St Augustine of Canterbury RC Primary School

Maths - Mental Calculations Policy

In the name of God the Father, the Son and the Holy Spirit, we remember that each person is gifted, unique and loved by God and so in the family of St Augustine's we:

Welcome everyone in Jesus' name;
Work together in Jesus' community;
Follow Jesus' example in all we do;
Learn with Jesus as our inspiration;
Grow in faith with Jesus as our leading light.

Y2

End of Year Objective:
Add and subtract numbers mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers; three one-digit numbers.

Rapid Recall

Children should be able to:

- recall and use addition and subtraction facts to 20 fluently
- derive and use related facts up to 100

Beadstrings are useful for deriving and using related facts up to 100.

60 + 40 = 100

Mental Strategies

Partition and combine multiples of tens and ones

Partitioning numbers is a core strategy for adding and subtracting pairs of numbers. Children can either partition both of the numbers in the calculation, or keep the first number the same and just partition the second. They should be encouraged to use mental methods when adding or subtracting:

- multiples of 10
- TU + or – U (not crossing tens boundaries)
- TU + or – TU (not crossing tens boundaries)

Examples of calculations

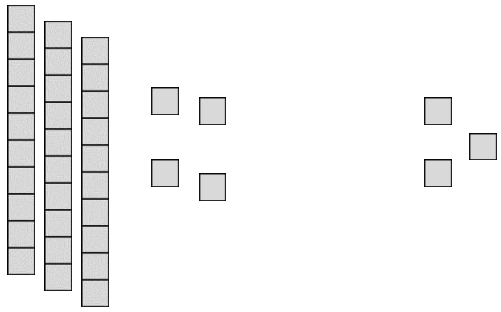
40 + 37	40 add 30 and 7 = 40 add 30 add 7
15 + 14	10 and 5 add 10 and 4 = 10 add 10 add 5 add 4 or 15 add 10 add 4
37 + 12	37 add 10 and 2 = 37 add 10 add 2
78 – 42	78 take away 40 and 2 = 78 take away 40 take away 2
80 – 35	80 take away 30 and 5 = 80 take away 30 take away 5

Prerequisite skills:

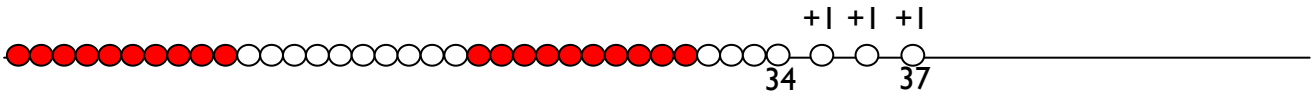
- Count using one to one correspondence
- Count forwards and backwards in ones and tens from any one- or two-digit number
- Understand place value, understand which digit represents tens and which digit represents ones and identify what changes if one is added or subtracted, and what changes if ten is added or subtracted.
- Partition numbers into tens and ones

Addition

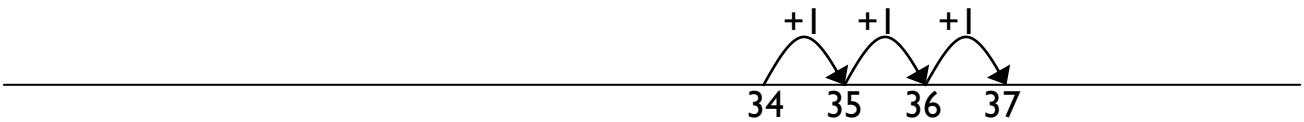
34 + 3 = 37 (shown using Base 10 equipment)



34 + 3 = 37 (shown using a beadstring)



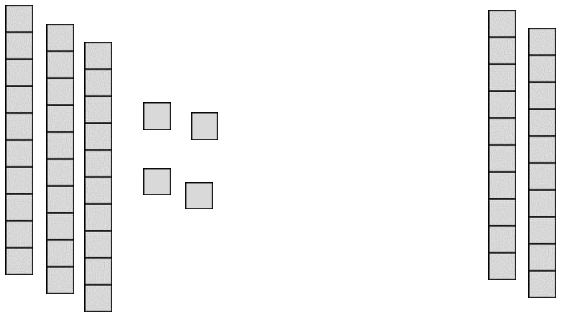
34 + 3 = 37 (shown using a numberline)



34 + 20 = 54 (shown using Base 10 equipment)

Children could use Base 10 equipment to calculate this as:

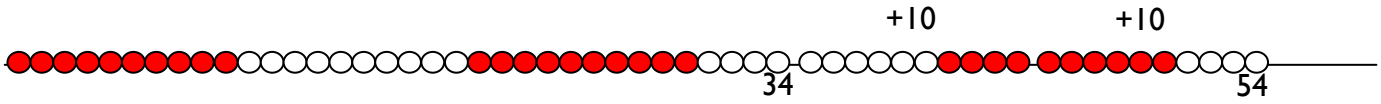
30 + 20 = 50
50 + 4 = 54



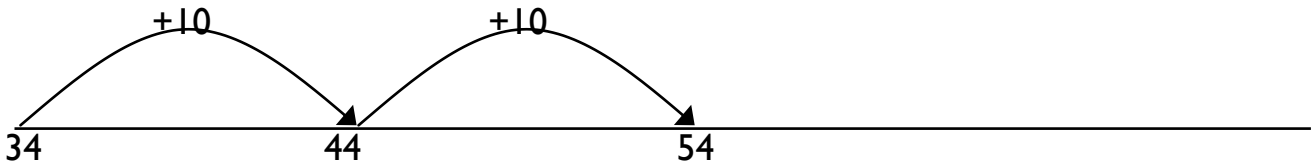
34 + 20 = 54 (shown using a beadstring)

Children could use a beadstring to calculate this as:

34 + 10 = 44
44 + 10 = 54



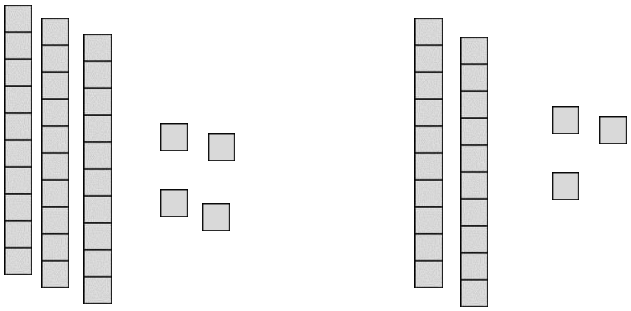
34 + 20 = 54 (shown using a numberline)



34 + 23 = 57 (shown using Base 10 equipment to partition both numbers)

Children could use Base 10 equipment to calculate this as:

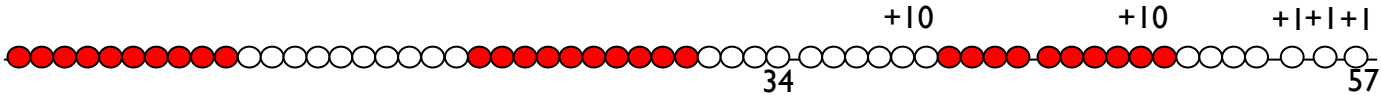
30 + 20 = 50
4 + 3 = 7
50 + 7 = 57



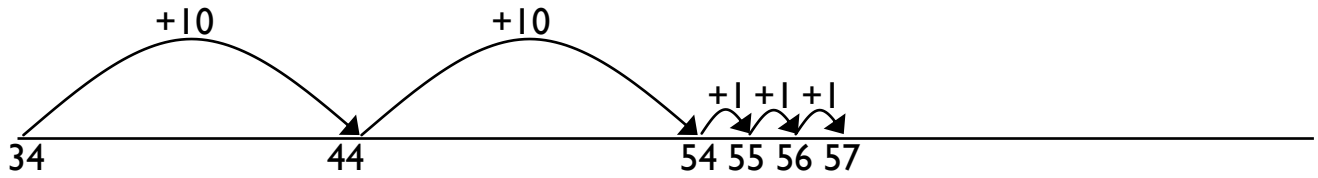
34 + 23 = 57 (shown using a beadstring to keep the first number the same and just partition the second)

Children could use a beadstring to calculate this as:

34 + 10 = 44
44 + 10 = 54
54 + 3 = 57

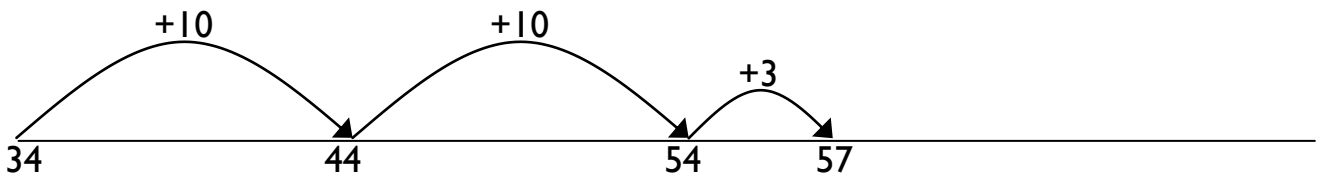


34 + 23 = 57 (shown using a numberline to keep the first number the same and just partition the second)



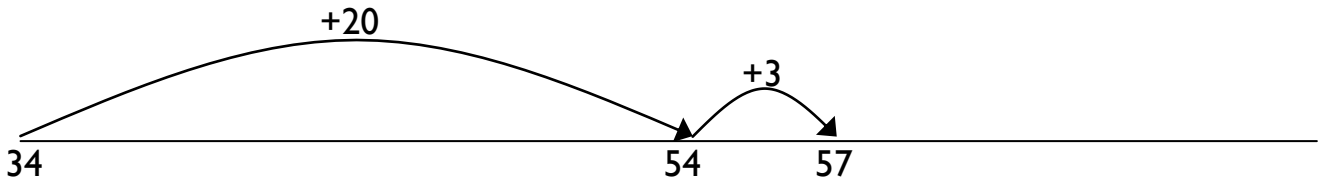
Encourage children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).

34 + 23 = 57



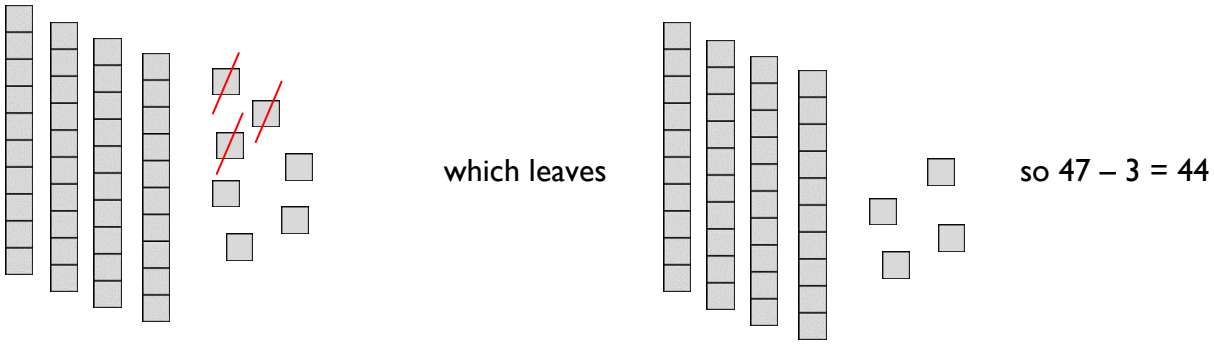
Followed by adding the tens in one jump and the units in one jump.

34 + 23 = 57

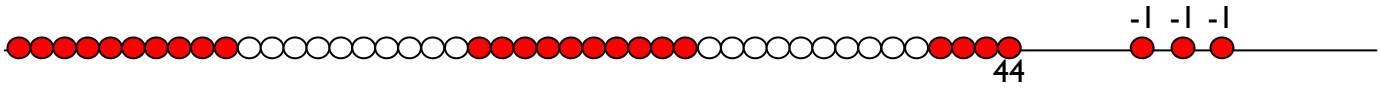


Subtraction

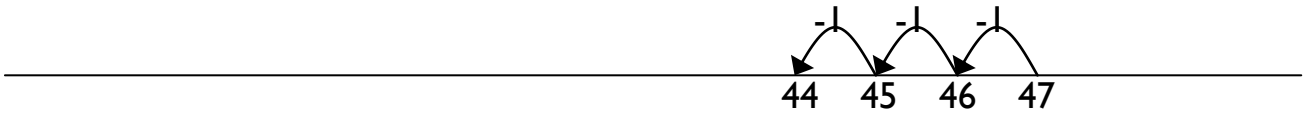
47 – 3 = 44 (shown using Base 10 equipment)



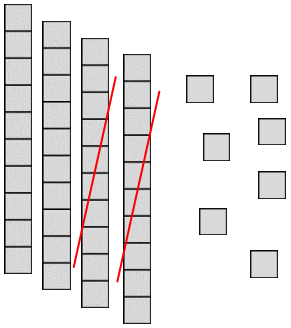
47 – 3 = 44 (shown using a beadstring)



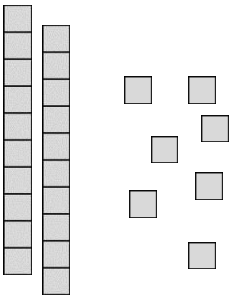
47 – 3 = 44 (shown using a numberline)



47 – 20 = 27 (shown using Base 10 equipment)



which leaves

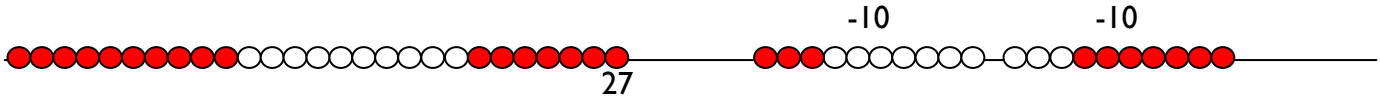


so 47 – 20 = 27

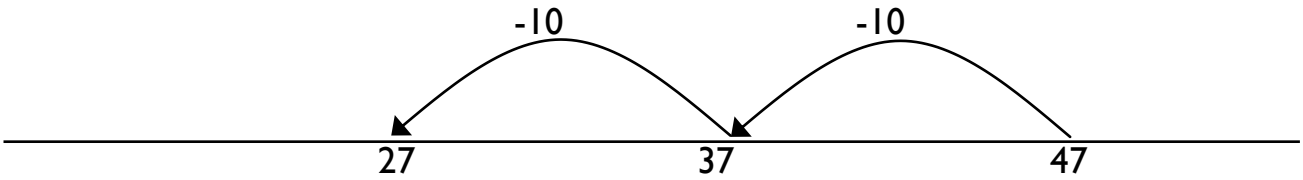
47 – 20 = 27 (shown using a beadstring)

Children could use a beadstring to calculate this as:

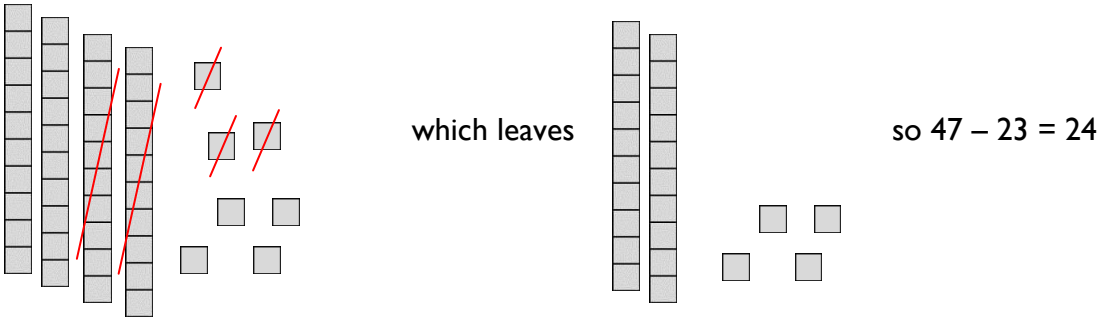
47 – 10 = 37
37 – 10 = 27



47 – 20 = 27 (shown using a numberline)



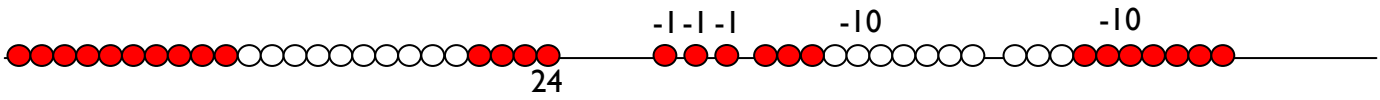
47 – 23 = 24 (shown using Base 10 equipment)



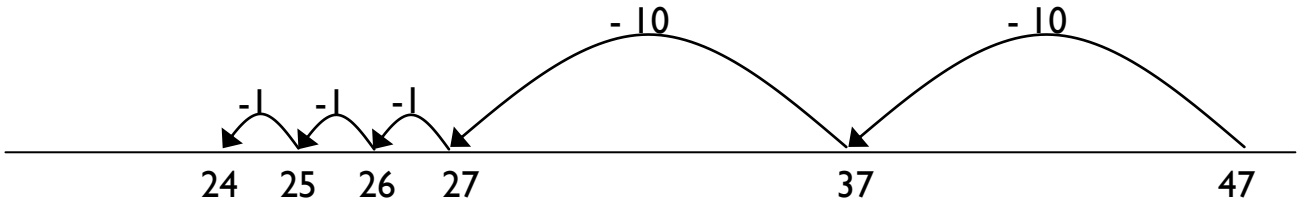
47 – 23 = 24 (shown using a beadstring)

Children could use a beadstring to calculate this as:

47 – 10 = 37
37 – 10 = 27
27 – 3 = 24

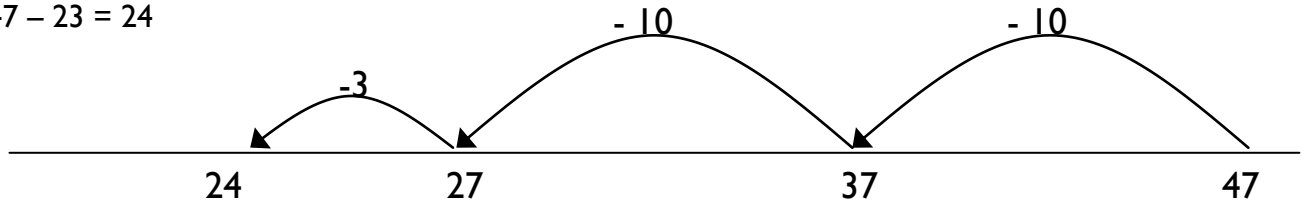


47 – 23 = 24 (shown using a numberline)



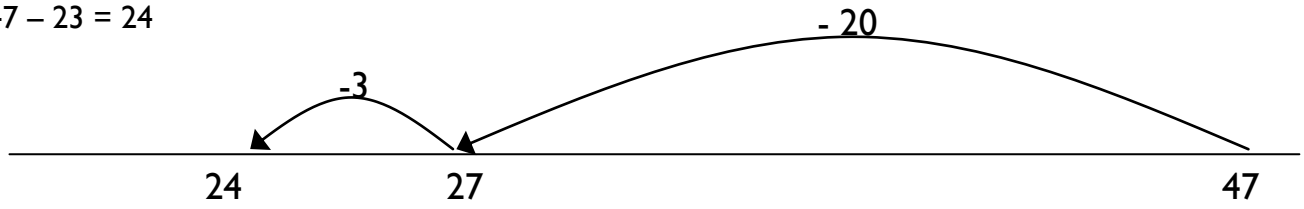
Encourage children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

47 – 23 = 24



Followed by subtracting the tens in one jump and the units in one jump.

47 – 23 = 24



Reorder numbers in a calculation

In Y2, children need to recognise that they can rearrange an addition, but not a subtraction. They also need to understand that the principle behind reordering a calculation is to make it more efficient, particularly when utilising a counting on strategy. Children need to be encouraged to identify calculations which should be reordered and those that are already in the most efficient format. When adding three single digit numbers, reordering should be based on number bonds or doubles with which the child is familiar.

Examples of calculations:

5 + 34	34 + 5
42 +11	doesn't need reordering as the greater number is first already
5 + 7 + 5	5 + 5 + 7 (utilising knowledge of number bonds or doubles)

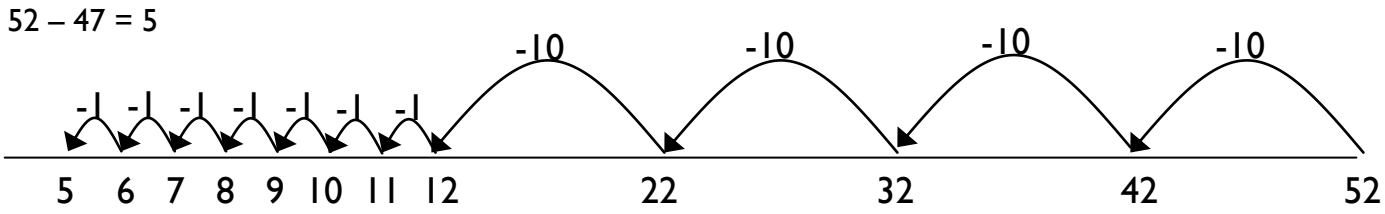
Prerequisite skills:

- Understand the place value of numbers to identify which number is the greater
- Understand that reordering works for addition but not subtraction* *(because children are not at the level when they are solving calculations such as 16 – 3 – 6, when reordering would be appropriate).*

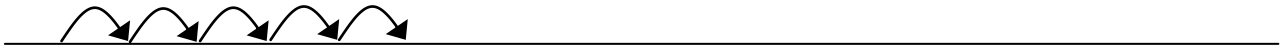
Find a small difference by counting up from the lesser to the greater number

Children should, using their knowledge of place value, be able to identify when numbers are close together. When that is the case, it is more efficient, when subtracting, to count on to find the difference, rather than taking away. For example, in the calculation 52 – 47, to solve this by:

52 – 47 = 5



is far less efficient than:



47 48 49 50 51 52 (counting up from 47 – 52)

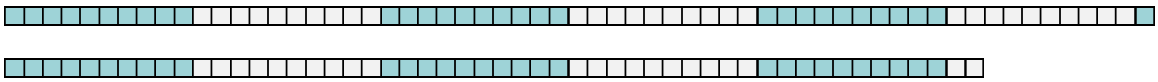
For children to use this method with understanding, it is important that they understand how counting on links to subtraction.

Initially, they should look at simple numbers to develop an understanding of the concept of difference and counting on. For example, with 7 – 4, they can make two towers, one of 7 cubes and one of 4 cubes (Step 1). The calculation can be phrased as 'How many more do we need to make the towers the same size?' To answer this question, the children can add cubes of a different colour onto the smaller tower until they are the same height.

3 more cubes are needed to make them the same size, so the difference between 7 and 4 is 3. This could be compared to taking away 4 from 7 so that children can see that it is the same answer.

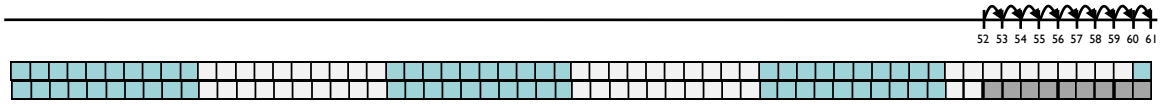
The next stage from this would be to encourage children to use the cubes to make lines rather than towers.

Once children can find the difference using this method using numbers up to 20, they can continue to use this strategy to solve calculations with two-digit numbers, using base 10 materials rather than cubes. For example, with the calculation 61 – 52, children can use base 10 to set out two lines, one for each number (the base 10 in the illustration are two colours to enable tens to be identified, this does not need to be the case with the materials children are using).



To find how many more are needed, or the difference, children would use a second colour of base ten ones to make the lines the same:

To make this a more sustainable method, it can be modelled alongside a number line jotting, e.g.



Examples of calculations

52 – 47
74 – 66
81 – 79

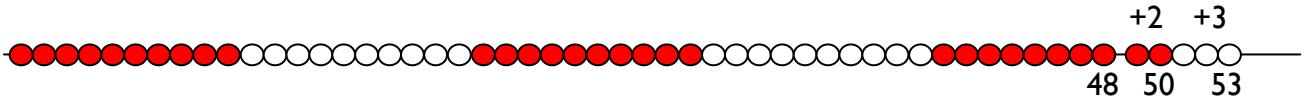
Prerequisite skills:

- Understand the place value of numbers to identify which number is the greater or lesser
- Place numbers on a partially marked and then unmarked number line
- Establish whether numbers are close together
- Count forwards and backwards in ones and tens form any one- or two-digit number

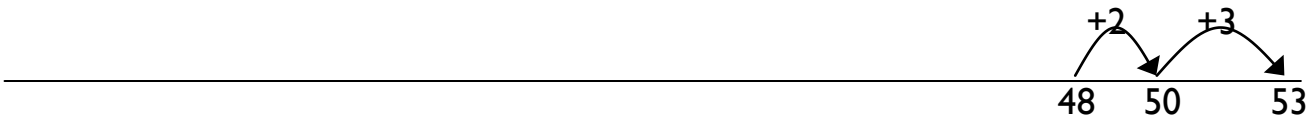
Begin to bridge through 10 when adding a single digit number (partitioning, e.g. 58 + 5 = 58 + 2 + 3)

Use of the bridging strategy relies heavily on children's efficient and accurate recall of number bonds to 10 or how far away a number is from a multiple of 10 (*see use of 10 frames in Year 1*). When calculating, e.g. 48 + 5, consider using bead strings or different coloured blocks of 10 cubes to illustrate it as 48 + 2 + 3 using the natural colour demarcations in the bead string to support this identification. This can also be shown using 10 frames (*see Year 1 'Partition small numbers' section for more information*).

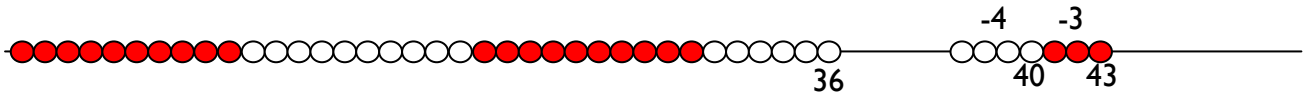
48 + 5 = 53



48 + 5 = 53



43 – 7 = 36



43 – 7 = 36

Examples of calculations

25 + 6 as 25 + 5 + 1
12 – 7 as 12 - 2 - 5

66 + 7 as 66 + 4 + 3
43 – 7 as 43 - 3 - 4

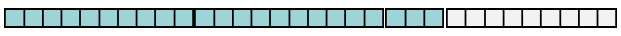
Prerequisite skills:

- Partition numbers in different ways, e.g. 5 as 2 + 3 to enable 58 + 5 as 58 + 2 + 3
- Know, or quickly derive, number bonds to 10

Add or subtract 9 and 19 by rounding and compensating

Children need to understand both the number system and number bonds in order to understand how to use a compensation method.

For adding 9, children should be shown how to add nine by using base 10 materials and then add ten to the same number to identify what would need to be adjusted to make the calculation correct,
e.g. 23 + 9



23 + 9

23 + 10 is one too many, so I have to subtract one

NB Teaching children to add nine on a hundred square without developing their understanding will not support their ability to understand and use this method effectively.

Examples of calculations
34 + 9 as 34 + 10 - 1
77 + 19 as 77 + 20 - 1, or 77 + 10 + 10 - 1
46 - 9 as 46 - 10 + 1
63 - 19 as 63 - 20 + 1, or 63 - 10 - 10 + 1

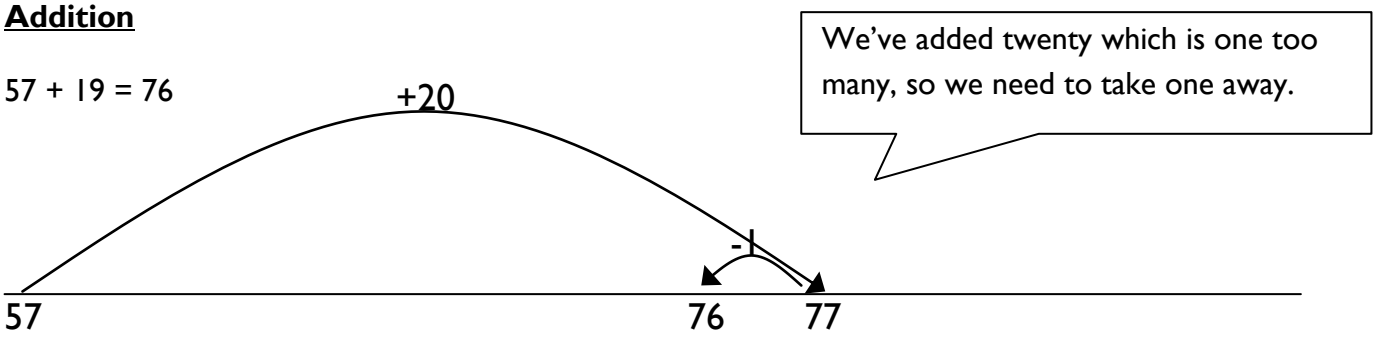
Prerequisite skills:

- Understand the relationship between 9 and 10 (i.e. a difference of 1)
- Be able to show visually using base 10 equipment

Empty numberlines could be used to model the calculation.

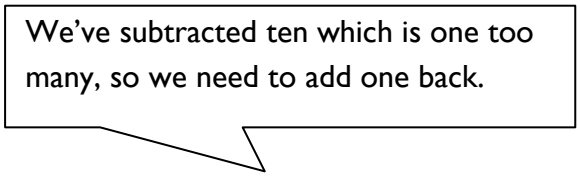
Addition

57 + 19 = 76

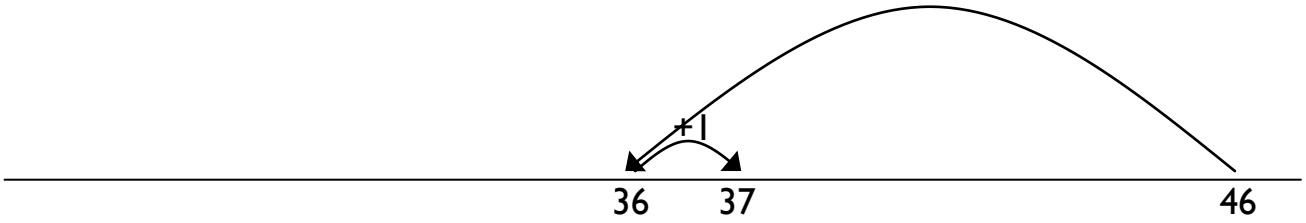


Subtraction

46 - 9 = 37



-10


+1
36
37
46