = 10 \times 6</math></li> </ul>

**Moorgate Primary Academy Multiplication Calculation: Year 5**

<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• Multiply and divide numbers mentally drawing upon known facts</li> <li>• Multiply and divide whole numbers and those involving decimals by 10, 100 &amp; 1000</li> <li>• Recognise and use square &amp; cube numbers (&amp; notation)</li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ multiply numbers up to 4 digits by a one - or two -digit number using a formal written method, including</li> <li>◆ long multiplication for two -digit numbers</li> </ul> <p style="background-color: yellow; padding: 5px;"><i>Compact methods for multiplication are efficient but often do not make the value of each digit explicit. When introducing multiplication of decimals, it is sensible to take children back to an expanded form such as the grid method where the value of each digit is clear, to ensure that children understand the process.</i></p> <p style="background-color: yellow; padding: 5px;"><i>Revert to expanded methods if children find formal calculation method difficult (see Y3/Y4)</i></p>



<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>																																																					
<p><i>Cuisenaire to represent scaling</i></p> <p><i>Statue is 3 times as tall: 3 metres</i></p> <p><i>flexible array</i></p> <p><i>arrays</i></p> <p><i>place value counters</i></p> <p><i>bar models</i></p>	<p><i>Children might use manipulatives alongside algorithms</i></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>10    8</p> <p>7    70    56</p> </div> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse;"> <tr><td> </td><td>1</td><td>8</td></tr> <tr><td>×</td><td>7</td><td> </td></tr> <tr><td colspan="3" style="border-top: 1px solid black;"> </td></tr> <tr><td> </td><td>7</td><td>0</td></tr> <tr><td colspan="3" style="border-top: 1px solid black;"> </td></tr> <tr><td> </td><td>5</td><td>6</td></tr> <tr><td colspan="3" style="border-top: 1px solid black;"> </td></tr> <tr><td>1</td><td>2</td><td>6</td></tr> </table> </div> </div> <p><i>Short multiplication</i></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>1 3 2 4</p> <p>  x 6</p> <hr/> <p>7 9 4 4</p> <p>1 1 2</p> </div> <div style="text-align: center;"> <p>3 . 2 4</p> <p>  x 6</p> <hr/> <p>1 9 . 4 4</p> <p>1 2</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>x    10    8</p> <p>10    100    80</p> <p>3    30    24</p> </div> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse;"> <tr><td> </td><td>1</td><td>8</td></tr> <tr><td>×</td><td>1</td><td>3</td></tr> <tr><td colspan="3" style="border-top: 1px solid black;"> </td></tr> <tr><td> </td><td>1</td><td>8</td><td>0</td></tr> <tr><td colspan="4" style="border-top: 1px solid black;"> </td></tr> <tr><td> </td><td>5</td><td>4</td><td> </td></tr> <tr><td colspan="4" style="border-top: 1px solid black;"> </td></tr> <tr><td>2</td><td>3</td><td>4</td><td> </td></tr> </table> </div> </div> <p><i>Long multiplication</i></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>1 3 2 4</p> <p>  x 2 6</p> <hr/> <p>7 9 4 4</p> <p>2 6 4 8 0</p> <p>1 1 2</p> <hr/> <p>3 4 4 2 4</p> <p>1 1 1</p> </div> <div style="text-align: center;"> <p>3 . 2 4</p> <p>  x 2 6</p> <hr/> <p>1 9 . 4 4</p> <p>6 4 . 8 0</p> <p>1 2</p> <hr/> <p>8 4 . 2 4</p> <p>1 1</p> </div> </div>		1	8	×	7						7	0					5	6				1	2	6		1	8	×	1	3					1	8	0						5	4						2	3	4	
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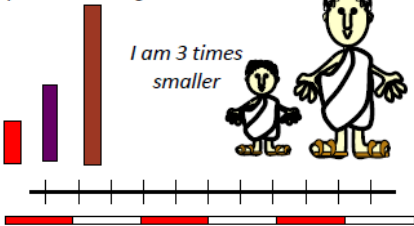



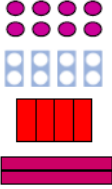
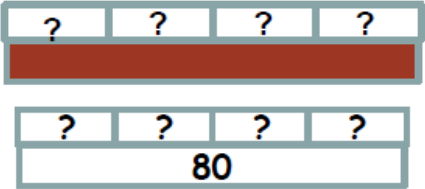
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count forwards in steps of powers of 10 from any given number up to 1 000 000</li> <li>◆ Practise and extend use of formal written method of short multiplication</li> <li>◆ Apply all multiplication tables frequently. Commit them to memory and use them confidently to make larger calculations</li> <li>◆ Multiply numbers mentally drawing upon known facts</li> </ul>
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Moorgate Primary Academy Multiplication Calculation: Year 6	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>• <b>Perform mental calculations, including with mixed operations and large numbers</b> (<i>increasingly large numbers &amp; more complex calculations</i>)</li> <li>• <i>Use all the multiplication tables to calculate mathematical statements in order to maintain fluency.</i></li> <li>• <b>Use estimation to check answers to calculations &amp; determine, in the context of a problem, an appropriate degree of accuracy.</b></li> <li>• <b>Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places</b></li> </ul> <div style="background-color: yellow; padding: 5px;"> <p><i>Use mental strategies to solve problems e.g.</i></p> <ul style="list-style-type: none"> <li>❖ <i>x4 by doubling and doubling again</i></li> <li>❖ <i>x5 by x10 and halving</i></li> <li>❖ <i>x20 by x10 and doubling</i></li> <li>❖ <i>x9 by multiplying by 10 and adjusting</i></li> <li>❖ <i>x6 by multiplying by 3 and doubling</i></li> </ul> </div>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ <b>Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication</b> (<i>short &amp; long multiplication</i>)</li> <li>◆ <b>Multiply one-digit numbers with up to two decimal places by whole numbers</b></li> </ul>
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
<i>Children apply, consolidate and secure their understanding of columnar multiplication within the context of new mathematical concepts taught within year 6. (see year 5 table for guidance)</i>	
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Undertake mental calculations with increasingly large numbers</li> <li>◆ Continue to use all multiplication tables to calculate mathematical statements in order to maintain fluency</li> </ul>

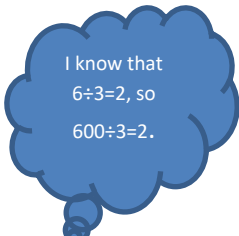
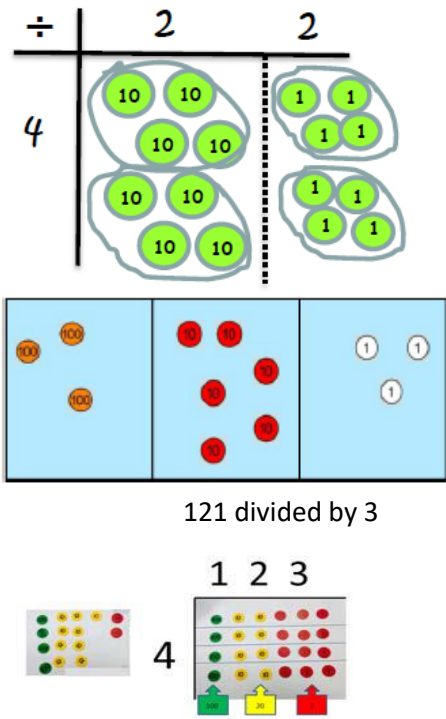
# Division

Moorgate Primary Academy Division Calculation: Year 1	
<p><b>Mental Calculation</b></p>	<ul style="list-style-type: none"> <li>Solve one-step problems involving multiplication and division, by calculating the answer using concrete</li> <li>objects, pictorial representations and arrays with the support of the teacher.</li> <li><i>(Pupils) make connections between arrays, number patterns, and counting in twos, fives and tens.</i></li> </ul> <p><i>Children should experiment with the concepts of sharing and grouping in a number of contexts. Initially they use their own recording—moving towards fluent, symbolic notation in Year 2. Conceptual understanding and recording should be continuously supported by the use of <b>arrays</b> as a default model, as well as other representations,</i></p>
<p><b>Written Calculation</b></p>	<ul style="list-style-type: none"> <li>Use a range of concrete and pictorial representations, including:</li> <li>manipulatives to support children’s own recording; and understanding of <i>sharing</i> and the link with multiplication - “How can we share 6 cakes between 2 people?”</li> <li>manipulatives, and real-life objects to support children’s own recording; and understanding of <i>grouping</i> and the link with multiplication.</li> <li>Dominoes and dice to reinforce concepts of doubling and halving.</li> </ul>
Possible Concrete and Visual Representations	Teacher Modelling/Children’s Recordings
<p>counting in groups of twos</p> <p>straw bundles</p> <p>four lots of two</p> <p>Numicon and counter arrays</p> <p>Cuisenaire</p> <p>four lots of two    two lots of four</p> <p>doubling</p> <p>flexible array</p> <p>bar models</p>	<p>Using concrete objects, pictorial representations and arrays with the support of an adult – take photographs/draw pictures – if using Numicon small icons could be stuck in</p> <p>Eight can be divided into four equal groups of two or two equal groups of four</p> <p>How many 2's can we fit on the 6 shape?</p>
<p><b>Fluency</b></p>	<ul style="list-style-type: none"> <li>Count in twos, fives and tens from different multiples e.g. 6, 8, 10, 12 etc.</li> <li>Emphasise patterns</li> <li>Find simple fractions e.g. half and quarter, of objects, numbers and quantities</li> </ul>

Moorgate Primary Academy Division Calculation: Year 2	
<b>Mental Calculation</b>	<ul style="list-style-type: none"> <li>❖ Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers .</li> <li>❖ Calculate mathematical statements for multiplication and division within</li> <li>❖ the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs .</li> </ul>
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</li> <li>◆ Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.</li> </ul>
Possible Concrete and Visual Representations	Teacher Modelling/Children's Recordings
<p><i>See possible representations used in Year 1</i></p>	<p>Record as number sentences using ÷ and =</p> <p style="text-align: center;"><math>8 \div 4</math></p> <p>Eight divided into four equal groups = two in each group</p> <p style="text-align: center;"><math>8 \div 4 = 2</math></p>   <p><i>Eight can be divided into four equal groups of two or two equal groups of four</i></p>
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count back in twos, threes, fives from zero and tens from any number</li> <li>◆ e.g. 12, 10, 8, 6 etc.</li> <li>◆ Emphasise patterns</li> <li>◆ Connect ten times table to place value and five times table to divisions on a clock face</li> <li>◆ Introduction to multiplication tables. Practise to become fluent in division facts for 2, 5 and 10</li> <li>◆ Solve division problems involving grouping and sharing</li> </ul>

Moorgate Primary Academy Division Calculation: Year 3	
Mental Calculation	<ul style="list-style-type: none"> <li>❖ Pupils should be taught to recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.</li> <li>❖ Pupils continue to practise their mental recall of multiplication tables .in order to improve fluency.</li> <li>❖ Pupils develop efficient mental methods, for example, using commutativity and associativity (e.g., <math>4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240</math>) and multiplication and division facts to derive related facts.</li> </ul>
Written Calculation	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>❖ 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.</li> <li>❖ 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.</li> </ul> <p style="background-color: yellow; padding: 5px;">❖ New written methods can be modelled alongside mental or informal methods to ensure understanding.</p>
Possible Concrete and Visual Representations	Teacher Modelling/Children's Recordings
<p><i>Cuisenaire to represent scaling</i></p>  <p><i>Statue is 3 metres</i></p>  <p><i>I am 3 times smaller</i></p>  <p><i>arrays</i></p>   <p><math>88 \div 4</math></p>  <p><i>bar models</i></p>	<p><b>Short division of <math>TU \div U</math></b></p> <p>For <math>81 \div 3</math>, the dividend of 81 is split into 60, the highest multiple of 3 that is also a multiple 10 and less than 81, to give <math>60 + 21</math>.</p> <p>Each number is then divided by 3.</p> $81 \div 3$ $60 \quad (3 \times 20)$ $21 \quad (3 \times 7)$ <p><u>ans=27</u></p>
Fluency	<ul style="list-style-type: none"> <li>❖ Recall and use related division facts for the 3, 4 and 8x tables (Continue to practise other tables)</li> <li>❖ Write and calculate mathematical statements for division using what is known</li> <li>❖ Use division facts to derive related division facts e.g. using <math>6 \div 3 = 2</math> to work out <math>60 \div 3 = 20</math></li> </ul>



Moorgate Primary Academy Division Calculation: Year 4	
<p><b>Mental Calculation</b></p> 	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>Recall multiplication and division facts for multiplication tables up to 12 × 12</li> <li>Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers</li> <li>Recognise and use factor pairs and commutatively in mental calculations.</li> </ul> <p>❖ Pupils practise mental methods and extend this to three-digit numbers to derive facts</p>
<p><b>Written Calculation</b></p>	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>multiply two-digit and three-digit numbers by a one-digit number using formal written layout</li> <li>solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.</li> </ul>
Possible Concrete and Visual Representations	Teacher Modelling/Children's Recordings
 <p>121 divided by 3</p>	<p><i>Progressing the method from year 3...</i></p> <p>The short division method is recorded like this:</p> $\begin{array}{r} 20 + 7 \\ 3 \overline{)60 + 21} \end{array}$ <p>This is then shortened to:</p> $\begin{array}{r} 27 \\ 3 \overline{)81} \end{array}$
<p><b>Fluency</b></p>	<ul style="list-style-type: none"> <li>Continue to practise recalling division facts for multiplication tables up to 12 x 12</li> <li>Practise mental methods and extend this to three-digit numbers for example <math>200 \times 3 = 600</math> into <math>600 \div 3 = 200</math></li> <li>Use place value, known and derived facts to divide mentally, including dividing by 1</li> <li>Recognise and use factor pairs and commutatively in mental calculations</li> </ul>

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**Moorgate Primary Academy Division Calculation: Year 5**

<b>Mental Calculation</b>	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>• multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</li> <li>• multiply and divide numbers mentally drawing upon known facts</li> <li>• identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.</li> </ul> <p style="background-color: yellow; text-align: center;"><i>Pupils apply all the multiplication tables and related division facts frequently and use them confidently .</i></p>
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<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ Pupils practise and extend their use of the formal written methods of short multiplication and short division.</li> <li>◆ Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.</li> </ul>
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<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
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*Cuisenaire to represent scaling*

*Statue is 3 metres*

*flexible arrays*

$4.8 \div 4$

**0.8**

**bar models**

To find  $196 \div 6$ , start by multiplying 6 by 10, 20, 30, ... to find that  $6 \times 30 = 180$  and  $6 \times 40 = 240$ . The multiples of 180 and 240 trap the number 196. This tells us that the answer to  $196 \div 6$  is between 30 and 40.

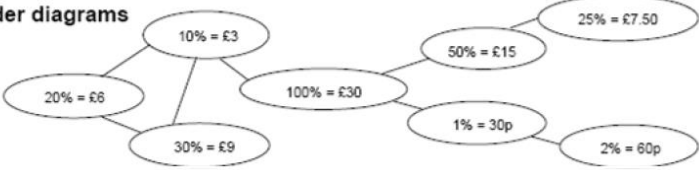
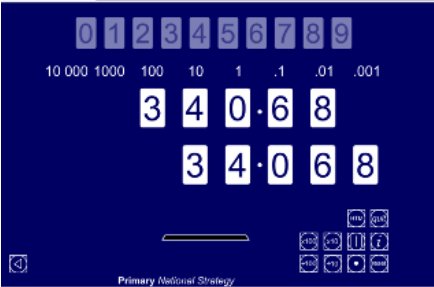
Start the division by first subtracting 180, leaving 16, and then subtracting the largest possible multiple of 6, which is 12, leaving 4.

$$\begin{array}{r}
 6 \overline{)196} \\
 - 180 \quad 6 \times 30 \\
 \hline
 16 \\
 - 12 \quad 6 \times 2 \\
 \hline
 4
 \end{array}$$

**Answer: 32 R 4**

The quotient 32 (with a remainder of 4) lies between 30 and 40, as predicted.

<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Count backwards in steps of powers of 10 for any given number up to 1 000 000</li> <li>◆ Count backwards with positive/negative whole numbers through zero</li> <li>◆ Practise mental calculation with increasingly large numbers</li> <li>◆ Apply all multiplication tables and related division facts frequently, commit</li> </ul>
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	them to memory and use them to confidently to make larger calculations
<b>Moorgate Primary Academy Division Calculation: Year 6</b>	
<b>Mental Calculation</b>	<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>• Perform mental calculations, including with mixed operations and large numbers.</li> <li>• Use their knowledge of the order of operations to carry out calculations involving the four operations.</li> <li>• Identify common factors, common multiples and prime numbers.</li> <li>• 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.</li> </ul> <p>Spider diagrams</p> 
<b>Written Calculation</b>	<ul style="list-style-type: none"> <li>◆ 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</li> <li>◆ 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.</li> </ul>
<b>Possible Concrete and Visual Representations</b>	<b>Teacher Modelling/Children's Recordings</b>
<p style="text-align: center;"><i>See possible representations used in year 5</i></p>  <p style="text-align: center;"><math>£1362.72 \div 40 = ?</math></p> <div style="border: 1px solid blue; padding: 5px; background-color: #e6f2ff; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"> <math>£1362.72 \div 4 = £340.68</math>  <i>[½ and ½ again.]</i>  <math>£340.68 \div 10 = £34.068</math>  <i>which rounds to £34.07.</i> </p> </div>	<p>Children consolidate the long division in year 5, progressing to a more refined approach.</p> $  \begin{array}{r}  23 \\  24 \overline{) 560} \\  \underline{-480} \\  80 \\  \underline{-72} \\  8  \end{array}  $ <p>Answer: 23 R 8</p>
<b>Fluency</b>	<ul style="list-style-type: none"> <li>◆ Practise division for larger numbers, using the formal written methods of short and long division</li> <li>◆ Continue to use all multiplication tables and division facts to maintain fluency</li> <li>◆ Perform mental calculations, including with mixed operations and larger numbers</li> </ul>

