Malmesbury Park Primary School

Addition

Welcome!

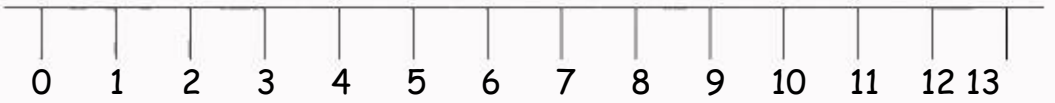
This booklet is designed to show the progression of key written calculation methods taught across the school from Year R to Year 6. These methods build on the children's developing understanding of number, with the aim of becoming more efficient and succinct.

We hope that this booklet will help to explain some of the newer calculation methods we use in school as well as enabling you to work with your child at home with their maths. As the methods are taught in progression through the school, when helping your child, we recommend you start by looking at the method they have most recently been taught at school.

Glossary

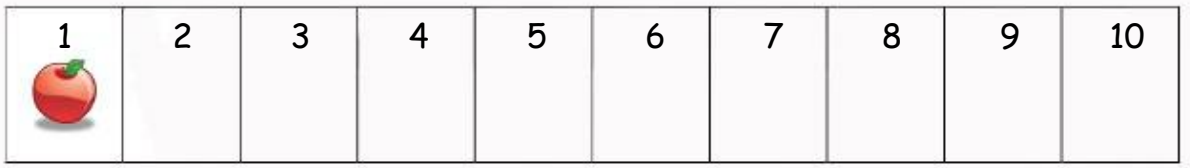
Compensating – Changing a number by rounding up to the next ten (e.g. 29 to 30) to make the calculation much easier. For instance, 33 + 99 is much easier when thought of as 33 + 100 - 1.

Number line – A line marked with numbers used by children to help them with their calculations. Number lines can be „structured with numbers already marked on, or „unstructured without numbers marked on.



Number sentence – the calculation written out with the answer.
e.g. 15 + 6 = 21

Number track – A track marked with numbers. Children can place objects on the track to help them count.



Partitioning – Splitting a number into each digit's place value. For example, if we partitioned the number 382 we would recognise it is made up of 300 + 80 + 2 or 3 hundreds 8 tens 2 units.

Place Value – The value of a digit within a number. For example, the place value of the digit 8 in the number 382 is 80 or 8 tens.

Key for Arrows

A jump forward (counting on) or backwards (counting back). The size of the jump is written above the arrow.

1. Counting Objects

In order to do this, children must:

- ✓ Be able to rote count in ones to 10 and beyond
- ✓ Accurately count objects
- ✓ Be beginning to experience bonds to 10 (e.g. 6+4 = 10)

This method really introduces children to the concept of addition. Given in a story context, children add a single digit number to another by counting out both amounts, putting them together and counting them again.

Example problem: I pick 2 apples, then I pick 3 more. How many do I have altogether?

Children start by counting out 2 apples…

1 2

Then they count 3 more…

1 2 3

Then put them together and count them again from 1.

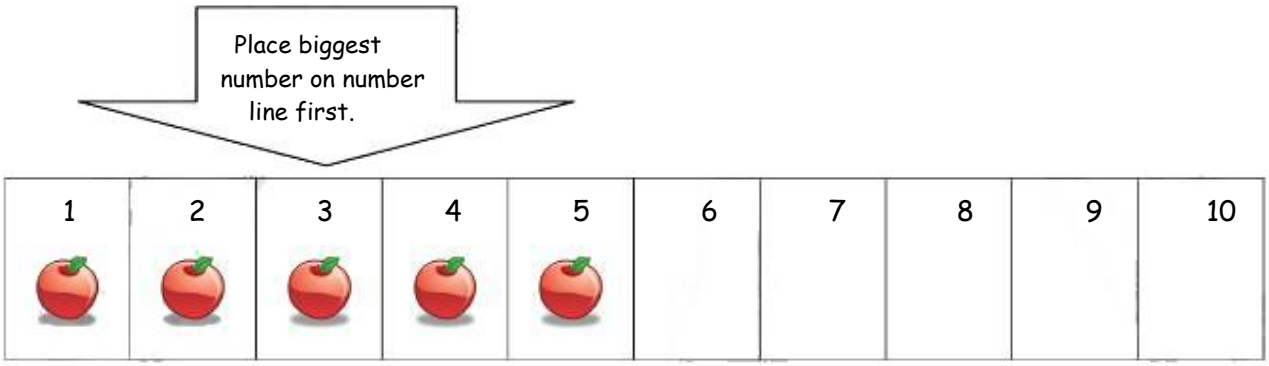
1 2 3 4 5

As children grow in confidence, they will start to add on from the first number: e.g. 2… 3, 4, 5.

They should then begin to recognise that it is quicker to start from the larger number, and add on a smaller amount. In the calculation above, 3 is the larger number, and so it is quicker to start with 3 and count on 2 from there: 3… 4, 5.

2. Using a number track/structured number line

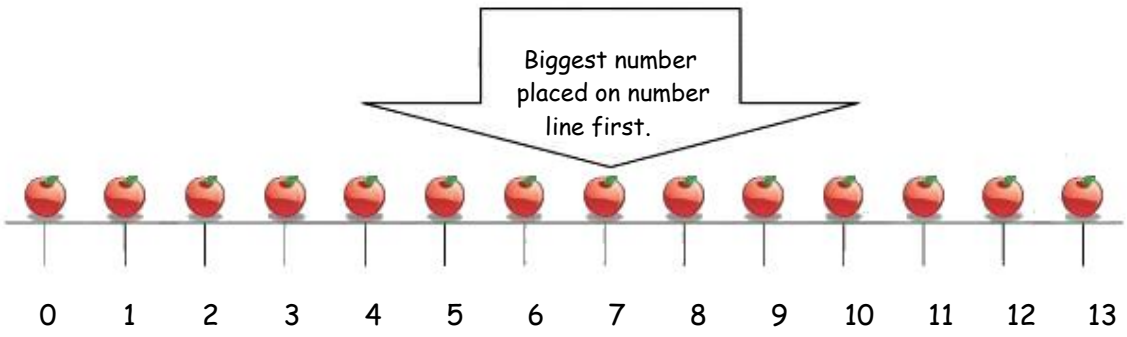
Once children can add groups of objects, a number track can be used to begin to arrange the objects in a more formal manner. Children place the objects to be counted onto the **structured** track, with one object on each square, and use the numbers to help them count. This can be done with physical objects on numbered floor tiles.



Once children are confident, they begin to move away from physical placing of objects to drawing objects on a structured number line.

Example problem: I have 7 apples. I buy 6 more. How many apples have I got now?

Children place or draw the largest number of objects on the structured number line and then count on in ones as they add on the smaller number.



Children may also count on other resources such as bead strings (a string with two colours of beads threaded on, typically grouped in 5's to aid counting).

At this stage, children can also begin to record their calculation as a number sentence:

7 + 6 = 13

3. Addition on a structured number line or number square

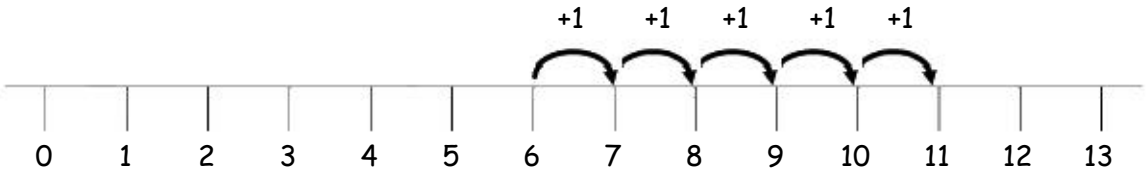
In order to do this, children must:

- ✓ Be able to count in ones from any given number
- ✓ Be able to partition two digit numbers
- ✓ Be able to count in tens from any number
- ✓ Understand the order of numbers in the number system
- ✓ Understand the importance of crossing the tens boundaries

At this stage, children count on in ones on a **structured** number line without objects or pictures to aid them. They start by finding the bigger number on a number line and then count on in jumps.

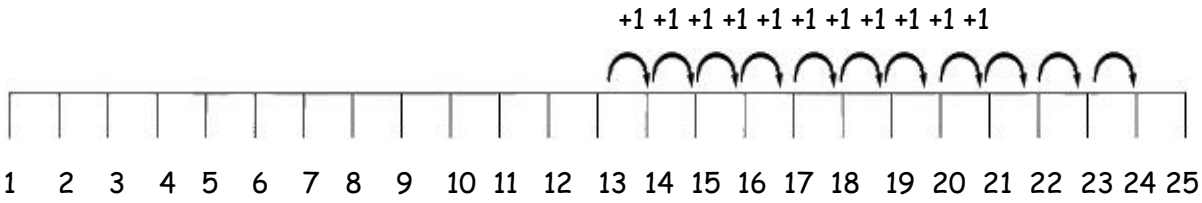
Example problem: I have 6 sweets and I buy 5 more. How many do I have now?

Number sentence 6 + 5 = 11

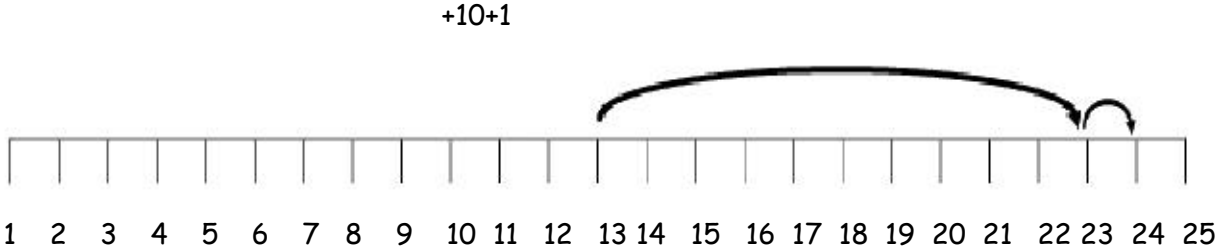


As the children progress to adding on two-digit numbers, they start by adding on in ones, as shown below:

Example problem: 13 + 11 = 24



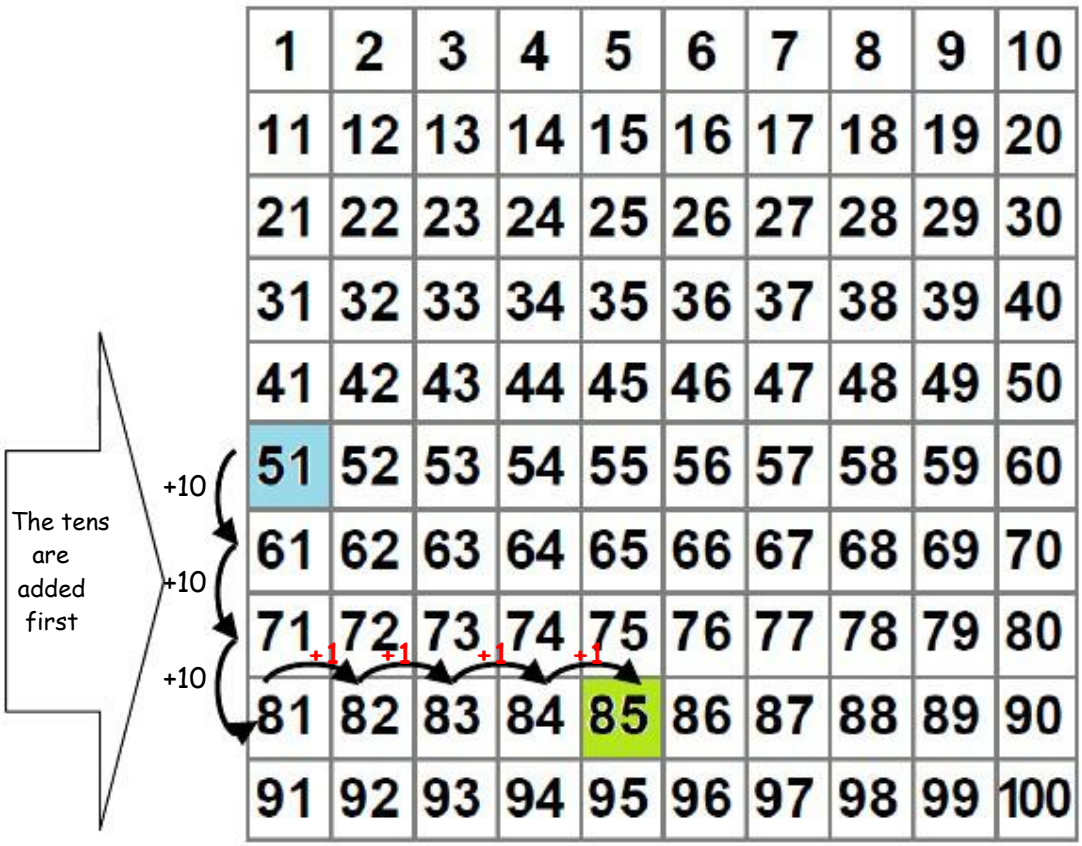
They then begin to add on larger jumps by partitioning the two-digit number into tens and units, adding the tens first.



A 1-100 number square can also be used at this stage, to allow pupils to add larger two digit numbers without the number lines becoming too long.

Here, the children start at the bigger number on the number square and add on in jumps as before.

Example problem: 51 + 34 =



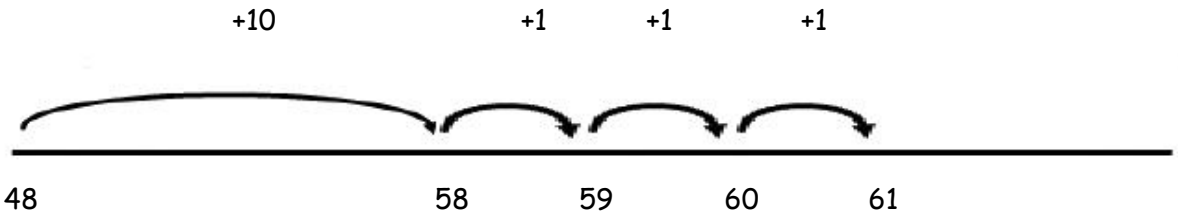
4. Addition on an unstructured number line by partitioning

In order to do this, children must:

- ✓ Be able to count in multiples of 10 from any given number
- ✓ Know and use number bonds to 10 (e.g. 6+4 = 10)
- ✓ Count on and over tens and hundred boundaries

At this stage the children draw their own unstructured (un-numbered) number line, starting their number line at the biggest number. They partition the smaller number into tens and units and then add it to the bigger number by counting on in jumps of tens and then units.

Example problem: 48 + 13 = 61 (48 + 10 + 1 + 1 +1 = 61)

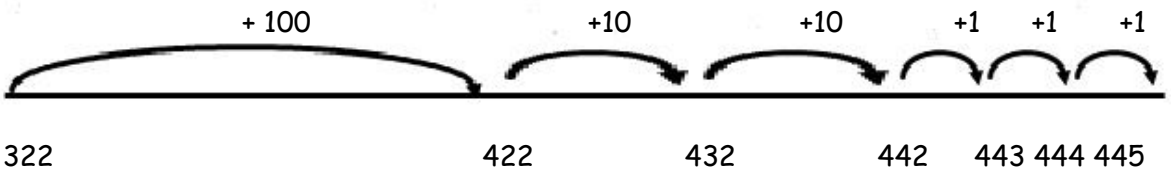


Sometimes a child may feel confident enough to count in more than one multiple of ten and/or more than one multiple of one.

Example problem: 35 + 24 = 59

The same principle applies when the children are adding bigger numbers (for example, 3-digit numbers). The children should always remember to add on to the bigger number and always add on (or jump on) from the greatest place value first; such as add on the hundreds, then the tens and finally the units.

Example problem: 322 + 123 = 445



5. Compensating (and re-adjusting) on a number line

In order to do this, children must:

- ✓ Understand rounding and use this in mental calculations
- ✓ Have a good understanding of the concepts of addition and subtraction
- ✓ Understand place value and the partitioning of thousands, hundreds, tens and units

Sometimes, a child might look at a sum and think, "Wouldn't it be easier if that Wasn't a ... but a…?"

Example Problem: 54 + 29

This would be much easier if it was 54 + 30... so why not change it?

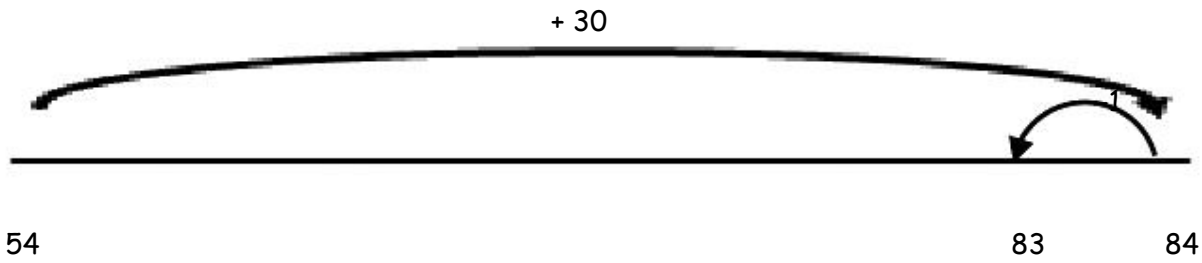
It is more efficient with this type of calculation to add 30 (the nearest whole ten), then subtract 1 from the answer.

54 + 30 = 84... but that's not the answer!

Because we added 1 to 29 to get to 30, we have to remember to take the 1 off the answer.

So, if 54 + 30 = 84
54 + 29 = 83

On a number line it would look like this:



6. Partitioned column method

In order to do this, children must:

- ✓ Have a good understanding of the concepts of addition and subtraction
- ✓ Be able to partition numbers into thousands, hundreds, tens and units

As children become confident with the concept of addition, we begin to move to more formal written methods. Partitioned column method is one of the bridging steps to formal column method that can be used to support pupils as they progress.

Example problem: 32 + 56 =

First, the two numbers being added are partitioned, and written above each other.

30 + 2
50 + 6
80 + 8 = 88

Children first add the units together, and record the answer under the line. They add the tens together and record the answer next to the units. They then recombine the tens and units to give the final answer.

This method can also be used when it is necessary to carry over the tens/hundreds boundaries (e.g. when the units add to more than 10)

Example problem: 57 + 95 =

50 + 7
90 + 5
140 + 12 = 152

Unlike with formal column methods, the 12 here is written underneath the units column still, not carried across to the tens.

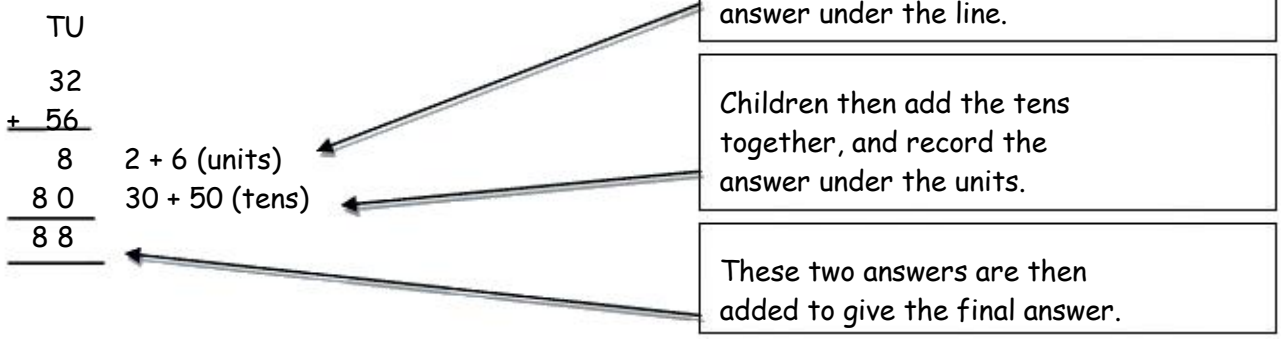
7. Expanded column method

In order to do this, children must:

- ✓ Understand place value and the partitioning of thousands, hundreds, tens and units
- ✓ Add in multiples of 10 (e.g. 20 + 30 = 50) or 100 (e.g. 500 + 200 = 700)

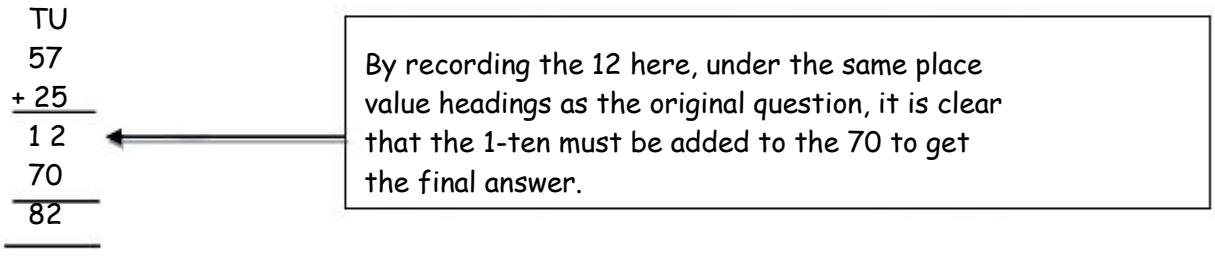
Like partitioned column method, expanded column method forms a bridging step to formal column method and is set out with the two numbers to be added are placed above each other (being careful to line up the tens and units). With this method, the numbers are not written in their partitioned form, and so it is worth noting down the column headings for pupils (H for hundreds, T for tens, U for units) to ensure they are still considering each digits place value.

Example problem: 32 + 56 =

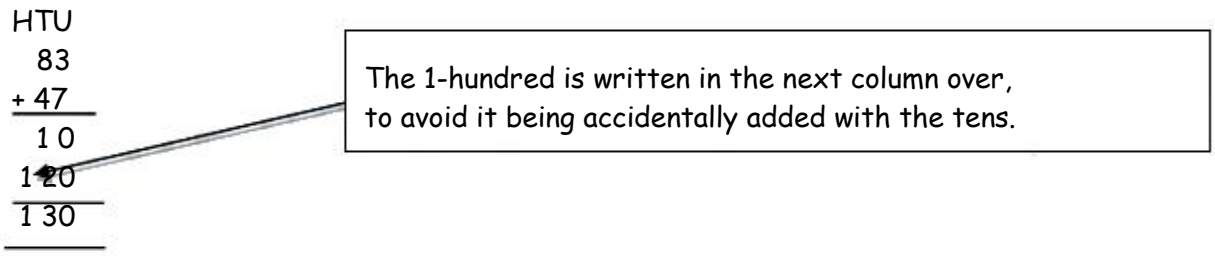


This middle stage serves to really support understanding when carrying over the tens or hundreds boundary.

Example problem: 57 + 25 =



Example problem: 83 + 47 =



8. Formal column method

In order to do this, children must:

- ✓ Have secure place value knowledge and be able to „hold a digit's place value mentally (i.e. know a 5 in the tens column represents 5 tens, or 50)
- ✓ Be able to mentally partition numbers

Once pupils are confident with expanded column method, the middle step can be removed.

Example problem: 32 + 56 =

```
  TU
  32
+ 56
  88
```

This is the most efficient method and can be used to quickly calculate larger sums.

Example problem: 457 + 224 =

```
  HTU
  457
+ 224
  68 1
   1
```

As 7 + 4 = 11, the 1-ten is carried over and written underneath the tens column, to be added as well as the 5 + 2.

This method can also be used when adding numbers involving decimals. Children must ensure they line up the decimal places carefully when setting out the question.

Example problem: 23.6 + 8.2 =

```
 T U. t
 23.6
+ 8.2
 31.8
 1
```

Be careful to line up the decimal places here.