



# Calculation policy: Addition

## MENTAL CALCULATIONS

All of the mental methods below need to be taught to the children explicitly. Children will need to see or draw models to show their understanding when they are learning these methods.

Year 1

### Mental recall of number bonds

$$6 + 4 = 10$$

$$25 + 75 = 100$$

$$\square + 3 = 10$$

$$19 + \square = 20$$

Year 2

### Use near doubles

$$6 + 7 = \text{double } 6 + 1 = 13$$

### Addition using partitioning and recombining

$$34 + 45 = (30 + 40) + (4 + 5) = 79$$

Year 3

### Counting on in repeated steps of 1, 10, 100, 1000

$$86 + 57 = 143 \text{ (by counting on in tens and then in ones)}$$

### Compensation by adding 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.

**Points to remember:**

**Children should not be made to go onto the next stage if:**

- 1) They are not ready.**
- 2) They are not confident.**
- 3) They do not understand the value of the numbers they are working with.**

**Children should be encouraged to approximate their answers before calculating.**

**Children should be encouraged to check their answers after calculation using an appropriate strategy i.e.; the inverse operation.**

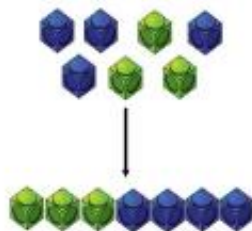
**Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.**

**By the end of year 6, children will have a range of calculation methods both mental and written. They will need to select which to use based on the numbers involved.**

## Addition: Early Years

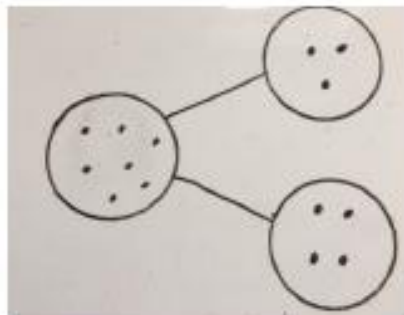
### Concrete:

Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).



### Pictorial:

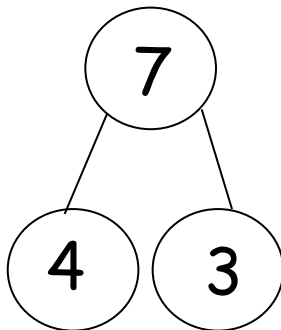
Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.



### Abstract:

$$4 + 3 = 7$$

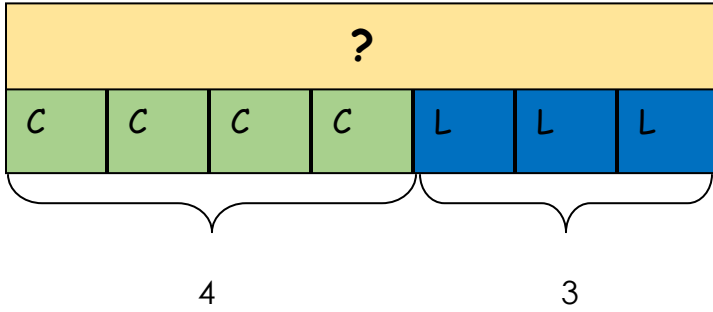
Four is a part, 3 is a part and the whole is seven.



Only when children are confident to represent numbers with written digits should they be expected to do this. Until that time, they should be encouraged to select the cubes and put a label with them.

How to use the bar method to support understanding...

Theo has got 4 cars and 3 lorries. How many toys has he got?



Theo has got \_\_\_\_\_ toys altogether.

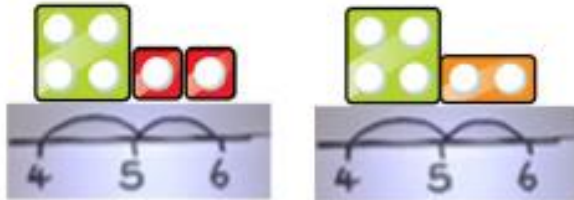
# Addition: Year 1 stage 1

## Concrete:

Counting on using number lines using cubes or Numicon.

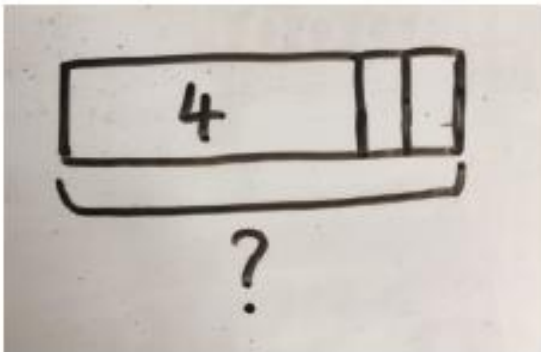


<https://mathsframe.co.uk/en/resources/resource/450/ITP-Number-Line>



## Pictorial:

A bar model which encourages the children to count on, rather than count all.



## Abstract:

The abstract number line:  
What is 2 more than 4?  
What is the sum of 2 and 4?  
What is the total of 4 and 2?  
 $4 + 2$

Think about using variation in the way questions are posed.



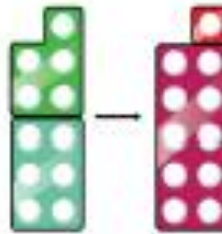
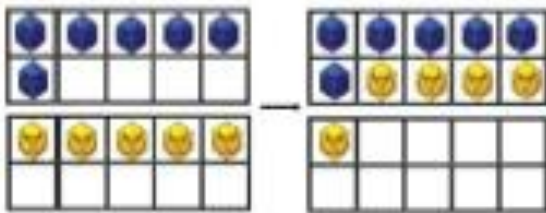
The main teaching within year 1 is to begin counting on rather than counting from 0 all of the time.

## Addition: Year 1 stage 2

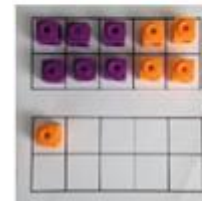
### Concrete:

Regrouping to make 10; using ten frames and counters/cubes or using Numicon.

$$6 + 5$$



$$6 + 5 = 11$$

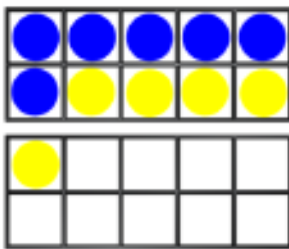


Start with the bigger number and use the smaller number to make 10.

<https://mathsframe.co.uk/en/resources/resource/69/itp-beadstring>

### Pictorial:

Children to draw the ten frame and counters/cubes.



Children to be encouraged to use their knowledge of number bonds to 10. So  $6 + 5$  would become  $6 + 4 + 1$ .



$$3 + 9 =$$

### Abstract:

I have to add  $7 + 4$ .  
If I have 7, how many more would I need to make 10?  
How many do I have left?

$$7 + 4 = 7 + 3 (= 10) + 1 = 11$$

This method is also very useful when using larger numbers.

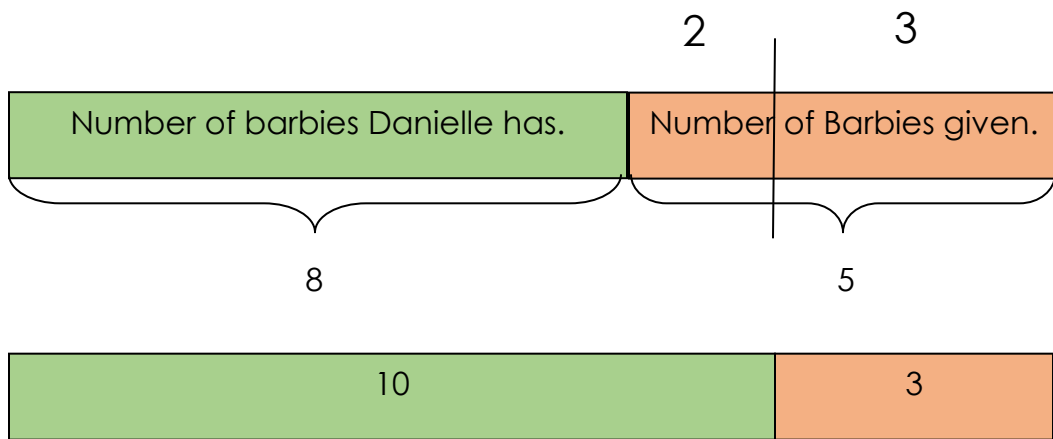
i.e.;  $23 + 28 = 28 + 2 = 30 + 21 = 51$

When children are fluent with their number bonds to 10, they need to be encouraged to use them in other situations where numbers can be partitioned.

**The above example is not a year 1 objective but shows why this method is important and why it is taught in early maths.**

How to use the bar method to support understanding...

Danielle has got 8 Barbies. She is given 5 more. How many Barbies does she have now?



Danielle has got \_\_\_\_\_ Barbies altogether.

N.B Children will need to create the first bar and the second to see that the total has not changed but the size of the bars has because they have 'made 10' before adding the rest of the number on.

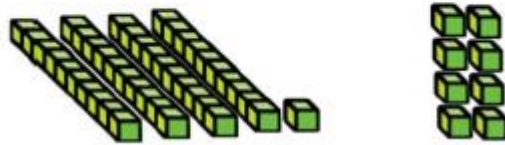


## Addition – Year 2

### Addition without exchanging (re-grouping)

#### Concrete:

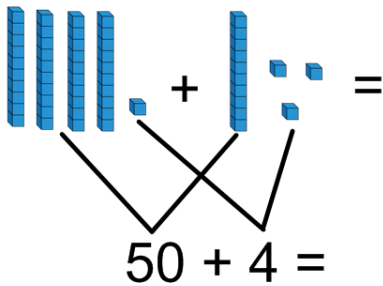
TO + O using base 10. Continue to develop understanding of partitioning and place value.  
 $41 + 8$



You would move onto using TO + TO ensuring that children were confident about the place value of the numbers they are using.

#### Pictorial:

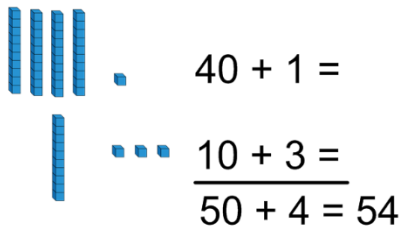
$$41 + 13 =$$



Children should be used to and encouraged to draw the stick and dots in their books to represent the numbers they are using.

#### When children are secure:

$$41 + 13 =$$



The expanded method should only be used when children are confident with the place value of the numbers they are using. They should still be drawing the sticks and dots to help with their understanding.

#### Abstract:

$$\begin{array}{r} 41 + 13 = \\ \diagdown \quad \diagup \\ \diagup \quad \diagdown \\ 50 + 4 = \end{array}$$

The expanded written method should only be used when children are confident with the place value of the numbers they are using. Some children will need to use sticks and dots to represent the numbers they are using for the whole of KS1 and this should be encouraged.

**For those children who are very confident with number, they could move onto representing their work using the expanded column method.**

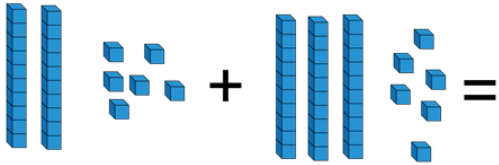
$$\begin{array}{r} 40 + 1 \\ 10 + 3 \\ \hline 50 + 4 \end{array}$$

When going from one method to another, teach them side by side so that the children can see they are doing the same but using a different process. Encourage children to use base 10 equipment to support their calculations.

## Year 2 – Addition with exchanging

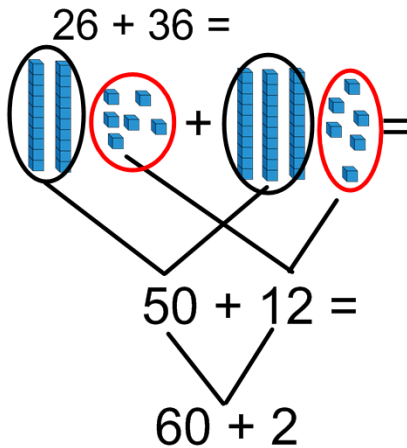
### Concrete:

$$26 + 36 =$$



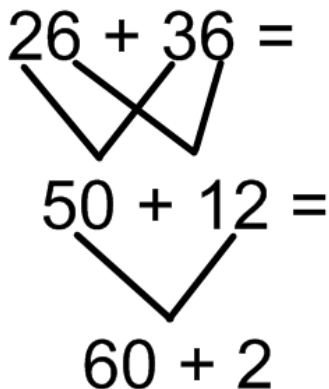
Children need to be encouraged to calculate how many ones there are first and then how many tens. Children should 'make' the 12 (by physically exchanging the 10 ones for a ten) and 50 before finding a solution.

### Pictorial:



Children need to be encouraged to calculate how many ones there are first and then how many tens.

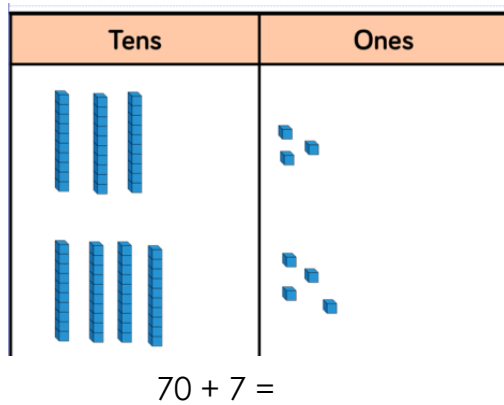
### Abstract:



Eventually, children will be able to lose the last step and mentally calculate  $50 + 12$ .

## Year 3 – addition without exchanging:

### Concrete:



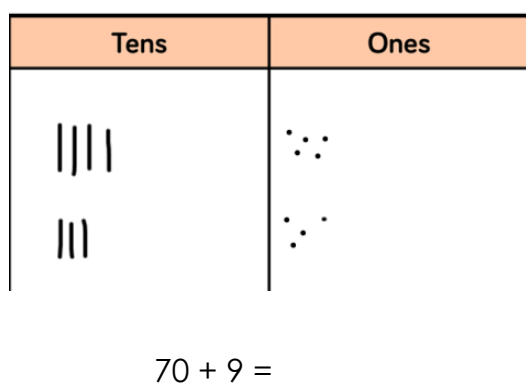
$30 + 3 =$

$40 + 4 =$

Continue to develop children's understanding of partitioning and place value to develop fluency. Children need to be able to see this image as both the numbers being partitioned (down the side) and the number being combined (underneath).

Children can begin to use place value counters instead of base 10 when they are confident enough to.

### Pictorial:



$40 + 5 =$

$30 + 4 =$

Children need to be able to see this image as both the numbers being partitioned (down the side) and the number being combined (underneath).

Children need to continue to use the images to support their understanding of place value.

### Abstract:

Expanded addition moving onto the compact method

$45 + 34 =$

$40 + 5 =$

$30 + 4 =$

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 $70 + 9 = 79$

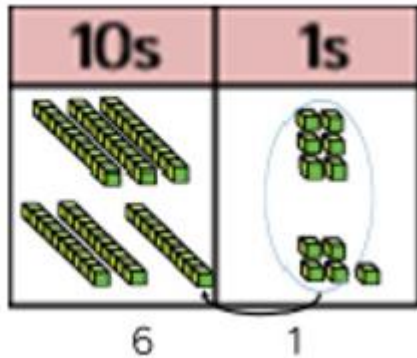


$$\begin{array}{r} 45 \\ + 34 \\ \hline 79 \end{array}$$

**Addition – Year 3**  
**With exchanging (re-grouping)**

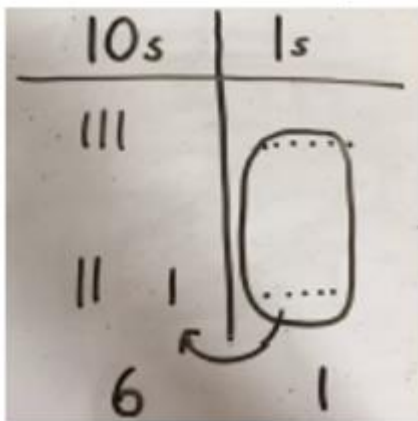
**Concrete:**

TO + TO using base 10. Continue to develop understanding of partitioning and place value.  
 $36 + 25$



As previously, children need to physically exchange the 10 ones for a ten if they haven't grasped the concept of exchanging already.

**Pictorial:**



$$30 + 6 =$$

$$20 + 5 =$$

Some children might see this calculation as  $20 + 30 + 11$ , which is good because it shows flexibility in number knowledge. If they need to add the extra step in, that is fine. Encourage children to then add the ones followed by the tens mentally.

$$60 + 1 =$$

**Abstract:**

$$36 + 25 =$$

$$30 + 20 = 50$$

$$6 + 5 = 11$$

$$50 + 11 = 61$$

Prior to using the formal written method when exchanging, children should be given the opportunity to continue to partition numbers and re-combine them. This increases mental fluency.

Abstract part 2:

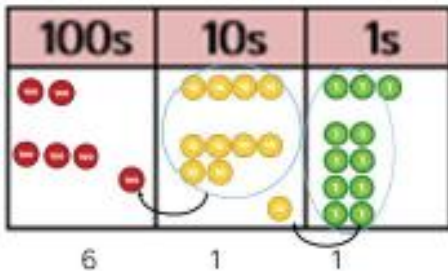
$$\begin{array}{r} 36 \\ + 25 \\ \hline 61 \end{array}$$

When carrying the tens, ensure as a school you are consistent in where the carried number is placed within the calculation.

## Year 4 – Calculation with larger numbers

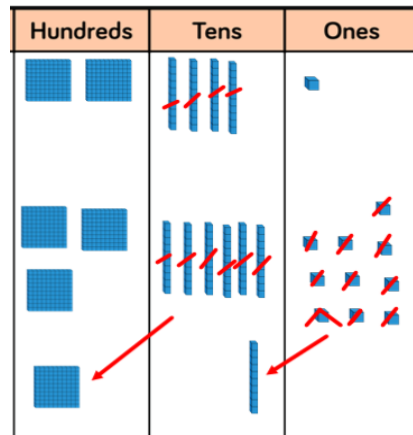
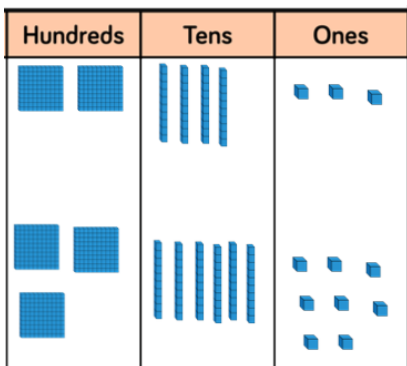
**Concrete:** Calculation shows  $243 + 368$

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.



**Pictorial:** Calculation shows  $243 + 368$

Children to represent the base 10 in a place value chart crossing out when they make an exchange



**Abstract:** Calculation shows  $243 + 368$

$$\begin{array}{r} \overset{1}{\phantom{+}} \overset{1}{\phantom{+}} \\ 243 \\ + 368 \\ \hline 611 \\ \hline \end{array}$$