KINGS ASH ACADEMY

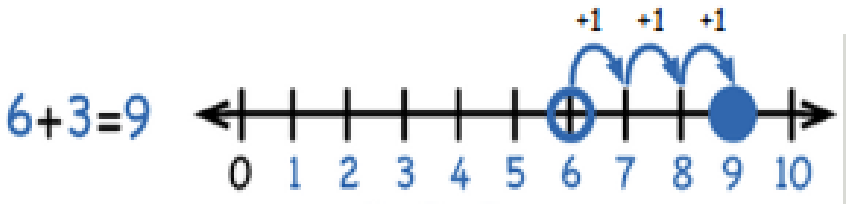
Calculation strategies for addition

Year 1 Add numbers up to 20.

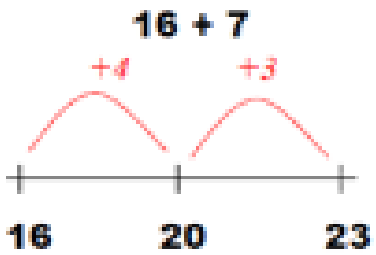
Children begin recording in Year 1 by developing ways of recording calculations using pictures.

4 + 2 = 6

They use number lines to count on in ones and practical resources to support calculations. Encourage children to start with the largest number first.



Children move on to adding 2 digits to 1 digit. Using a numbered line if needed or if ready, move onto an unnumbered line.



Mental Calculations:

- Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- Number bonds to 20,including 0.
- Count on in ones from a given 2-digit number
- Add two single-digit numbers
- Add 1 digit and 2 digit numbers to 20, including 0.
- Add three single-digit numbers spotting doubles or pairs to 10
- Count on in tens from any given 2-digit number
- Add 10 to any given 2-digit number
- Use number facts to add single-digit numbers to two-digit numbers, e.g. use 4 + 3 to work out 24 + 3, 34 + 3…
- Add by putting the larger number first

Points to consider:

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line.

Children should:

- Have access to a wide range of counting equipment, everyday objects and number lines, and be shown numbers in different contexts.
- Read and write the addition (+) and equals (=) signs within number sentences
- Solve one step problems, interpret addition number sentences and solve missing number problems, using concrete objects and pictorial representations to solve them

Key skills for addition at Y1:

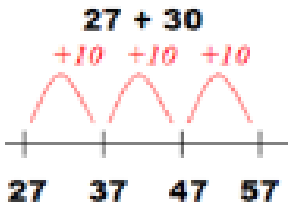
- Read and write numbers to 100 in numerals including 1 -20 in words
- Recall number bonds to 10 and 20, and addition facts within 20
- Count to and across 100
- Count in multiples of 1, 2, 5 and 10

The Big Ideas for Y1:

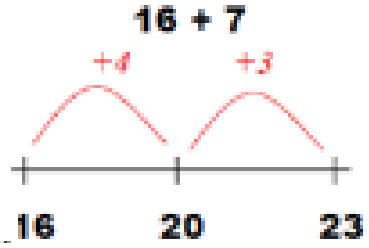
- Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5 and adding the 2 to 8 to make 10 and then the 5 to total 15.
- Thinking of part whole relationships is helpful in linking addition and subtraction. For example, where the whole is 6, and 4 and 2 are parts. This means that 4 and 2 together form the whole, which is 6 and 6 subtract 4 leaves the 2 and 6 subtract 2 leaves the 4.

Year 2 Add with 2 digit numbers.

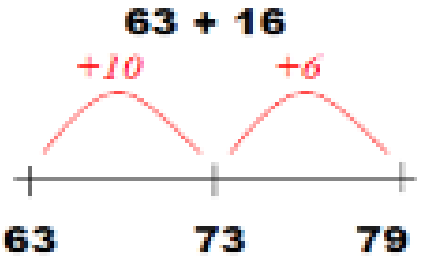
Add 2 digit numbers and tens:



Add 2 digit numbers and ones:



Add pairs of 2 digit numbers moving to the partitioned column method when secure adding tens and units:



23 + 34:

	20	+	3
+	30	+	4
	50	+	7
		=	57

STEP 1: Only provide examples that do **NOT** cross the tens boundary until they are secure with the method itself.

STEP 2: Once children can add a multiple of ten to a 2-digit number mentally (e.g. 80+11), they are ready for adding pairs of 2-digit numbers that DO cross the tens boundary (e.g. 58 + 43).

58 + 43:

50	+	8	
40	+	3	
90	+	11	
		=	101

STEP 3: Children who are confident and accurate with this stage should move onto the expanded addition methods with 2 and 3-digit numbers (see Y3).

Mental Calculations:

- Count on in ones and tens from any given 2-digit number
- Add 2 digit numbers and 1s
- Add 2 digit numbers and 10s
- Add two 2 digit numbers
- Add three 1 digit numbers
- Show that addition of two numbers can be done in any order (commutative)
- verse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
- Number bonds – knowing all the pairs of numbers which make a total of 20 and derive and use related facts up to 100

Points to consider:

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary

Children should:

- Physically make and carry out the calculation with Dienes or place value counters, then compare their practical version to the written form to help them to build on understanding.

Key skills for addition at Y2:

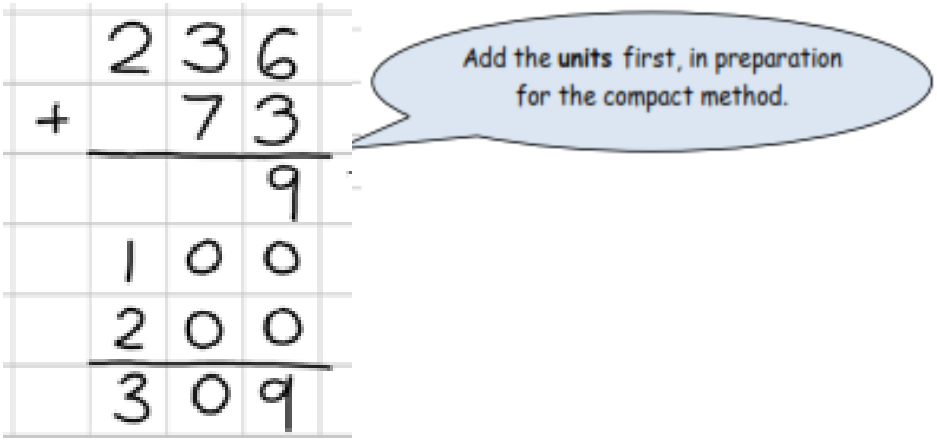
- Add a 2-digit number and ones (e.g. 27 + 6)
- Add a 2-digit number and tens (e.g. 23 + 40)
- Add pairs of 2-digit numbers (e.g. 35 + 47)
- Add three single-digit numbers (e.g. 5 + 9 + 7)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using < > and = signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

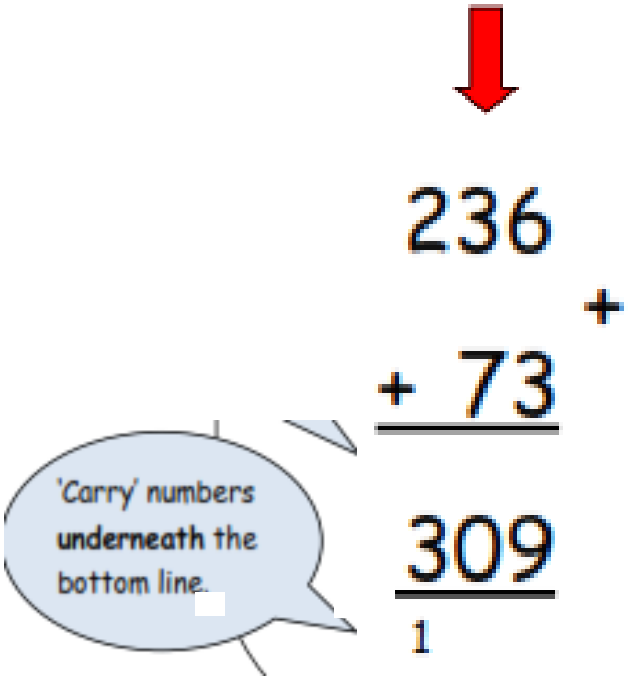
The Big Ideas for Y2:

- Understanding that addition of two or more numbers can be done in any order is important to support children's fluency. When adding two numbers it can be more efficient to put the larger number first. For example, given 3 + 8 it is easier to calculate 8 + 3.
- When adding three or more numbers it is helpful to look for pairs of numbers that are easy to add. For example, given 5 + 8 + 2 it is easier to add 8 + 2 first than to begin with 5 + 8.
- Understanding the importance of the equals sign meaning 'equivalent to' (i.e. that 6 + 4 = 10, 10 = 6 + 4 and 5 + 5 = 6 + 4 are all valid uses of the equals sign) is crucial for later work in algebra. Empty box or missing number problems can support the development of this key idea. Correct use of the equals sign should be reinforced at all times. Altering where the equals sign is placed develops fluency and flexibility.

Year 3 Add numbers with up to 3 digits.

At the beginning of the year (if needed) brief recap of partitioning method. Once secure with place value introduce the **expanded column addition** method:





n method with 'carrying' for children who are
3 digit expanded column. Remind children the
seven tens' not 'three add seven'.

Mental Calculations:

- Add 3 digit numbers and 1s
- Add 3 digit numbers and 10s
- Add 3 digit numbers and 100s
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
- Estimate the answer to a calculation and use inverse operations to check answers.

Points to consider:

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary, expanded column, compact column, carrying

Children should:

- Recognise the value of the hundreds, tens and units without recording the partitioning.
- Be able to add in columns

Key skills for addition at Y3:

- Solve problems, including missing number problems, using number facts, place value and more complex addition and subtraction.
- Add numbers with up to 3 digits using written methods of columnar addition.
- Recognise the place value of each digit in a 3 digit number.
- Move onto compact column addition method once secure and confident with 3 digit expanded column.
- Introduce 'carrying' for the first time for very able children. Comparing the expanded method to compact column method to develop an understanding of the process and the reduced number of steps involved.

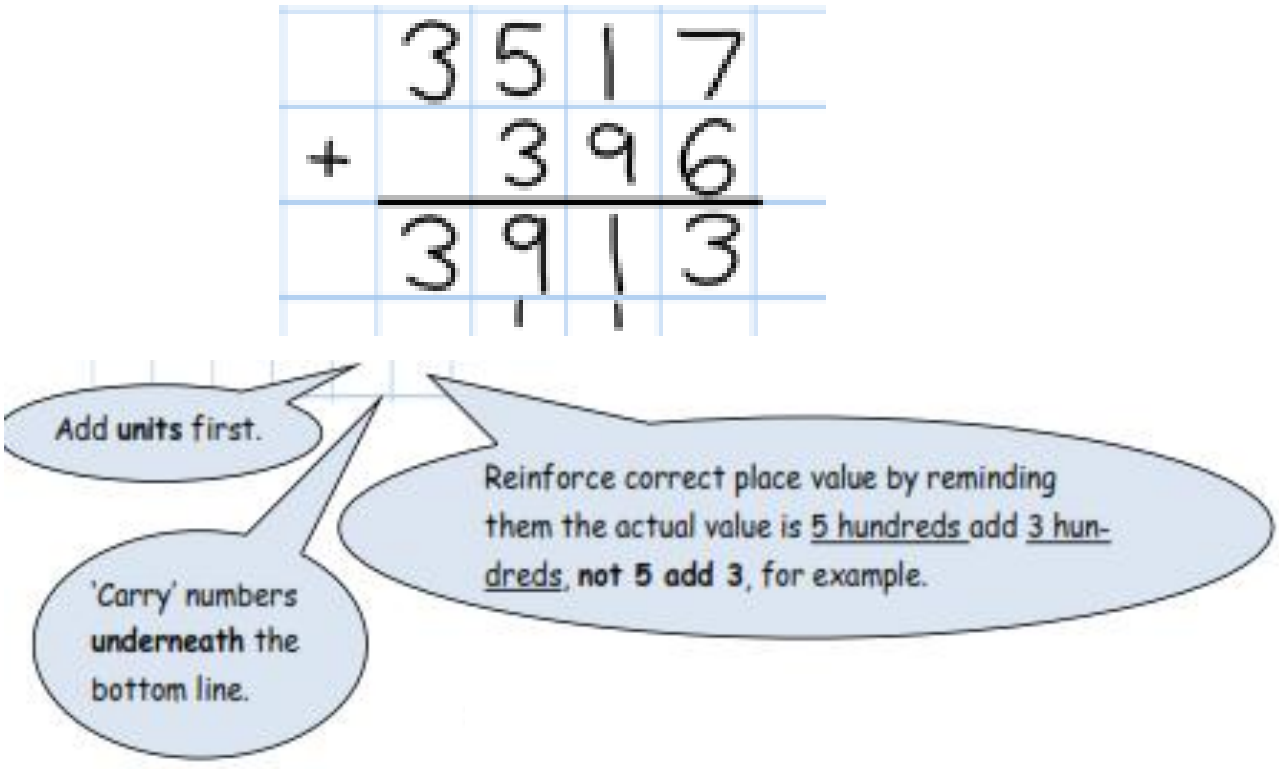
The Big Ideas for Y3:

- Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5, and adding the 2 and 8 to make 10, then the 5 to 15. This should then be applied when calculating with larger numbers.

Year 4 Add numbers with up to 4 digits.

At the beginning of the year, brief recap of **expanded column addition** method. Once children secure move from expanded addition to the **compact column method**, adding units first and 'carrying' numbers underneath the calculation.

e.g. 3517 + 396 = 3913



Discuss similarities and differences between expanded and compact addition methods. Also include money and measures context.

Mental Calculations:

- Estimate and use the inverse operation to check calculations and solve missing number problems.
- Find 1000 more or less than a given number.
- Continue to practise a wider range of mental addition strategies i.e number bonds, add the nearest multiple of 10, 100, 1000 etc.

Points to consider:

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse

Children should:

- Be able to distinguish between expanded and compact addition methods. Discussing similarities and differences.

Key skills for addition at Y4:

- Select most appropriate method: mental or written and explain why.
- Recognise the place value of each digit in a 4 digit number.
- Round any number to the nearest 10,100 or 1000.
- Estimate and use inverse operations to check answers to a calculation.
- Solve 2 step problems in context, deciding which operations and methods to use and why – include money and measures.
- Add numbers with up to 4 digits using the formal written method of column addition.

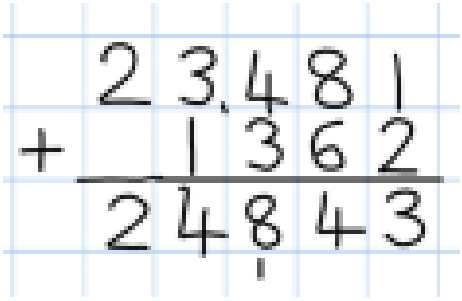
The Big Ideas for Y4:

- It helps to round numbers before carrying out a calculation to get a sense of the size of the answer. For example, 4786 – 2135 is close to 5000 – 2000, so the answer will be around 3000. Looking at the numbers in a calculation and their relationship to each other can help make calculating easier. For example, 3012 – 2996. Noticing that the numbers are close to each other might mean this is more easily calculated by thinking about subtraction as difference.

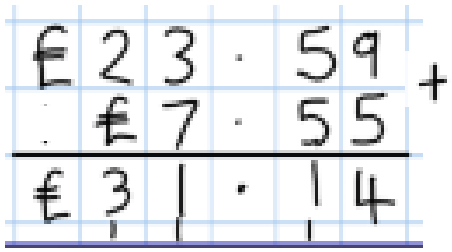
Year 5 Add numbers with more than 4 digits.

At the beginning of the year, brief recap of **expanded column addition** method. Once children secure move from expanded addition to the **compact column method**, including money, measures and decimals with different numbers of decimal places.

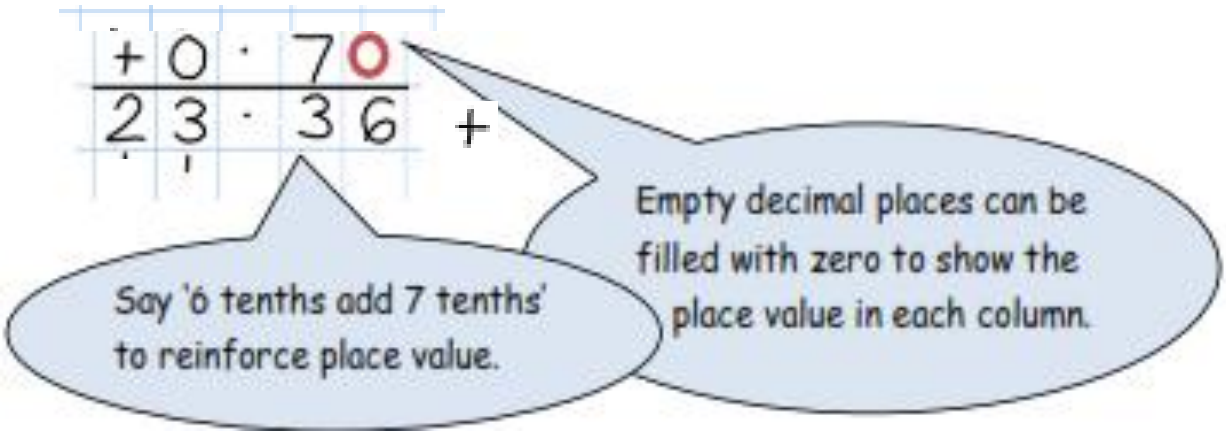
Numbers should exceed 4 digits.



The decimal point should be aligned in the same way as the other place value columns and must be in the same column in the answer.



Pupils should be able to add more than two values, carefully aligning place value columns.



Mental Calculations:

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies i.e add the nearest multiple of 10, 100, 1000; using number bonds.
- Use rounding to check answers and accuracy.

Points to consider:

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths

Children should:

- Understand the place value of **tenths and hundredths** and use this to align numbers with different numbers of decimal places.

Key skills for addition at Y5:

- Solve multi step problems in contexts, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10,000 and 100,000.
- Add numbers with more than 4 digits using formal written method of columnar addition.

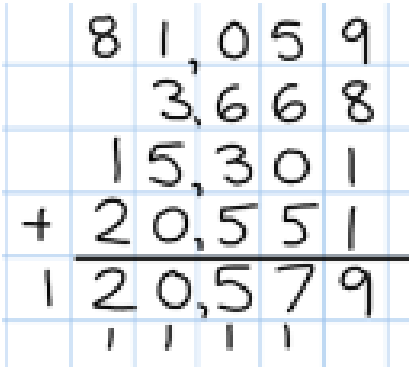
The Big Ideas for Y5:

- Before starting any calculation is it helpful to think about whether or not you are confident that you can do it mentally. For example, 3689 + 4998 may be done mentally, but 3689 + 4756 may require paper and pencil.

Year 6 Add several numbers of increasing complexity.

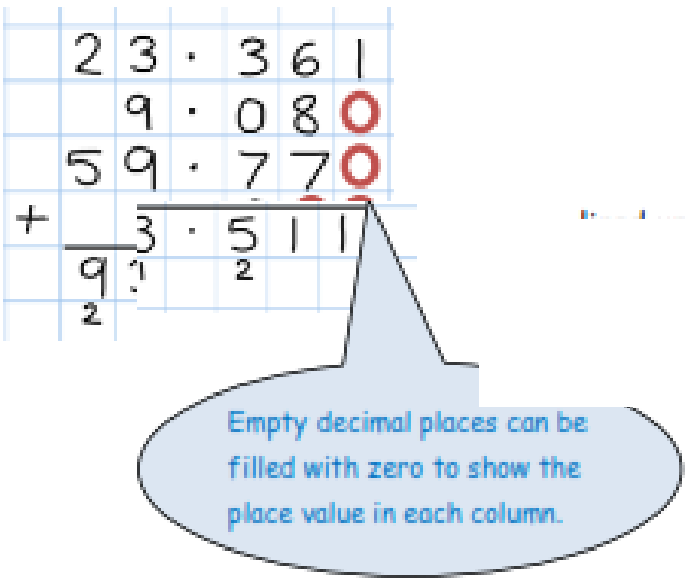
At the beginning of the year, brief recap of **expanded column addition** method. Once children secure move from expanded addition to the **compact column method**.

Add several numbers with more than 4 digits.



Add several numbers with different numbers of decimal places (including money and measures):

- Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically including in the answer row.
- Zeroes could be added into any empty decimal places to show there is no value to add.



Mental Calculations:

- Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Points to consider:

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths

Children should:

- Understand the place value of **tenths and hundredths** and use this to align numbers with different numbers of decimal places.

Key skills for addition at Y6:

- Solve multi step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit.
- Round any whole number to a required degree of accuracy.

The Big Ideas for Y6:

- Deciding which calculation method to use is supported by being able to take apart and combine numbers in many ways. For example, calculating 8·78 + 5·26 might involve calculating 8·75 + 5·25 and then adjusting the answer.
- The associative rule helps when adding three or more numbers: 367 + 275 + 525 is probably best thought of as 367 + (275 + 525) rather than (367 + 275) + 525.