This booklet has been written to show you the stages that your child will go through in learning how to add, subtract, multiply and divide.

Some children will miss out some stages while others may use additional strategies to consolidate their understanding. Children will not be moved on to the next stage until they are ready and confident to do so.

This booklet should help you to help your child. If you are unsure what strategies your child is using please talk to the class teacher.

Children are not expected to reach the later strategies in each section until near the end of key stage 2.

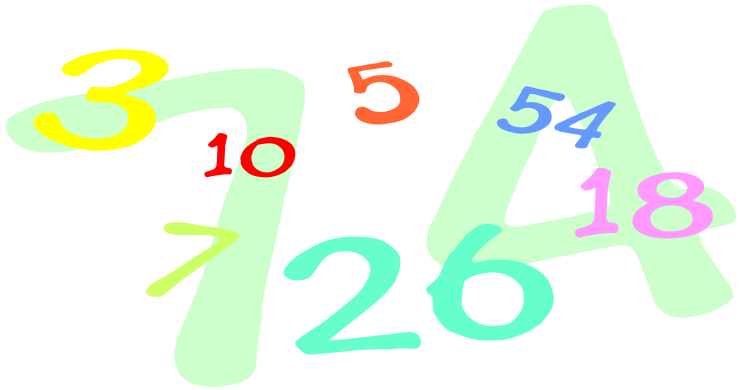
By the end of year 6, children will have a range of calculation methods, mental and written for all four operations. Selection will depend upon the numbers involved.

Children should be encouraged to:-

- ✓ Approximate their answers before calculating.
- ✓ Check their answers after calculation using an appropriate strategy.
- ✓ Consider if a mental calculation would be appropriate before using written methods.

# Featherstone Wood Primary & Nursery School

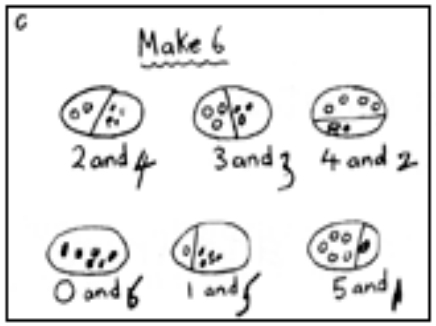
## 'Supporting Your Child with Mathematics'




## Progression in Written Calculations

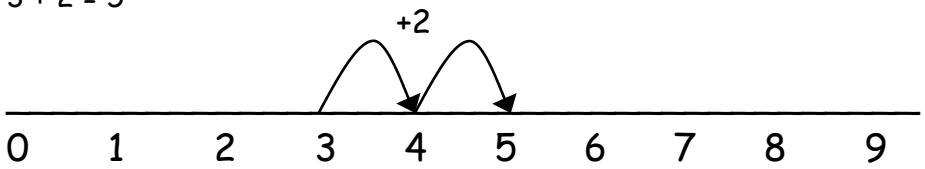
# Addition

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



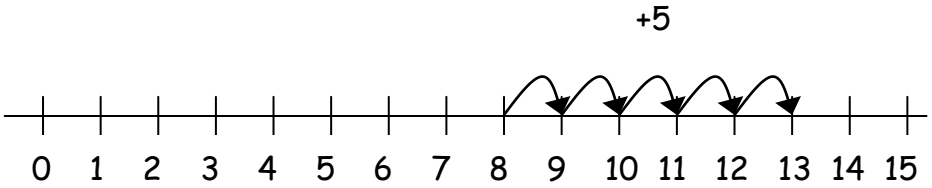

They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.

3 + 2 = 5




Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones.

8 + 5 = 13




Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

## Long division HTO ÷ TO

972 ÷ 36

```
      27
36 ) 972
   - 720      (20x)
     252
   - 252      (7x)
       0
        ↓
Answer :  27
```

What I know
10 x 36 = 360
20 x 36 = 720
5 x 36 = 180
2 x 36 = 72
7 x 36 = 252

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3\ ^{2}/_{10}$ which could then be written as $3\ ^{1}/_{5}$ in its lowest terms.

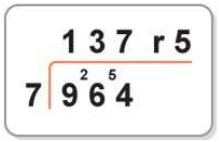
Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.

87.5 ÷ 7

```
    12.5
7 ) 87.5
  - 70.0     (10x)
    17.5
  - 14.0     (2x)
     3.5
  -  3.5     (0.5x)
       0
        ↓
Answer :  12.5
```

What I know
10 x 7 = 70
2 x 7 = 14
5 x 7 = 35
0.5 x 7 = 3.5

Progression to short division



Leading to subtraction of other multiples.

96 ÷ 6

```
   1 6
6 ) 96
  - 60      (10x)
    36
  - 36      (6x)
    0
        ↓
Answer :  16
```

What I know
10 x 6 = 60
1 x 6 = 6
5 x 6 = 30
6 x 6 = 36

Remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division. They should make sensible decisions about rounding up or down after division. For example 62 ÷ 8 is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?
Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?
Answer: 8 (the remaining 6 apples still need to be placed into a box)

Children can start to subtract larger multiples of the divisor, e.g. 30x

**Long division HTO ÷ O**

196 ÷ 6

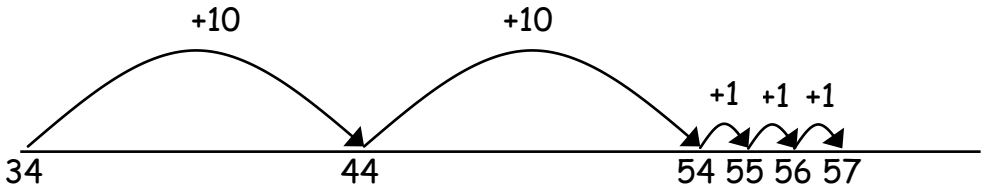
```
    32 r 4
6 ) 196
  - 180     (30x)
    16
  -  12     (2x)
     4
        ↓
Answer :  32  4/6
```

What I know
10 x 6 = 60
20 x 6 = 120
30 x 6 = 180
2 x 6 = 12

Any remainders should be shown as fractions, i.e. 14 remainder $^{2}/_{6}$.

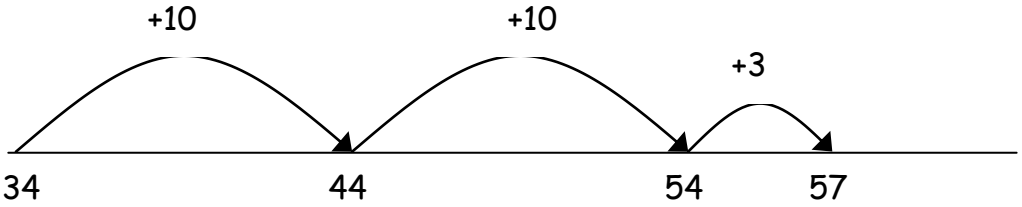
✓ First counting on in tens and ones.

34 + 23 = 57 (34 + 10 + 10 + 1 + 1 + 1)



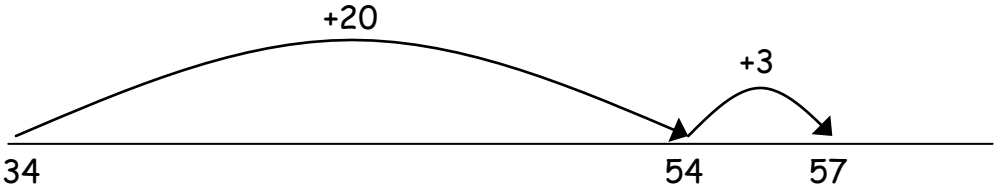

✓ Then helping children to become more efficient by adding the ones in one jump (by using the known fact 4 + 3 = 7).

34 + 23 = 57 (34 + 10 + 10 + 3)



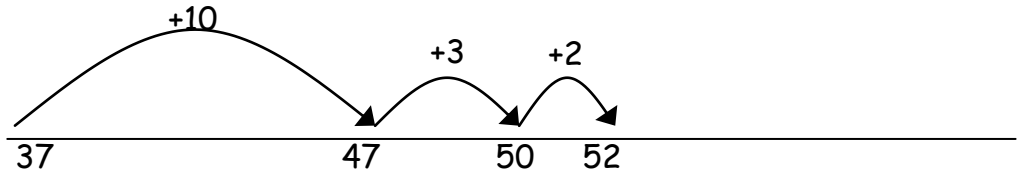

✓ Followed by adding the tens in one jump and the ones in one jump.

34 + 23 = 57 (34 + 20 + 3)




✓ Bridging through ten can help children become more efficient.

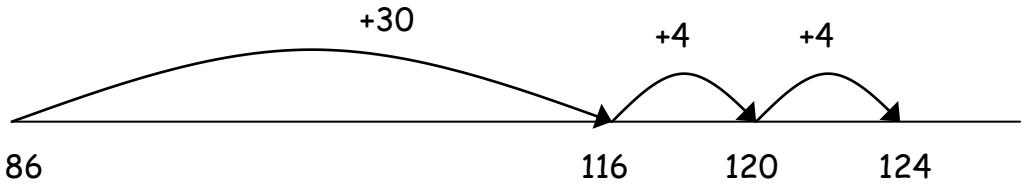
37 + 15 = 52 (37 + 10 + 3 + 2)



Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

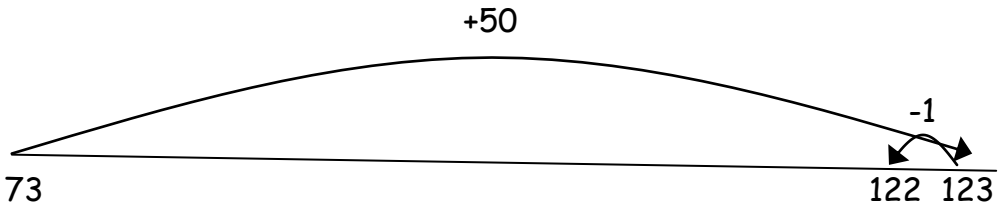
✓ Count on from the largest number irrespective of the order of the calculation.

38 + 86 = 124




✓ Compensation

49 + 73 = 122 (73 + 50 – 1)




Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

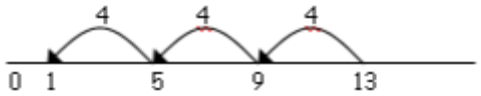
Moving to adding the least significant digits first in preparation for 'carrying'.

Adding the least significant digits first

| | |
|---|---|
| 67 | 267 |
| 24 + | 85 + |
| 11 ( 7 + 4) | 12 ( 7 + 5) |
| 80 (60 + 20) | 140 (60 + 80) |
| 91 | 200 |
| | 352 |

Children should also move onto calculations involving remainders. This can be done by counting down or up using multiplication facts.

13 ÷ 4 = 3 r 1

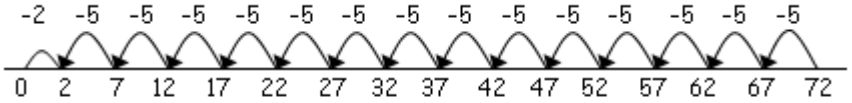



✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

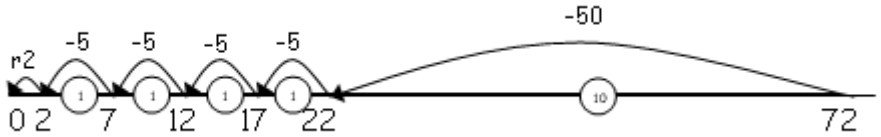
26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

e.g. 72 ÷ 5




Moving onto:




Then onto the vertical method:

**Long division TO ÷ O**

72 ÷ 3

| | | |
|---|---|---|
| 3 ) 72 | | |
| - 30 | (10x) | |
| 42 | | |
| - 30 | (10x) | |
| 12 | | |
| - 6 | (2x) | |
| 6 | | |
| - 6 | (2x) | |
| 0 | ↓ | |
| Answer : | 24 | |

What I know

10 x 3 = 30

1 x 3 = 3

2 x 3 = 6

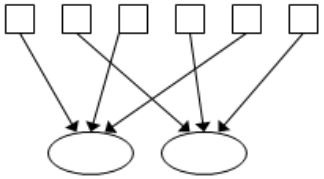
## Division

Children will share items out in equal groups in play and problem solving. They will count in 2s and 10s and later in 5s.

Children will develop their understanding of division and use jottings to support calculation

✓ **Sharing equally**

6 sweets shared between 2 people, how many do they each get?

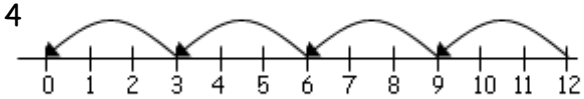


✓ **Grouping or repeated subtraction**

There are 6 sweets, how many people can have 2 sweets each?

✓ **Repeated subtraction using a number line**

12 ÷ 3 = 4




✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

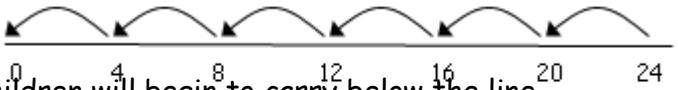
□ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ △ = 4

The emphasis in Y3 is on grouping rather than sharing.
Children will continue to use:

✓ **Repeated subtraction using a number line**

Children will use an empty number line to support their calculation.

24 ÷ 4 = 6




From this, children will begin to carry below the line.

$$\begin{array}{r} 625 \\ 48 + \\ \hline 673 \\ \scriptstyle 1 \end{array} \qquad \begin{array}{r} 367 \\ 85 + \\ \hline 452 \\ \scriptstyle 11 \end{array} \qquad \begin{array}{r} 3587 \\ 675 + \\ \hline 4262 \\ \scriptstyle 111 \end{array}$$

*Using similar methods, children will:*

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding mixed amounts, e.g. £3.59 + 78p.*
- ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *extend the carrying method to numbers with at least four digits.*

Children should extend the carrying method to numbers with any number of digits.

$$\begin{array}{r} 7648 \\ 1486 + \\ \hline 9134 \\ \scriptstyle 111 \end{array} \qquad \begin{array}{r} 6584 \\ 5848 + \\ \hline 12432 \\ \scriptstyle 111 \end{array} \qquad \begin{array}{r} 42 \\ 6432 \\ 786 \\ 4684 + \\ \hline 11944 \\ \scriptstyle 121 \end{array}$$

*Using similar methods, children will*

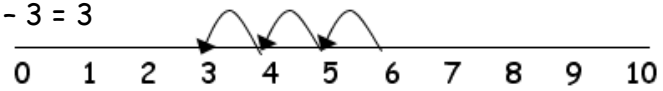
- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding mixed amounts, e.g. 401.2 + 26.85 + 0.71.*

## Subtraction

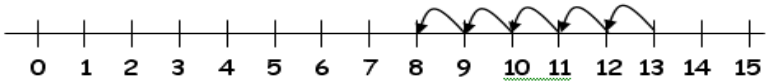
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.

They use numberlines and practical resources to support calculation. Teachers *demonstrate* the use of the numberline.

6 – 3 = 3




The numberline will also be used to show that 6 – 3 means 'the difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.




Children then begin to use numbered lines to support their own calculations - using a numbered line to count back in ones.

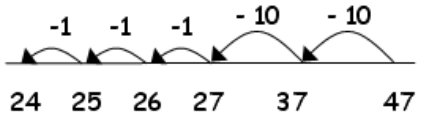
13 – 5 = 8

Children will begin to use empty number lines to support calculations.

**Counting back**

✓ First counting back in tens and ones.

47 – 23 = 24




**ThHTO x O** (Short multiplication – multiplication by a single digit) 4346 x 8

Children will approximate first 4346 x 8 is approximately 4346 x 10 = 43460

| x | 4000 | 300 | 40 | 6 |
|---|---|---|---|---|
| 8 | 32000 | 2400 | 320 | 48 |

32000
2400
320
48 +
34768

**HTO x TO** (Long multiplication – multiplication by more than a single digit)

372 x 24

Children will approximate first 372 x 24 is approximately 400 x 25 =10000

| x | 300 | 70 | 2 |
|---|---|---|---|
| 20 | 6000 | 1400 | 40 |
| 4 | 1200 | 280 | 8 |

6000
1400
1200
280
40
8 +
8928
1

**U.th x O** e.g. 4.92 x 3

Children will approximate first 4.92 x 3 is approximately 5 x 3 = 15

| x | 4 | 0.9 | 0.02 |
|---|---|---|---|
| 3 | 12 | 2.7 | 0.06 |

12
0.7
0.06 +
12.76

**HTO x O** (Short multiplication – multiplication by a single digit)

346 x 9

Children will approximate first 346 x 9 is approximately 350 x 10 =3500

| x | 300 | 40 | 6 |
|---|---|---|---|
| 9 | 2700 | 360 | 54 |

2700
360
54+
3114
1 1

**TO x TO** (Long multiplication – multiplication by more than a single digit)

72 x 38

Children will approximate first 72 x 38 is approximately 70 x 40 = 2800

| x | 70 | 2 |
|---|---|---|
| 30 | 2100 | 60 |
| 8 | 560 | 16 |

2100
560
60
16 +
2736
1

**O.t x O** e.g. 4.9 x 3

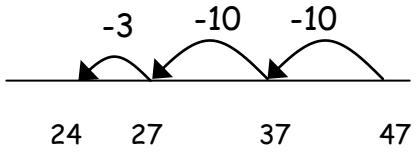
Children will approximate first 4.9 x 3 is approximately 5 x 3 = 15

| x | 4 | 0.9 |
|---|---|---|
| 3 | 12 | 2.7 |

12
2.7 +
14.7

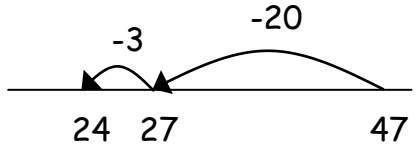
✓ Then helping children to become more efficient by subtracting the ones in one jump (by using the known fact 7 – 3 = 4).

47 – 23 = 24



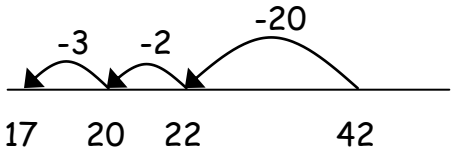

✓ Subtracting the tens in one jump and the ones in one jump.

47 – 23 = 24




✓ Bridging through ten can help children become more efficient.

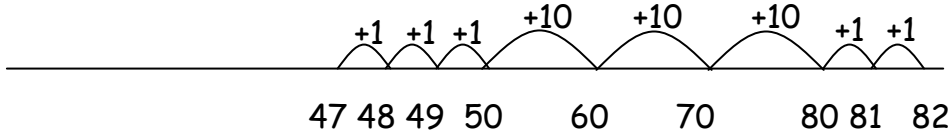
42 – 25 = 17




**Counting on**

Count on from 47 to 82 in jumps of 10 and jumps of 1.

82 - 47




**Help children to become more efficient with counting on by:**

✓ Adding the ones in one jump;
✓ Adding the tens in one jump and the ones in one jump;
✓ Bridging through ten.

Children will continue to use empty number lines with increasingly large numbers.

Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

**Partitioning and decomposition– This gives further reinforcement and will be a very brief phase for most children.**
This process will have been demonstrated using arrow cards to show the partitioning and base 10 materials to show the decomposition of the number.

**NOTE** When solving the calculation 89 – 57, children should know that 57 **does NOT EXIST AS AN AMOUNT** it is what you are subtracting from the other number. Therefore, when using base 10 or other materials, children would need to count out only the 89.

89 = 80 + 9
57 - 50 + 7
30 + 2 = 32

*Initially, the children will be taught using examples that do not need the children to exchange.*

From this the children will begin to exchange.

71
46 -

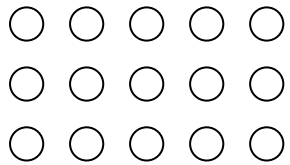
Step 1 70 + 1 Step 2 60 + 11
40 + 6 - 40 + 6 -
20 + 5 = 25

This would be recorded by the children as

$\cancel{70}^{60} + {}^{1}1$
40 + 6 -
20 + 5 = 25

✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



5 x 3 = 15

3 x 5 = 15

Children will also develop an understanding of
✓ Using symbols to stand for unknown numbers to complete equations using inverse operations

□ x 5 = 20 3 x △ = 18 □ x O = 32

✓ **Partitioning**

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

Children will continue to use arrays where appropriate leading into the grid method of multiplication.

**Grid method**

**TO x O** (Short multiplication – multiplication by a single digit)

23 x 8

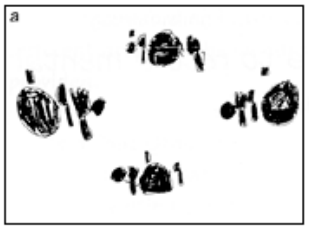
Children will approximate first 23 x 8 is approximately 25 x 8 = 200

| x | 20 | 3 |
|---|---|---|
| 8 | 160 | 24 |

160
+ 24
184

# Multiplication

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



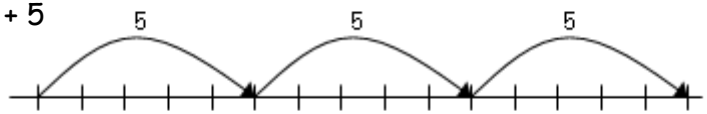
Children will develop their understanding of multiplication and use jottings to support calculation:

✓ **Repeated addition**

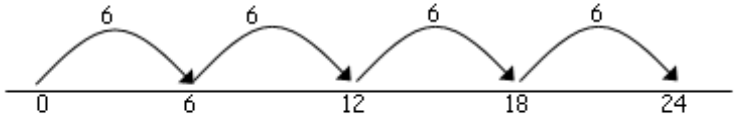
3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3

Repeated addition can be shown easily on a number line:

5 x 3 = 5 + 5 + 5

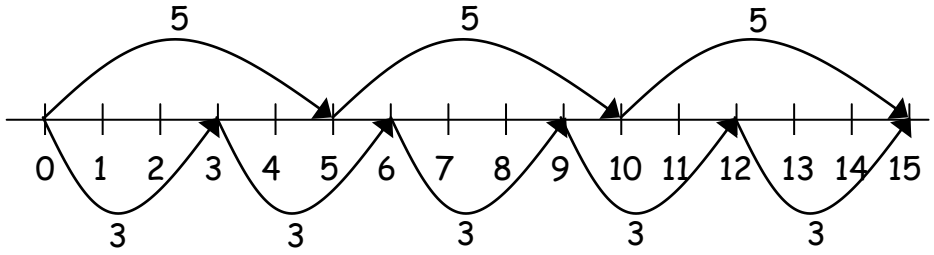



4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6 or 6 x 4




✓ **Commutativity**

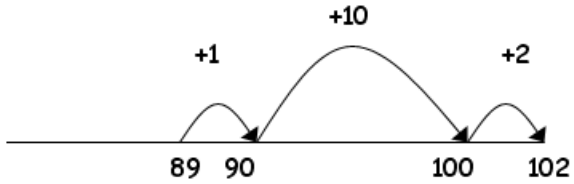
Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.




*Children should know that ones line up under ones, tens under tens, and so on.*

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

102 – 89 = 13




**Partitioning and decomposition – different number of digits**

754 =
- 86

Step 1

700 + 50 + 4
- 80 + 6

Step 2 *(adjust from Tens to Ones)*

700 + 40 + 14
- 80 + 6

Step 3 *(adjust from Hundreds to Tens)*

600 + 140 + 14
- 80 + 6
600 + 60 + 8 = 668

This would be recorded by the children as

600 140
~~7~~00 + ~~5~~0 + $^{1}$4
- 80 + 6
600 + 60 + 8 = 668

**Decomposition**

614 1
~~7~~~~5~~4
- 86
668

*Using this method children should:*

- ✓ *begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
- ✓ *know that decimal points should line up under each other.*

*For example:*

£8.95 = 8 + 0.9 + 0.05
-£4.38 4 + 0.3 + 0.08 -

leading to

= 8 + 0.8 + 0.15 *(adjust from Tens to Ones)*
4 + 0.3 + 0.08 -
4 + 0.5 + 0.07

= £4.57

$$\begin{array}{r} {\scriptstyle 1\phantom{00}} \\ 8.85 \\ -\ 4.38 \end{array}$$

Alternatively, children can set the amounts to whole numbers, i.e. 895 – 438 and convert to pounds after the calculation.

Step 1 754 = 700 + 50 + 4
286 - 200 + 80 + 6 -

Step 2 700 + 40 + 14 *(adjust from Tens to Ones)*
200 + 80 + 6 -

Step 3 600 + 140 + 14 *(adjust from Hundreds to Tens)*
200 + 80 + 6 -
400 + 60 + 8 = 468

This would be recorded by the children as

$$\begin{array}{r} {\scriptstyle 600\quad 140} \\ 7\cancel{00} + 5\cancel{0} + {}^{1}4 \\ 200 + 80 + 6 \\ \hline 400 + 60 + 8 = 468 \end{array}$$

**Decomposition**

$$\begin{array}{r} {\scriptstyle 614\ 1} \\ 7\cancel{5}4 \\ 286 \\ \hline 468 \end{array}$$

$$\begin{array}{r} {\scriptstyle 5\ 13\ 1} \\ 6\cancel{4}67 \\ 2684 \\ \hline 3783 \end{array}$$

*Children should:*

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other.*

Where the numbers involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should continue to be used.

3002 – 1997 = 1005