



# Written and Manipulatives Policy

Signed: ----- Date: -----  
Chair of Governors

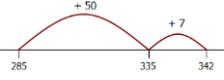
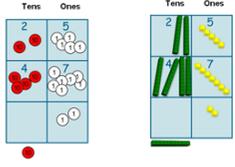
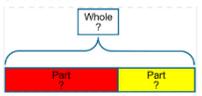
Signed: ----- Date: -----  
Headteacher

Adopted and Approved by the Governing Body: **October 2023**  
Review Date: **October 2027**

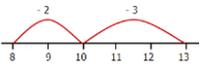
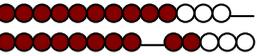
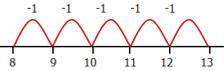
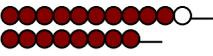
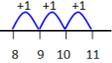
## Written Manipulatives Calculation Policy

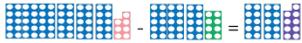
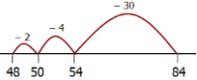
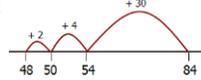
The intent of our Mathematics curriculum is to be accessible to all and to maximise the development of every child's ability and academic achievement. Every child has an **equal** opportunity to access maths at their level and pace and this is catered for through differentiation to enhance a **safe** learning environment. We want children to make rich connections across Mathematical ideas to develop fluency, reasoning and problem solving and their taught **resilience** will enhance and develop these skills. Within (and beyond) lessons, children are challenged with "next steps" and extensions, creating a culture, where, within lessons, our learners want to be **ambitious** in all that they access and achieve. Our pupils will learn to apply their Mathematical knowledge not only within their Mathematics lessons but also across the curriculum, for example in Art, Science, Geography and DT. We want our pupils to understand that a confident understanding of Mathematics is the bedrock for Science, Technology and Engineering (STEM), necessary for the management of every day finances and a crucial component of most forms of employment. As our pupils progress, we intend that they: be able to calculate swiftly and accurately; have the ability to reason mathematically; have an appreciation of the beauty and power of mathematics and a sense of enjoyment and **curiosity** about the subject.

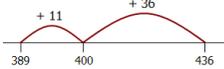
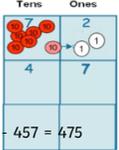


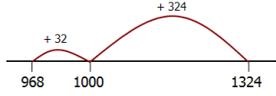
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|----|--|--|--|--|--|--|---|
|    |  | representations and mental strategies.<br><br>(e.g. dienes, 100 square, abacus, numicon)   |  |  | $80 + 2 = 82$  |  | Estimate answers and use inverse to check.  |
|    |  |  |  |  |  |  |   |
| Y3 | Use formal written methods of columnar addition.<br><br>TO + TO<br>HTO + TO<br>HTO + HTO   | Place value counters, dienes<br><br>Number line $57 + 285 = 342$<br><br>Use alongside dienes as needed<br><br>                            | No number line<br><br><br>$57 + 285 = 342$<br><br>$285 + 50 = 335$<br>$335 + 7 = 342$   | Chaining<br><br>$56 + 33 = 80 + 9$<br><br>Bar model<br><br>(see Y2)  | Vertical expansion method using multi base and place value counters<br><br> | Compact vertical<br><br>$\begin{array}{r} 374 \\ + 248 \\ \hline 622 \\ \hline \end{array}$ Use alongside place value counters   | Estimate answers and use inverse to check.  |
| Y4 | Use formal written methods of columnar addition.<br><br>HTO + HTO<br>ThHTO + HTO<br>ThHTO + ThHTO                                      | Estimate and use inverse operations to check answers to a calculation.<br><br>Estimate, compare and calculate different measures, including money in pounds and pence.   | Chaining<br><br>$132 + 121 = 100 + 50 + 3$<br><br>$789 + 642 = 1431$<br><br>$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline \end{array}$<br><br>   | $5735 + 562 = 6297$<br><br>$\begin{array}{r} 5735 \\ + 562 \\ \hline 6297 \\ \hline \end{array}$   |  | Solve addition two-step problems in contexts, deciding which operations and methods to use & why.<br><br>Solve simple measure and money problems involving fractions and decimals to 2dp |   |
| Y5 | Add whole numbers >4 digits, including using formal written methods (columnar addition).<br><br>Decimals up to 2dp (eg $72.5 + 45.7$ ) | Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.<br><br>Solve addition multi-step problems in contexts, deciding which operations and methods to use and why. | Solve problems involving number up to 3dp.<br><br>Solve problems involving converting between units of time. [Measurement]<br><br>Use all four operations to solve problems involving measure [eg length, mass, volume, money] using decimal notation including scaling. [Measurement] | Chaining<br><br>$234 + 223 = 400 + 50 + 7$<br><br>Bar model<br><br> |  | Compact vertical<br><br>$\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 72.26 \\ \hline 11 \\ \hline \end{array}$   | Pupils practise adding decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1.<br><br>Compact vertical Using place value counters.<br><br>$3.243$<br><br>$+ 18.070$ |

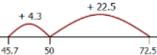
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|    |  |  |   |  |                                    |  | $\begin{array}{r} \phantom{21.}313 \\ \hline \phantom{21.}313 \\ \hline \phantom{21.}313 \end{array}$   |
| Y6 | Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp. (Context: Measures) | Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | Use knowledge of the order of operations to carry out calculations involving subtraction. | <p><b>Solve problems which require answers to be rounded to specified degrees of accuracy. [Fractions]</b></p> <p><b>Solve problems involving the calculation and conversion of units of measure, using decimal notation to 3dp where appropriate. [Measurement]</b></p> | <p>Chaining</p> $453+342=700+90+5$ | <p>Bar model</p>  | <p><b>Compact</b> vertical using place value counters</p> $\begin{array}{r} 3.243 \\ + \underline{18.070} \\ \hline 21.313 \\ \hline 2 \quad 1 \end{array}$ |

|    |   | <b>SUBTRACTION</b>   |   |   |   |
|----|---|--|---|---|---|
|    | Statutory Expectations  |  |   |   |   |
| YR | Count ... from 1-20 ... and say which no. is 1 less than a given no. Using quantities objects, subtract two U numbers and count back to find the answer. [Expected] Estimate no. of objects; check quantities by counting up to 20. [Exceeding] | <p>Practical or recorded using ICT.</p> <p>Chloe was playing in the maths area. "I need three more" she said as she added some cubes to the circle. She then realised she had more than her friend. "Oh, I have too many". She removed one. "Now we have the same".</p> <p>During a game of skittles outdoors Joseph knocked three numbered skittles down. He was able to calculate his score in his head.</p> <p><a href="#">[EYFS Profile exemplifications. STA]</a></p> | <p>Pictures/Objects</p> <p>I have five cakes. I eat two of them. How many do I have left?</p>   <p><math>10 - 3 = 7</math></p> <p>Could be written as <math>5 - 2 = 3</math></p>   | <p>Symbolic</p> <p>Mum baked 9 biscuits. I ate 5. How many were left?</p>  <p><b>[Might be recorded as: <math>9 - 5 = 4</math>]</b></p>  |   |
| Y1 | Subtract (and add) one-digit and two-digit numbers to 20 ( $9 + 9$ , $18 - 9$ ), including zero<br><br>Read/write/interpret statements involving addition (+), subtraction (-) and equals (=) signs   | <p>Practical or recorded using ICT.</p> <p>Pupils use concrete objects and pictorial representations (e.g. place value counters, Dienes, numicon)</p>  | <p><b>Taking away</b> - jumps of 1<br/>(efficient jumps)</p> <p><math>13 - 5 = 8</math></p>  <p>No number line:</p> <p><math>13 - 3 = 10</math></p> <p><math>10 - 2 = 8</math></p> <p><math>13 - 5 = 8</math></p>   | <p><b>Counting on</b> - jumps of 1</p> <p>(modelled using bead strings)</p> <p><math>11 - 8 = 3</math></p>   <p>the difference between</p>  <p>and is</p> <p><math>8 - 5 = 3</math></p> | <p><b>Counting on</b> (efficient jumps)</p> <p>With, or without, number line</p> <p><math>8 + 2 = 10</math></p> <p><math>10 + 1 = 11</math></p> |

|           |   |   |   |  |   |   |  |
|-----------|---|---|---|--|---|---|--|
| <p>Y2</p> | <p><b>TO - O</b><br/><b>TO - tens</b><br/><b>TO - TO</b></p> <p>[Show subtraction of two numbers <u>cannot</u> be done in any order.]</p> | <p>Recognise/use relationship betw. +/- to check calculations and missing number problems.</p> <p>Pupils use concrete objects and pictorial representations and <b>mental strategies</b> (eg. place value counters, Dienes)</p> | <p>Practical/visual images</p> <p><math>95 - 60 = 35</math></p>  | <p><b>Taking away</b> <math>84 - 36 = 48</math></p>  <p>Also jumps can be done in 10s/1s</p> | <p><b>Taking away</b> (no number line)</p> <p><math>84 - 36 = 48</math></p> <p><math>84 - 30 = 54</math></p> <p><math>54 - 4 = 50</math></p> <p><math>50 - 2 = 48</math></p> <p>Use arrow cards</p>  | <p><b>Find the Difference</b> <math>84 - 48 = 36</math></p>  <p>Also jumps can be done in 10s/1s</p> | <p>Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers.</p> <p><math>98 - 35 = 63</math></p> <p>90 and 8<br/>30 and 5<br/>60 and 3</p> |
|-----------|---|---|---|--|---|---|--|

|           |   |   |   |   |  |  |  |
|-----------|---|---|---|---|--|--|--|
| <p>Y3</p> | <p>Use <b>formal</b> written methods of <b>columnar addition</b></p> <p><b>TO - TO</b><br/><b>HTO - TO</b><br/><b>HTO - HTO</b></p> | <p>Dienes, numicon, place value counters</p> <p><b>Counting on</b> <math>436 - 389 = 47</math></p>  | <p><b>Taking away</b> (no number line)</p> <p><math>326 - 178 = 148</math></p> <p><math>326 - 100 = 226</math></p> <p><math>226 - 70 = 156</math></p> <p><math>156 - 6 = 150</math></p> <p><math>150 - 2 = 148</math></p> | <p><math display="block">\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}</math></p> <p><math>874 - 523 = 351</math></p> <p>No decomposition</p> | <p>Oral and practical</p> <p><b>Decomposition</b></p> <p><math>723 - 458 = 265</math></p>  | <p><b>Decomposition</b></p>  <p><math>932 - 457 = 475</math></p>  | <p>Estimate answers and use inverse to check.</p> <p>Bar Model</p> |
|-----------|---|---|---|---|--|--|--|

|           |  |  |   |  |  |
|-----------|--|--|---|--|--|
| <p>Y4</p> | <p>Use <b>formal</b> written methods of <b>columnar subtraction</b>.</p> <p><b>HTO - HTO</b><br/><b>ThHTO - TO</b><br/><b>ThHTO - HTO</b><br/><b>ThHTO - ThHTO</b></p> | <p>Dienes, place value counters, numicon</p> <p><b>Counting on</b> <math>1324 - 968 = 356</math></p>  | <p><b>Decomposition</b></p> <p><math display="block">\begin{array}{r} 1374 \\ - 968 \\ \hline 406 \end{array}</math></p> <p><math>1374 - 968 = 406</math></p> | <p><b>Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why.</b></p> <p>Solve simple measure and money problems involving fractions and decimals to 2dp.</p> | <p>Estimate and use inverse operations to check.</p> <p>Estimate, compare and calculate different measures, including money in pounds and pence.</p> |
|-----------|--|--|---|--|--|

|    |   |  |   |   |   |  |   |
|----|---|--|---|---|---|--|---|
|    |   |  |   |   |   | Bar Model  |   |
| Y5 | <p>Subtract whole numbers &gt;4 digits, including using <b>formal methods (columnar subtraction)</b>.</p> <p>Decimals up to 2dp (eg. 72.5 - 45.7)</p> | <p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.</p> <p>Solve multi-step problems in contexts, deciding which operations/methods to use and why.</p>   | <p>Solve problems involving number up to 3dp. [<i>Fractions</i>]</p> <p>Solve problems involving converting between units of time. [<i>Measurement</i>]</p> <p>Solve problems involving measure [e.g. length, mass, volume, money] using decimal notation including scaling. [<i>Measurement</i>]</p> | <p>Dienes, place value counters</p> <p>Counting on</p>  <p>72.5 - 45.7 = 26.8</p> | <p><b>Taking away</b></p> <p>(no number line)</p> <p>72.5 - 45.7</p> <p>72.5 - 40 = 32.5</p> <p>32.5 - 5 = 27.5</p> <p>27.5 - 0.7 = 26.8</p>  | <p><b>Decomposition</b></p> <p>72.5 - 45.7 = 26.8</p> $\begin{array}{r} 72.5 \\ - 45.7 \\ \hline 26.8 \end{array}$ | <p>Pupils practise subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1.</p> <p>Bar Model</p> |
| Y6 | <p>Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp (Context: Measures)</p>                | <p>Use knowledge of the order of operations to carry out calculations involving subtraction.</p> <p>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</p> <p>Dienes, place value counters</p> | <p>Solve problems which require answers to be rounded to specified degrees of accuracy. [<i>Fractions</i>]</p> <p>Solve problems involving the calculation and conversion of units of measure, using decimal notation to 3dp where appropriate. [<i>Measurement</i>]</p>                              | <p>Bar Model</p>  | <p>There was 2.5 litres in the jug. He drank 385 ml. How much was left?</p> <p>18.07 km - 3.263 km</p> <p>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</p> | <p><b>Decomposition</b></p> <p>72.5 - 45.7 = 26.8</p> $\begin{array}{r} 72.5 \\ - 45.7 \\ \hline 26.8 \end{array}$ |   |

| Statutory Expectations |  | MULTIPLICATION  |   |   |  |  |
|------------------------|--|---|---|---|--|--|
| YR                     | <p>Children ... solve problems, including doubling, halving and sharing. [Expected]</p> <p>Solve practical problems that involve combining groups of 2/5/10. [Exceeding]</p> | <p>Practical/ recorded using ICT (e.g. digital photos / pictures on IWB)</p> <p>How many 10p coins are here? How much money is that?</p> <p>This domino is a double 4. How many spots does it have?</p> | <p>Pictures/Objects</p>  <p>How many socks in three pairs?</p>  | <p>Symbolic</p> <p>3 pairs, 2 socks in each pair:</p>  |  |  |



Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)

Practical/recorded using ICT

Pictures/Symbolic

There are five cakes in each bag.

How many cakes are there in three bags?



Double sided counters

Using numicon number line to solve repeated addition problems by laying pieces upon track.

Visual (eg modelled using bead strings/double sided counters)

5 x 3 or 3 x 5 [two, three times] or [three groups of two]



0 5 10 15

Bar model

Arrays

5 x 2 or 2 x 5



Y1

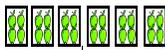
Calculate statements for multiplication within the multiplication tables and write them using the multiplication and equals signs.

[Show multiplication of two numbers can be done in any order.]

Pictures/Symbolic

There are four apples in each box.

How many apples in six boxes?



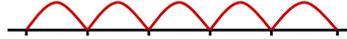
Pupils use a variety of language to describe multiplication.

Bar model

Repeated addition

Double sided counters

5 x 3 or 3 x 5



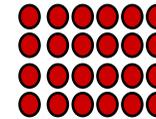
0 3 6 9 12 15



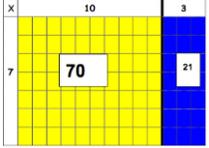
0 5 10 15

Arrays Real life arrays e.g. egg boxes

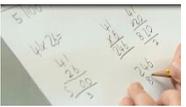
6 x 4 or 4 x 6



Y2

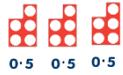
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|----|--|--|---|---|----|---|---|-----|----|---|---|--|
| Y3 | <p>Write/calculate statements using the multiplication tables that they know (progressing to formal written methods).</p> <p><b>TO x O</b></p> <p>(multiplier is 2/3/4/5/8/10)</p> | <p>Make the link between arrays and the grid method.<br/>Explicit:</p>  | <p><math>36 \times 4 = 144</math></p> <table border="1" data-bbox="645 188 786 252"> <tr> <td>X</td> <td>30</td> <td>6</td> </tr> <tr> <td>4</td> <td>120</td> <td>24</td> </tr> </table> | X | 30 | 6 | 4 | 120 | 24 | <p><math>36 \times 4 = 144</math></p> <p><math>30 \times 4 = 120</math></p> <p><math>6 \times 4 = 24</math></p> | <p><math>36 \times 4 = 144</math></p> $\begin{array}{r} 36 \\ \times 4 \\ \hline 144 \\ \hline \end{array}$ | <p><i>Pupils develop reliable written methods for multiplication, starting with calculations of TU by U (progressing to formal written methods of short multiplication).</i></p> |
| X  | 30   | 6  |   |   |    |   |   |     |    |   |   |  |
| 4  | 120  | 24   |   |   |    |   |   |     |    |   |   |  |

|    |   |  |   |   |  |   |
|----|---|--|---|---|--|---|
| Y4 | <p>Use formal written layout:</p> <p><b>TO x O</b></p> <p><b>HTO x O</b></p> <p>Convert between different units of measure [eg km to m; hr to mi]</p> | <p><math>43 \times 6 = 258</math></p> <p>(estimate: <math>40 \times 6 = 240</math>)</p> <p><math>40 \times 6 = 240</math></p> <p><math>3 \times 6 = 18</math></p> <p>Bar model</p> | <p><math>24 \times 6 = 144</math></p> $\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \hline \end{array}$ |  <p>Using known facts to generate new facts.</p> <p><math>5 \times 4 = 20</math></p> <p><math>4 \times 5 = 20</math></p> |  | <p><math>342 \times 7 = 2394</math></p> $\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline \end{array}$ |
|----|---|--|---|---|--|---|

|    |  |  |      |    |   |  |    |      |     |      |   |     |    |     |  |  |  |      |   |  |   |  |   |
|----|--|--|------|----|---|--|----|------|-----|------|---|-----|----|-----|--|--|--|------|---|--|---|--|---|
| Y5 | <p>Use a formal written method (including long x for TO numbers)</p> <p><b>TO x TO</b></p> <p><b>HTO x O / HTO x TO</b></p> <p><b>ThHTO x O</b></p> <p>Convert between units of measure (eg km/m; m/cm; cm/mm; kg/g; litre and ml)</p> | <p><math>47 \times 36 = 1692</math></p> <p>(estimate <math>50 \times 40 = 2000</math>)</p> <table border="1" data-bbox="360 1193 495 1273"> <tr> <td>x</td> <td>40</td> <td>7</td> <td></td> </tr> <tr> <td>30</td> <td>1200</td> <td>210</td> <td>1410</td> </tr> <tr> <td>6</td> <td>240</td> <td>42</td> <td>282</td> </tr> <tr> <td></td> <td></td> <td></td> <td>1692</td> </tr> </table> | x    | 40 | 7 |  | 30 | 1200 | 210 | 1410 | 6 | 240 | 42 | 282 |  |  |  | 1692 |  <p>Partition into 2 short multiplication sums as an interim step.</p> | <p><math>2741 \times 6 = 16446</math></p> <p>(estimate <math>3000 \times 6 =</math></p> $\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ \hline \end{array}$ <p>18000</p> | <p><math>24 \times 16 = 384</math> (estimate <math>25 \times 15 = 375</math>)</p> $\begin{array}{r} 24 \\ \times 16 \\ \hline 144 \\ 240 \\ \hline 384 \\ \hline \end{array}$ | <p><math>124 \times 26 = 3224</math> [see Y6]</p> $\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ \hline \end{array}$ | <p><i>Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division. This relates to scaling by simple fractions, including those &gt; 1.</i></p> <p><i>Find fractions of numbers and quantities, writing remainders as a fraction.</i></p> |
| x  | 40   | 7  |      |    |   |  |    |      |     |      |   |     |    |     |  |  |  |      |   |  |   |  |   |
| 30 | 1200   | 210  | 1410 |    |   |  |    |      |     |      |   |     |    |     |  |  |  |      |   |  |   |  |   |
| 6  | 240  | 42   | 282  |    |   |  |    |      |     |      |   |     |    |     |  |  |  |      |   |  |   |  |   |
|    |  |  | 1692 |    |   |  |    |      |     |      |   |     |    |     |  |  |  |      |   |  |   |  |   |

Bar model

Multi-digit numbers (up to 4 digits)  $\times$  TU whole number using the **formal** method of **long multiplication**.



Apply knowledge of patterns to variations of place.

Multiply one-digit numbers with up to two decimal places by whole numbers.

$$124 \times 26 = 3224$$

$$\begin{array}{r} \phantom{1} \phantom{2} \\ 1 \phantom{2} \phantom{4} \\ \times \phantom{2} \phantom{6} \\ \hline 7 \phantom{4} \phantom{4} \\ 2 \phantom{4} \phantom{8} \phantom{0} \\ \hline 3 \phantom{2} \phantom{2} \phantom{4} \\ \phantom{1} \phantom{1} \end{array}$$

[NB See Y5 method]

$$4.7 \times 8 = 37.6$$

(estimate  $5 \times 8 = 40$ )

$$\begin{array}{r} 4.7 \\ \times \phantom{8} \\ \hline 37.6 \\ \phantom{5} \end{array}$$

[Or  $47 \times 8$ , then divide the solution by 10.]

Bar model

$$5.65 \times 9 = 50.85$$

(estimate  $6 \times 9 = 54$ )

$$\begin{array}{r} \times \phantom{5} \phantom{0.6} \phantom{0.05} \\ 9 \phantom{45} \phantom{5.4} \phantom{0.45} \\ \hline 50.85 \end{array}$$

[Or compute  $565 \times 9$ , then divide the solution by 100.]

Use a variety of images to support understanding of  $x$  with fractions. Use understanding of relationship between unit fractions and  $\div$  to work backwards by  $x$  a quantity that represents a unit fraction to find the whole quantity (eg if  $\frac{1}{4}$  of a length is 36cm, whole length  $36 \times 4 = 144$ cm).  $x$  numbers with up to 2dp by U/TU whole numbers (starting with simplest cases e.g.  $0.4 \times 2 = 0.8$ , and in practical contexts).

Y6

**Statutory Expectations**

**DIVISION**

Children ... solve problems, including doubling, halving and sharing. [Expected]  
They solve practical problems that involve sharing into equal groups. [Exceeding]

Practical / recorded using ICT (e.g. digital photos/pictures on IWB)

Pictures/Objects



6 cakes shared between 2



6 cakes put into groups of 2



Symbolic

6 cakes shared between 2



There are 8 raisins.

Take half of them.

How many do you have?

Share the 10 grapes between 2 people.

Sharing should only be used briefly as a precursor to grouping, which is a more preferable method and should be moved on to as soon as possible. Solving division by grouping strengthens mental calculation strategies.

Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)

Practical/recorded using ICT

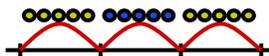
Pictures/Symbolic

How many apples in each bowl if I share 12 apples between 3 bowls?



Visual (modelled using bead strings)

$15 \div 5 = 3$



0                    5                    10                    15

Double sided counters

There are 14 people on the bus. Half of them get off.

How many remain on the bus?

There are 20 people in the class. One quarter are boys. How many boys are there?

YR

Y1



