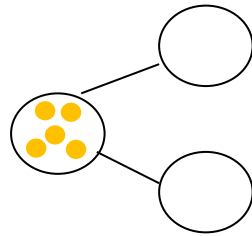
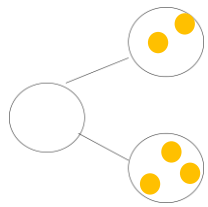


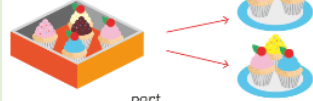
Key Stage 1 Addition and Subtraction Calculation Programme of Study

| Addition EYFS | | Manipulatives | Subtraction EYFS | |
|---|----------|--|---|---|
| Pictorial | | | Pictorial | |
| | | Counters Numicon Multi-link Compare bears Fingers Any objects | | |
| Addition Year 1 | | | Subtraction Year 1 | |
| Pictorial | Abstract | Manipulatives | Pictorial | Abstract |
| 2 people are on the bus. 5 more get on at the next stop. How many people are on the bus now? [Might be recorded as: $2 + 5 = 7$] | | | Counters Number lines Numicon Multi-link Compare bears Fingers | Mum baked 13 biscuits. I ate 8. How many were left? [Might be recorded as: $13 - 8 = 5$] |
| Cubes/counters/dots/multi-link: $2 + 5 = 7$ Numicon: | | Cubes/counters/dots/multi-link: $13 - 8 = 5$ | | |



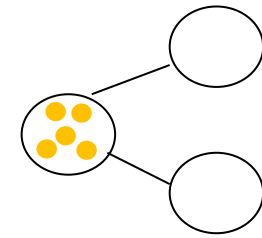
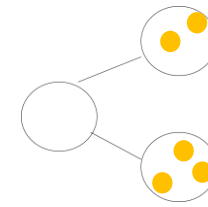
Bar Model/ Part Part Whole

Put 5 cupcakes on two plates.



2 and 3
make 5.

This is a number bond.



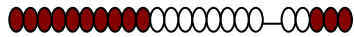
Addition Year 2

Pictorial

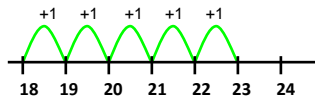
Abstract

$$18 + 5 = 23$$

Beads:

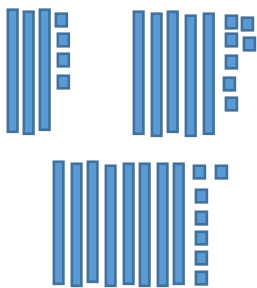


Number line:

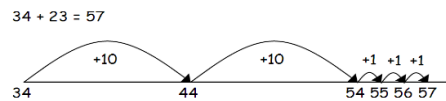


$$34 + 23 = 57$$

Dienes:



Number line:



Partitioning:

$$\begin{array}{r} 34 + 23 = 57 \\ \hline 30 + 20 = 50 \\ 4 + 3 = 7 \\ \hline 50 + 7 = 57 \end{array}$$

Manipulatives

Counters

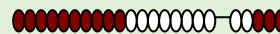
Number lines

Numicon

Multi-link

Dienes

Stringed beads



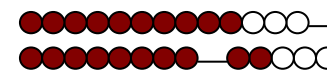
Subtraction Year 2

Pictorial

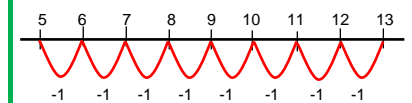
Abstract

$$13 - 8 = 5$$

Beads:

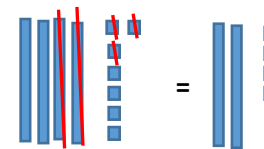


Number line:



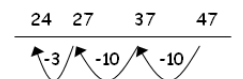
$$47 - 23 = 24$$

Dienes:



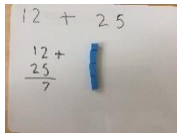
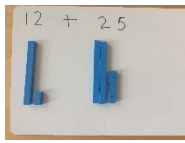
Number line:

$$47 - 23 = 24$$



Introduced by the end of Year 2

$12 + 25 = 37$



Column Addition

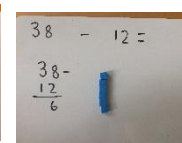
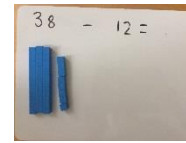
Model partitioning for expanded written method first.

$$\begin{array}{r} 12 \\ + 25 \\ \hline 37 \end{array}$$

Dienes



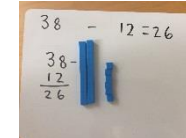
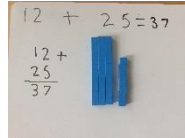
$38 - 12 = 26$



Column Subtraction

Model partitioning for expanded written method first.

$$\begin{array}{r} 38 \\ - 12 \\ \hline 26 \end{array}$$



Bar Model/ Part Part Whole



$3 + 5 = 8$



$5 + 3 = 8$





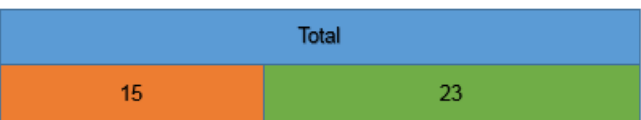


$8 - 5 = 3$



$8 - 3 = 5$

Key Stage 2 Addition and Subtraction Calculation Programme of Study

| Addition Year 3 | | Manipulatives | Subtraction Year 3 | | | | | | | | | | | | | |
|--|--|---|--|--|------|--|--|--|-----|-----|------|--|--|-----|--|-----|
| Pictorial | Abstract | | Pictorial | Abstract | | | | | | | | | | | | |
| 12 + 25 = 37 | | Counters Dienes Place Value Counters Place Value Cards     | 38 - 12 = 26 | | | | | | | | | | | | | |
| | <p>Column Addition - Expand to include decimals</p> <p>Model partitioning for expanded written method first.</p> $\begin{array}{r} 12 \\ + 25 \\ \hline 7 \\ 30 \\ \hline 37 \end{array}$ $\begin{array}{r} 18 \\ + 25 \\ \hline 13 \\ 30 \\ \hline 43 \end{array}$ | | | <p>Column Subtraction- Expand to include decimals</p> <p>Model partitioning for expanded written method first.</p> $\begin{array}{r} 38 \\ - 12 \\ \hline 6 \\ 20 \\ \hline 26 \end{array}$ | | | | | | | | | | | | |
| <p>Jo has 15 pencils and Ellie has 23. How many altogether ?</p>  <p>What if we knew the total what else could we say ?</p> | | <p>Bar Model/ Part Part Whole</p> | <p>Identify the missing numbers in these bar models. They are not drawn to scale.</p> <table border="1" data-bbox="1299 1045 1713 1165"> <tr><td colspan="3">1000</td></tr> <tr><td></td><td>353</td><td>354</td></tr> </table> <table border="1" data-bbox="1299 1212 1713 1332"> <tr><td colspan="3">2000</td></tr> <tr><td>493</td><td></td><td>754</td></tr> </table> | | 1000 | | | | 353 | 354 | 2000 | | | 493 | | 754 |
| 1000 | | | | | | | | | | | | | | | | |
| | 353 | 354 | | | | | | | | | | | | | | |
| 2000 | | | | | | | | | | | | | | | | |
| 493 | | 754 | | | | | | | | | | | | | | |

Introduced by the end of Year 3

$18 + 25 = 43$

$43 + 91 = 134$

$74 + 67 = 141$

Counters

Dienes

Place Value Counters

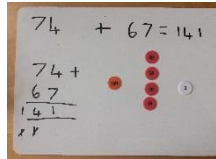
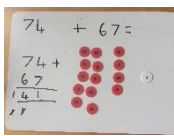
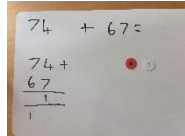
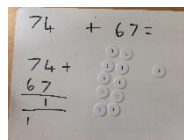
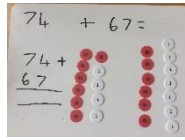
Place Value Cards



$38 - 12 = 26$

$63 - 15 = 48$

$523 - 59 = 464$



Column Addition -

Use the language of carrying

$$\begin{array}{r} 18 \\ + 25 \\ \hline 43 \end{array}$$

$$\begin{array}{r} 43 \\ + 91 \\ \hline 134 \end{array}$$

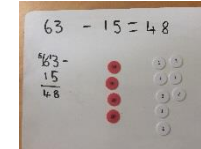
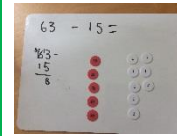
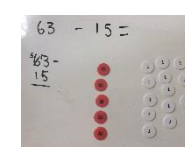
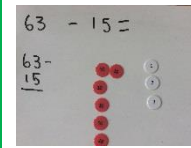
$$\begin{array}{r} 74 \\ + 67 \\ \hline 141 \end{array}$$

Decimals:

$$\begin{array}{r} 3.5 \\ + 2.4 \\ \hline 5.9 \end{array}$$

$$\begin{array}{r} 5.6 \\ + 8.1 \\ \hline 13.7 \end{array}$$

$$\begin{array}{r} 8.6 \\ + 5.8 \\ \hline 13.4 \end{array}$$



Column Subtraction-

Use the language of carrying

$$\begin{array}{r} 38 \\ - 12 \\ \hline 26 \end{array}$$

$$\begin{array}{r} 63 \\ - 15 \\ \hline 48 \end{array}$$

$$\begin{array}{r} 523 \\ - 59 \\ \hline 464 \end{array}$$

Decimals:

$$\begin{array}{r} 6.7 \\ - 2.4 \\ \hline 4.3 \end{array}$$

$$\begin{array}{r} 4.15 \\ - 2.8 \\ \hline 1.7 \end{array}$$

$$\begin{array}{r} 7.1310 \\ - 4.73 \\ \hline 2.57 \end{array}$$

Column Subtraction-

(with multiple 0s)

$$\begin{array}{r} 30010 \\ - 697 \\ \hline 2303 \end{array}$$

Addition Year 4, 5, 6

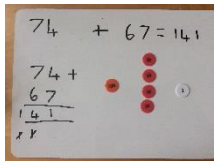
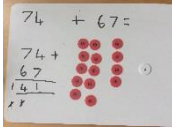
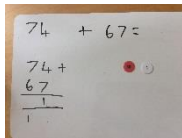
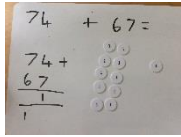
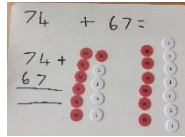
Pictorial

Abstract

$18 + 25 = 43$

$43 + 91 = 134$

$74 + 67 = 141$



Column Addition -

Use the language of carrying

$$\begin{array}{r} 18 \\ + 25 \\ \hline 43 \\ \uparrow \end{array} \quad \begin{array}{r} 43 \\ + 91 \\ \hline 134 \\ \uparrow \end{array} \quad \begin{array}{r} 74 \\ + 67 \\ \hline 141 \\ \uparrow \uparrow \end{array}$$

Decimals:

$$\begin{array}{r} 3.5 \\ + 2.4 \\ \hline 5.9 \end{array} \quad \begin{array}{r} 5.6 \\ + 8.1 \\ \hline 13.7 \\ \uparrow \end{array} \quad \begin{array}{r} 8.6 \\ + 5.8 \\ \hline 13.4 \\ \uparrow \uparrow \end{array}$$

Manipulatives

Counters

Dienes

Place Value Counters

Place Value Cards



Subtraction Year 4, 5, 6

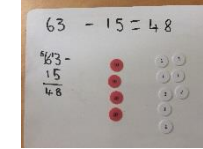
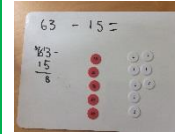
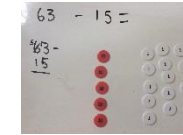
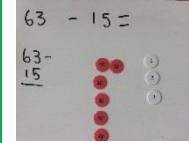
Pictorial

Abstract

$38 - 12 = 26$

$63 - 15 = 48$

$523 - 59 = 464$



Column Subtraction-

Use the language of carrying

$$\begin{array}{r} 38 \\ - 12 \\ \hline 26 \end{array} \quad \begin{array}{r} 63 \\ - 15 \\ \hline 48 \\ \uparrow \end{array} \quad \begin{array}{r} 523 \\ - 59 \\ \hline 464 \\ \uparrow \uparrow \end{array}$$

Decimals:


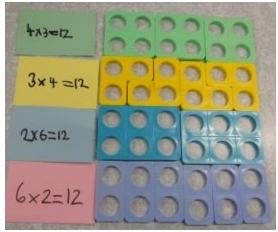



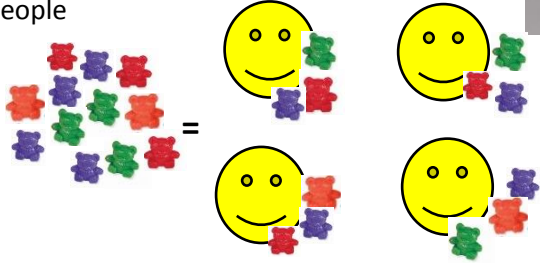
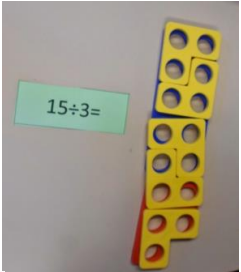
$$\begin{array}{r} 6.7 \\ - 2.4 \\ \hline 4.3 \end{array} \quad \begin{array}{r} 4.15 \\ - 2.8 \\ \hline 1.7 \end{array} \quad \begin{array}{r} 7.13 \\ - 4.73 \\ \hline 2.57 \\ \uparrow \uparrow \end{array}$$

Column Subtraction-

(with multiple 0s)

$$\begin{array}{r} 300 \\ - 697 \\ \hline 2303 \\ \uparrow \uparrow \end{array}$$

Key Stage 1 Multiplication and Division Calculation Programme of Study

| <p>Multiplication EYFS</p> | <p>Manipulatives</p> | <p>Division EYFS</p> |
|---|--|---|
| <p>Pictorial</p> | | <p>Pictorial</p> |
| <p>Symbols/pictures/objects</p> <p>3 lots of 2 counters = 3×2</p>   | <p>Counters Numicon Multi-link Compare bears Fingers Any objects</p>   | <p>Symbols/pictures/objects</p> <p>4 sticks shared between 2 children.</p>  <p>Sharing: share these bears between 4 people</p>   |

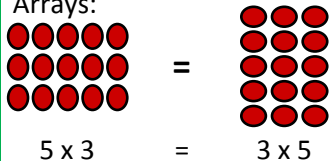
Multiplication Year 1

Pictorial

Abstract

$5 \times 3 = 15$ or $3 \times 5 = 15$ (commutative law*)

Arrays:



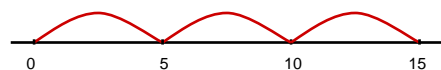
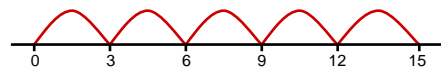
Numicon:



Dots/counters/cubes:



Repeated addition / number lines:



Manipulatives

Counters

Number lines

Numicon

Multi-link

Compare bears

Fingers



Division Year 1

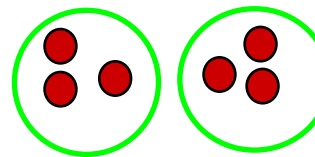
Pictorial

Abstract

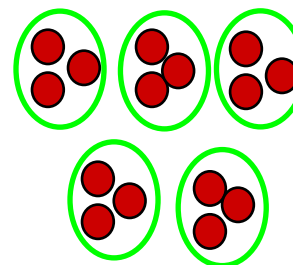
$6 \div 3 = 2$

$15 \div 5 = 3$

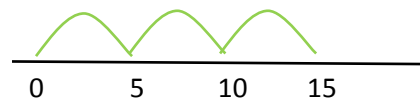
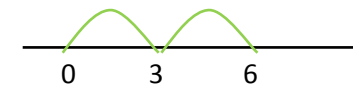
Grouping counters:







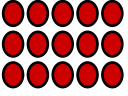
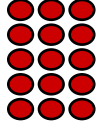


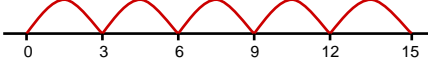
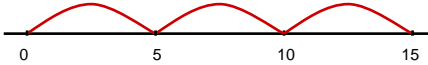
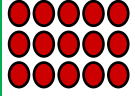
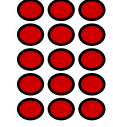


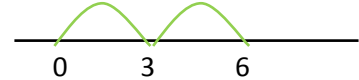



Sharing counters:



Repeated addition / number lines



| Multiplication Year 2 | | Manipulatives | Division Year 2 | |
|--|---|---|---|---|
| Pictorial | Abstract | | Pictorial | Abstract |
| $5 \times 3 = 15$ or $3 \times 5 = 15$ (commutative law*) | | Counters Number lines Numicon Multi-link Compare bears Fingers       | $6 \div 3 = 2$ $15 \div 5 = 3$ | |
| Arrays:  =  $5 \times 3 = 3 \times 5$ Numicon:  Dots/counters/cubes:  | Repeated addition / number lines:   | | Arrays:  =  $5 \times 3 = 3 \times 5$ Numicon:  Dots/counters/cubes:  | Repeated addition / number lines:   |

- Commutative Law: where the numbers can be in any order and still produce the same answer

e.g. $6 \times 5 = 30$ $5 \times 6 = 30$

$4 + 9 = 13$ $9 + 4 = 13$

Key Stage 2 Multiplication and Division Calculation Programme of Study

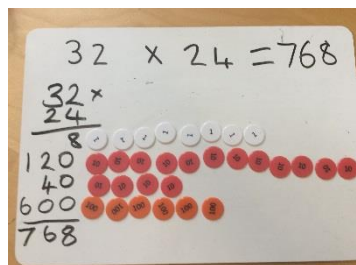
| Multiplication Year 3 | | Manipulatives | Division Year 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------|---|------------------|----------|--|----|-----|--|---|----|--|--|-----|--|--|--|--|---|---|---|---|---|--|---|---|--|-------|--|--|---|--|--|---|--|--|-------|--|--|---|
| Pictorial | Abstract | | Pictorial | Abstract | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $43 \times 6 = 258$ | | <p>Counters Dienes Place Value Counters Place Value Cards</p> | $36 \div 3 = 12$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Short Multiplication – ensure pupils can partition into tens and ones before introducing grid Expand to include decimals (times tables are crucial for this method)</p> <p>Grid:</p> <table border="1"> <tr><td>x</td><td>6</td><td></td></tr> <tr><td>40</td><td>240</td><td></td></tr> <tr><td>3</td><td>18</td><td></td></tr> <tr><td></td><td>258</td><td></td></tr> </table> | | | x | 6 | | 40 | 240 | | 3 | 18 | | | 258 | | <p>Long method – chunking then move to compact Expand to include decimals Expanded (times tables are crucial for this method)</p> <table border="1"> <tr><td></td><td>1</td><td>2</td></tr> <tr><td>3</td><td>3</td><td>6</td></tr> <tr><td></td><td>3</td><td>0</td></tr> <tr><td></td><td colspan="2"><hr/></td></tr> <tr><td></td><td>6</td><td></td></tr> <tr><td></td><td>6</td><td></td></tr> <tr><td></td><td colspan="2"><hr/></td></tr> <tr><td></td><td>0</td><td></td></tr> </table> | | | 1 | 2 | 3 | 3 | 6 | | 3 | 0 | | <hr/> | | | 6 | | | 6 | | | <hr/> | | | 0 |
| x | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | 240 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 258 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <hr/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <hr/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>There are 9 white flowers. There are 3 times as many red flowers as white flowers. How many red flowers are there?</p> | | <p>Bar Model/ Part Part Whole</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>By the end of Year 3 introduce expanded multiplication in Year 4 section</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Multiplication Year 4

Pictorial

Abstract

$$32 \times 24 = 768$$



Long Multiplication

Expand to include decimals
(times tables are crucial for this method)

Expanded:

$$\begin{array}{r} 32 \\ 24 \times \\ \hline 8 \\ 120 \\ 40 \\ 600 \\ \hline 768 \end{array}$$

Progressing onto compact:

$$\begin{array}{r} 32 \\ 24 \times \\ \hline 128 \\ 640 \\ \hline 768 \end{array}$$

Order of calculation

u x u (4x2)

u x t (4x3)

t x u (2x2)

t x t (2x3)

Manipulatives

Counters

Dienes

Place Value Counters

Place Value Cards



Division Year 4

Pictorial

Abstract

$$570 \div 5 = 114$$

Short Method (for number divide by a 1 digit number)

Expand to include decimals

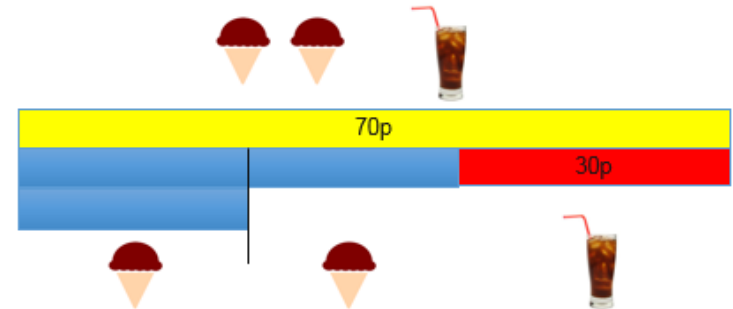
Use the language of exchanging

(times tables are crucial for this method)

$$\begin{array}{r} 114 \\ 5 \overline{) 570} \end{array}$$

Bar Model/ Part Part Whole

- I buy 2 chocolate ice creams and a drink for 70p
- If the drink costs 30p. How much would one chocolate ice cream cost ?



Multiplication Year 5 and 6

Abstract

$$32 \times 24 = 768$$

Long Multiplication

Expand to include decimals
(times tables are crucial for this method)

$$\begin{array}{r} 32 \\ 24 \times \end{array}$$

Order of calculation

$u \times u$ (4x2)

$u \times t$ (4x3)

$t \times u$ (2x2)

$t \times t$ (2x3)

$$\begin{array}{r} 128 \\ 640 \\ \hline 768 \end{array}$$

Manipulatives

Counters
Dienes
Place Value Counters
Place Value Cards



Division Year 5 and 6

Abstract

$$570 \div 5 = 114$$

Short Method (for number divide by a 1 digit number)

Expand to include decimals
Use the language of exchanging
(times tables are crucial for this method)

$$\begin{array}{r} 114 \\ 5 \overline{) 570} \end{array}$$

$9.3 \times 54 = 483.6$

(decimals)

$$\begin{array}{r} 9.3 \\ \times 54 \\ \hline 372 \\ 4650 \\ \hline 502.2 \end{array}$$

- 1) Line up the two numbers forgetting about the PV columns
- 2) Pretend the decimal point(s) aren't there and treat them as whole numbers.
- 3) Work out exactly the same way as if they were whole numbers.
- 4) Vertically add the numbers generated.
- 5) Count how many numbers are to the right of the decimal in the original multiplication (the 3 therefore 1 number).
- 6) Then put a decimal place back into your answer, depending on how many you counted in step 5 (in the instance it's 1). Counting from the right.

$684 \div 19 = 36$

Long method (for number divide by a 2 digit number)

Expand to include decimals

Expanded

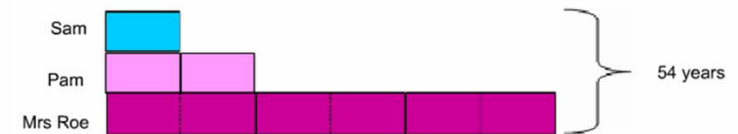
(times tables are crucial for this method)

$$\begin{array}{r} 36 \\ 19 \overline{) 684} \\ \underline{190} \quad (10 \times 19) \\ 494 \\ \underline{380} \quad (20 \times 19) \\ 114 \\ \underline{95} \quad (5 \times 19) \\ 19 \\ \underline{19} \quad (1 \times 19) \\ 00 \end{array}$$

Bar Model/ Part Part Whole

Question 1:

Mrs Roe is three times as old as her daughter, Pam, who is twice as old as her brother, Sam. If their total age is 54 years, how old is Pam?



$9 \text{ units} \rightarrow 54 \text{ years}$

$1 \text{ unit} \rightarrow 54 \div 9 = 6$

$2 \text{ units} \quad 2 \times 6 = 12$

Pam is **12** years old.

For videos to help with manipulatives and method go to:

<https://www.youtube.com/user/NCETM>