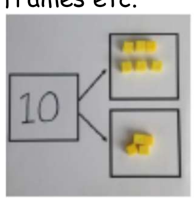
Ashfield Primary School – Addition calculation policy

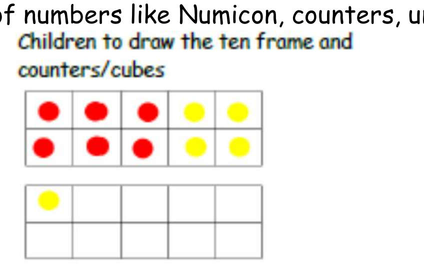
Our aim is for children to use mental methods when appropriate but for calculations that they cannot solve in their heads, we aim to teach children to use an appropriate written method which they can use accurately and confidently. This policy shows how to build up to a compact, efficient method of Addition. **Please see the attached appendix for further examples of concrete, pictorial and abstract methods**

<table>
<tr><th></th><th>Year group</th></tr>
<tr>
<td>Pre-requisites:
- Uses some number names and number language accurately.
- Recites numbers in order to 10.
Knows that numbers identify how many objects are in a set.
- Beginning to represent numbers using fingers, marks on paper or pictures.
- Compare sets and say when they have the same number.

Key vocabulary:
Add, number, more, count, count on, all, add, make, and, sum, total, altogether, score, one more, two more, ten more, how many more to make? How many more is … than?</td>
<td><u>Reception</u>
Finds the total number of items in two groups by counting all of them.
Add two single digit numbers and count on to find the answer.
Records, using marks that they can interpret and explain.

Children should add single digit numbers together using practical objects. Children will first add by counting all the objects. Later when children are able to subitise (recognise how many there are without having to actually count them), they will start with the largest group of objects and count on from there. Children are not expected to record the calculation with the appropriate signs at this point.
 
2 + 1 = 3 3 + 3 = 6

Children should be given the opportunity to:
Use practical objects like dinosaurs, toy cars, compare bears etc.
Use mathematical representations of numbers like Numicon, counters, unifix cubes, part part whole models and ten frames etc.



</td>
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</table>

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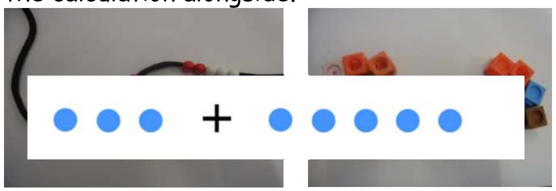
Pre-requisites:
- count reliably with numbers from 1 – 20 and place them in order
- say 1 more than a given number
- add two single digit numbers together
- count on to find answers
- have practical experience of doubling

Key vocabulary:
Number bonds, number line, add, more, plus, make, sum, total, altogether, inverse, double, equals, sign, tens, ones

Year 1

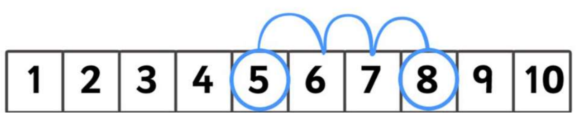
Add one-digit and two-digit numbers to 20, including 0.
Read, write and interpret mathematical statements involving addition (+) and equals (=) signs.

Children should be able to solve one step addition problems using concrete objects and pictorial representations and should write the calculation alongside.



8 + 5 = 13   3 + 5 = 8

5 + 3 = 8



Children should also be able to count on using a numbered number line and record their addition using the appropriate signs. Children should draw their jumps **above** the number line. Use language such as: 'Put your finger on number five. Count on (count forwards) three.'

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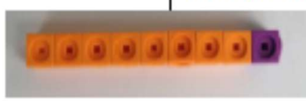
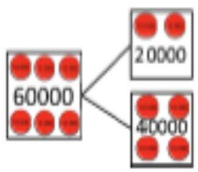
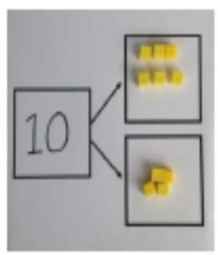
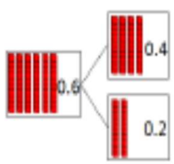
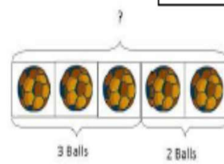
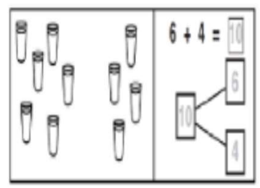
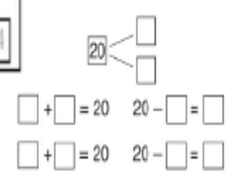
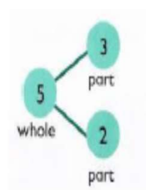
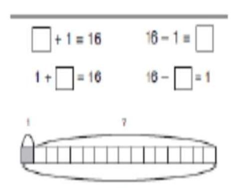
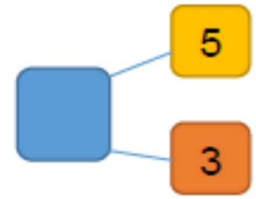
	Concrete	Pictorial	Abstract
	  Use cubes to add two numbers together as a group or in a bar. Then recount all using one-to-one correspondence.  Pupils could place ten on top of the whole as well as writing it down. The parts could also be written in alongside the concrete representation.   	 Use pictures to add two numbers together as a group or in a bar.      	$4 + 3 = 7$  Use the part-part whole diagram as shown above to move into the abstract. $10 = 6 + 4$ $10 - 6 = 4$ $10 - 4 = 6$ $10 = 4 + 6$

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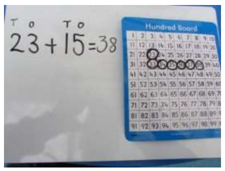
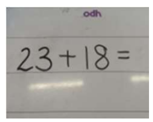
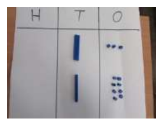
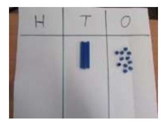
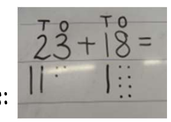
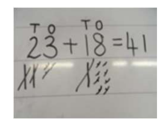
Pre-requisites: - count to and across 100 forwards - count, read and write numbers to 100 in numerals - count in tens - understand how to use a numbered number line - memorise number bonds to 10 and 20 - add one and two-digit numbers using numbers to 20 using apparatus **Key vocabulary:** Number bonds, number line, add, addition, more, plus, make, sum, total,	**<u>Year 2</u>** **Add numbers using concrete objects, pictorial representations and mentally, including: a two-digit number and ones, a two-digit number and tens, two two-digit numbers and three one-digit numbers together.**  Children should be taught to use a hundred square to count on in ones and tens. Children should partition the number to be added into tens and ones and should represent this using pictorial representations under the tens and ones columns (tens sticks and ones dots). They should add on the tens first, then add on the ones. Children should be able to use their knowledge of place value in order to add two two-digit numbers together, first using base ten equipment practically, then moving onto drawing pictorial representations (tens sticks and ones dots). e.g. **23 + 18 = 41** calculated practically:    calculated using pictorial representations:  		

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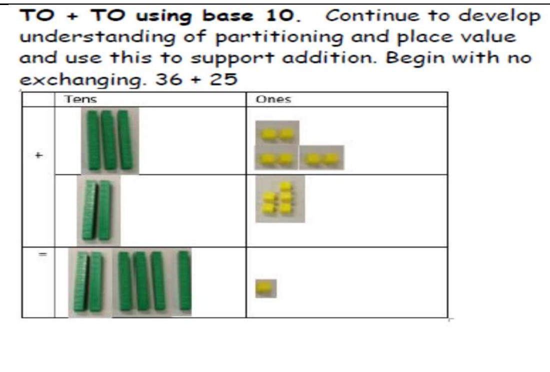
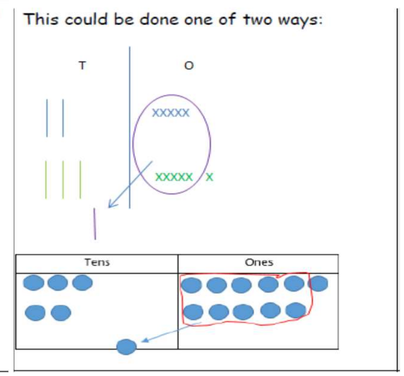
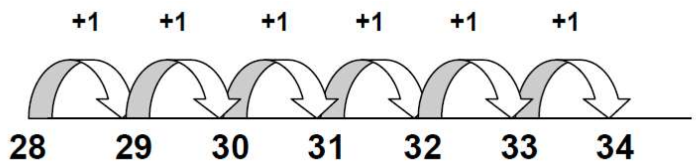
<table>
<tr>
<td>altogether, tens boundary, inverse, double, equals, sign, tens, ones</td>
<td>

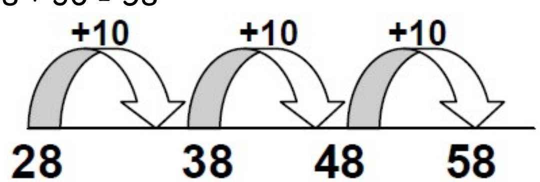




Counting on in ones using an empty number line, within 100…
28 + 6 = 34

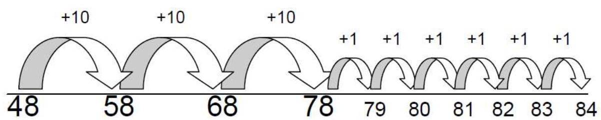


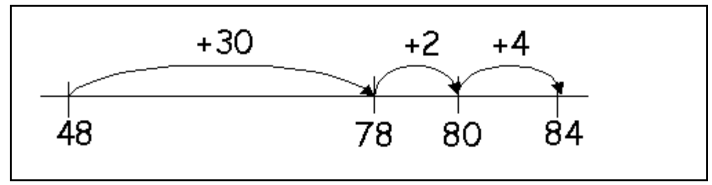
…and in tens
28 + 30 = 58



'Put the biggest number first (48), and then partition the smaller number (36 = 30 + 6)
</td>
</tr>
</table>

and count on: 48 + 30 + 6.'





Children should also learn how to draw empty number lines. They should first be shown how to add multiples of 10 in one go. They should then be taught to work out how many more to add to get to the tens boundary and then how many more to add to finish the calculation. e.g. **48 + 36 =84**

Also use the partitioning method to add two two-digit numbers:

43 + 25 = 68
40 + 20 = 60
3 + 5 = 8
60 + 8 = 68

'Partition the numbers into tens and units.
Add the tens together and then add the units together.
Recombine to give the answer'.

Then move on to calculations that bridge the tens:
48 + 36 = 40 + 8 + 30 + 6
40 + 30 = 70
8 + 6 = 14
70 + 14 = 84
48 + 36 = 84

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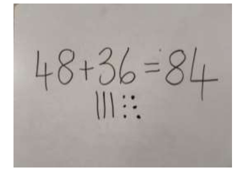
<td>
They may wish to represent the number to be added on (36) first using tens and ones marks underneath the number (in order to remind themselves how many tens and how many ones to add on).

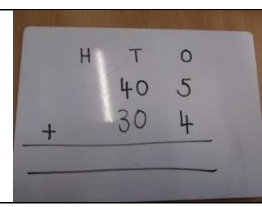


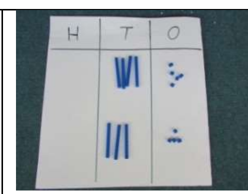
+ and = signs to be introduced with missing numbers
e.g. □7 + 6 = 34   34 = 6 + □
. 28 + □ = 34   34 □ 6 + 28
28 + 6 = □   34 = □ + 28
</td>
</tr>
<tr>
<td>
Pre-requisites:
- understanding of the place value of 2 digit numbers
- be able to count in tens from any number
- be able to add multiples of 10 together
- understand how to draw a blank number line
</td>
<td>
<u>**Year 3**</u>
Add numbers with up to three digits, using formal written methods of columnar addition.

Chn should be shown the expanded column method alongside the compact column method. The expanded column method should be taught using base ten equipment in a Hs, Ts and Os grid before expecting children to record their method. This is an important step as it ensures children understand the place value of each digit before moving onto the compact method. Children should become confident solving expanded and compact calculations without carrying before moving onto carrying.

Expanded method (no carrying)e.g. 45 + 34 = 79

Children should be able to partition both numbers into Hs, Ts and Os and create them using base ten equipment.





</td>
</tr>
</table>

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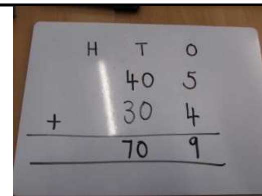
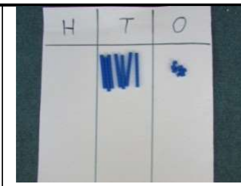
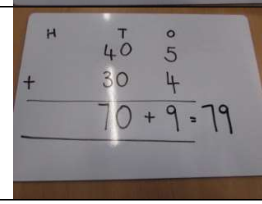
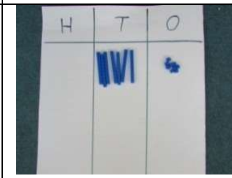
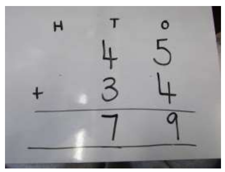
- understand bridging
- recall addition facts to 20 fluently

Key vocabulary: Number bonds, number line, add, addition, more, plus, make, sum, total, altogether, tens/hundreds boundary, inverse, double, equals, sign, column addition, column, hundreds, tens, ones, exchange

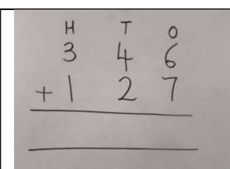
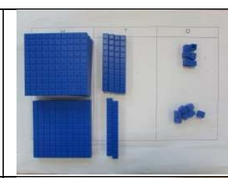
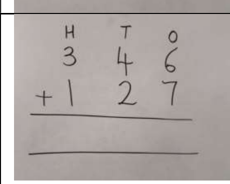
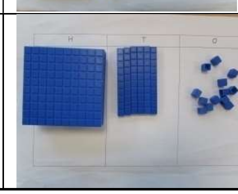
Children should then group any ones together, then tens then hundreds (in that order) and put their answers in the answer space.		
Children should then add the numbers in the tens and ones columns together to produce their answer.		



Children should also be shown alongside this method that you can also write the calculation in the compact form (not partitioned or expanded).

Once children are confident solving expanded and compact column addition calculations, they should move onto calculations involving carrying. This should always be taught with base ten equipment alongside to demonstrate the value of the carried numbers. Use the words "carry ten" or "carry one hundred" **not** "carry one".

Compact method (involving carrying)e.g. 346 + 127 =

Children should be able to partition both numbers into Hs, Ts and Os and create them using base ten equipment. Chn should write the calculation alongside.		
Children should then group any ones together, then tens then hundreds (in that order).		

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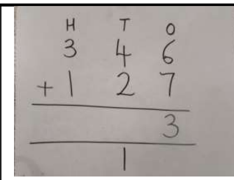
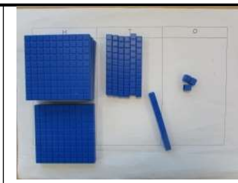
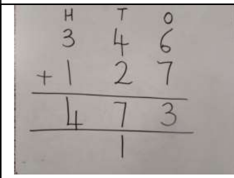
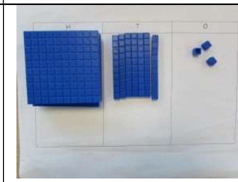
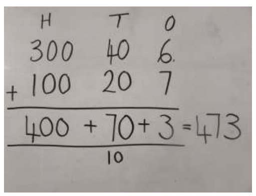
Children should then see if they have enough ones to make a new ten. Exchange the newly formed ten into the tens column. Write 1 (which is worth 10) underneath the tens and see how many ones you have left in the ones column. Add your answer into the ones column.		
Children should then count up how many tens they have altogether and remember to add the exchanged ten (shown as a 1 underneath) to their answer. Write the answer in the tens column then add up the hundreds column.		



Children should also be shown alongside this method that you can also write the calculation in the expanded form. This will reinforce the value of the digits in each column.

If the children are completing a word problem, draw a bar model to represent what it's asking them to do

?	
243	368

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Pre-requisites:
- understanding of place value up to 3 digits
- understanding of how to add accurately using compact column addition
- an understanding you begin column calculations from the right hand side

Key vocabulary:
Add, addition, more, plus, make, sum, total, altogether, tens/hundreds/ thousands boundary, inverse, equals, column addition, column, efficient written method, decimal, exchange

Year 4

Add numbers with up to 4 digits using the formal methods of columnar addition.

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

This method should be taught when children are completely confident in using the compact column method and can understand the need to carry numbers over into the larger columns. Use the words "exchange ten ones for one ten" or "exchange ten tens for one hundred" **not** "carry one". Children can continue to write Th, H, T, O above each column to help remind them of the place value of each digit.

e.g. 176 + 147 = 323

	H	T	O
+			

The digit that has been 'exchanged' should be recorded under the line in the correct column.

2789 + 642 = 1431

	Th	H	T	O
	1	8	4	5
+		5	2	6
	2	3	7	1
	1		1	

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Pre-requisites:

- understanding of place value up to 1, 000, 000 (10,000,000 Year 6)
- understanding of decimal numbers

Key vocabulary:
Add, addition, more, plus, make, sum, total, altogether, tens /hundreds boundary, inverse, equals, column addition, column, efficient written method, order of operations, decimal, exchange

Years 5 and 6

Add whole numbers with more than 4 digits, including using formal written method (columnar addition)
use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Non-Statutory

Pupils practise using the formal written methods of columnar addition and subtraction with increasingly large numbers to aid fluency
They practise adding and subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, 0.83 + 0.17 = 1).

NB Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.

Larger numbers should be introduced when children are completely confident in using the compact column method and can understand the need to exchange numbers over into the larger columns. Continue to use the words "exchange ten ones for one ten" or "exchange ten tens for one hundred" etc **not** "carry one". Children should not need H, T, O etc marked above each column once working with 4 or 5 digit numbers but use these if needed.

e.g. 21,848 + 1,523 = 23,371

	Tth	Th	H	T	O
	2	1	8	4	8
+		1	5	2	3
	2	3	3	7	1
		1		1	

The digit that has been 'exchanged' should be recorded under the line in the correct column.

£154.75 + £233.82 = £388.57

	H	T	O	.	$\frac{1}{10}$	$\frac{1}{100}$
	1	5	4	.	7	5
+	2	3	3	.	8	2
	3	8	8	.	5	7
			1			

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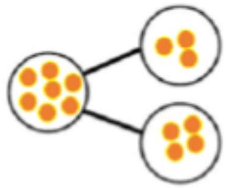
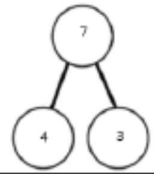
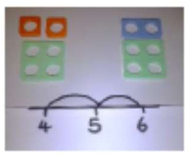
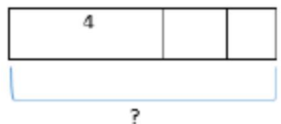
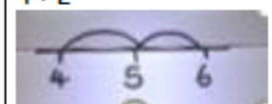
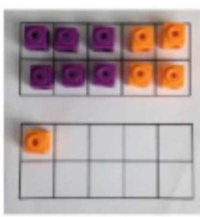
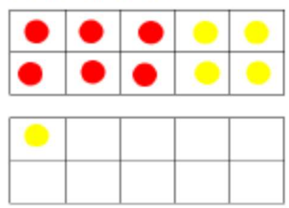
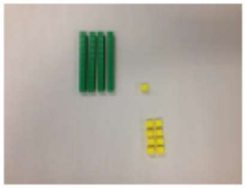
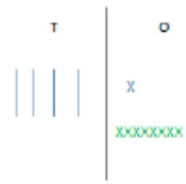
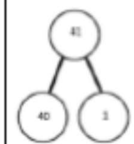
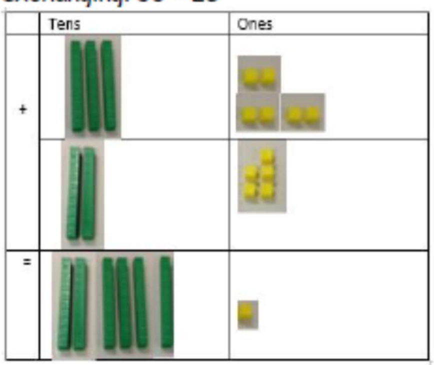
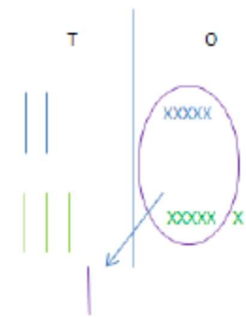
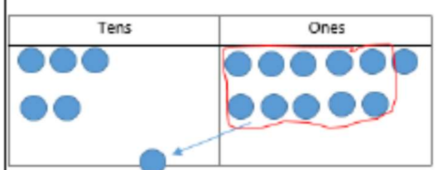
	<table><tr><td>Tth</td><td>Th</td><td>H</td><td>T</td><td>O</td></tr><tr><td>2</td><td>1</td><td>8</td><td>4</td><td>8</td></tr></table> + The digit that has been 'exchanged' should be recorded under the line in the correct column. Children should also have experience adding decimal numbers with more than 4 digits.

Appendix : Examples of concrete, pictorial and abstract

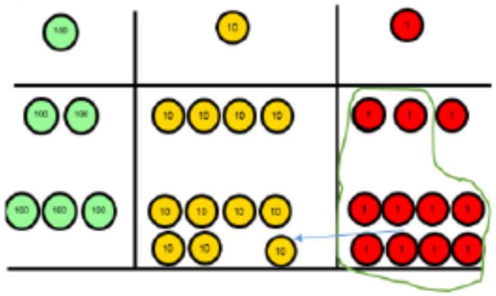
Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears etc)  		4 + 3 = 7 (four is a part, 3 is a part and the whole is seven) 
Counting on using number lines by using cubes or numicon  	A bar model which encourages the children to count on 	The abstract number line: What is 2 more than 4? What is the sum of 4 and 4? What's the total of 4 and 2? 4 + 2 
Regrouping to make 10 by using ten frames and counters/cubes or using numicon: 6 + 5  	Children to draw the ten frame and counters/cubes 	Children to develop an understanding of equality e.g 6 + ☐ = 11 and 6 + 5 = 5 + ☐ 6 + 5 = ☐ + 4

Ashfield Primary School – Addition calculation policy

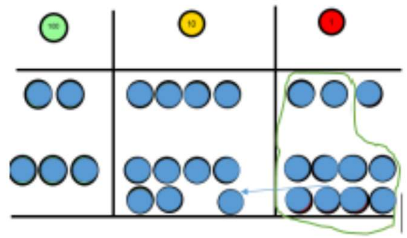
TO + O using base 10. Continue to develop understanding of partitioning and place value 41 + 8 	Children to represent the concrete using a particular symbol e.g. lines for tens and dot/crosses for ones.  	41 + 8  1 + 8 = 9 40 + 9 = 49 $\begin{array}{r} 41 \\ +\ \ 8 \\ \hline 49 \end{array}$
TO + TO using base 10. Continue to develop understanding of partitioning and place value and use this to support addition. Begin with no exchanging. 36 + 25  	This could be done one of two ways:   	Looking for ways to make 10 36 + 25= 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 Formal method: $\begin{array}{r} 36 \\ +25 \\ \hline 61 \\ \hline {\scriptstyle 1} \end{array}$

Ashfield Primary School – Addition calculation policy

Use of place value counters to add HTO + TO, HTO + HTO etc. once the children have had practice with this, they should be able to apply it to larger numbers and the abstract



Chidren to represent the counters e.g. like the image below



If the children are completing a word problem, draw a bar model to represent what it's asking them to do

?	
243	368

```
 243
+368
 611
 1 1
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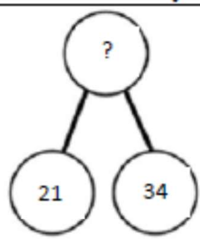
Fluency variation, different ways to ask children to solve 21+34:



Sam saved £21 one week and £34 another. How much did he save in total?

21+34=55. Prove it! (reasoning but the children need to be fluent in representing this)

```
 21
+34
___
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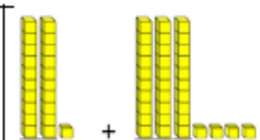
21 + 34 =

$\square$ = 21 + 34

What's the sum of twenty one and thirty four?



Always use missing digit problems too: