

# TWHF Calculation Policy

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**School Name:** Grange Junior School

**Version No:** 1

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**Owner:** CEO

**Approved by:** CEO

**Ratified date:** June 2020

**Interim review date:** 01/06/2021

**Next review date:** June 2023

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# Year 3

## Year 3

|          |             |                |          |
|----------|-------------|----------------|----------|
| Addition | Subtraction | Multiplication | Division |
|----------|-------------|----------------|----------|

### Written Method

|                 |                    |                      |                |
|-----------------|--------------------|----------------------|----------------|
| Column addition | Column Subtraction | Short Multiplication | Short division |
|-----------------|--------------------|----------------------|----------------|

$$\begin{array}{r}
 223 \\
 + 114 \\
 \hline
 337
 \end{array}$$

$$\begin{array}{r}
 \overset{1}{\cancel{2}}\overset{1}{3}4 \\
 - \underline{152} \\
 \hline
 \underline{182}
 \end{array}$$

Short Multiplication

Short division

Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction

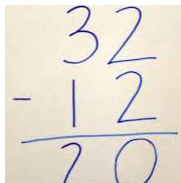
Intermediate step may be needed to lead to clear subtraction understanding

Start with multiplying by one digit numbers and showing the clear addition alongside the grid.


Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.

Add the ones first, then the tens, then the hundreds.

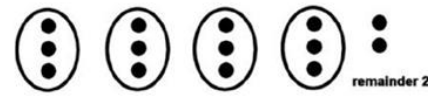
$$47 - 24 = 23$$

$$\begin{array}{r}
 40 + 7 \\
 - 20 + 4 \\
 \hline
 20 + 3
 \end{array}$$


|   |     |    |
|---|-----|----|
| × | 30  | 5  |
| 7 | 210 | 35 |

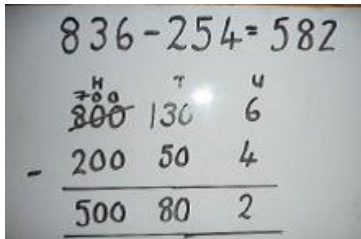


Draw dots and group them to divide an amount and clearly show a remainder.



$$\begin{array}{r}
 20 + 5 \\
 40 + 8 \\
 \hline
 60 + 13 = 73
 \end{array}$$

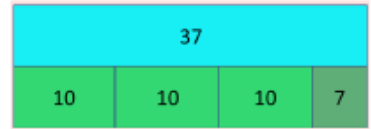
Partition written method

$$836 - 254 = 582$$


$210 + 35 = 245$

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

Use bar models to show division with remainders.



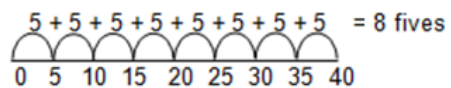
Start by partitioning the numbers before formal column to show the exchange

Formal Method

$$\begin{array}{r}
 \overset{H}{800} \overset{T}{30} \overset{U}{6} \\
 - \overset{H}{200} \overset{T}{50} \overset{U}{4} \\
 \hline
 \overset{H}{500} \overset{T}{80} \overset{U}{2}
 \end{array}$$

|    |     |    |
|----|-----|----|
|    | 10  | 8  |
| 10 | 100 | 80 |
| 3  | 30  | 24 |

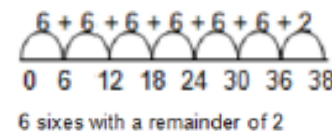
Without remainder  
 $40 \div 5$  Ask 'How many 5s in 40?'



With remainder  
 $38 \div 6$  Ask 'How many 6s in 38?'

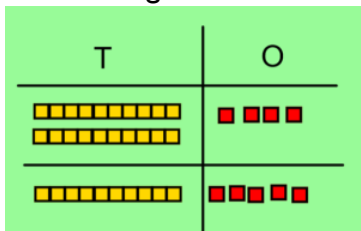
$$\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$$

$$\begin{array}{r} \overset{1}{\cancel{2}}\overset{1}{3}4 \\ - 152 \\ \hline 182 \end{array}$$

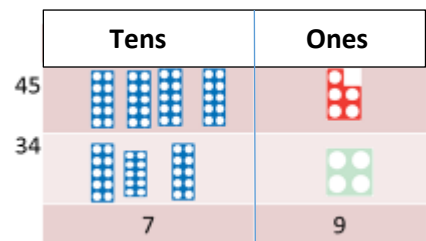


Developing conceptual understanding

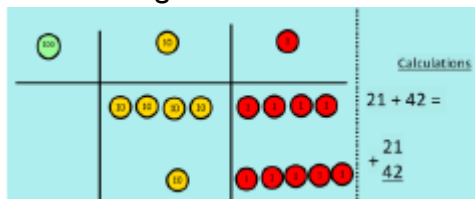
Model using base 10 or Numicon



Add together the ones first and then the tens



Place value grid



Exchange ten ones for a ten, Model using Numicon or place value

Column subtraction without regrouping (friendly numbers)  
Use Numicon or base 10



Draw representations to support understanding



Column subtraction with regrouping  
Begin with base 10 or Numicon.  
Move to place value counters, modelling the exchange of a ten into ten ones. Use the phrase 'take and make' for exchange.

Ones

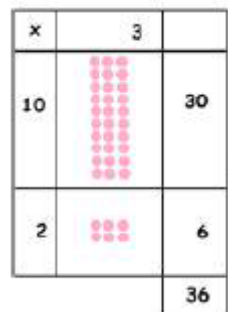
Start by reinforcing mental methods of partitioning

Start by reinforcing mental methods of partitioning:

$$15 \times 2 = 30$$

$$13 \times 3 = (10 \times 3) + (3 \times 3) = 30 + 9 = 39$$

Show the links with arrays to first introduce the grid method.



Move onto base ten to move towards a more compact method.

Division as grouping  
Use cubes, counters, objects or place value counters to aid understanding.

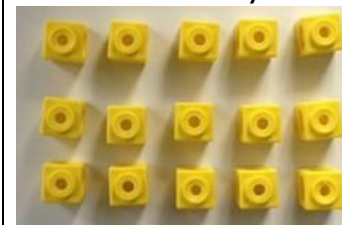


24 divided into groups of 6 = 4

$$96 \div 3 = 32$$

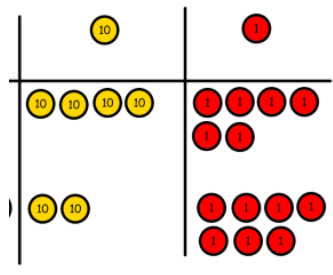


Division with arrays



Link division to multiplication by creating an array and thinking about the number sentences that can be created.

counters



Calculations

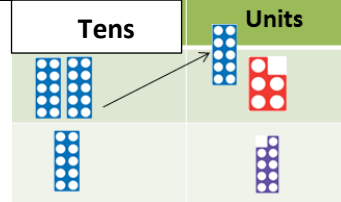
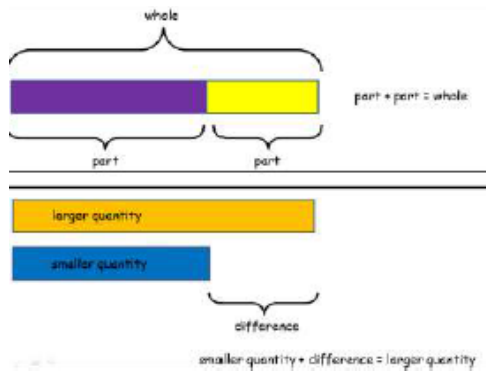
$$\begin{array}{r} 146 \\ + 527 \\ \hline \end{array}$$

Missing Number Problems

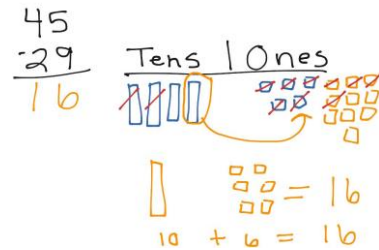
Missing numbers should be placed in all possible places:

$$\begin{array}{l} 3 + 4 = \quad \quad \quad = 4 + 3 \\ 3 + \quad = 7 \quad \quad \quad 7 = \quad + 4 \\ 4 + \quad = 7 \quad \quad \quad 7 = 3 + \quad \\ + \nabla = 7 \quad \quad \quad 7 = \quad + \nabla \end{array}$$

Bar Model



Pictorial representation

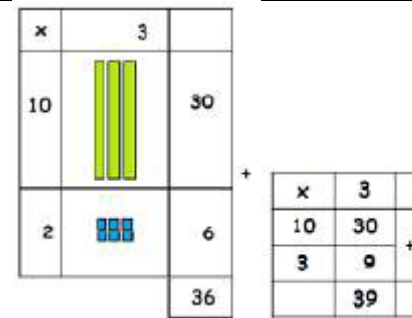
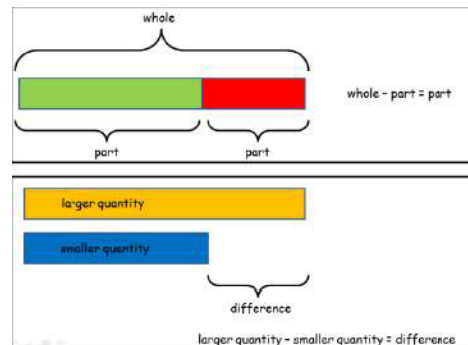


Missing number problems:

Missing numbers should be placed in all possible places:

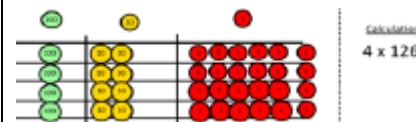
$$\begin{array}{l} 16 - 9 = \quad \quad \quad = 16 - 9 \\ 16 - \quad = 7 \quad \quad \quad 7 = \quad - 9 \\ 7 = 16 - \quad \quad \quad \quad - 9 = 7 \\ \quad - \nabla = 7 \quad \quad \quad 7 = \quad - \nabla \end{array}$$

Bar Model

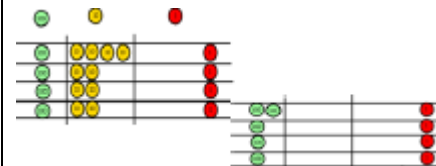


Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows

Fill each row with 126



Add up each column, starting with the ones making any exchanges needed



Then you have your answer.

Missing Number problems

Missing numbers placed in all possible places.

$$\begin{array}{l} 7 \times 2 = \quad \quad \quad = 2 \times 7 \\ 7 \times \quad = 14 \quad \quad \quad 14 = \quad \times 7 \\ \quad \times 2 = 14 \quad \quad \quad 14 = 2 \times \quad \\ \quad \times \nabla = 14 \quad \quad \quad 14 = \quad \times \nabla \end{array}$$

Bar Model

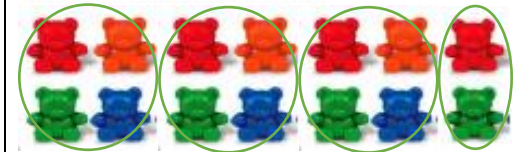
Eg  $15 \div 3 = 5$      $5 \times 3 = 15$

$15 \div 5 = 3$      $3 \times 5 = 15$

Division with remainders

$14 \div 3 =$

Divide objects between groups and see how much is left over

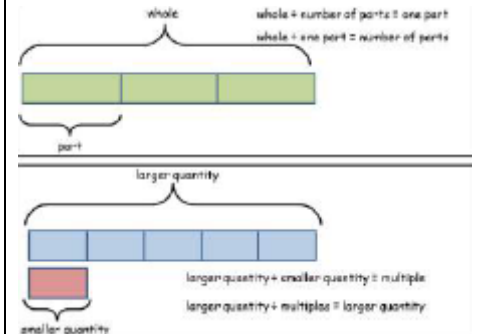


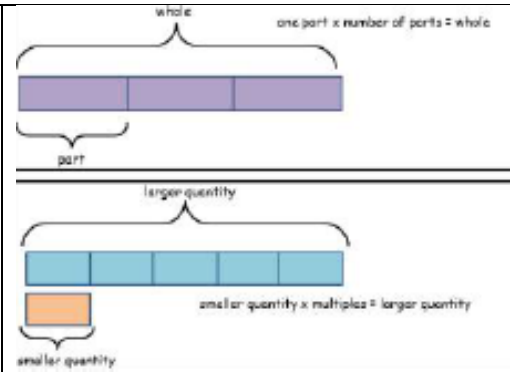
Missing Number Problems

Missing numbers placed in all possible places.

$$\begin{array}{l} 6 \div 2 = \quad \quad \quad = 6 \div 2 \\ 6 \div \quad = 3 \quad \quad \quad 3 = 6 \div \quad \\ \quad \div 2 = 3 \quad \quad \quad 3 = \quad \div 2 \\ \quad \div \nabla = 3 \quad \quad \quad 3 = \quad \div \nabla \end{array}$$

Bar Model





**With jottings Or in your head**

add numbers mentally, including:

- a three-digit number and ones
- a three-digit number and tens
- a three-digit number and hundreds

**Counting on**

$115 + 2$

"Put 115 in your head, 116, 117."

**Partition number and recombine**

$127 + 90 = 100 + 20 + 7 + 90$   
 $= 100 + 110 + 7$   
 $= 100 + 117$   
 $= 217$

Two two-digit numbers (including answer crossing 100)

|  |  |
|--|--|
| <p>Counting on with number lines</p> <p><math>48 + 36 = 64</math></p>  | <p>Partition both numbers and recombine</p> <p><math>27 + 82 = 20 + 7 + 80 + 2</math><br/> <math>= 100 + 9</math><br/> <math>= 109</math></p>        |
| <p>Add the nearest multiple of 10, then adjust</p> <p><math>63 + 59</math> is the same as <math>63 + 60 = 1</math></p> | <p>Count on by partitioning the second number only</p> <p><math>36 + 93 = 93 + 30 + 6</math><br/> <math>= 123 + 6</math><br/> <math>= 129</math></p> |

subtract numbers mentally, including:

- a three-digit number and ones
- a three-digit number and tens
- a three-digit number and hundreds

**Counting back:**  $263 - 5$

"Put 263 in your head, 262, 261, 260, 259, 258."

Use unprepared numbered lines to subtract, by counting back:

$516 - 400 = 116$

Subtract mentally a near multiple of 10 to or from a two-digit number:

$678 - 90 = 678 - 100 + 10$

- two two-digit numbers (including answer crossing 100)

|  |   |
|--|---|
| <p>Use known number facts and place value to subtract (partition second number only)</p> <p><math>37 - 12 = 37 - 10 - 2</math><br/> <math>= 27 - 2</math><br/> <math>= 25</math></p> | <p>Find a small difference by counting up</p> <p><math>42 - 39 = 3</math></p> |
| <p>Subtract mentally a number near 10 to or from a two-digit number</p> <p><math>35 - 19 = 35 - 20 + 1</math></p>  |   |

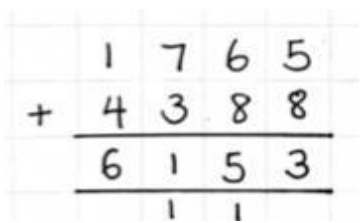
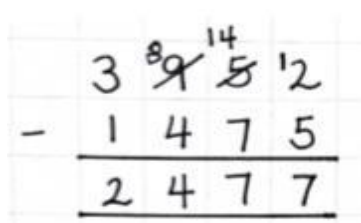
understand and use mental methods using multiplication a facts (e.g. using  $3 \times 2 = 6$ ,  $6 \div 3 = 2$  and  $2 = 6 \div 3$ ) to derive related facts (e.g.  $30 \times 2 = 60$ ,  $60 \div 3 = 20$  and  $20 = 60 \div 3$ )

|                     |                       |                       |                   |
|---------------------|-----------------------|-----------------------|-------------------|
| $30 \times 5 = 150$ | $50 \times 3 = 150$   | $150 \div 5 = 30$     | $150 \div 3 = 50$ |
| $3 \times 50 = 150$ | $5 \times 3 = 15$     | $15 \div 3 = 5$       | $150 \div 30 = 5$ |
| $5 \times 30 = 150$ | $50 \times 30 = 1500$ | $30 \times 50 = 1500$ | $150 \div 50 = 3$ |

Recall and use x and ÷ facts for the 3, 4 and 8 times tables.

Recall and use x and ÷ facts for the 3, 4 and 8 times tables. Recall x and ÷ facts for x tables up to  $12 \times 12$

# Year 4

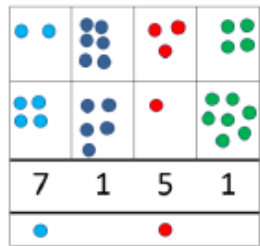
| Year 4   |   |  |  |
|--|---|--|--|
| Addition   | Subtraction   | Multiplication   | Division   |
| Written Method   |   |  |  |
| <p>Column addition</p>    | <p>Column Subtraction</p>   | <p>Multiplying a 3 or 4-digit number by a 1-digit number:</p> $\begin{array}{r} 246 \\ \times 7 \\ \hline 1722 \\ 34 \end{array}$  | <p><b>Compact short division</b></p> $318 \div 6$ $\begin{array}{r} 053 \\ 6 \overline{) 318} \\ \underline{30} \phantom{0} \\ 18 \\ \underline{18} \\ 0 \end{array}$ $318 \div 3 = 53$  |
| <p>add numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate</p> <p>Use the written method with decimals in the context of money</p> $\begin{array}{r} \pounds 32.50 \\ + \pounds 21.75 \\ \hline \pounds 54.25 \end{array}$ | <p>subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate</p> <p>Subtraction using expanded written method using exchange</p> $81 - 57 \quad \dots \text{recorded as}$ $\begin{array}{r} \text{T} \quad \text{O} \quad \text{T} \quad \text{O} \quad \text{T} \quad \text{O} \\ 80 \quad 1 \rightarrow 70 \quad 11 \quad 70 \quad 80 \quad 11 \\ - 50 \quad 7 \quad - 50 \quad 7 \quad - 50 \quad 7 \\ \hline \phantom{0} \quad 20+4 \quad \rightarrow 24 \quad 20+4 \quad \rightarrow 24 \end{array}$ <p>Use the written method with decimals in the context of money</p> $\begin{array}{r} \pounds 42.50 - \pounds 13.35 = \pounds 29.15 \\ \pounds 42.50 \\ - \pounds 13.35 \\ \hline \pounds 29.15 \end{array}$ | <p>multiply two-digit and three-digit numbers by a one-digit number using formal written layout</p> <p>Multiplying a 3-digit number by a 1-digit number:</p> $\begin{array}{r} 246 \\ \times 7 \\ \hline 1400 \quad (6 \times 7) \\ 280 \quad (40 \times 7) \\ 1400 \quad (200 \times 7) \\ \hline 1722 \end{array}$ <p>Multiplying a 2-digit number by a 1-digit number:</p> $\begin{array}{r} 23 \\ \times 7 \\ \hline 161 \\ 2 \end{array}$ | <p>divide numbers up to 3 digit by a one-digit number using the formal written method of short division and begin to interpret remainders.</p> <p><b>Compact short division showing answer with a remainder</b></p> <p>432 ÷ 5 becomes</p> $\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{40} \phantom{0} \\ 32 \\ \underline{30} \\ 2 \end{array}$ |

Multiplying a 2-digit number by a 1-digit number:

$$\begin{array}{r} 23 \\ \times 7 \\ \hline 21 \quad (3 \times 7) \\ 140 \quad (20 \times 7) \\ \hline 161 \end{array}$$

Developing conceptual understanding

Place value grid

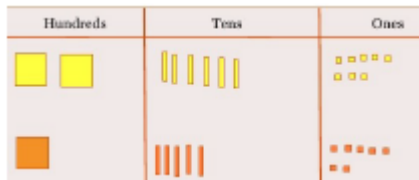


Arrow Cards



Base 10 (tens and ones)

Exchange ten ones for a ten and ten tens for a hundred and ten hundred for a thousand

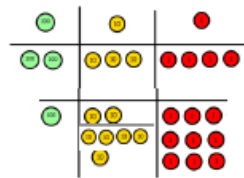


Adding decimals using common denominators

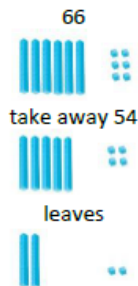
$$\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$$

Model processes of exchange using numicon, base ten and then move to place value grids

$$234 - 179$$



Base 10 (tens and ones)



Subtracting decimals using common denominators

It is important that children know that when multiplying by ten it is not just a matter of adding a zero! The digits move left, and a place holder (0) may have to be inserted.

Dividing by partition

$$72 \div 4:$$

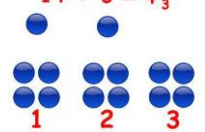
$$40 \div 4 = 10$$

$$32 \div 4 = 8$$

$$72 \div 4 = 18$$

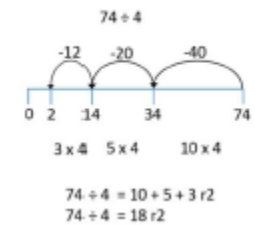
$$14 \div 3 = 4 \frac{2}{3}$$

Sharing representing remainders as fractions



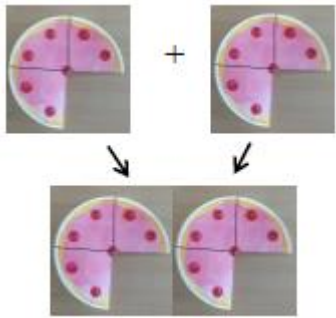
Repeated subtraction of chunks

Using a number line to take off chunks

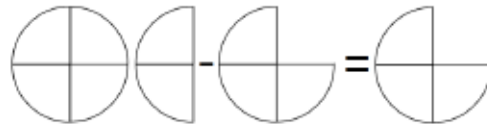


Repeated subtraction of chunks on a

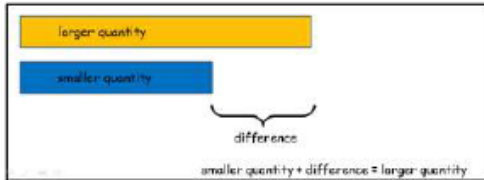
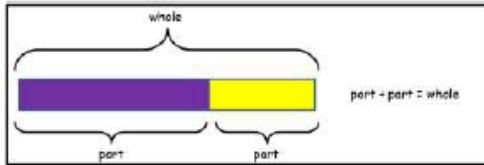




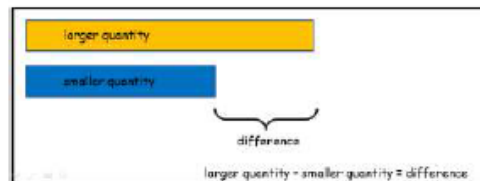
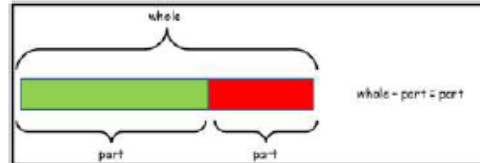
$$\frac{6}{4} - \frac{3}{4} = \frac{3}{4}$$



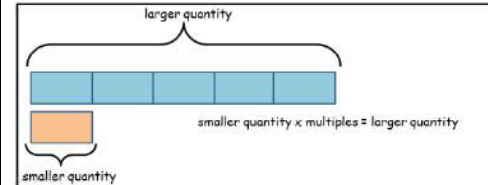
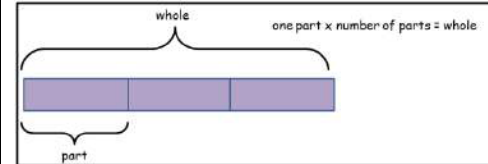
### Bar Model



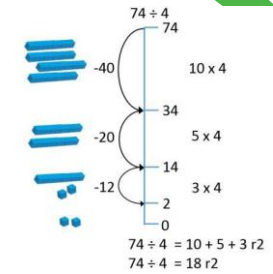
### Bar Model



### Bar Model



### vertical number line



### To divide by 10 and 100

$$7 \div 10 = 0.7$$

$$7 \div 100 = 0.07$$

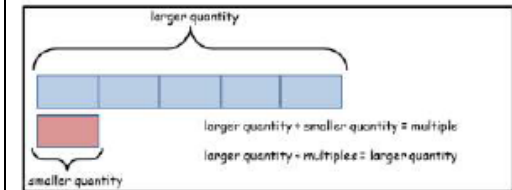
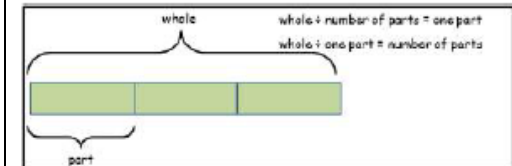
$$10 \cdot \frac{7}{100}$$

$$7 \cdot \frac{10}{100}$$

$$0.7 \quad (\div 10)$$

$$0.07 \quad (\div 100)$$

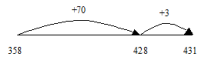
### Bar Model



With jottings Or in your head

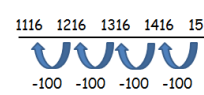

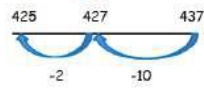
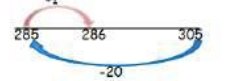
add numbers mentally, including:

- a four-digit number and ones
- a four-digit number and tens
- a four-digit number and hundreds
- a four-digit number and thousands

|  |  |
|--|--|
| Counting on<br>3115 + 2<br>"Put 3115 in your head, 3116, 3117."  | Adding near numbers and adjusting<br>7433 + 90 = 7433 + 100 - 10<br>= 7533 - 10<br>= 7523  |
| Partition number and recombine<br>5127 + 2000<br>= 5000 + 100 + 20 + 7 + 2000<br>= 7000 + 100 + 20 + 7<br>= 7127                                 | Count on by splitting units to make next multiple of ten/hundred<br>2360 + 500 = 2360 + 400 + 40 + 60<br>= 2400 + 400 + 60<br>= 2860 |
| Partition both numbers into hundreds, tens and ones and recombine<br>358 + 73 = 300 + 50 + 8 + 70 + 3<br>= 300 + 120 + 11<br>= 420 + 11<br>= 431 | Partition second number only into hundreds, tens and ones and recombine<br>358 + 73 = 358 + 70 + 3<br>= 428 + 3<br>= 431             |
| Partitioning with number lines<br>                              | Add the nearest multiple of 10 or 100, then adjust<br>458 + 79 = 458 + 80 - 1  |

subtract numbers mentally, including:

- a four-digit number and ones
- a four-digit number and tens
- a four-digit number and hundreds
- a four-digit number and thousands

|  |   |
|--|---|
| Counting back: 5263 - 5<br>"Put 5263 in your head, 5262, 5261, 5260, 5259, 5258."<br>Subtract mentally a 'near multiple of 10' to or from a two-digit number:<br>3678 - 90 = 3678 - 100 + 10 | Use unprepared numbered lines to subtract, by counting back:<br>1516 - 400 = 1116<br>           |
| • three and two-digit numbers<br>Use known number facts and place value to subtract (partition second number only)<br>437 - 12 = 437 - 10 - 2<br>= 427 - 2<br>= 425                          | Find a small difference by counting up<br>6003 - 5998 = 5<br>                                   |
|   | Subtract mentally a number near 10 to or from a two-digit number<br>305 - 19 = 305 - 20 + 1<br> |

recall multiplication facts for multiplication tables up to 12 × 12

- Play games, chant, test etc to increase speed of recalling facts.
- Make models and images to display facts.
- Investigate patterns within tables.

Use knowledge of multiplication facts and place value to derive related facts.

|              |                |                |              |
|--------------|----------------|----------------|--------------|
| 30 × 5 = 150 | 50 × 3 = 150   | 150 ÷ 5 = 30   | 150 ÷ 3 = 50 |
| 3 × 50 = 150 | 5 × 3 = 15     | 15 ÷ 3 = 5     | 150 ÷ 30 = 5 |
| 5 × 30 = 150 | 50 × 30 = 1500 | 30 × 50 = 1500 | 150 ÷ 50 = 3 |

Partition

$$18 \times 9 = (10 \times 9) + (8 \times 9)$$

$$= 90 + 72$$

$$= 162$$

recall division facts for multiplication tables up to 12 × 12

- Play games, chant, test etc to increase speed of recalling facts.
- Make models and images to display facts.
- Investigate patterns within tables.

Use knowledge of multiplication facts and place value to derive related facts.

|              |                |                |              |
|--------------|----------------|----------------|--------------|
| 30 × 5 = 150 | 50 × 3 = 150   | 150 ÷ 5 = 30   | 150 ÷ 3 = 50 |
| 3 × 50 = 150 | 5 × 3 = 15     | 15 ÷ 3 = 5     | 150 ÷ 30 = 5 |
| 5 × 30 = 150 | 50 × 30 = 1500 | 30 × 50 = 1500 | 150 ÷ 50 = 3 |


Partitioning/Chunking

$$77 \div 5 = (50 \div 5) + (25 \div 5) + (\text{remainder } 2)$$

$$= 10 + 5 + (\text{remainder } 2)$$

$$= 15 \text{ remainder } 2$$

# Year 5

| Year 5  |   |  |  |    |    |   |   |   |    |   |   |   |   |    |
|---|---|--|--|----|----|---|---|---|----|---|---|---|---|----|
| Addition  | Subtraction   | Multiplication   | Division   |    |    |   |   |   |    |   |   |   |   |    |
| Written Method  |   |  |  |    |    |   |   |   |    |   |   |   |   |    |
| <p>Compact written method involving carrying<br/> <math>25,748 + 46,374 =</math></p> $\begin{array}{r} 25,748 \\ + 46,374 \\ \hline 72,122 \\ \hline 1\ 1\ 1\ 1 \end{array}$            | <p>Compact written method exchanging across columns<br/> <math>45,748 - 26,374 =</math></p> $\begin{array}{r} 3\ 1\ 6\ 1 \\ 45,748 \\ - 26,374 \\ \hline 19,374 \end{array}$  | <p>Long multiplication<br/> <math>5172 \times 38 =</math></p> $\begin{array}{r} 5172 \\ \times 38 \\ \hline 41376 \\ + 155160 \\ \hline 196536 \\ \hline 1 \end{array}$  | <p>Compact short division<br/> <math>432 \div 5</math> becomes</p> $\begin{array}{r} 86\ r2 \\ 5 \overline{) 432} \\ \underline{40} \phantom{2} \\ 32 \\ \underline{30} \\ 2 \end{array}$  |    |    |   |   |   |    |   |   |   |   |    |
| <p>Compact written method involving carrying</p> $\begin{array}{r} 264 + 148 \\ \hline 412 \\ \hline 1\ 1 \end{array}$ <p>Addition involving decimals using compact written methods</p> | <p>Subtraction using expanded written methods in a vertical layout</p> $\begin{array}{r} 66 - 54 \\ \hline 10 + 2 \rightarrow 12 \end{array}$ <p>Introduce practically, e.g</p>  <p>take away 54<br/>leaves</p> <p>Compact written method</p> $\begin{array}{r} 81 - 57 \\ \hline 24 \end{array}$ <p>Subtraction of decimal numbers to 2 decimal places using compact written method</p> $\begin{array}{r} 7\ 8\ 11 \\ - 5\ 7 \\ \hline 2\ 4 \end{array}$ | <p>Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers</p> <p>Multiplying a 3 or 4-digit number by a 1-digit number:</p> $\begin{array}{r} 246 \\ \times 7 \\ \hline 1722 \\ \hline 34 \end{array}$ | <p>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 (as fractions, as decimals or by rounding (for example, <math>98 \div 4 = 98/4 = 24\ r\ 2 = 24\ \frac{1}{2} = 24.5</math> 8 25))</p> <table border="1" data-bbox="1680 1037 2128 1212"> <tr> <td></td> <td>1</td> <td>2</td> <td>2</td> <td>3</td> <td rowspan="2">r2</td> </tr> <tr> <td>4</td> <td>4</td> <td>8</td> <td>9</td> <td>14</td> </tr> </table> |    | 1  | 2 | 2 | 3 | r2 | 4 | 4 | 8 | 9 | 14 |
|   | 1   | 2  | 2  | 3  | r2 |   |   |   |    |   |   |   |   |    |
| 4   | 4   | 8  | 9  | 14 |    |   |   |   |    |   |   |   |   |    |

$$3.56 + 2.47$$

$$\begin{array}{r} 3.56 \\ + 2.47 \\ \hline 6.03 \\ \hline 1 \quad 1 \end{array}$$

$$£2.31 - £1.53$$

$$\begin{array}{r} \overset{1}{\cancel{2}}.\overset{12}{\cancel{3}}\overset{1}{\cancel{1}} \\ \underline{£1.53} \\ £0.78 \end{array}$$

### Developing conceptual understanding

Progress to expanded written methods involving hundreds

$$145 + 127$$

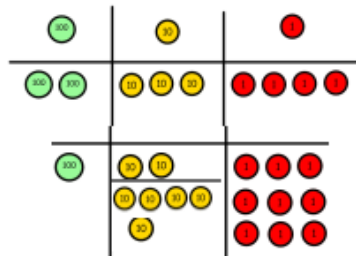
|   |     |    |    |     |
|---|-----|----|----|-----|
|   | H   | T  | O  |     |
|   | 100 | 40 | 5  |     |
| + | 100 | 20 | 7  |     |
|   | 200 | 60 | 12 | 272 |

Base 10 (tens and ones)  
Exchange ten ones for a ten and ten tens for a hundred and ten hundred for a thousand



Add decimals

$$234 - 179$$



Model process of exchange using Numicon, base ten and then move to PV counters.

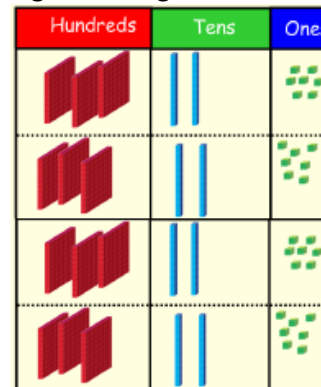
Subtract with 4 digits, including money and measures

$$\begin{array}{r} \cancel{2} \cancel{3} \cancel{4} \\ - \quad 2 \quad 1 \quad 2 \quad 8 \\ \hline 2 \quad 8 \quad 9 \quad 2 \quad 8 \end{array}$$

Use zeros for place-holders.

$$\begin{array}{r} \overset{10}{\cancel{2}} \overset{8}{\cancel{3}} \overset{1}{\cancel{4}} \overset{0}{\cancel{0}} \\ - \quad 3 \quad 7 \quad 2 \quad \cdot \quad 5 \\ \hline 6 \quad 7 \quad 9 \quad 6 \quad \cdot \quad 5 \end{array}$$

Column multiplication for 3 and 4 digits x 1 digit



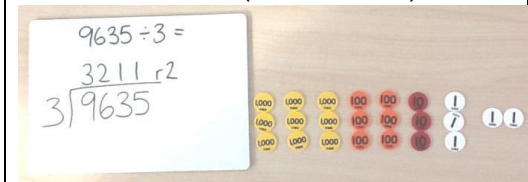
It is important at this stage that they always multiply the ones first.

Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping.  $321 \times 2 = 642$

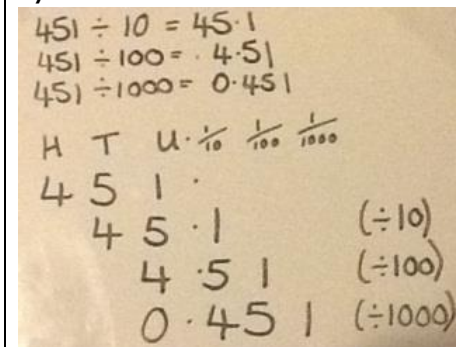
Pictorial

|   |      |    |    |
|---|------|----|----|
| x | 300  | 20 | 7  |
| 4 | 1200 | 80 | 28 |

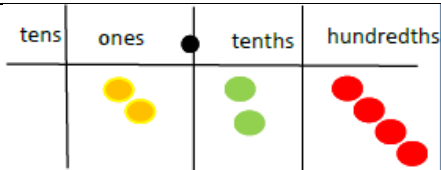
Use practical resources to support solving division number sentences with remainders (ThHTU ÷ U)



Divide whole numbers and decimals by 10, 100 and 1000



Bar Model



Introduce decimal place value counters and model exchange for addition.

Relate to money and measure

$$72.8$$

$$+ 54.6$$

$$\underline{127.4}$$

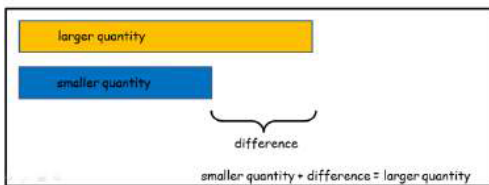
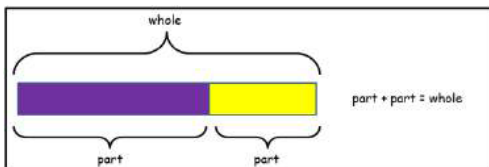
$$11$$

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

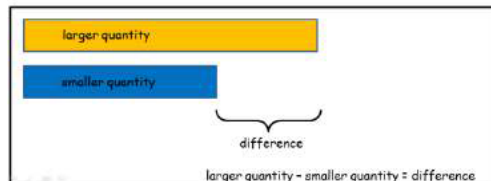
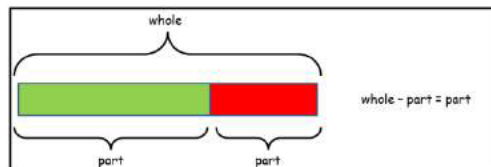
Insert zeros for place holders.

$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \end{array}$$

Bar Model



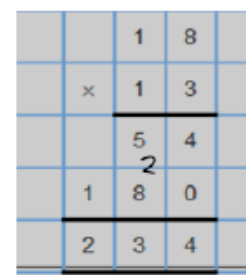
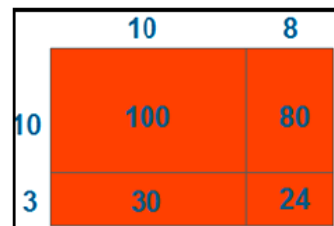
Bar Model



$$\begin{array}{r} 327 \\ \times 4 \\ \hline 1308 \end{array}$$

This will lead to a compact method.

Bar modelling to support problem solving



18 x 3 on the first row

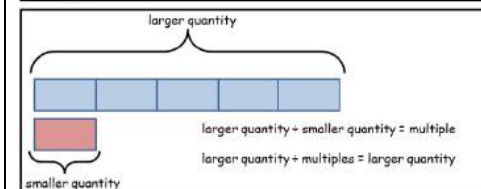
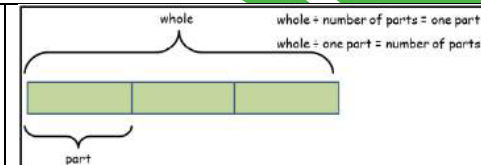
(8 x 3 = 24, carrying the 2 for 20, then 1 x 3)

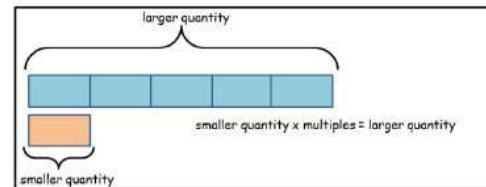
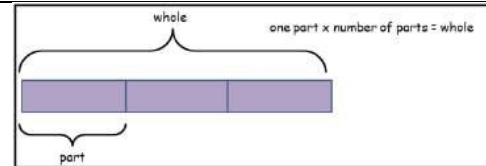
18 x 10 on the 2nd row. Show

multiplying by 10 by putting zero in ones first

$$\begin{array}{r} 1234 \\ \times 16 \\ \hline 7404 \quad (1234 \times 6) \\ 12340 \quad (1234 \times 10) \\ \hline 19744 \end{array}$$

Bar Model





With jottings Or in your head

Add numbers mentally with increasingly large numbers ( e.g. 2358 + 773)

Subtract numbers mentally with increasingly large numbers ( e.g. 12 462 – 2300 = 10 162)

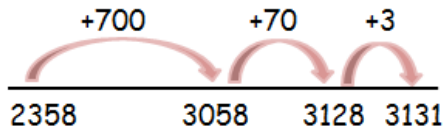
Multiply numbers mentally drawing upon known facts  
 Partition  
 $47 \times 6 = (40 \times 6) + (7 \times 6)$   
 $= (240) + (42)$   
 $= 282$   
 Double and halve  
 $25 \times 16 = 50 \times 8 = 100 \times 4 = 200 \times 2$   
 $= 400$

Divide numbers mentally drawing upon known facts  
 Partitioning  
 $72 \div 3 = (60 \div 3) + (12 \div 3)$   
 $= 20 + 4$   
 $= 24$

Partition both numbers and recombine

$$\begin{aligned}
 2358 + 773 &= 2000 + 300 + 50 + 8 + 700 + 70 + 3 \\
 &= 2000 + 1000 + 120 + 11 \\
 &= 3000 + 100 + 30 + 1 \\
 &= 3131
 \end{aligned}$$

Partitioning with number lines



Partition second number only into hundreds, tens and ones and recombine

$$\begin{aligned}
 2358 + 773 &= 2358 + 700 + 70 + 3 \\
 &= 3058 + 70 + 3 \\
 &= 3128 + 3 \\
 &= 3131
 \end{aligned}$$

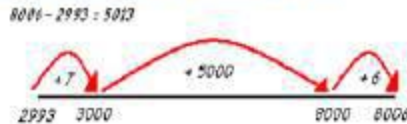
Add the nearest multiple of 10 or 100, then adjust

$$458 + 79 = 458 + 80 - 1$$

Subtract the nearest multiple of 10 or 100, then adjust

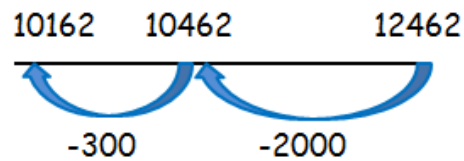
$$\begin{aligned}
 458 - 79 &= 458 - 80 + 1 \\
 &= 378 + 1 \\
 &= 379
 \end{aligned}$$

Find a difference by counting up



Use known number facts and place value to subtract (partition second number only)

$$\begin{aligned}
 12\ 462 - 2300 &= 12\ 462 - 2000 - 300 \\
 &= 10\ 462 - 300 \\
 &= 10\ 162
 \end{aligned}$$



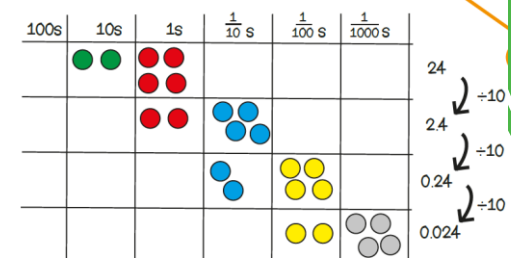
Multiply whole numbers and those involving decimals by 10, 100 and 1000

Place Value



Divide whole numbers and those involving decimals by 10, 100 and 1000

Place Value



Identify multiples, (and use them to construct equivalence statements, e.g.  $4 \times 35 = 2 \times 2 \times 35$ ;  $3 \times 270 = 3 \times 3 \times 9 \times 10 = 9^2 \times 10$ )

Factor trees:



Identify factors, including finding all factor pairs of a number, and common factors of two numbers (and use them to construct equivalence statements, e.g.  $4 \times 35 = 2 \times 2 \times 35$ ;  $3 \times 270 = 3 \times 3 \times 9 \times 10 = 9^2 \times 10$ )

Recognise and use square numbers and cube numbers, and the notation for squared ( $^2$ ) and cubed ( $^3$ )

$$\begin{aligned}
 3 \times 3 &= 3^2 \\
 1 \times 1 &= 1^2 & 1 \times 1 \times 1 &= 1^3 \\
 2 \times 2 &= 2^2 & 2 \times 2 \times 2 &= 2^3 \\
 & & 3 \times 3 \times 3 &= 3^3
 \end{aligned}$$

# Year 6

## Year 6

|          |             |                |          |
|----------|-------------|----------------|----------|
| Addition | Subtraction | Multiplication | Division |
|----------|-------------|----------------|----------|

### Written Method

Compact written method involving carrying  
 $325,748 + 246,374 =$

$$\begin{array}{r} 325,748 \\ + 246,374 \\ \hline 572,122 \\ \hline 1111 \end{array}$$

Compact written method exchanging across columns  
 $445,748 - 126,374 =$

$$\begin{array}{r} 3161 \\ 445,748 \\ - 126,374 \\ \hline 319,374 \end{array}$$

Long multiplication  
 $2427 \times 38 =$

$$\begin{array}{r} 2427 \\ \times 38 \\ \hline 19416 \\ 72810 \\ \hline 92226 \\ \hline 11 \end{array}$$

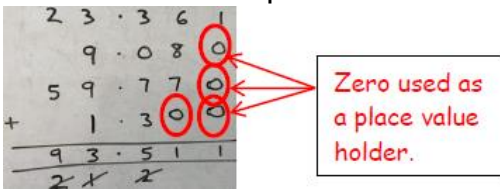
Long Division  
 $432 \div 15$  becomes

$$\begin{array}{r} 28 \cdot 8 \\ 15 \overline{) 432 \cdot 0} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Addition involving decimals using compact written methods  
 $3.56 + 2.47$

$$\begin{array}{r} 3.56 \\ + 2.47 \\ \hline 6.03 \\ \hline 11 \end{array}$$

Add several numbers with different numbers of decimal places



Compact written method  
 $81 - 57$

$$\begin{array}{r} T O \\ 7811 \\ - 57 \\ \hline 24 \end{array}$$

Subtraction of decimal numbers to 2 decimal places using compact written method

$\pounds 2.31 - \pounds 1.53$

$$\begin{array}{r} 121 \\ \pounds 2.31 \\ - \pounds 1.53 \\ \hline \pounds 0.78 \end{array}$$

Short multiplication and Long multiplication as in Year 5, but apply to numbers with decimals.

$$\begin{array}{r} 3.19 \\ \times 8 \\ \hline 25.52 \end{array}$$

divide numbers up to 4 digits by a two-digit number using the formal written method of short and long division, and interpret remainders as whole number remainders, fractions, or by rounding.

**Short Division**

$98 \div 7$  becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \end{array}$$

Answer: 14

$432 \div 5$  becomes

$$\begin{array}{r} 86 \text{ r}2 \\ 5 \overline{) 432} \end{array}$$

Answer: 86 remainder 2

$496 \div 11$  becomes

$$\begin{array}{r} 45 \text{ r}1 \\ 11 \overline{) 496} \end{array}$$

Answer: 45  $\frac{1}{11}$

**Long Division**

$432 \div 15$  becomes

$$\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28 remainder 12

$432 \div 15$  becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28  $\frac{12}{15} = \frac{4}{5}$

**Remainders**



Quotients expressed as fractions or decimal fractions  
 $61 \div 4 = 15 \frac{1}{4}$  or 15.25

Developing conceptual understanding

Relate to money and measure

$$\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 11 \end{array}$$

Insert zeros for place holders.

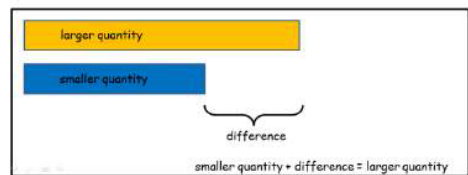
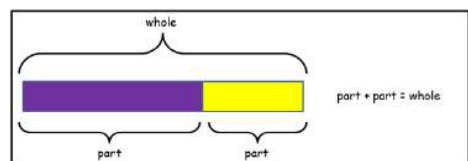
$$\begin{array}{r} 23.361 \\ 9.080 \\ + 59.770 \\ \hline 93.511 \\ 212 \end{array}$$

Fractions

$$\frac{3}{4} + \frac{7}{8} = \frac{13}{8}$$

$\frac{3}{4} \times \frac{2}{2} = \frac{6}{8}$   
 $\frac{6}{8} + \frac{7}{8} = \frac{13}{8} = \frac{15}{8}$

Bar Model



Subtract with 4 digits, including money and measures

$$\begin{array}{r} \cancel{8} \cancel{1} 0 \cancel{8} 6 \\ - 2128 \\ \hline 28928 \end{array}$$

Use zeros for place-holders.

$$\begin{array}{r} \cancel{7} \cancel{1} 6 \cancel{9} 0 \\ - 3725 \\ \hline 67965 \end{array}$$

$$\begin{array}{r} \cancel{1} \cancel{0} 5 \cdot \cancel{4} 1 9 \text{ kg} \\ - 36 \cdot 08 0 \text{ kg} \\ \hline 69 \cdot 33 9 \text{ kg} \end{array}$$

Fractions

$$\frac{4}{6} - \frac{1}{3} = \frac{2}{6}$$

$\frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$   
 $\frac{4}{6} - \frac{2}{6} = \frac{2}{6}$

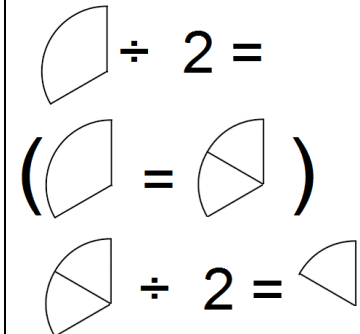
Bar Model

Fractions

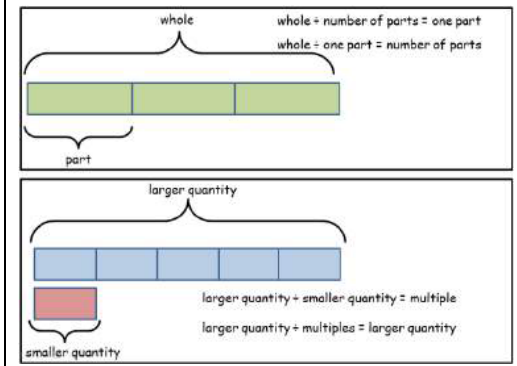
Bar Model

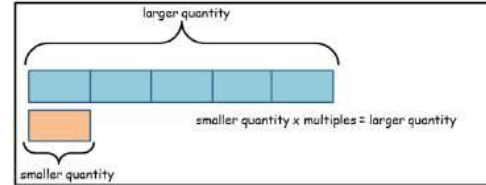
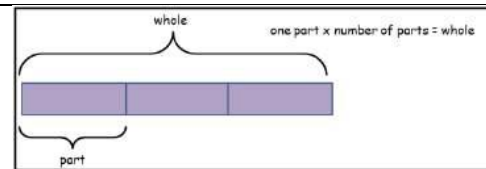
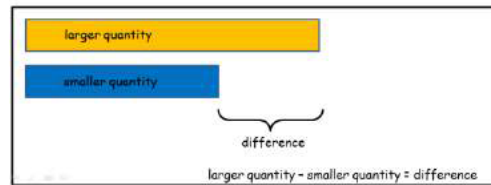
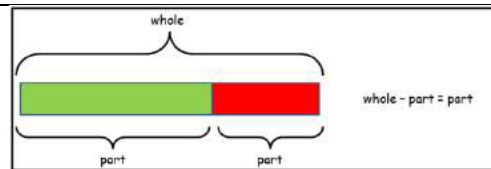
Fractions

$$\frac{1}{3} \div 2 = \frac{1}{6}$$



Bar Model





**With jottings Or in your head**

perform mental calculations, including with mixed operations and large numbers (*and decimals*)

Partition both numbers into hundreds, tens, ones and decimal fractions and recombine

$$\begin{aligned} 35.8 + 7.3 &= 30 + 5 + 0.8 + 7 + 0.3 \\ &= 30 + 12 + 1.1 \\ &= 42 + 1.1 \\ &= 43.1 \end{aligned}$$

Partition second number only into hundreds, tens, ones and decimal fractions and recombine

$$\begin{aligned} 35.8 + 7.3 &= 35.8 + 7 + 0.3 \\ &= 42.8 + 0.3 \\ &= 43.1 \end{aligned}$$

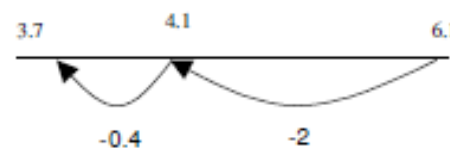
Add the nearest whole number then adjust

$$\begin{aligned} 52 + 11.9 &= 52 + 12 - 0.1 \\ &= 64 - 0.1 \\ &= 63.9 \end{aligned}$$

perform mental calculations, including with mixed operations and large numbers (*and decimals*)

Use known number facts and place value to subtract

$$6.1 - 2.4 = 3.7$$



Subtract the nearest whole number then adjust

$$\begin{aligned} 52 - 11.9 &= 52 - 12 + 0.1 \\ &= 40 + 0.1 \\ &= 40.1 \end{aligned}$$

perform mental calculations, including with mixed operations and large numbers (*and decimals*)

Partitioning

$$\begin{aligned} 4.7 \times 6 &= (4 \times 6) + (0.7 \times 6) \\ &= (24) + (4.2) \\ &= 28.2 \end{aligned}$$

Double and halve

$$\begin{aligned} 4.25 \times 32 &= 8.5 \times 16 \\ &= 17 \times 8 \\ &= 34 \times 4 \\ &= 68 \times 2 \\ &= 136 \end{aligned}$$

perform mental calculations, including with mixed operations and large numbers (*and decimals*)

Partitioning

$$\begin{aligned} 7.2 \div 3 &= (6 \div 3) + (1.2 \div 3) \\ &= 2 + 0.4 \end{aligned}$$