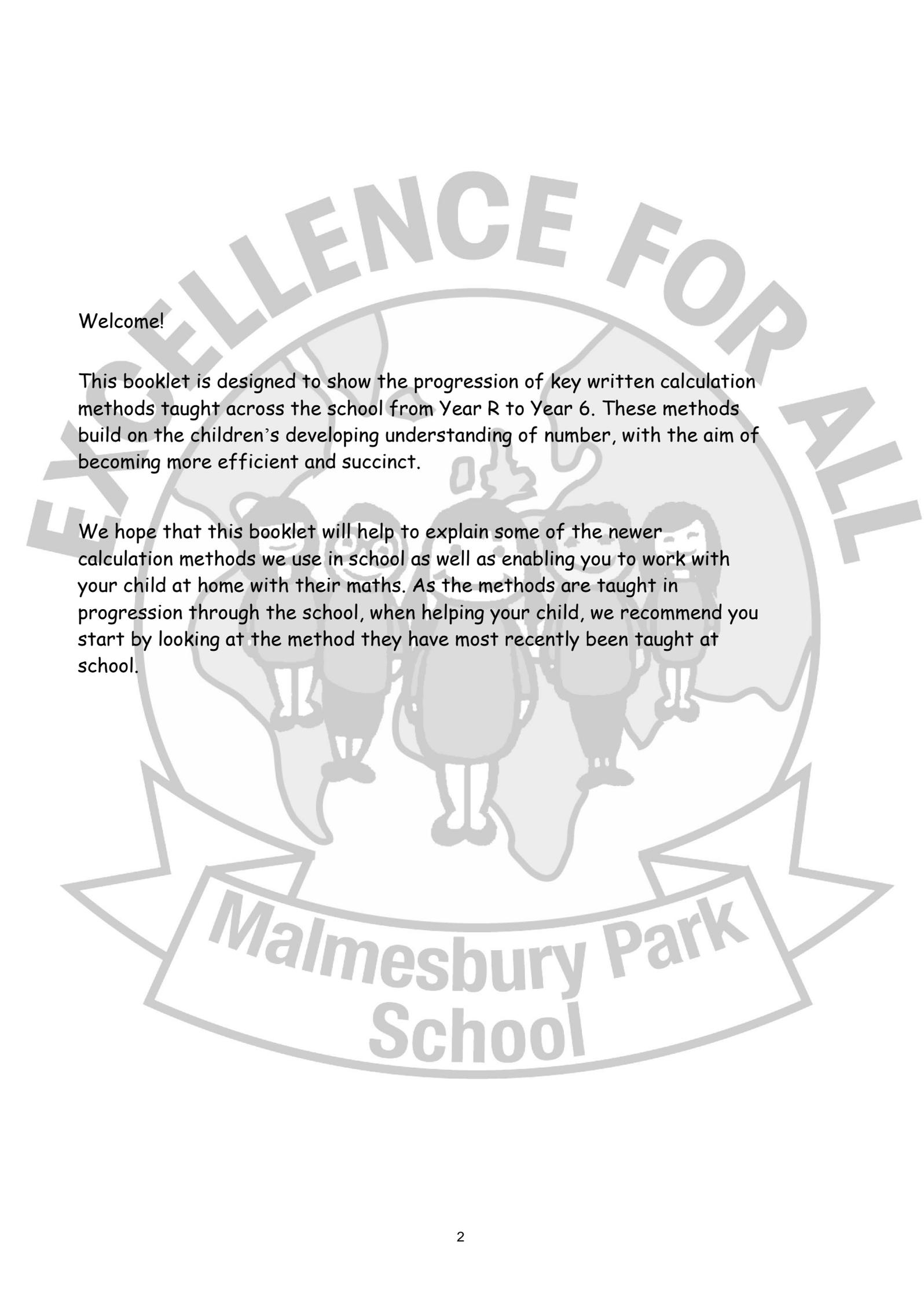


# Malmesbury Park Primary School



## Subtraction



Welcome!

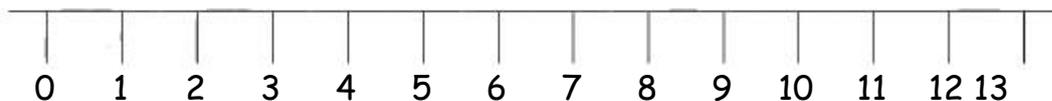
This booklet is designed to show the progression of key written calculation methods taught across the school from Year R to Year 6. These methods build on the children's developing understanding of number, with the aim of becoming more efficient and succinct.

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

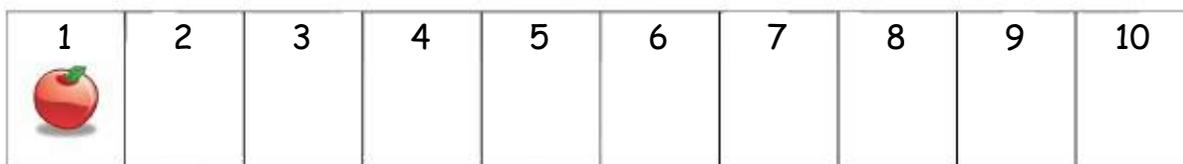
**Compensating** - Changing a number by rounding up to the next ten (e.g. 29 to 30) to make the calculation much easier. For instance,  $33 + 99$  is much easier when thought of as  $33 + 100 - 1$ .

**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. Taking away objects

In order to do this, children must:

- ✓ Be able to count up and back in ones
- ✓ Be able to accurately count objects
- ✓ Begin to experience bonds to 10 using practical resources (e.g.  $6+4 = 10$ )
- ✓ Recognise that, at this stage, they should take the smaller number away from the bigger number

Given in the context of a problem/story, and using concrete objects, children subtract a single digit number from another by first counting out the amount of objects they started with and then taking away objects one at a time to see how many are left.

Example problem: I have 7 apples, and I eat 3. How many are left?

Children begin by counting out 7 apples.



They take away one at a time, counting 1, 2, 3, moving the subtracted ones well away from the rest.

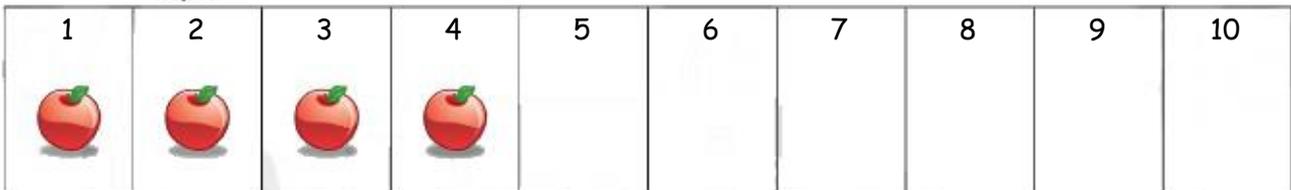
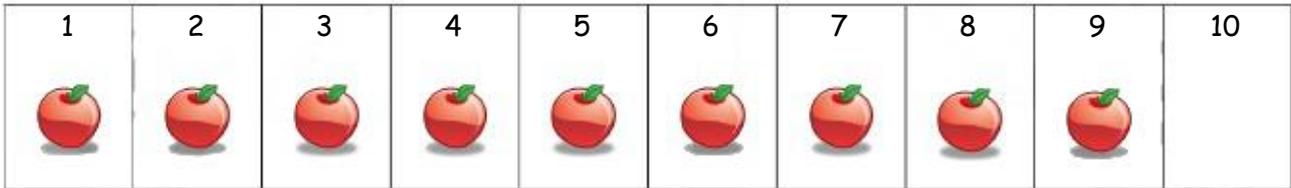


Finally, they count up how many are left.

## 2. Using a number track/structured number line

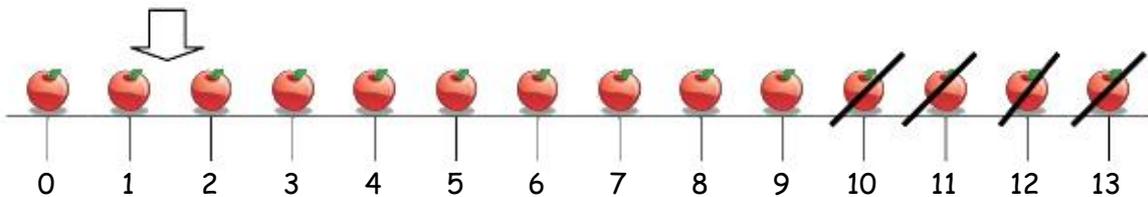
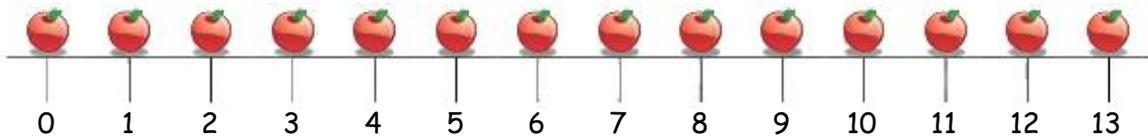
Once children can subtract physical objects, a number track can be used to begin to arrange the objects in a more formal manner. Children place the total number of objects onto the **structured** track, with one object on each square, and use the numbers to help them count. They can then count the number of objects to be taken away, and remove them from the number track, always starting from the right hand side, to encourage the concept of counting back.

Example problem: I have 9 apples in a bag. I give away 5, how many are left?



As their confidence grows, children could start to draw the objects themselves onto a number line and then cross the objects to take them away.

Example problem: I have 13 apples on my tree. 4 are eaten by a hungry caterpillar, how many are left?



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:

$$13 - 4 = 9$$

### 3. Subtracting by counting back on a structured number line

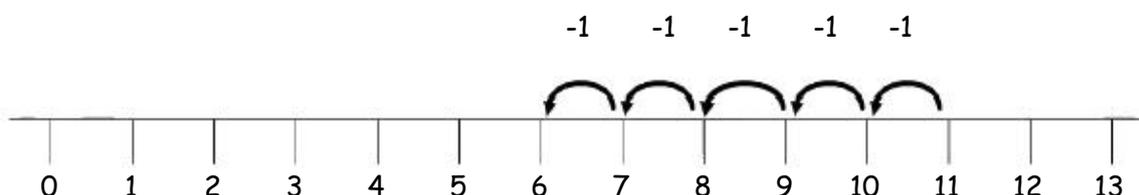
In order to do this, children must:

- ✓ Be able to count back in ones and tens from any number
- ✓ Understand the order of numbers in the number system
- ✓ Be able to partition numbers into tens and units
- ✓ Begin to understand the concept of difference

At this stage, children count back in ones on a **structured** number line without objects or pictures to aid them.

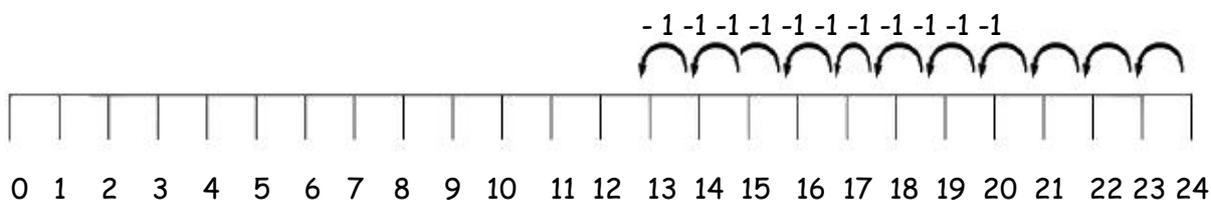
Example problem: I have 11 sweets and I eat 5. How many do I have now?

$$11 - 5 = 6$$

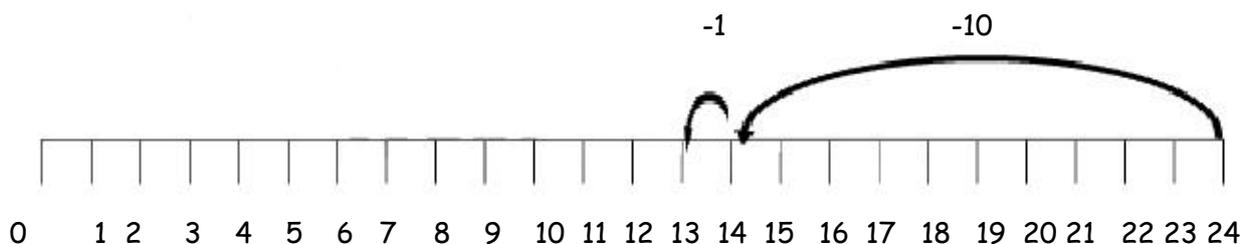


As the children progress to subtracting two-digit numbers, they start by taking away in ones, as shown below:

Example problem:  $24 - 11 = 13$



They then begin to subtract larger jumps by partitioning the two-digit number into tens and units, taking away the tens first.



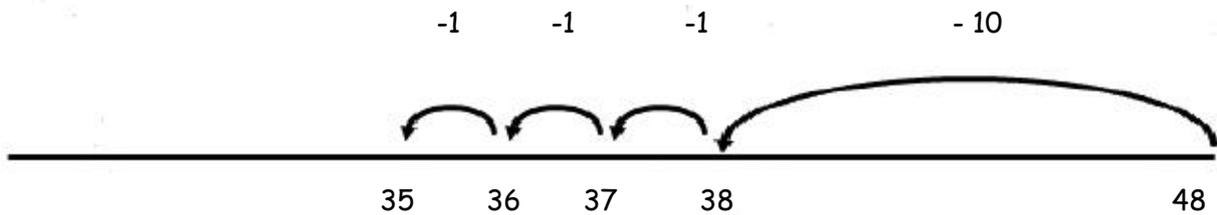
## 4. Subtraction on unstructured number lines by partitioning

In order to do this, children must:

- ✓ Be able to count back in ones and tens from any number
- ✓ Understand the order of numbers in the number system
- ✓ Be able to partition numbers into hundreds, tens and units
- ✓ Begin to understand the concept of difference

At this stage, the children draw their own unstructured number lines. They partition the smaller number into tens and units and, starting at the far right end of the number line, count back from the bigger number in jumps of tens and then units.

Example problem:  $48 - 13 = 35$  ( $48 - 10 - 1 - 1 - 1 = 35$ )



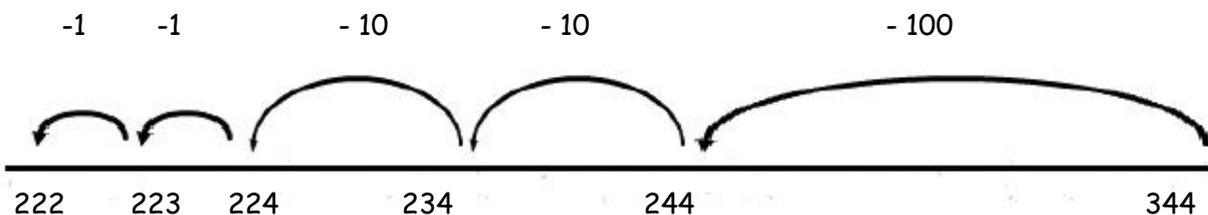
Sometimes a child may feel confident enough to count back in more than one multiple of ten and/or more than one multiple of one.

Example problem:  $59 - 24 = 35$



The same principle applies when the children are subtracting bigger numbers (for example, 3-digit numbers). The children should always remember to count back from the bigger number and always count back (or jump back) the digit with the greater value first (so subtract the hundreds, then the tens and finally the units.)

Example problem:  $344 - 122 = 222$



It is important to remember the children should only partition the number they are taking away.

## 5. Counting on

In order to do this, children must:

- ✓ Be able to count on in ones and tens from any number
- ✓ Understand the order of numbers in the number system
- ✓ Be able to partition numbers into hundreds, tens and units
- ✓ Understand inverse operations (subtract as the opposite to add)

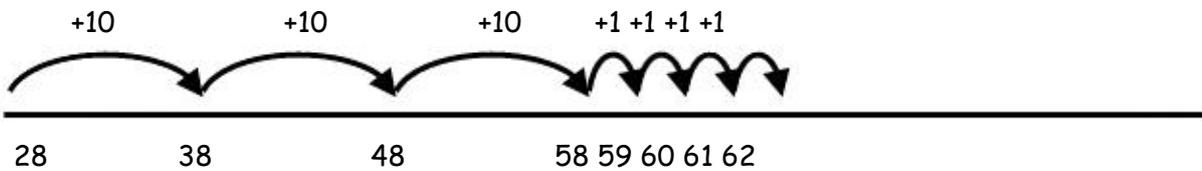
The concept of "counting on" for subtraction is a useful alternative method that can be taught at this stage to support children who are yet to be secure in subtraction methods.

Here, rather than counting back from the bigger number, the child starts at the smaller number and counts on in jumps until they reach the bigger number.

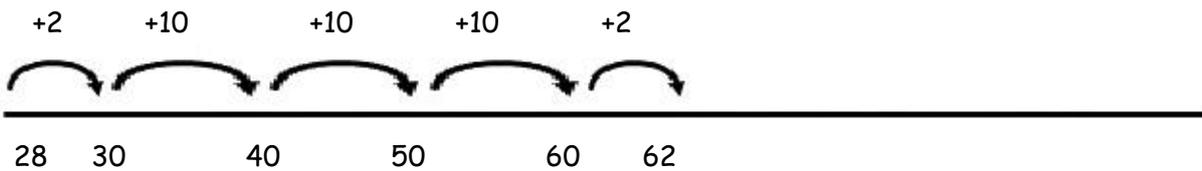
Example problem:  $62 - 28 = 34$

This problem can be rearranged to read  $28 + ? = 62$ .

Starting from 28, pupils add on in tens, then units.



As they become more confident, they may also notice that they can begin by adding to the nearest whole ten to make adding the tens easier.



## 6. 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
- ✓ Be able to count back in tens from any number, on and over tens or hundreds boundaries
- ✓ Understand the order of numbers in the number system

Sometimes a child may look at a calculation and think, "wouldn't it be easier if that Wasn't a... but a...?"

Example problem:  $54 - 19 =$

This would be much easier if it was  $54 - 20$ ... so why not change it?

It is more efficient with this type of calculation to subtract 20 (the nearest whole ten), then add 1 to the answer.

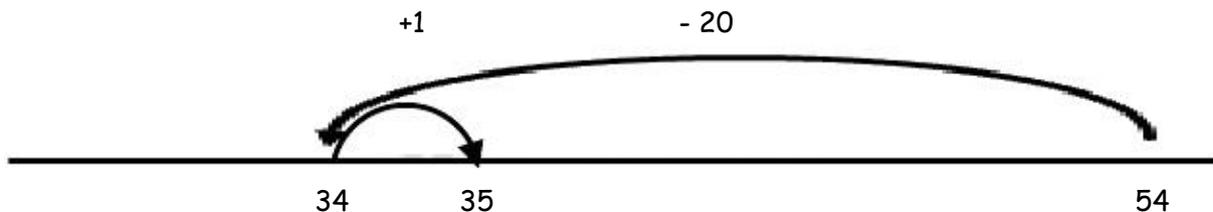
$54 - 20 = 34$ ... but that's not the answer!

Because we added 1 to 19 at the start, we have to remember to give back the 1, to get the answer.

So, if  $54 - 20 = 34$

$54 - 19 = 35$

On a number line it would look like this:



## 7. Partitioned (expanded) column method

In order to do this, children must:

- ✓ Understand place value (particularly concepts like how many 10's in 100)
- ✓ Partition numbers into thousands, hundreds, tens and units
- ✓ Have a good understanding of the concepts of addition and subtraction

As children become confident with the concept of subtraction, we begin to move to more formal written methods. This method is a useful bridging step to formal column methods.

Example problem:  $45 - 23 =$

The two numbers are first partitioned and written over each other, being careful to line up the tens and units. The bottom number is then taken away from the top number, starting with the units.

$$\begin{array}{r} 40 + 5 \\ - 20 + 3 \\ \hline 20 + 2 \\ \hline \end{array} = 22$$

Beware that children do not see these + signs and ADD the units. The + here is only to show the partitioning.

Once the units and tens have been subtracted, pupils recombine these numbers to give the final answer.

This method can also be used when exchanging is required. The partitioning here supports children in understanding what is being exchanged and from where.

Example problem:  $52 - 28 =$

Here, we cannot take 8 units from 2 units, so we exchange 1-ten for 10-units, leaving 4-tens (or 40). Now we can calculate  $12 - 8 =$

$$\begin{array}{r} 50 + 2 \\ - 20 + 8 \\ \hline \hline \end{array} \quad \begin{array}{r} 40 + 12 \\ - 20 + 8 \\ \hline 4 \end{array} \quad \begin{array}{r} 40 + 12 \\ - 20 + 8 \\ \hline 20 + 4 = 24 \end{array}$$

The concept of exchanging tens for units can be quite tricky for some children to grasp, and so this can be modelled using hundreds, tens and unit blocks, or plastic pennies, pounds and notes.

## 8. Formal column method (decomposition)

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
- ✓ Understand the concept of exchanging tens for units or hundreds for tens

Once children are confident with the partitioned column method shown above, the physical partitioning of the numbers is removed, and the method shortened.

Children start by placing the two numbers to be subtracted on top of each other, being careful to line up the hundreds, tens and units. Although pupils will at this stage have encountered negative numbers (and so be moving away from the idea that you cannot subtract bigger numbers from smaller numbers) they must here still place the larger number on the top, and the smaller below.

Example problem:  $175 - 132$

$$\begin{array}{r} \text{HTU} \\ 175 \\ - 132 \\ \hline 43 \end{array}$$

Starting with the units, the bottom number is subtracted from the top, and the difference written underneath the line. ( $5 - 2 = 3$ )

Whilst technically there is a 0 here, children should be taught that the 0 is not needed.

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

Example problem:  $2.34 - 1.2 =$

$$\begin{array}{r} 2.34 \\ - 1.20 \\ \hline 1.14 \end{array}$$

Although in the question this reads 1.2, children should learn that 1.2 and 1.20 are the same number, and that the 0 is needed here to ensure the decimal place is lined up correctly.

## Exchanging using formal column method

This method can also be used when exchanging is needed.

Example problem:  $252 - 129$

$$\begin{array}{r}
 \text{HTU} \\
 41 \\
 252 \\
 -129 \\
 \hline
 123
 \end{array}$$

Here, we cannot take 9 units from 2 units, so we exchange one of the tens (leaving 4-tens) and write the 1 above the units. Now we can calculate  $12 - 9 =$

Sometimes, it is necessary to exchange across two place values.

Example problem:  $203 - 125 =$

$$\begin{array}{r}
 \text{HTU} \\
 203 \\
 -125 \\
 \hline
 \end{array}$$

Here, as we cannot take 5-units from 3-units, we look to exchange one of our tens. In this problem though, we do not have any tens to exchange. We must first therefore exchange 1-hundred for 10-tens.

$$\begin{array}{r}
 \text{HTU} \\
 1 \quad 1 \\
 203 \\
 -125 \\
 \hline
 \end{array}$$

We now have 1-hundred left, and 10-tens. We exchange 1-ten for 10-units...

$$\begin{array}{r}
 \text{HTU} \\
 1 \quad 19 \quad 1 \\
 203 \\
 -125 \\
 \hline
 178
 \end{array}$$

...leaving 9-tens, and giving us 13-units. We can now calculate  $13-5$  and continue as before.