PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION

MENTAL CALCULATIONS
(ongoing)
These are a **selection** of mental calculation strategies:
See NNS Framework Section 5, pages 30-41 and Section 6, pages 40-47

Mental recall of subtraction facts
10 – 6 = 4 17 - □ = 11
20 - 17 = 3 10 - □ = 2

Find a small difference by counting up
82 – 79 = 3

Counting on or back in repeated steps of 1, 10, 100, 1000
86 - 52 = 34 (by counting back in tens and then in ones)
460 - 300 = 160 (by counting back in hundreds)

Subtract the nearest multiple of 10, 100 and 1000 and adjust
24 - 19 = 24 - 20 + 1 = 5
458 - 71 = 458 - 70 - 1 = 387

Use the relationship between addition and subtraction
36 + 19 = 55 19 + 36 = 55
55 – 19 = 36 55 – 36 = 19

Teachers should record the methods and strategies which the children can use confidently and records should be passed to the next teacher on transition. Record sheets are provided (see appendix 2).

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

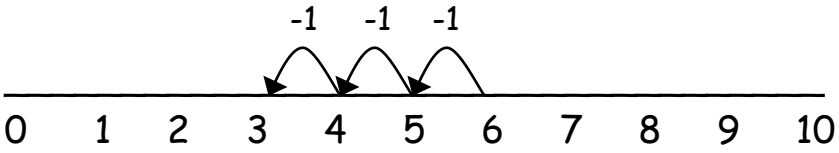
THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

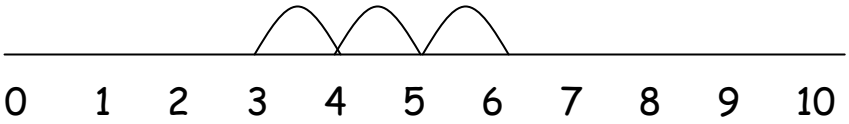
Children are given lots of practical opportunities to develop their understanding of subtraction. Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.

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

6 – 3 = 3

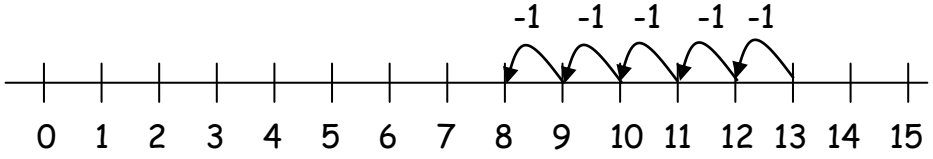


The numberline should also be used to show that 6 - 3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.



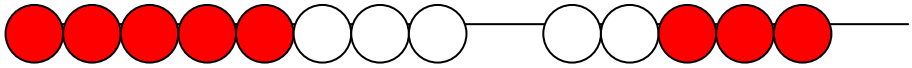
Children then begin to use number lines to support their own calculations - using a number line to count back in ones.

13 – 5 = 8



Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.

13 – 5 = 8



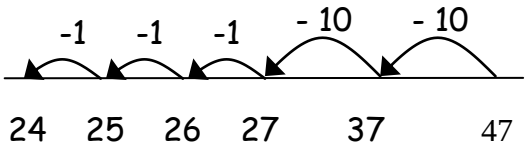
Y2

Children will begin to use empty number lines to support calculations. The 'counting back' and 'counting on' strategies should be taught simultaneously throughout Year 2. Children should be taught to recognise when one strategy is more efficient to use than the other depending on the numbers involved.

Counting back

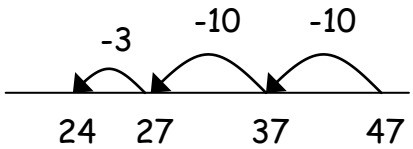
✓ First counting back in tens and ones.

47 – 23 = 24



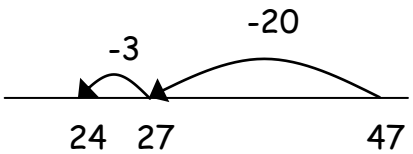
✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

47 – 23 = 24



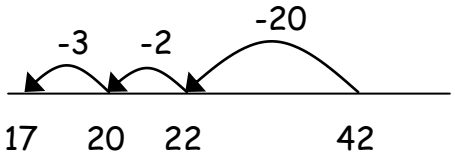
✓ Subtracting the tens in one jump and the units in one jump.

47 – 23 = 24



✓ Bridging through ten can help children become more efficient.

42 – 25 = 17

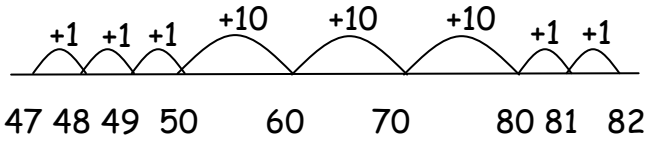


Counting on

If the numbers involved in the calculation are close together or near to multiples of 10, 100 etc, it can be more efficient to count on.

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

82 - 47



Help children to become more efficient with counting on by:

- ✓ Subtracting the units in one jump;
- ✓ Subtracting the tens in one jump and the units in one jump;
- ✓ Bridging through ten.

Y3

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 process should be 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 materials, children would need to count out only the 89.

$$\begin{array}{rcl} 89 & = & 80 + 9 \\ -\ 57 & & \underline{50 + 7} \\ & & 30 + 2 = 32 \end{array}$$

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

From this the children will begin to exchange.

$$\begin{array}{rcl} 71 & = & = \\ -\ 46 & & \end{array}$$

Step 1 $70 + 1$

$-\ \underline{40 + 6}$

Step 2 $60 + 11$

$-\ \underline{40 + 6}$

$20 + 5 = 25$

The calculation should be read as e.g. take 6 from 1.

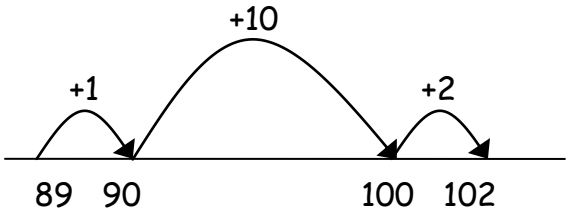
This would be recorded by the children as

$$\begin{array}{l} \overset{60}{\cancel{70}} + {}^{1}1 \\ -\ \underline{40 + 6} \\ 20 + 5 = 25 \end{array}$$

Children should know that units line up under units, 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



Y4

Partitioning and decomposition

754 =
- 86

Step 1 700 + 50 + 4
- 80 + 6

Step 2 700 + 40 + 14 *(adjust from T to U)*
- 80 + 6

Step 3 600 + 140 + 14 *(adjust from H to T)*
- 80 + 6
600 + 60 + 8 = 668

This would be recorded by the children as

600 140
~~700~~ + ~~50~~ + $^{1}4$
- 80 + 6
600 + 60 + 8 = 668

Decomposition

$$\begin{array}{r} {\scriptstyle 614\ 1} \\ 7\not{5}4 \\ -\ 86 \\ \hline 668 \end{array}$$

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *using this method, children should also 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:

$$\begin{array}{rcl} £8.95 & = & 8 + 0.9 + 0.05 \\ -£4.38 & & -\ 4 + 0.3 + 0.08 \\ \hline & = & 8 + 0.8 + 0.15 \\ & & -\ 4 + 0.3 + 0.08 \\ \hline & & 4 + 0.5 + 0.07 \end{array}$$

(adjust from T to U)

= £4.57

leading to

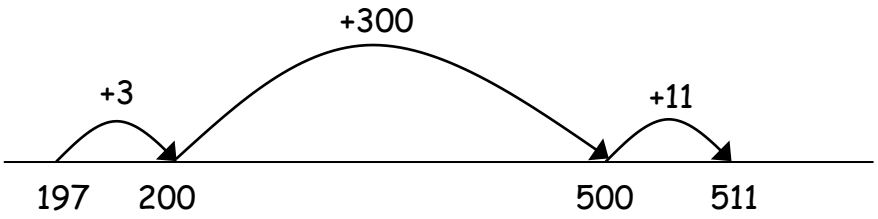
$$\begin{array}{r} {\scriptstyle 1} \\ 8.85 \\ -\ 4.38 \\ \hline \end{array}$$

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

NB If your children have reached the concise stage they will then continue this method through into years 5 and 6. They will not go back to using the expanded methods.

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.

511 – 197 = 314



Y5

Partitioning and decomposition

Step 1
$$\begin{array}{rcl} 754 & = & 700 + 50 + 4 \\ \underline{- 286} & & \underline{- 200 + 80 + 6} \end{array}$$

Step 2
$$\begin{array}{rl} 700 + 40 + 14 & \textit{(adjust from T to U)} \\ \underline{- 200 + 80 + 6} & \end{array}$$

Step 3
$$\begin{array}{rl} 600 + 140 + 14 & \textit{(adjust from H to T)} \\ \underline{- 200 + 80 + 6} & \\ 400 + 60 + 8 = 468 & \end{array}$$

This would be recorded by the children as

$$\begin{array}{l} \overset{600}{\cancel{7}}00 + \overset{140}{\cancel{5}}0 + {}^{1}4 \\ \underline{- 200 + 80 + 6} \\ 400 + 60 + 8 = 468 \end{array}$$

Decomposition

$$\begin{array}{l} \overset{614\ 1}{\cancel{7}\cancel{5}}4 \\ \underline{- 286} \\ 468 \end{array}$$

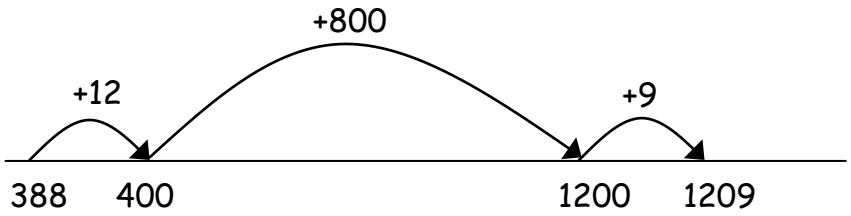
Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other.*

NB If your children have reached the concise stage they will then continue this method through into year 6. They will not go back to using the expanded methods.

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.

1209 – 388 = 821



Y6

Decomposition

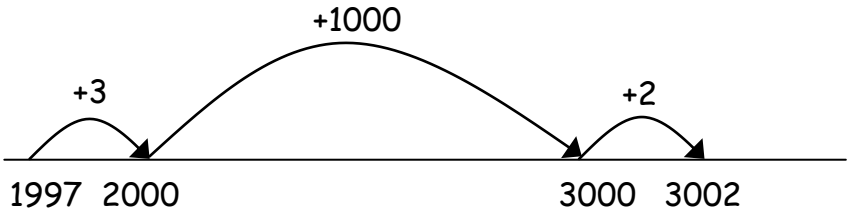
$$\begin{array}{r} {\scriptstyle 5\,13\,1} \\ 6\not{4}67 \\ -\ 2684 \\ \hline 3783 \end{array}$$

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 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.

3002 – 1997 = 1005



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

Children should not be made to go onto the next stage if:

1) **they are not ready.**
2) **they are not confident.**

Children should use practical apparatus until they are confident without it.
Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

Children who use English as an additional language or children who arrive from other schools may already have efficient methods for calculating. The children should be encouraged to use their methods but they should also be able to explain the methods they are using. If it is apparent that a child is unable to explain the method they are using (and this is not due to a lack of English language) or they have a lack of understanding of the method they are using, then the children should be taught the methods in the calculation policy with an emphasis on explaining how the method works.