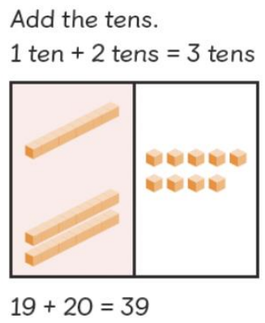
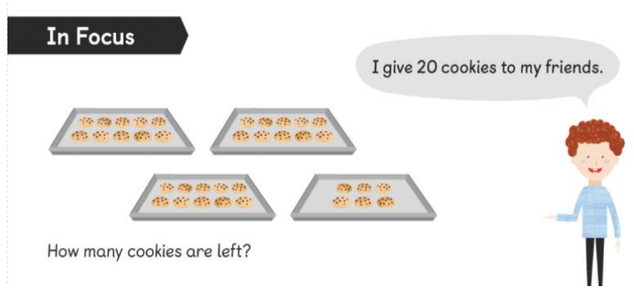
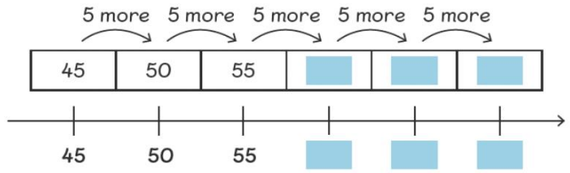
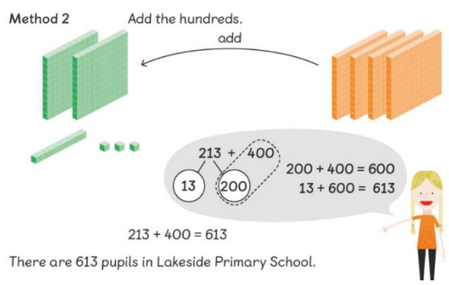
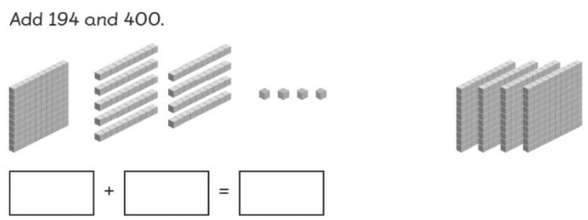
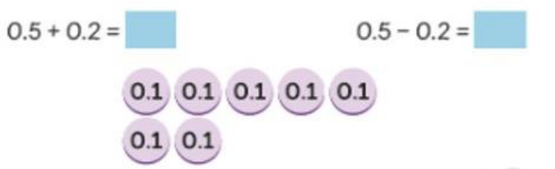
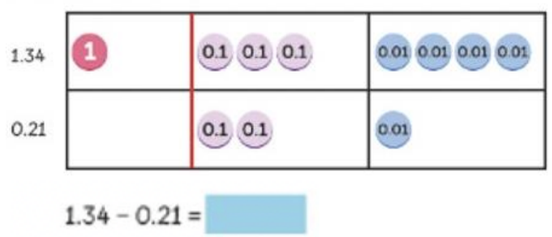
Mental Calculations: Addition and Subtraction

Mental maths strategies are accepted ways of working maths out in your head that help us take shortcuts and get to the correct answer in an efficient way. Mental maths strategies are the foundations for most of the areas of mathematics that use numbers. Without efficient mental strategies, children can often struggle to quickly and fluently calculate. Mental strategies are also the foundation of any written or formal method in mathematics. Referring to it as mental maths does not mean you cannot write anything down at all, but any written work would be quick jottings to help remember through multi-step problems.

At Air Balloon, we follow the CPA approach- concrete materials; followed by pictorials and models; then abstract. One or more of these stages will be shown concurrently in a lesson. The examples shown start from KS1 and move on to KS2. However, teachers are encouraged to refer back to previous Key Stages' calculation strands to consolidate and reinforce fluency when calculating addition and subtraction problems. Base 10, number lines, place value counters and 10 frames are key resources which are used to reinforce calculations. Missing number problems should be included in lessons regularly, to check understanding.

Air Balloon Hill PRIMARY School

Fluent Mental Calculations: Addition and Subtraction

Strand	Key Stage Objectives	Concrete *Modelling and handling real objects*	Pictorial *Modelling and drawing with other objects and pictures*	Abstract *Abstract algorithms and notations (such as the + - symbols)*
Counting Forwards and Backwards Counting forwards and backwards is first encountered in KS1, beginning at one and counting on in ones. Pupils' sense of number is extended by beginning at different numbers and counting forwards and backwards in steps, not only of ones, but also of twos, fives, tens, hundreds, tenths and hundredths.	**KS1:** 1. *Counting on or back in tens from any number* 2. *Counting on or back in fives from any multiple of 5*	1.  2. 	1.  2.  	1. **27 + 60 = ?** by counting on in tens from 27 2. **35 - 15 = ?** by counting back in steps of 5 from 35
	LKS2: 1. *Counting on or back in hundreds from any number*	 	 	**1. 570 + 300 = ?** by counting on in hundreds from 570
	UKS2: 1. *Counting on or back in tenths and/or hundredths – this includes in the context of measure and money problems.*	 	 	**1. 3.2 + 0.6 = ?** by counting on in tenths. **1.7 + 0.55 = ?** by counting on in tenths and hundredths.

Partitioning

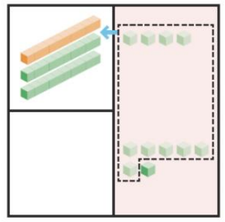
This strand of mental addition and subtraction extends from the 'Make 10 and Then' from Number Sense Maths. It is important to establish that when adding or subtracting a 1-digit number, mental methods can be used as opposed to written column method. Partitioning strategies teach children how to break up larger numbers into smaller ones. It is important that children are aware that numbers can be partitioned along the place value boundaries (canonically). This can be extended further in KS2 through other methods of partition for efficient addition and subtraction (non-canonically).

KS1:

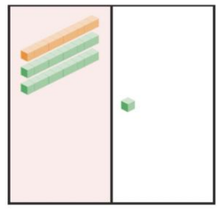
1. *Calculations with 2-digit and 1-digit whole numbers which involve crossing place value boundaries.*

Add 24 and 7.

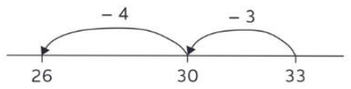
Step 1 Add the ones.
4 ones + 7 ones = 11 ones
Regroup the ones.
11 ones = 1 ten and 1 one



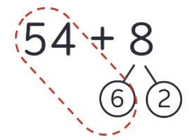
Step 2 Add the tens.
1 ten + 2 tens = 3 tens



24 + 7 = 31



33 – 7 = 26



So,
54 + 8 = 54 + 6 + 2

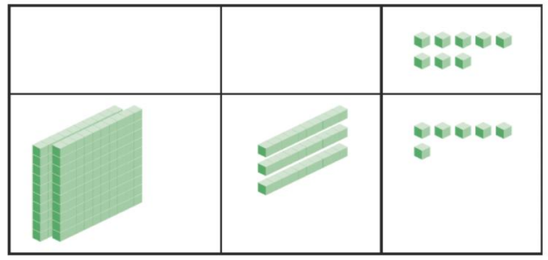
2. 17 + 6 = 23
by 17 + 3 = 20
20 + 3 = 23

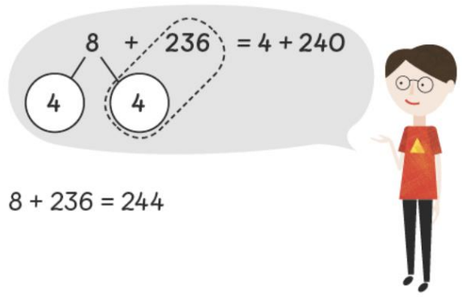
LKS2:

1. *Calculations with 3-digit and 4-digit whole numbers with 1-digit numbers which involves crossing place value boundaries.*

Add 8 and 236.

Method 1





8 + 236 = 244

1. 456 + 8= 464
by 456 + 4 = 460
460 + 4 = 464

UKS2:

1. *Calculations with decimal numbers which involve crossing place value boundaries*

What is the total cost of the  and  ?

£1.30 + £0.80 =

1.4 and 0.8

1. 1.4 + 1.7= ?
by 1.4 + 0.6 + 1.1

and 0.8 + 0.35= ?
by 0.8 + 0.2 + 0.15

Compensating and adjusting

Compensation involves adding more than you need and then subtracting the extra.
This strategy is useful for adding numbers that are close to a multiple of 10, such as numbers that end in 1 or 2, or 8 or 9.
The number to be added is rounded to a multiple of 10 plus or minus a small number.
For example, adding 9 is carried out by adding 10, then subtracting 1.
A similar strategy works for adding decimals that are close to whole numbers.

KS1

See Mental Calculations: Number bonds within 20 for guidance.

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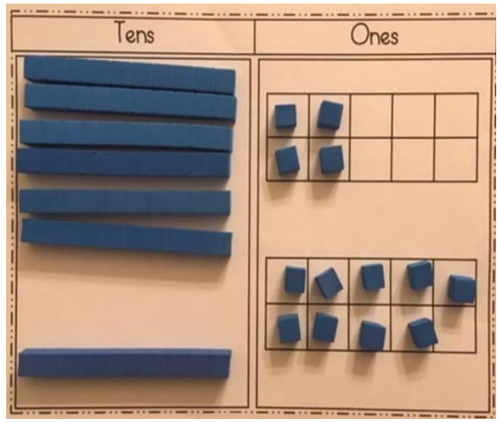
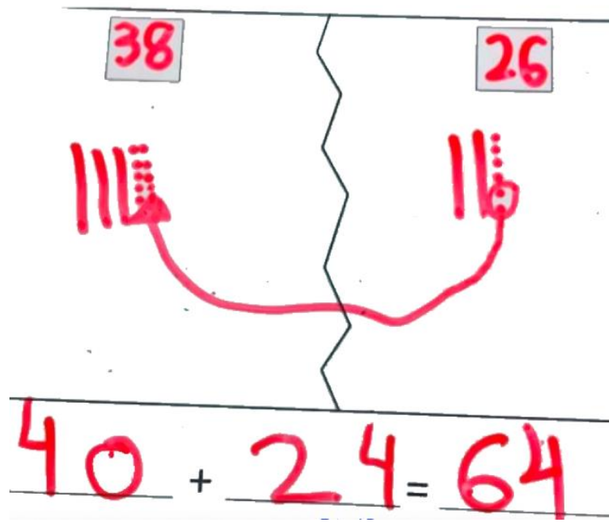
LKS2

1. *Compensating and adjusting to 10*
2. *Compensating and adjusting multiples of 10*

Use base 10 and 10 frames to add or take away ones to 'adjust' the number to 10 or a multiple of 10. 'Compensate' by adding or taking away ones.





1. 34 + 9=?
by 34 + 10 – 1

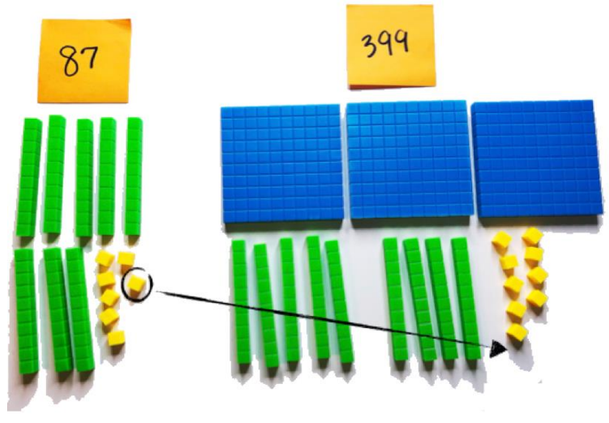
or 34 – 11= ?
by 34 – 10 – 1 = ?

2. 138 + 69= ?
by 138 + 70 – 1

or 299 – 48 = ?
by 300 – 48 – 1

UKS2

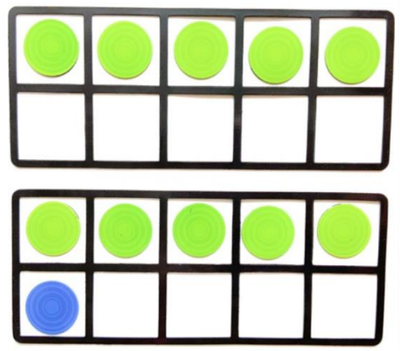
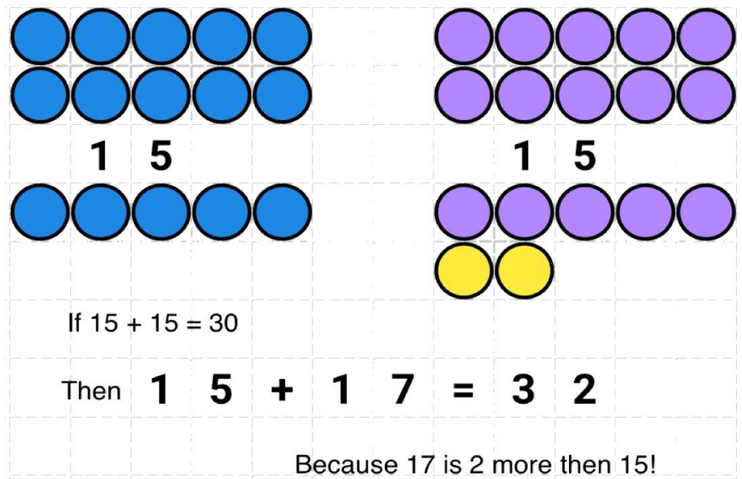
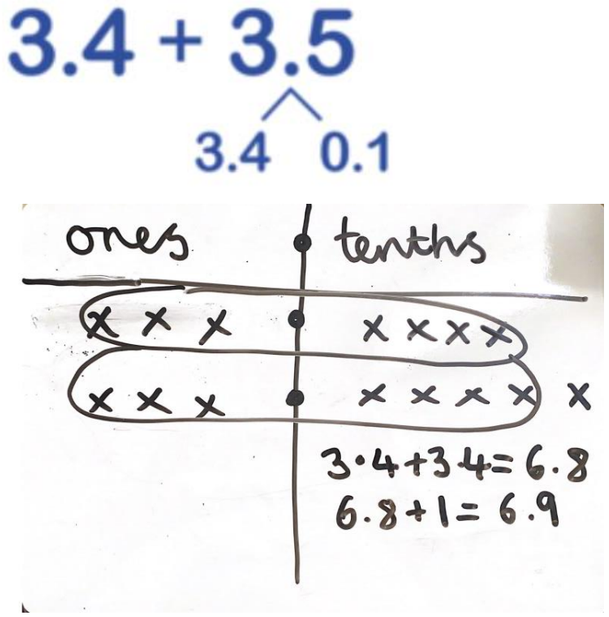
1. *Compensating and adjusting multiples of 10 or 100*
2. *Compensating and adjusting multiples with decimals*



Children to use white boards to draw their own base 10 when adjusting numbers to 100/ a multiple of 100 (see above).

1. 2 ½ + 1 ¾
by 2½ + 2 – ¼

or 5.7 + 3.9 =?
by 5.7 + 4.0 – 0.1

Calculating near doubles When children have an automatic recall of basic double facts (see 'Mental Calculations: Number bonds within 20'), they can use this information when adding two numbers that are very close to each other.	**KS1:** *See Mental Calculations: Number bonds within 20 for guidance.*	*See Mental Calculations: Number bonds within 20 for guidance.*	*See Mental Calculations: Number bonds within 20 for guidance.*	*See Mental Calculations: Number bonds within 20 for guidance.*
	LKS2: 1. *Near doubles to multiples of 10*	*20 + 30 = double 20 + 10* 	*5+6 =* *5+5=10+1* *So…* *50+60=110* 	1. **60 + 70** is double 60 and add 10 *or* double 70 and subtract 10 or 75 + 76 is double 76 and subtract 1 *or* double 75 and add 1.
	UKS2: 1. *Near doubles to numbers under 20* 2. *Decimal near doubles to whole numbers*	1. 		1. **18 + 16** is double 18 and subtract 2 *or* double 16 and add 2 2. **2.5 + 2.6** is double 2.5 add 0.1 or double 2.6 subtract 0.1