WOOLENWICK JUNIOR SCHOOL
PROGRESSION THROUGH CALCULATIONS FOR <u>ADDITION</u>

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one **accurate** and **efficient** written method of calculation for addition, which they know they can rely on when mental methods are not appropriate.

MENTAL CALCULATIONS (ongoing)

To subtract successfully, children need to be able to:

Mental recall of number bonds and addition pairs

6 + 4 = 10   □ + 3 = 10

25 + 75 = 100   19 + □ = 20   9 + 9 = 18

Use doubles and near doubles

6 + 7 = double 6 + 1 = 13

Add mentally a series of one-digit numbers

5 + 8 + 4 =

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 (by counting on in tens and then in ones)

460 - 300 = 160 (by counting back in hundreds)

Add multiples of 10 or of 100 using the related addition fact and their knowledge of place value

If 6 + 7 = 13   60 + 70 = 130   600 + 700 = 1300

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

Partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways

234   200 + 30 + 4   100 +130 + 4   100 + 120 + 14

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for addition.

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

PHASE 1: Practical Resources and Pictures (NNF – YR, P Levels)

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, cubes, counters** etc.
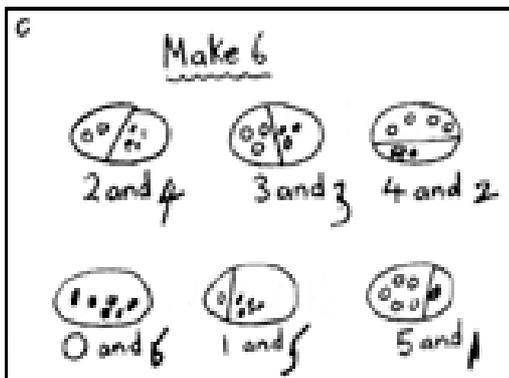
| 1 | ? | | 5 | ? | 7 | | ? | 10 |

What is the number before 5? And after 5?
Before 10? What is the number between 3 and 5?
• What numbers are between 7 and 10?

Vocabulary
add, more, and, make, sum, total, altogether, score, double

PHASE 2: Numberlines – Count on (NNF – Y1, Level 1)

They use **numberlines** and **practical resources** to support calculation and teachers *demonstrate* the use of the numberline. They should also be very familiar with the use of a **hundred numbers square**.
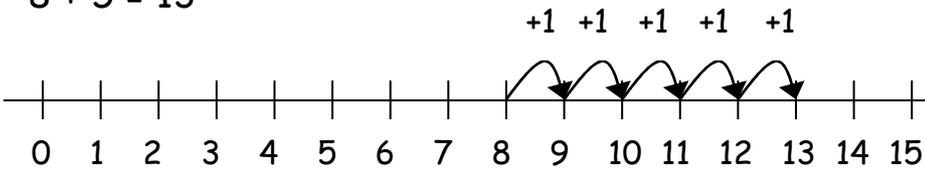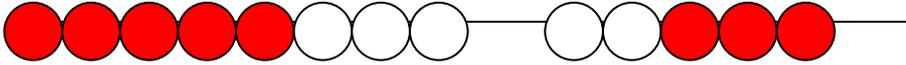
3 + 2 = 5
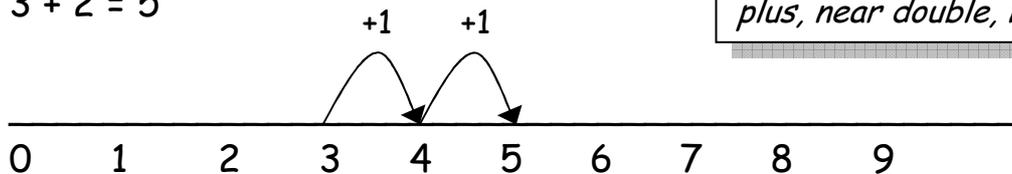
Vocabulary
plus, near double, much more


```
       +1     +1
      /‾‾\   /‾‾\
     /    \ /    \
0   1   2   3   4   5   6   7   8   9
```

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

8 + 5 = 13

+1 +1 +1 +1 +1

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Bead strings or **bead bars** can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.
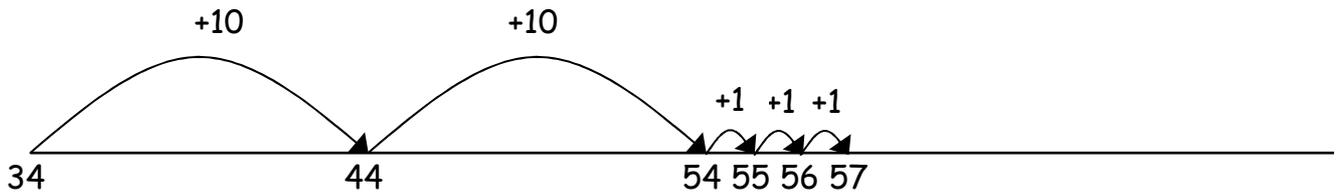
PHASE 3: Empty Numberline – Count on including compensation (NNF – Y2/3, Level 2)

Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.
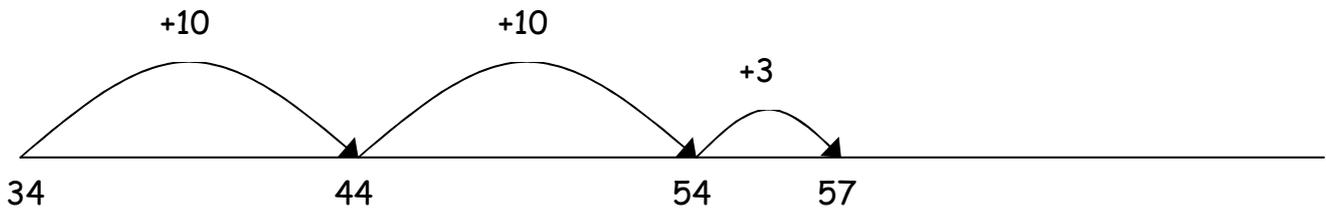
✓ First counting on in tens and ones.

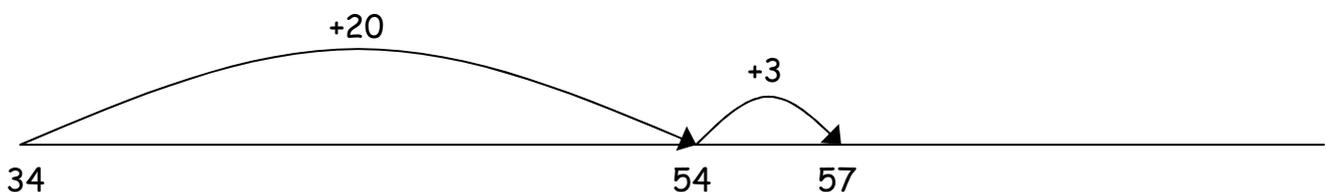| Vocabulary |
| addition |

34 + 23 = 57

+10 +10 +1 +1 +1

34 44 54 55 56 57

✓ Then helping children to become more efficient by adding the units in one jump.
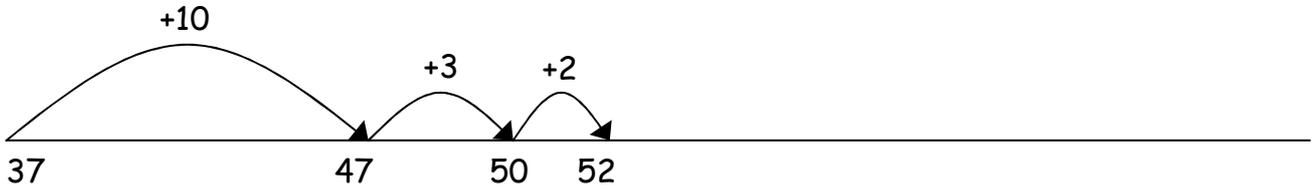
34 + 23 = 57

+10 +10 +3

34 44 54 57

✓ Followed by adding the tens in one jump and the units in one jump.
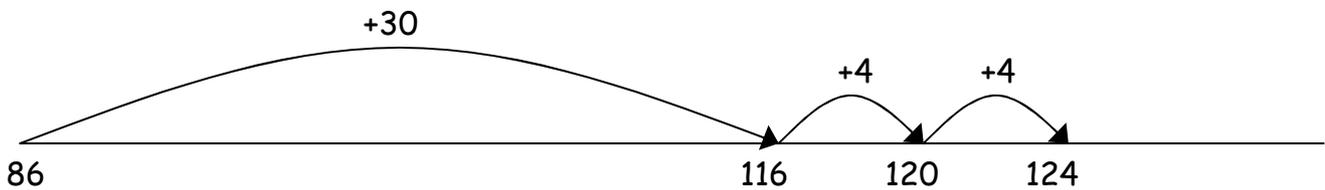
34 + 23 = 57

+20 +3

34 54 57

✓ Bridging through ten can help children become more efficient.

37 + 15 = 52

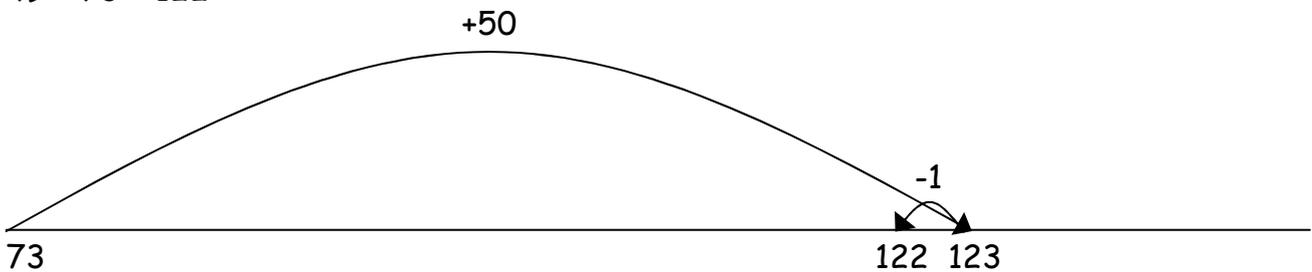✓ Count on from the largest number irrespective of the order of the calculation.

38 + 86 = 124

✓ Compensation

49 + 73 = 122

PHASE 4: Partitioning (NNF – Y3/4, Level 3)

This process should be demonstrated using **arrow cards** to show the partitioning and **base 10 materials** to show the decomposition of the number.

✓ Adding the tens and then the ones

Vocabulary
increase

47 + 76 = 47 + 70 + 6 = 117 + 6 = 123

47 + 76 = 40 + 70 + 7 + 6 = 110 + 13 = 123

✓ Partitioning both numbers to mirror the column method.

```
  47 =  40 + 7
+ 76 =  70 + 6
        110 + 13 = 123
```

PHASE 5: Expanded method in columns (NNF – Y3/4, Level 3)

✓ Adding most significant digits first

```
        67
      + 24
        80  (60 + 20)
        11  ( 7 + 4)
        91
```

```
        267
      +  85
        200
        140  (60 + 80)
         12  ( 7 +  5)
        352
```

✓ Adding the least significant digits first – in preparation for 'carrying'.

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

PHASE 6: Column method (NNF – Y4/5/6, Level 3/4)

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

```
    625                  783                  367
  +  48                +  42                +  85
    673                  825                  452
     1                    1                    1 1
```

```
   587            3587
+  475         +   675
  1062           4262
   1 1            1 1 1


  7648           6584              42
+  1486        +  5848           6432
  9134          12432            786
   1 11           1 11             3
                              +  4681
                                11944
                                 1 2 1
```

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 or 401.2 + 26.85 + 0.71.*
- ✓   *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*

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 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.**