MENTAL CALCULATIONS

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 number bonds

6 + 4 = 10   □ + 3 = 10

25 + 75 = 100   19 + □ = 20

Use near doubles

6 + 7 = 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 (by counting on in tens and then in ones)

460 - 300 = 160 (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
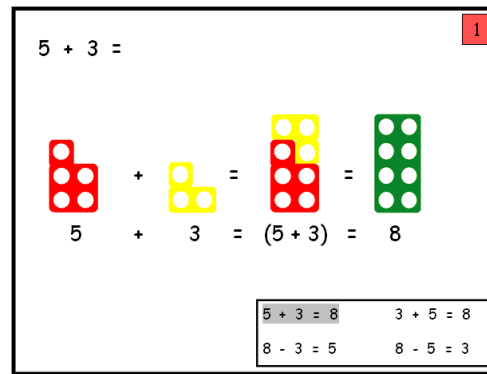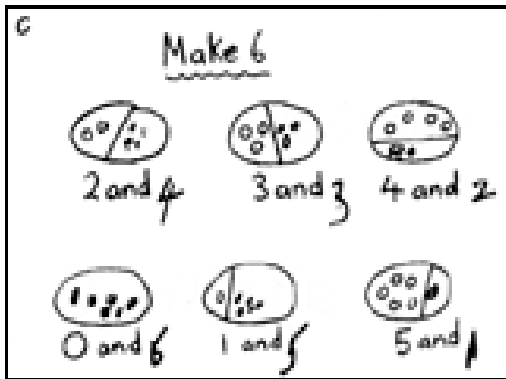
36 + 19 = 55   19 + 36 = 55

55 – 19 = 36   55 – 36 = 19

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED.
THEY ARE NOT REPLACED BY WRITTEN METHODS.
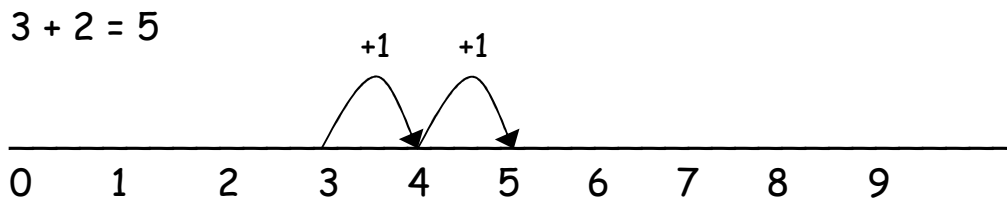
Reception and Year 1

Pupils 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, Numicon etc.


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

$3 + 2 = 5$

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

$8 + 5 = 13$
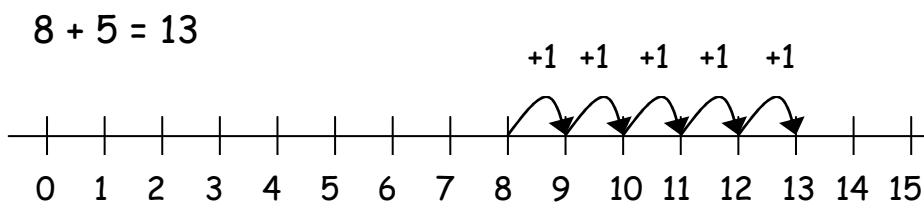
Numicon plates, bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.
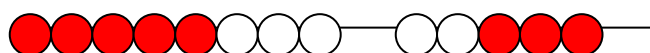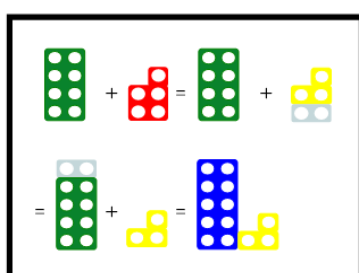
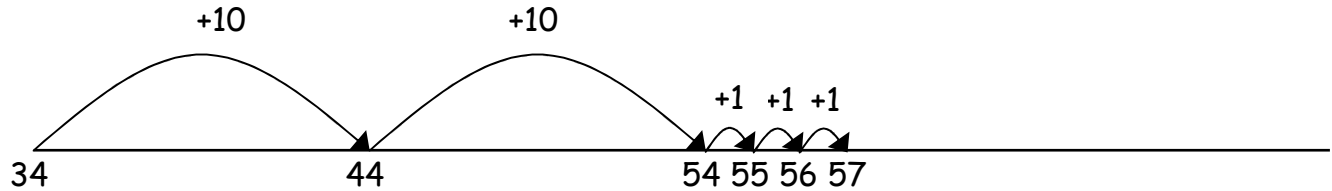# Year 2

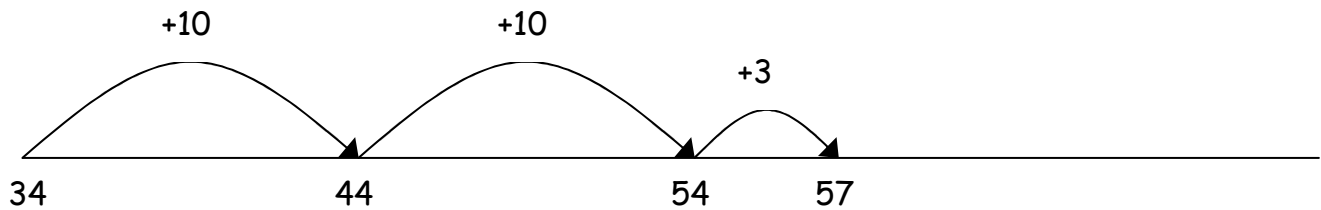Pupils will begin to use 'empty number lines' themselves starting with the larger number and counting on.

✓ First counting on in tens and ones.

34 + 23 = 57

✓ Then helping pupils 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 pupils become more efficient.

37 + 15 = 52
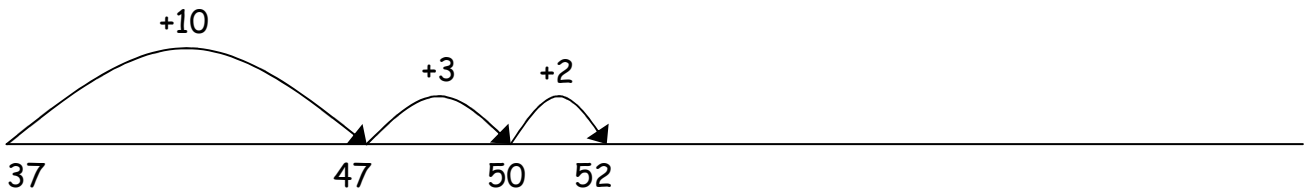
Year 3

Pupils 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
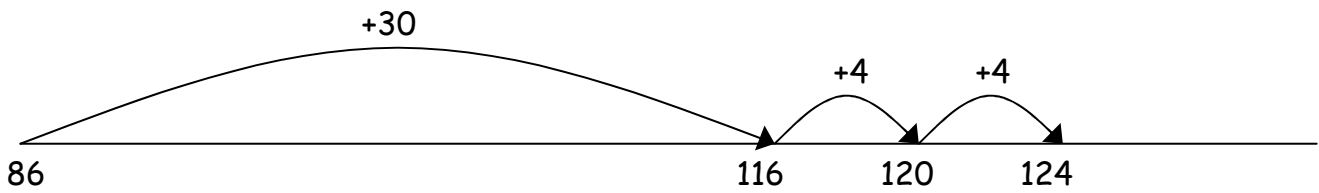
✓ Compensation

49 + 73 = 122
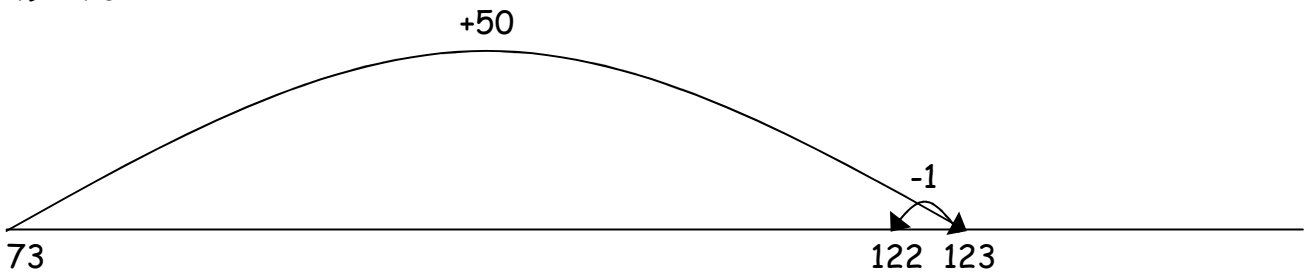
Pupils will begin to use informal pencil and paper methods (jottings) to support record and explain partial mental methods building on existing mental strategies.

Step 1 – Adding most significant digits first, and then moving to adding least significant digits.

Step 2 - Moving to adding the least significant digits first in preparation for "carrying'.

Adding the least significant digits first, without using place value cards

	2	8
+	3	5
	1	3
	5	0
	6	3

(8 + 5)
(20 + 30)

Year 4

From this, pupils will begin to "carry" below the line, using the correct mathematical vocabulary.

28 + 35

8

[1] 8 plus 5 is 13 (10 + 3)

20 plus 30 is 50
50 add the 'carried' 10 is 60 [3]

[2a] 3 from the 13

'carried' 10 from the 13 [2b]

2	8
+ 3	5
6	3
1	

28 + 35 = 63   35 + 28 = 63
63 − 35 = 28   63 − 28 = 35

239 + 53

8b

	2	3	8
+		5	3
		1	1
		8	0
	2	0	0
	2	9	1

239 + 53 = 291   239 + 53 = 291
291 − 238 = 53   291 − 53 = 238

365 + 88

8c

	3	6	5
+		8	8
		1	3
	1	4	0
	3	0	0
	4	5	3

365 + 88 = 453   88 + 365 = 453
453 − 365 = 88   453 − 88 = 365

368 + 494

10

	3	6	8
+	4	9	4
		1	2
	1	5	0
	7	0	0
	8	6	2

368 + 494 = 862   494 + 368 = 862
862 − 494 = 368   862 − 368 = 494

368 + 494

11

[1] 8 plus 4 is 12 (10 + 2)

[3a] 60 plus 90 is 150
150 add the 'carried' 10 is 160

300 plus 400 is 700
700 add the 'carried' 100 is 800 [4]

[2a] 2 from the 12

'carried' 10 from the 12 [2b]

'carried' 100 from the 160 [3b]

	3	6	8
+	4	9	4
	8	6	2
	1	1	

368 + 494 = 862   494 + 368 = 862
862 − 494 = 368   862 − 368 = 494

Using similar methods, pupils 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.*

Year 5

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

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

Pupils should extend their methods to decimal numbers.

Using similar methods, pupils 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.*

Year 6

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

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

Using similar methods, pupils 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.*

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

Pupils should not be made to go onto the next stage if:
> **1. they are not ready**
> **2. they are not confident.**

Pupils should be encouraged to approximate their answers before calculating.
Pupils should be encouraged to check their answers after calculation using an appropriate strategy.
Pupils should be encouraged to consider if a mental calculation would be appropriate before using written methods.

A COMPLETE SET OF WRITTEN METHODS POSTERS FOR THE FOUR RULES ARE AVAILABLE FROM THE LEA.