

# PROGRESSION THROUGH CALCULATIONS FOR ADDITION

## 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

In the Foundation Stage, Key Stage 1 and Year 3, calculations will be referred to as number sentences.

### **Mental recall of number bonds and complements**

$$6 + 4 = 10$$

$$\square + 3 = 10$$

$$25 + 75 = 100$$

$$19 + \square = 20$$

For clarification: complements to 10 include addition sums in which the two numbers add to make a total of 10 e.g.  $3 + 7 = 10$ . Number bonds to 10 include any numbers below 10 added together which total a number up to 10 e.g.  $3 + 4 = 7$ . Children should learn to know number bonds and complements with quick recall. Lots of practice is needed.

### **Use near doubles**

$$6 + 7 = \text{double } 6 + 1 = 13$$

### **Addition using partitioning and recombining**

$$34 + 45 = (30 + 40) + (4 + 5) = 79$$

### **Counting on or back in repeated steps of 1, 10, 100, 1000**

$$86 + 57 = 143 \text{ (by counting on in tens and then in ones)}$$

$$460 - 300 = 160 \text{ (by counting back in hundreds)}$$

### **Add the nearest multiple of 10, 100 and 1000 and adjust**

$$24 + 19 = 24 + 20 - 1 = 43$$

$$458 + 71 = 458 + 70 + 1 = 529$$

### **Use the relationship between addition and subtraction**

$$36 + 19 = 55$$

$$19 + 36 = 55$$

$$55 - 19 = 36$$

$$55 - 36 = 19$$

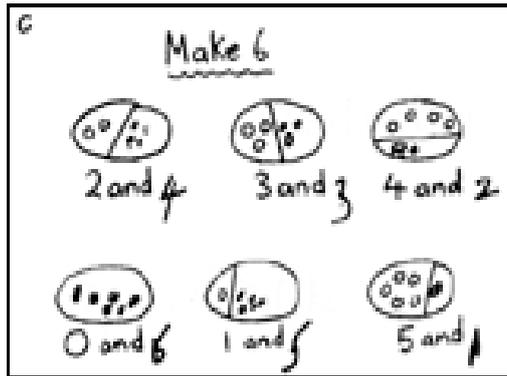
Teachers should record the methods and strategies which the children can use confidently and records should be passed to the next teacher on transition. Record sheets are provided (see appendix 2).

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

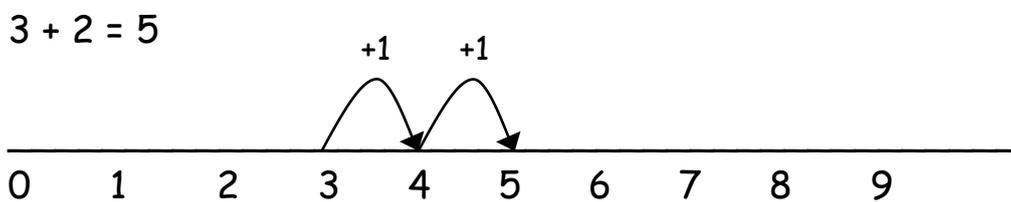
THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

## YR and Y1

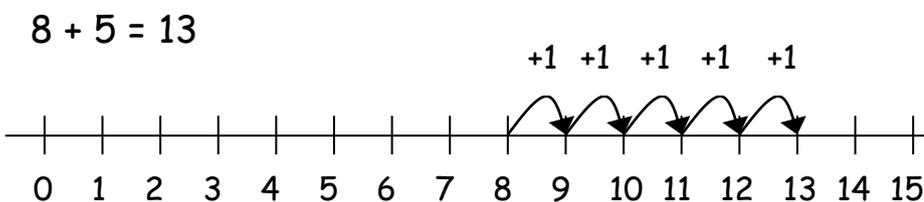
Children are given lots of practical opportunities to develop their understanding of addition. They are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



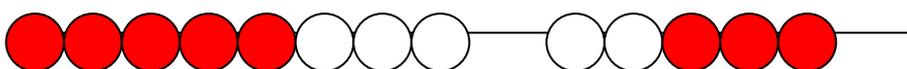
They use numberlines and practical resources to support calculation and teachers demonstrate the use of the numberline.



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



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

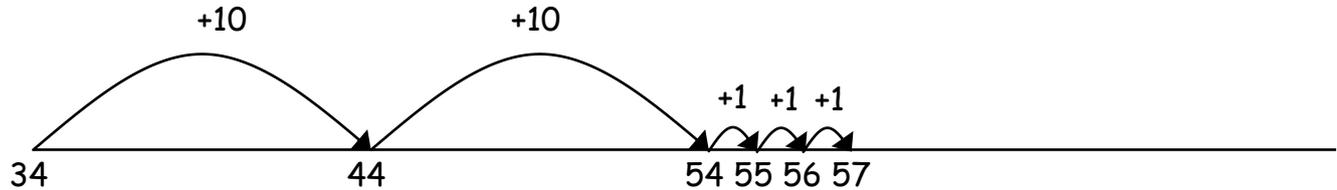


## Y2

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

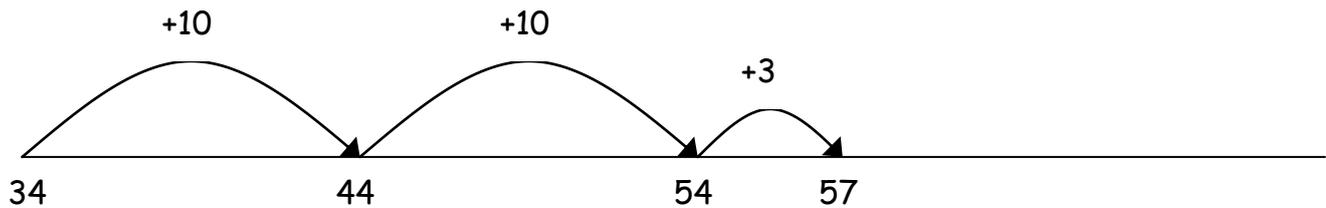
- ✓ First counting on in tens and ones.

$$34 + 23 = 57$$



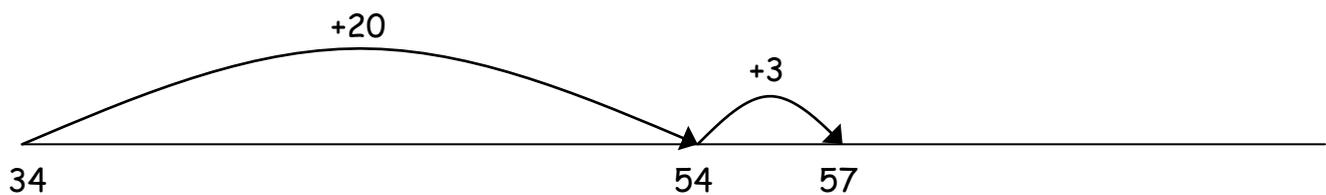
- ✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact  $4 + 3 = 7$ ).

$$34 + 23 = 57$$



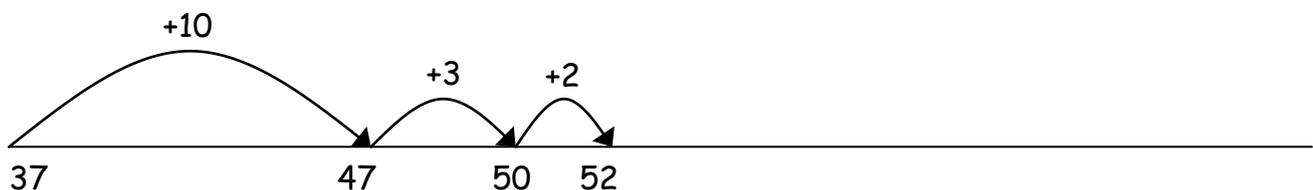
- ✓ Followed by adding the tens in one jump and the units in one jump.

$$34 + 23 = 57$$



- ✓ Bridging through ten can help children become more efficient.

$$37 + 15 = 52$$

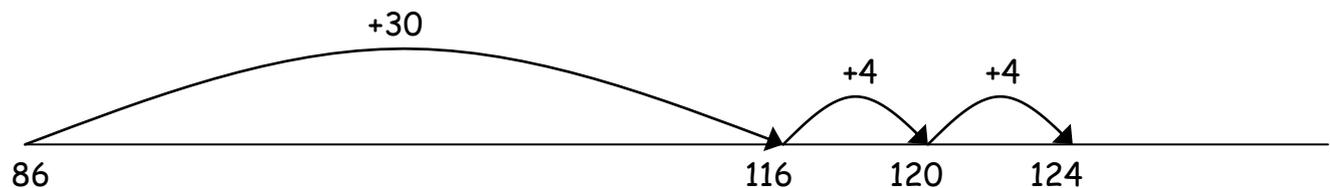


### Y3

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

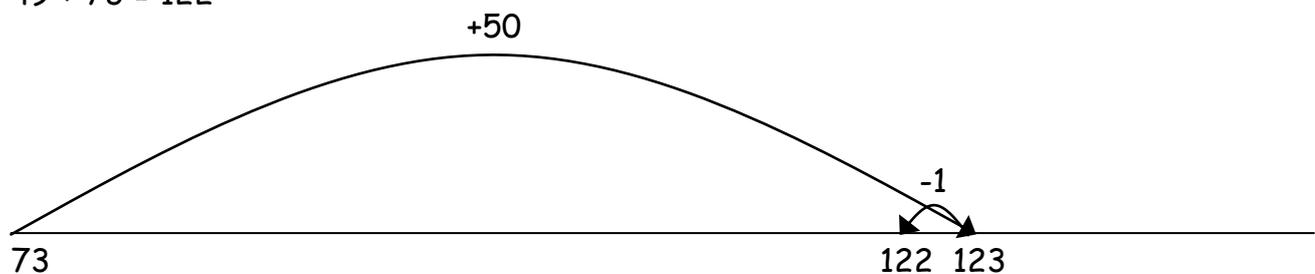
- ✓ Count on from the largest number irrespective of the order of the calculation.

$$38 + 86 = 124$$



- ✓ Compensation

$$49 + 73 = 122$$



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

Adding most significant digits first, then moving to adding least significant digits.

$$\begin{array}{r} 67 \\ + 24 \\ \hline 80 \text{ (60 + 20)} \\ \underline{11} \text{ (7 + 4)} \\ \hline 91 \end{array}$$

$$\begin{array}{r} 267 \\ + 85 \\ \hline 200 \\ 140 \text{ (60 + 80)} \\ \underline{12} \text{ (7 + 5)} \\ \hline 352 \end{array}$$

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

$$\begin{array}{r} 67 \\ + 24 \\ \hline 11 \text{ ( } 7 + 4 \text{)} \\ \underline{80} \text{ (} 60 + 20 \text{)} \\ \underline{91} \end{array}$$

$$\begin{array}{r} 267 \\ + 85 \\ \hline 12 \text{ ( } 7 + 5 \text{)} \\ 140 \text{ (} 60 + 80 \text{)} \\ \underline{200} \\ \underline{352} \end{array}$$

## Y4

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

$$\begin{array}{r} 625 \\ + 48 \\ \hline 673 \\ \underline{1} \end{array}$$

$$\begin{array}{r} 783 \\ + 42 \\ \hline 825 \\ \underline{1} \end{array}$$

$$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ \underline{11} \end{array}$$

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 or subtracting mixed amounts, e.g. £3.59 + 78p.

## Y5

Children should extend the carrying method to numbers with at least four digits.

$$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ \underline{11} \end{array}$$

$$\begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \\ \underline{111} \end{array}$$

Using similar methods, children will:

- ✓ add several numbers with different numbers of digits;
- ✓ begin to add two or more decimal fractions with up to three digits and the same number of decimal places;
- ✓ know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m - 280 cm.

## Y6

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

$$\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 42 \\ 6432 \\ 786 \\ 3 \\ + 4681 \\ \hline 11944 \\ \hline 121 \end{array}$$

*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 or subtracting mixed amounts, e.g.  $401.2 + 26.85 + 0.71$ .*

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**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 need to 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.**