Ashcroft Infant and Nursery School Calculation Policy

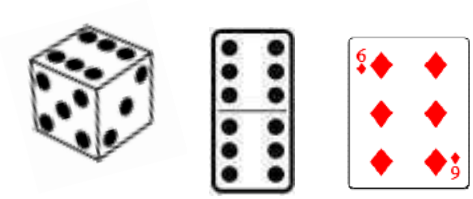
Foundation Stage **Number**

Nursery and Reception

A key priority of any School maths curriculum is to ensure that children develop a strong sense of number and place value. Children will continually encounter numbers in the world around them, whether that be on a bus they saw on the way to school this morning or on their front door at home. But the ability to recognise the symbol 5, and name it, is very different from understanding the 'fiveness' of it, and it is the development of this latter skill that is crucial to a child's mathematical ability.

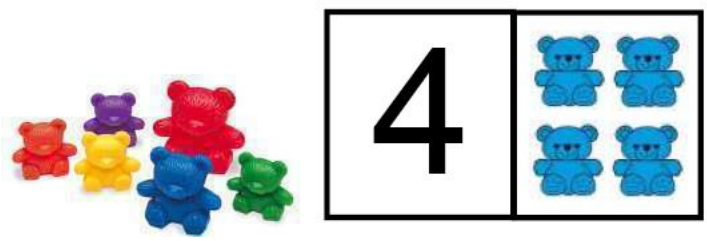
Furthermore, it is important to recognise that just because a child can recite number names in order, does **not** necessarily mean that they can count. As with learning the alphabet, children can recall a sequence of numbers by rote without any real grasp or understanding of what they mean (hence young children often omit numbers as they count). Gaining familiarity with number names through songs and rhymes is of course helpful, but emphasis should be placed on helping children make links between these number names and the number of objects they equate to.

An intuitive sense of number begins at a very early age, and even before they start school, many children can identify one, two or three objects in a group, regardless of whether they can count. This ability to instantly compute the total in a small group of objects derives from stable, mental images of number which have developed over time from a variety of experiences with different patterns of number. For example, a child might immediately recognise the 6 on a dice, domino piece or playing card:



It is possible that the child has memorised this familiar arrangement of 6 dots. Alternatively, they may have mentally sub-grouped them into two sets of 3, fostering an understanding that a number can be composed of smaller parts. In both cases, no actual counting of objects is involved; instead, the child has relied on other mental strategies.

In the Foundation Stage, as well as teaching the children to count objects, significant attention is given to cultivating number recognition and the development of mental representations. In order to do this, much of their experience with number play in the early years will involve concrete, movable objects.

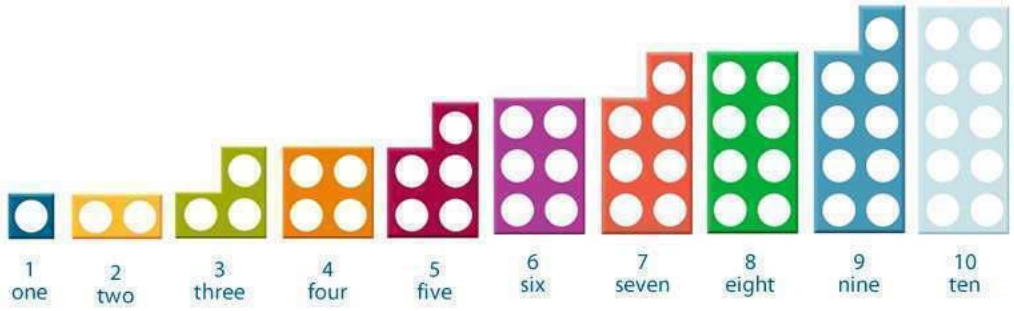


Ashcroft Infant and Nursery School Calculation Policy

Foundation Stage **Number**

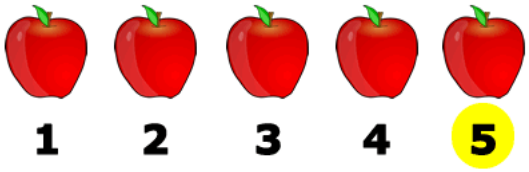
Nursery and Reception

Use of **Numicon** is another great way to help children develop mental representations of number.



These experiences and number representations will help children:

- **Reliably count the number of objects in a set using the numbers one to twenty.**



- **Place numbers in order.**

Numicon, in particular, helps children visualise how the size of numbers relate to each other.

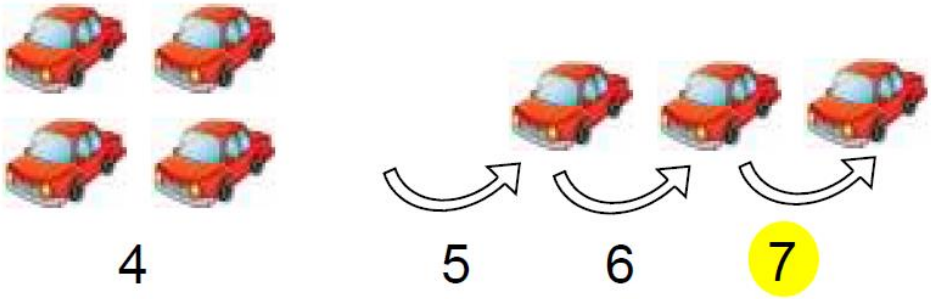
- **Say which number is one more or one less than a given number.**

Ashcroft Infant and Nursery School Calculation Policy

Foundation Stage **Number**

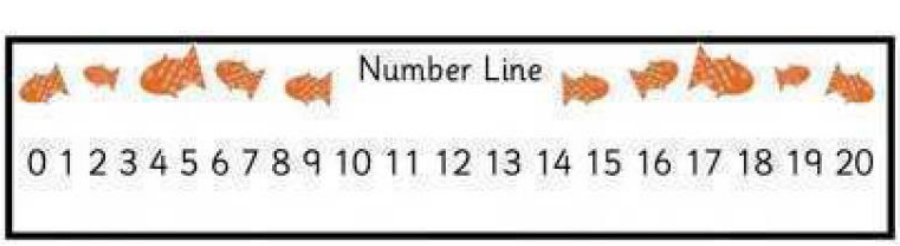
Nursery and Reception

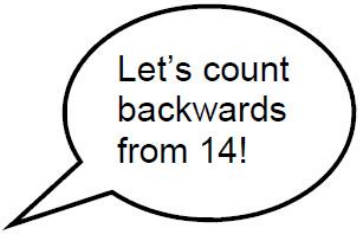
Use objects to add two single-digit numbers by counting on to find the answer.



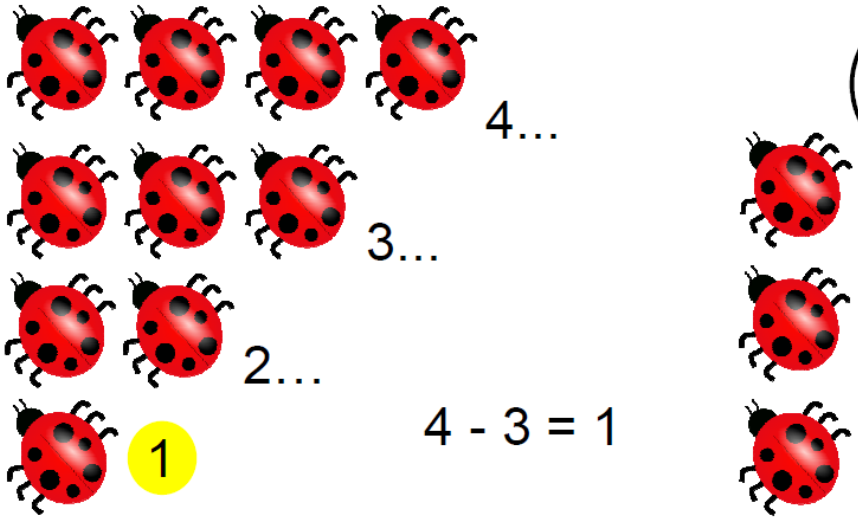
4 + 3 = 7

Use objects to subtract two single-digit numbers by counting back to find the answer.
The first step into **subtraction** is to learn how to count **backwards**.

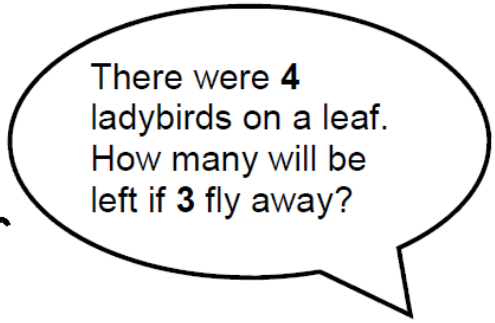




Children will then utilise this strategy to solve simple subtractions:



4 - 3 = 1



Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Children are expected to:
Represent and use number bonds and related subtraction facts within 20.
Once a basic number sense has developed for the numbers up to ten (see the Foundation stage section of the calculation policy), children must establish a **strong sense of 'ten'**. Children will become familiar with the '**tenness'** of ten using a variety of practical resources:

Numicon:

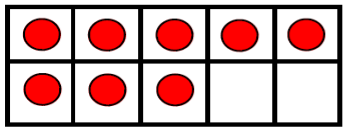
10 = 7 + 3 4 + 6

20 = 11 + 9

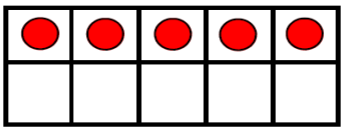
Children should also be made familiar with the **related subtraction facts**:

10 - 7 = 3

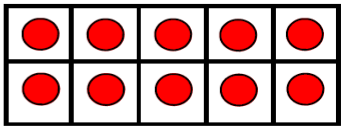
Ten-Frames:
A ten-frame, like the one below, is a great tool for embedding an understanding of ten. By placing counters in different arrangements on the frame, children can begin to generate **various mental images** of the number ten, as well as how other numbers relate to it.



There are 8 counters. I need 2 more to make 10.



5 and 5 make 10.



I have 10 counters. If I take away 4 of them, I will have 6 left.

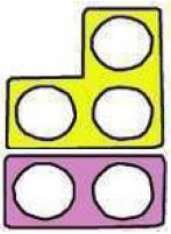
Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

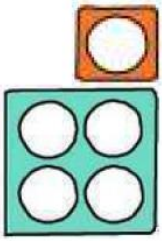
Year 1

A knowledge of **number bonds** is not just about knowing how to make the numbers 10 and 20. Children should also start to investigate ways to make other numbers less than 20. Several resources can aid this learning:

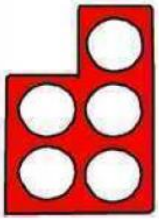
Numicon:



3 + 2 = 5
5 - 3 = 2
5 - 2 = 3



4 + 1 = 5
5 - 1 = 4
5 - 4 = 1

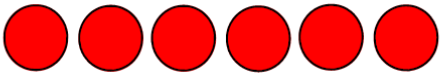


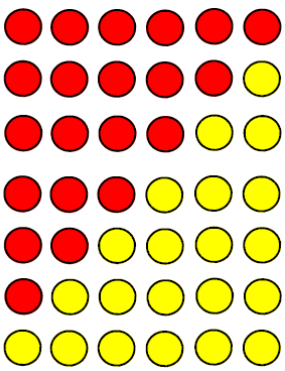
5 + 0 = 5
5 - 0 = 5

The **concrete** or **pictorial representations** of number facts should always be linked to the **abstract** (i.e. the number sentence it relates to).

Double-sided counters:

Red-Yellow counters can be used to help children find out about different ways of making the same number. They may also start to spot patterns.





6 + 0 = 6
5 + 1 = 6
4 + 2 = 6
3 + 3 = 6
2 + 4 = 6
1 + 5 = 6
0 + 6 = 6

How can we arrange these counters to make the number 6?

Can you use these to help you write some **take away** number sentences?

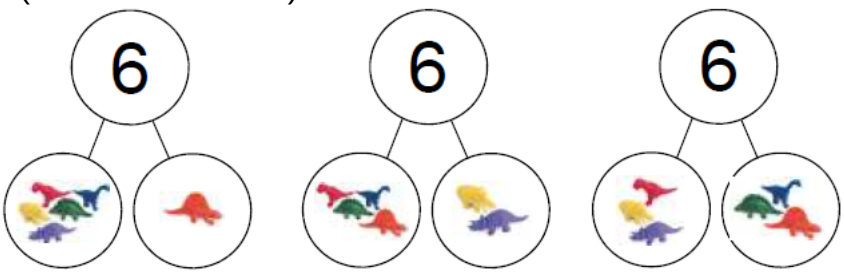
Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Part Part Whole

The 'Part Part Whole' model allows children to visualise the concept that numbers are made up of **2 or more parts** (i.e. other numbers)



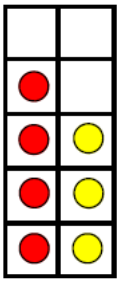
5 + 1 = 6
6 - 1 = 5
6 - 5 = 1

4 + 2 = 6
6 - 2 = 4
6 - 4 = 2

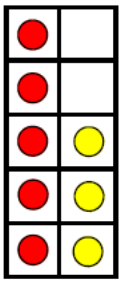
3 + 3 = 6
6 - 3 = 3

Ten-frames

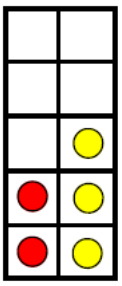
Ten-frames (and Numicon resources) can naturally lead the eye to **addition concepts**:



4 + 3 = 7
7 - 3 = 4
7 - 4 = 3

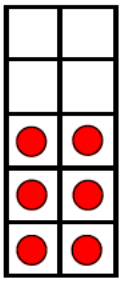


5 + 3 = 8
8 - 3 = 5
8 - 5 = 3

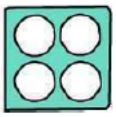


2 + 3 = 5
5 - 2 = 3
5 - 3 = 2

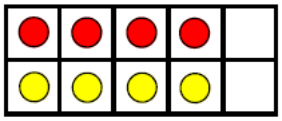
They can also help the children visualise **addition doubles**:



3 + 3 = 6



2 + 2 = 4



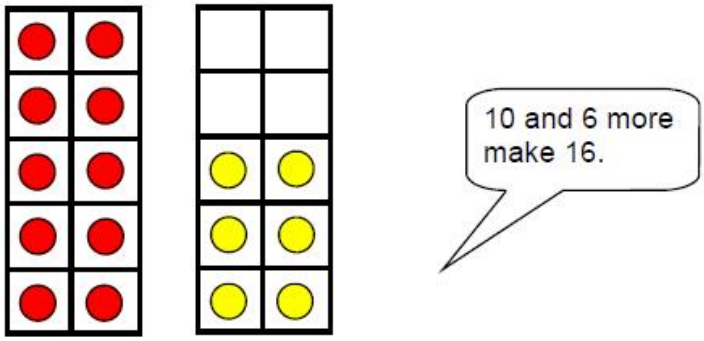
4 + 4 = 8

Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Furthermore, Numicon and ten-frame resources can provide the first step into understanding **2-digit numbers**. By using two ten-frames simultaneously, children can start to see **the value of each digit** in a **'teen' number**.



It will also be helpful, at this stage, to introduce the children to **Base 10 resources** and use them to partition '**teen' numbers** into **tens** and **units**.

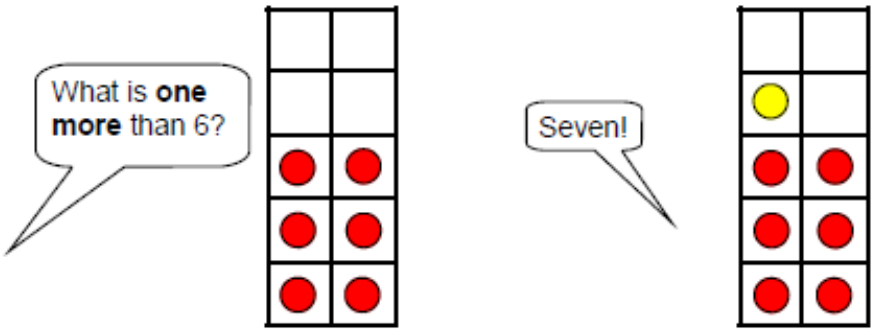
Through all of the above, children should start to recognise the **relationship** between **addition** and **subtraction** facts.

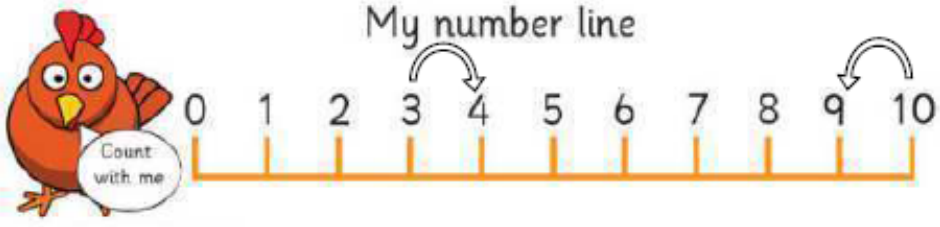
Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Identify one more or one less than a given number.
With visual representations to support them, children should be able to tell you what is **one more** or **one less** than any given number.





3 + 1 = 4

10 - 1 = 9

Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Add and subtract any one-digit or two-digit number up to (and including) 20.
We have already seen how children can start to understand addition as combining groups. To help them work out the total of two numbers, children may initially count them up. Once again, concrete, movable objects will support this process.

Eventually, as children become more competent, they will be able to hold the **biggest number** in their head and then **count on** - perhaps using their fingers - from there. Using two sets of dice, one with digits and another with dots, is a great way to encourage children to practice this skill.

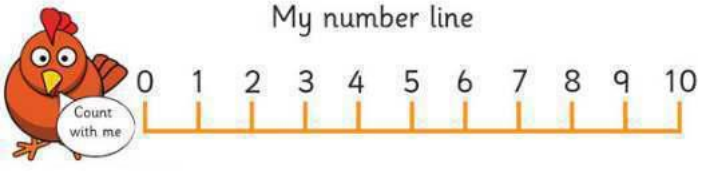
Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

They will also begin to use a **number line** to add or subtract numbers.

6 + 2 = 8



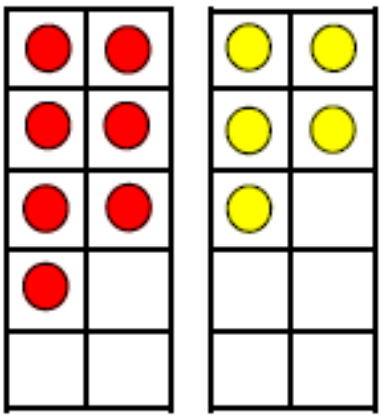
9 - 4 = 5

Through these processes, children should start to understand that **addition** makes numbers **bigger** whilst **subtraction** makes numbers **smaller**.

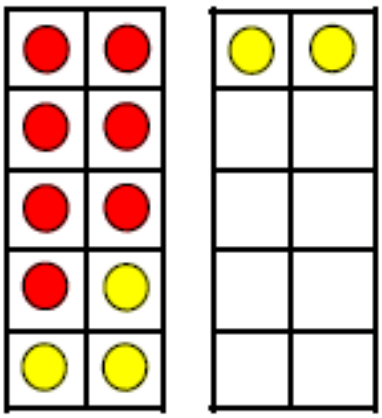
They should also recognise that they can add numbers **in any order** and still get the **same answer**.

T**en-frames** will help the children visualise what is happening when they add two numbers that bridge through 10.

For example, with the calculation 7 + 5 = ? children will begin to identify the opportunity to make 10 first, and then add the remainder.



7 + 5 = ?
7 + 3 + 2 = ?
10 + 2 = 12



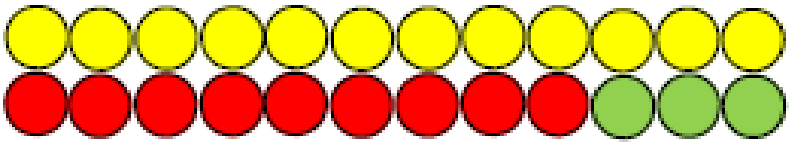
Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Children should begin to understand **subtraction** as both **taking away** and **finding the difference** between.

A simple **bar model** can help them get to grips with the latter:

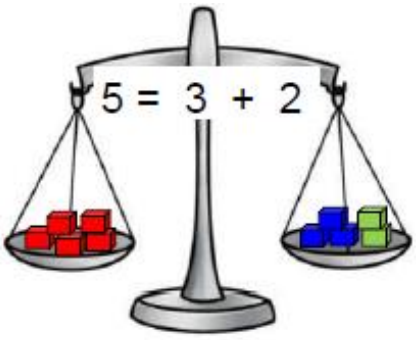


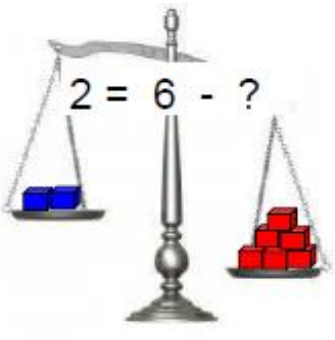
The difference between 12 and 9 is 3.

or 12 - 9 = 3

This model is introduced using concrete objects first (including cards with pictures), which the children can move, before progressing to pictorial representations.

Understand that the equals sign (=) is a sign of equivalence.
Many children develop the misconception that the **answer** to a calculation is on the right hand side of the equals sign. Scales can be used to help children explore the idea that **both sides** of a calculation must **balance**:



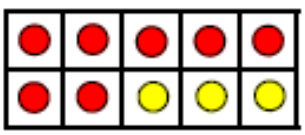


It is important that the children experience the **equals sign** (=) in **different positions**.
By writing calculations either side of the equals sign (e.g. 2+4=5+1), the children will not just interpret it as meaning 'the answer'.

Through all this, the children should start to see that **addition** and **subtraction** are **related operations**.

For example: 7 + 3 = 10 is related to 7 = 10 - 3.

This understanding can be supported with a tens frame:



Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 1

Solve missing number problems.

Children must be able to complete missing number problems, where the 'missing number' can be placed in all possible positions:

For example: $7 + \square = 9$

$\square - 3 = 11$

$\square = 8 + 5$

Vocabulary

addition, add, forwards, put together, more than, total, altogether, distance between, difference between, equals = same as, pattern, odd, even, digit, counting on, subtraction, subtract, take away, minus, less than, most, least.

Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

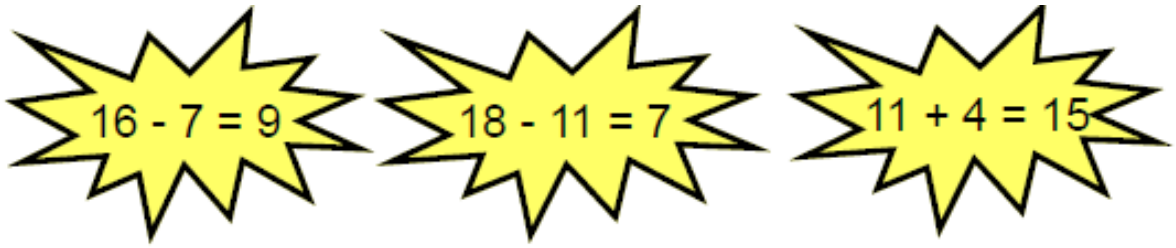
Year 2

Children are expected to:

Recall addition and subtraction number facts to 20 fluently.

In Year 1, a great deal of emphasis is placed on generating different mental images and internal representations of number, with a view to build up a bank of facts about them. In order to achieve this, a wide variety of concrete and pictorial resources (please see the Year 1 calculation policy for more details) are used to support the children's investigations.

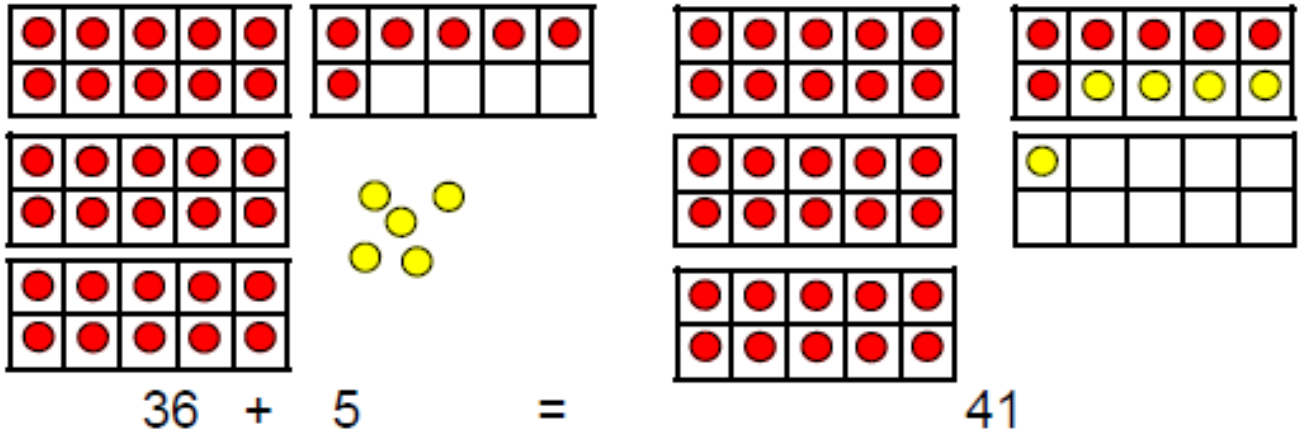
The expectation in Year 2 is that children should now be able to recall these number facts to 20 **from memory**, no longer requiring concrete resources to support them.



- **Use these addition and subtraction facts to 20 to derive related facts to 100.**

Add or subtract a 2-digit number and ones.

Following on from Year 1, multiple ten-frames can be used as a starting point to **add** a **single-digit number** to a **2-digit number**.

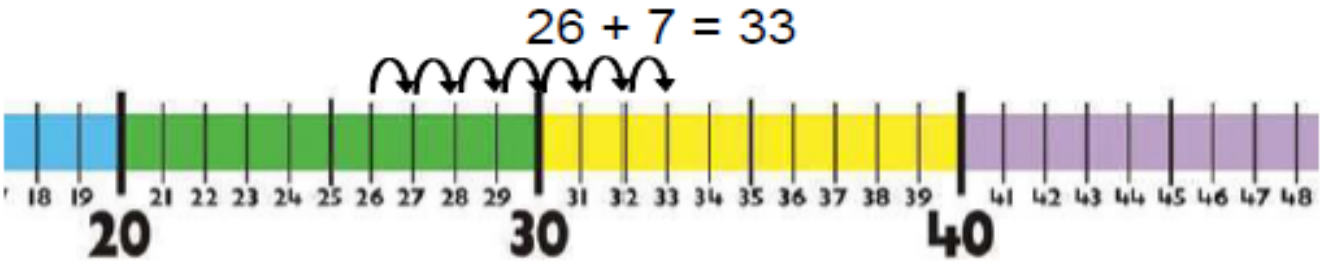


Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

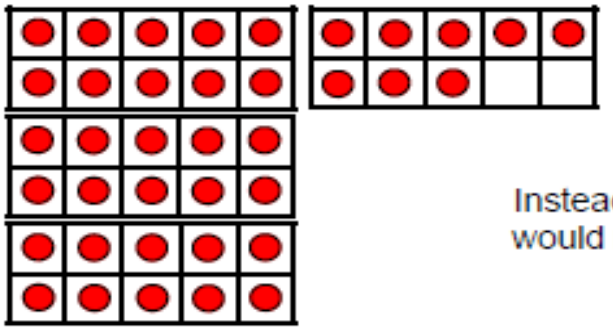
Year 2

Another early strategy might be to use a **number line** to count up in ones.



As a child's number knowledge develops, they will begin to use their known **number facts** to help them solve calculations mentally.

For example, you could present a child with the following calculation:

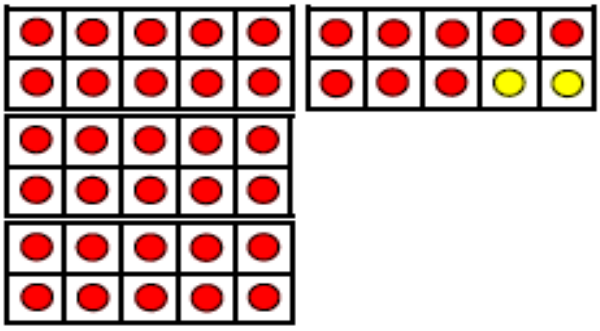


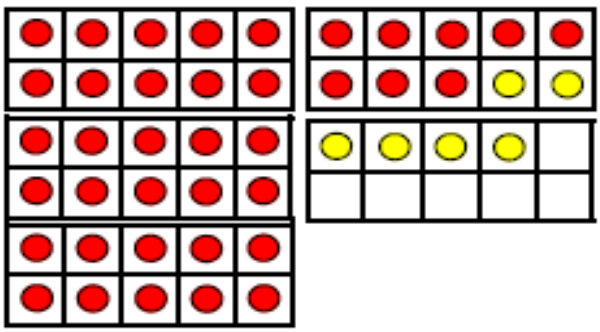
38 + 6 = ?

Instead of counting on in ones, children would mentally partition the **6** into **2** and **4**.

This way, the calculation is broken down into 2 steps.

38 + 2 = 40





40 + 4 = 44

This child has simultaneously recalled their **number bonds to ten**, since they knew that **2** needed to be added to the 3**8** to reach the next ten (i.e. **40**).

The value of practising this strategy on ten-frames first is that it is very visual for the children and facilitates their understanding of how to add across a ten.

Ashcroft Infant and Nursery School Calculation Policy

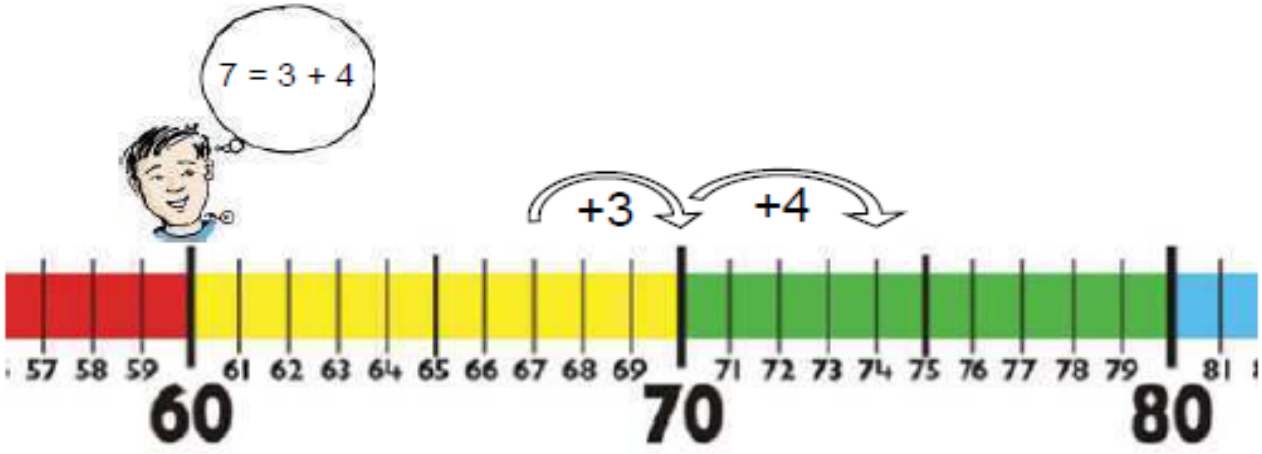
Addition and Subtraction

Year 2

Children can use the same strategy on a number line.

67 + 7 = ?

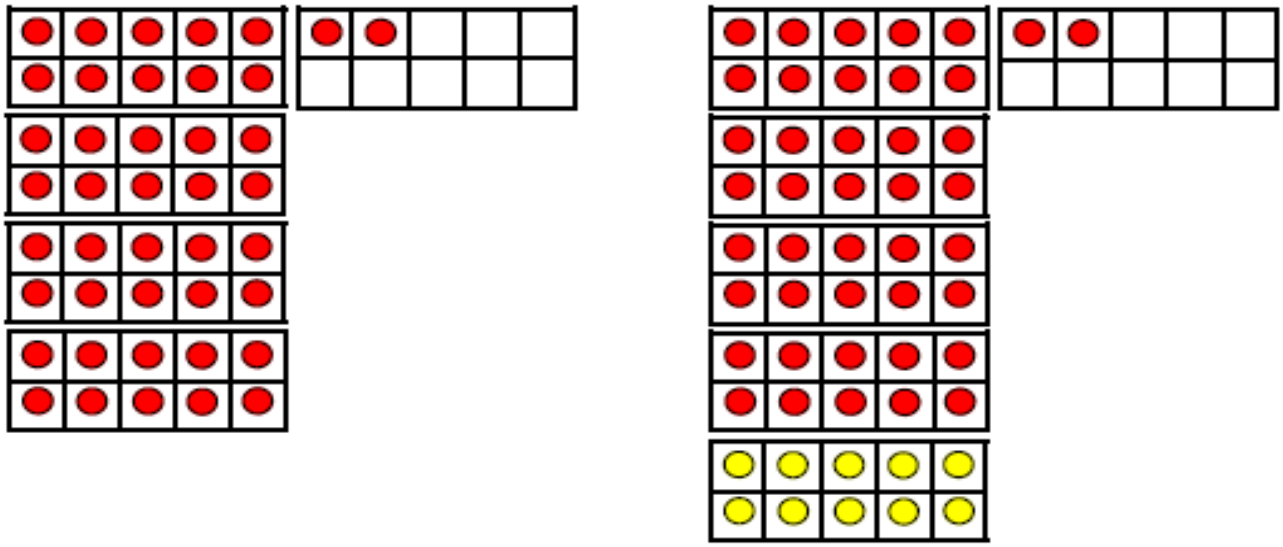
The child recalls a known fact by **partitioning** the **7** into **3** and **4** first and then:



Questions, like the ones above, involve **'bridging 10'.**

- **Add or subtract a 2-digit number and tens.**

Ten-frames, **base 10** and **Numicon** are all useful resources to help children build on their conceptual understanding of place value and adding on tens.



42 + 10 = 52

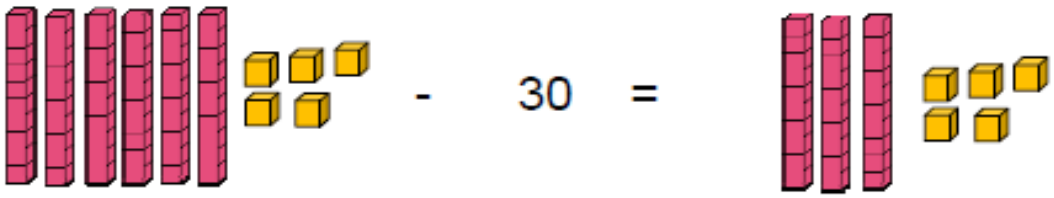
By placing the 'units' frame to the right of the others, you will reinforce their understanding of place value.

Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 2

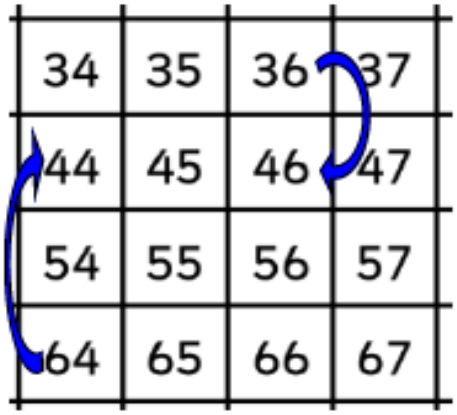
Base 10:



65 - 30 = 35

These examples clearly illustrate to the children that when you are adding or taking away tens alone, the number of units remains unchanged.

Once children have grasped this concept using concrete resources, they can move on to using more abstract, pictorial representations.



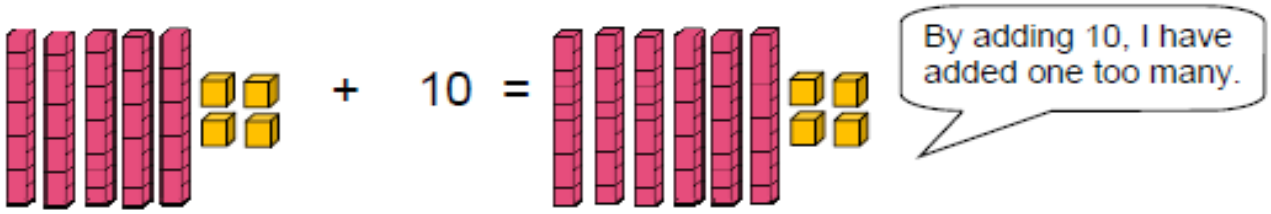
A **hundred square** is a useful tool with regards to enabling children to add or subtract 10s from any number. It will also reinforce the idea that the **units don't change** but that the **tens increase** or **decrease** respectively.

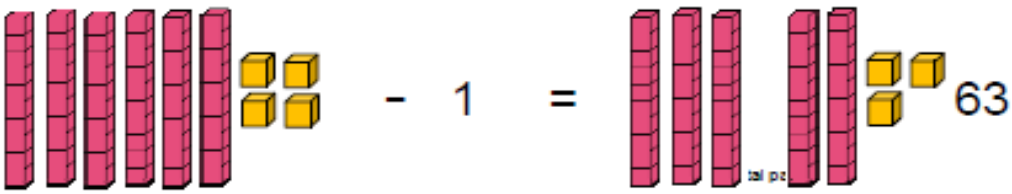
For example: 36 + 10 = 46

Or: 64 - 20 = 44

Children can also use this knowledge to help them **add or subtract 9 or 11,** by adding/ subtracting 10 and then **adjusting by 1**.

54 + 9 = ?



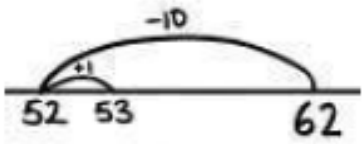
So…  - 1 = 63

Ashcroft Infant and Nursery School Calculation Policy

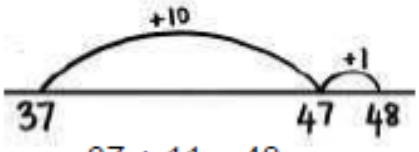
Addition and Subtraction

Year 2

With time and practice, children will be able to use this strategy mentally.



62 - 9 = 53

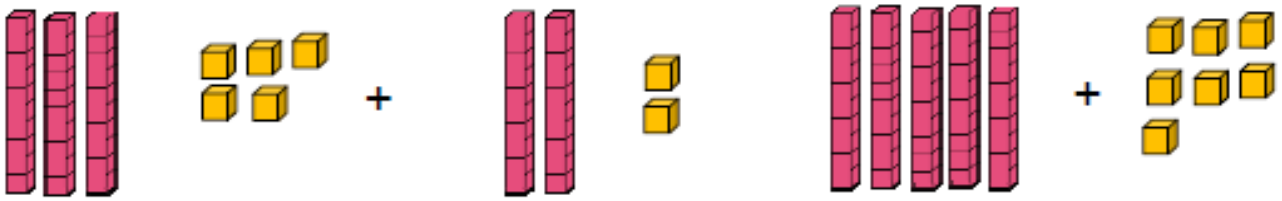


37 + 11 = 48

- **Add or subtract two 2-digit numbers**

Initially, the children might use base 10 resources to **partition** the numbers into their **tens** and **units** and then add them separately.

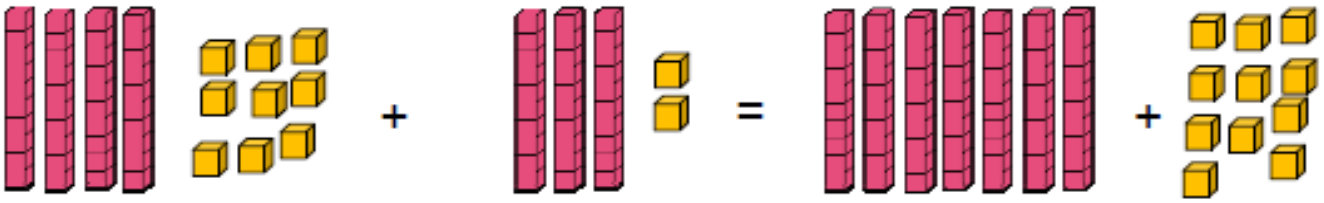
For example: 35 + 22



30 + 5 + 20 + 2 = 50 + 7

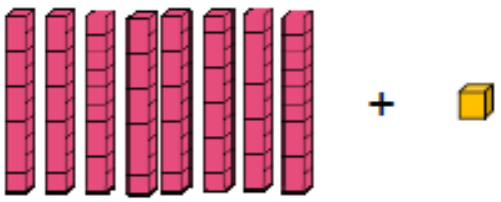
A more challenging example is when the children are required to **bridge 10**:

49 + 32 = ?



40 + 9 + 30 + 2 = 70 + 11

Ten of the **units** can be exchanged for a **rod**:



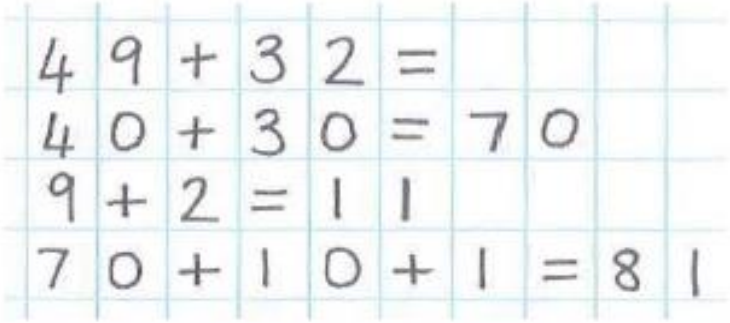
80 + 1 = 81

Ashcroft Infant and Nursery School Calculation Policy

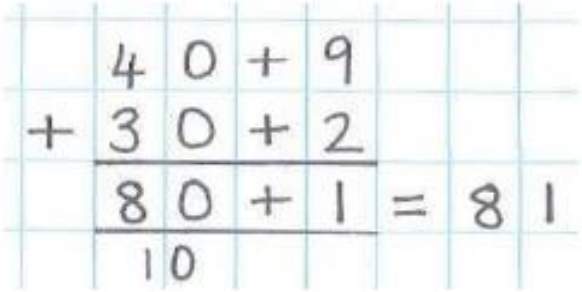
Addition and Subtraction

Year 2

To begin with, children can record their work with **jottings** such as:

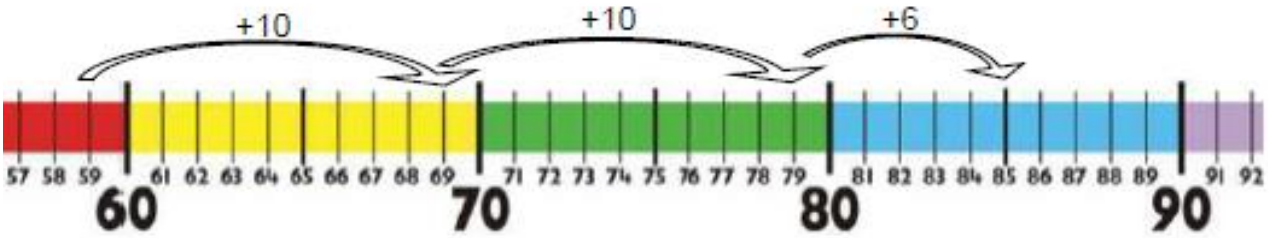


They will then progress to a more **formal columnar method** (in preparation for Year 3):



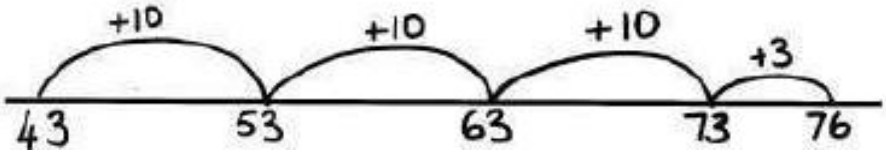
Number lines can also be used to add two 2-digit numbers:

59 + 26 = ?



Starting with the biggest number, the children add the tens first and then the units.

More able children will be able to use the **same strategy** on a **blank number line** or **mentally.**

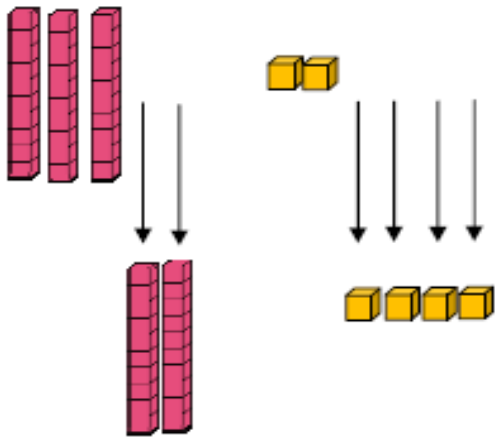


Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 2

Subtraction calculations can also be carried out using base 10 resources:



56 - 24 = 32

Children will record their workings informally to start with…

5	6	−	2	4	=		
5	6	−	2	0	=	3	6
3	6	−	4	=	3	2	

…before progressing to a more formal **partitioned columnar method** (in preparation for Year 3):

	5	0	+	6			
−	2	0	+	4			
	3	0	+	2	=	3	2

Please note: At this stage, **ONLY** use examples where the number of units being taken away is **smaller** than the number of units there were initially.
e.g. **79 – 34** (where **4** is **smaller** than **9**)

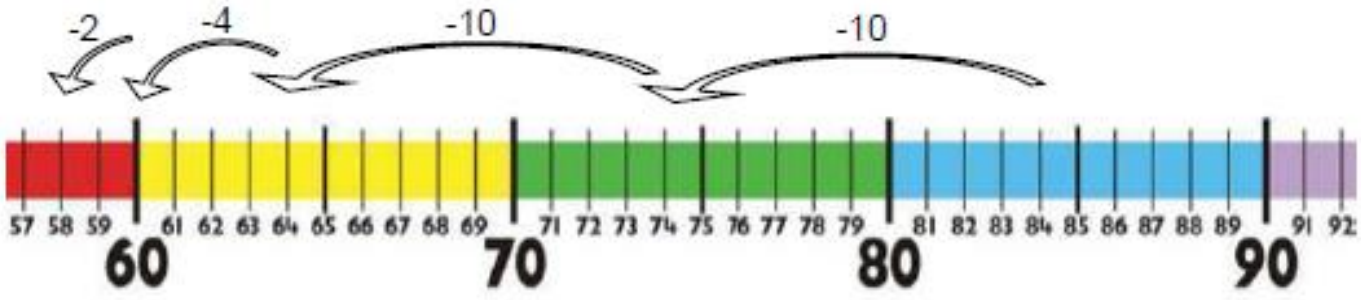
Children will move beyond this in Year 3.

Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

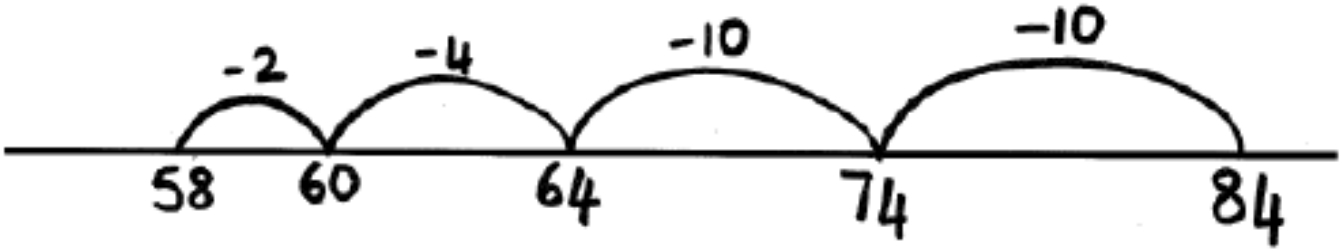
Year 2

Children can solve **subtraction calculations** on a number line in the same way; they start on the **biggest number** and then take away the **tens**, followed by the **units**.



84 - 26 = 58

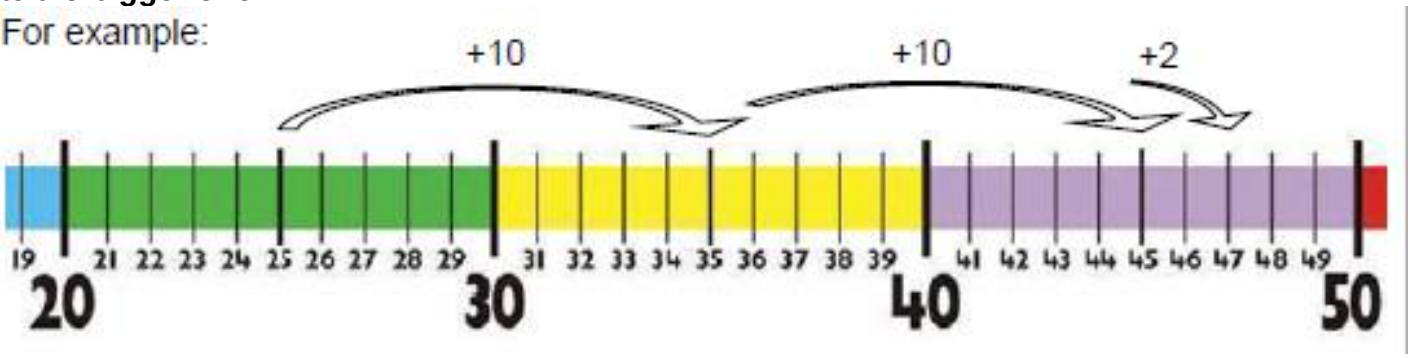
This can also be done on a **blank number line** or **mentally**:



The children are also taught to understand that a **subtraction** calculation can be solved by **finding the difference** between two numbers.

The **difference between** two numbers can be calculated by counting up from the smaller **number** to the **bigger one**.

For example:



So, the difference between 47 and 25 is 22.

Or 47 - 25 = 22

Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

Year 2

Add three 1-digit numbers.
Children should use a **number line** or **known number facts** to help them.

$$6 + 8 + 5$$

They may want to change the order of the calculation so that they are able to use facts they are more certain of first. For instance, they may do:

$$6 + 5 = 11$$
$$11 + 8 = 19$$

Know that the addition of two numbers can be done in any order (commutative) but that subtraction cannot.

$41 + 22 = 63$ is the same as $22 + 41 = 63$
However, $55 - 18 = 37$ is NOT the same as $18 - 55$

Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

The **inverse** of a function is the **reverse** of it.

For example:

The inverse of $8 + 9 = 17$ is $17 - 9 = 8$ or $17 - 8 = 9$ because **subtraction** is the **reverse** of **addition**.

$18 + 7 = 11 + \square$

$35 + \square + \square = 100$

$64 - \square = 49$

$29 = \square - 24$

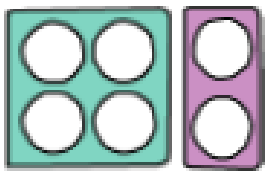
Ashcroft Infant and Nursery School Calculation Policy

Addition and Subtraction

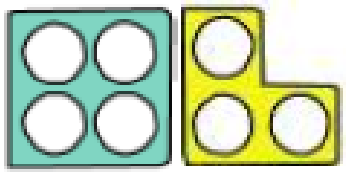
Year 2

Solve problems with addition and subtraction, applying their increasing knowledge of mental and written methods.
In particular, children should be given the opportunity to explore the pattern derived from adding odd and even numbers.

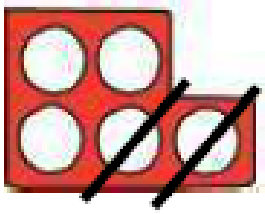
Even + Even = Even



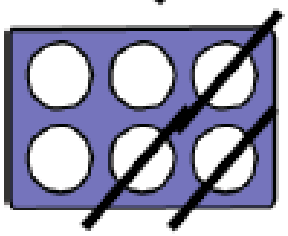
Even + Odd = Odd



Odd - Even = Odd



Even - Odd = Odd



And so on...

Vocabulary
+, add, addition, more, plus, make, sum, total, altogether, how many more to make…? how many more is… than…? how much more is…? =, equals, sign, is the same as, tens, units, partition, multiple of 10, tens boundary, more than, one more, two more… ten more… one hundred more, -, subtraction, subtract, take away, difference, difference between, minus, less than, one less, two less… ten less… one hundred less