Addition at Ravensbury

Year 1

+ = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

2 = 1+ 1

2 + 3 = 4 + 1

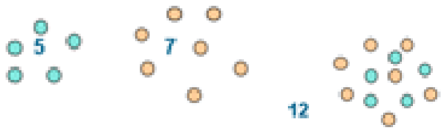
Missing numbers need to be placed in all possible places.

3 + 4 = □ □ = 3 + 4

3 + □ = 7 7 = □ + 4

Counting and Combining sets of Objects

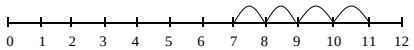
Combining two sets of objects (aggregation) which will progress onto adding on to a set (augmentation)



Understanding of counting on with a numbertrack.

Understanding of counting on with a number line (supported by models and images).

7+ 4



Mental Strategies (addition and subtraction)

Children should experience regular counting on and back from different numbers in 1s and in multiples of 2, 5 and 10.

Children should memorise and reason with number

Year 2

Missing number problems e.g. 14 + 5 = 10 + □ 32 + □ + □ = 100 35 = 1 + □ + 5

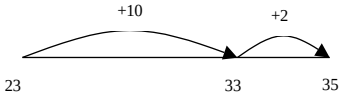
It is valuable to use a range of representations (also see Y1). Continue to use number lines to develop understanding of:

Counting on in tens and ones

23 + 12 = 23 + 10 + 2

= 33 + 2

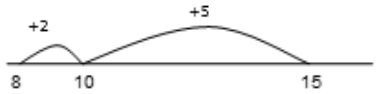
= 35



Partitioning and bridging through 10.

The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5.

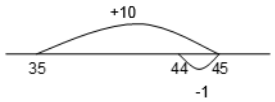
8 + 7 = 15



Adding 9 or 11 by adding 10 and adjusting by 1

e.g. Add 9 by adding 10 and adjusting by 1

35 + 9 = 44



Year 3

Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

Partition into tens and ones

Partition both numbers and recombine.

Count on by partitioning the second number only e.g.

247 + 125 = 247 + 100 + 20+ 5

= 347 + 20 + 5

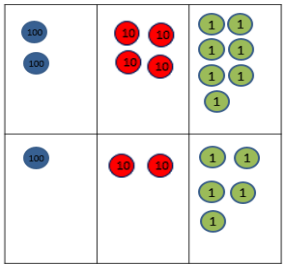
= 367 + 5

= 372

Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10.

Towards a Written Method

Introduce expanded column addition modelled with place value counters (Dienes could be used for those who need a less abstract representation)



200 + 40 + 7

100 + 20 + 5

300 + 60 +12 = 372

247

+125

12

60

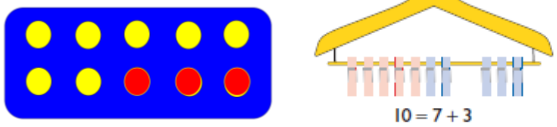
300

372

Leading to children understanding the exchange between tens and ones.

bonds for numbers to 20, experiencing the = sign in different positions.

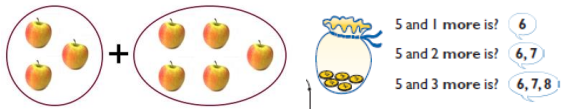
They should see addition and subtraction as related operations. E.g. 7 + 3 = 10 is related to 10 – 3 = 7, understanding of which could be supported by an image like this.



Use bundles of straws and Dienes to model partitioning teen numbers into tens and ones and develop understanding of place value.

Children have opportunities to explore partitioning numbers in different ways.
e.g. 7 = 6 + 1, 7 = 5 + 2, 7 = 4 + 3 =

Children should begin to understand addition as combining groups and counting on.



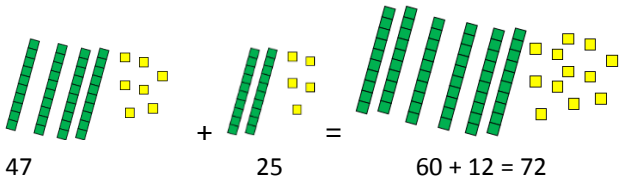
Vocabulary
Addition, add, forwards, put together, more than, total, altogether, distance between, difference between, equals = same as, most, pattern, odd, even, digit, counting on.

Questions for Mastery and Reasoning

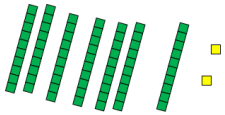
True or false? Addition makes numbers bigger.
True or false? You can add numbers in any order and still get the same answer.

Towards a Written Method

Partitioning in different ways and recombine
47+25



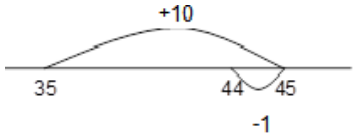
Leading to exchanging:
72

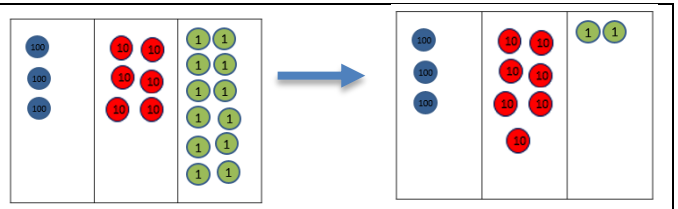


Expanded written method
40 + 7 + 20 + 5 =
40+20 + 7 + 5 =
60 + 12 = 72

$$\begin{array}{r} 40 + 7 \\ +\ 20 + 5 \\ \hline 60 + 12 = 72 \end{array}$$

Mental Strategies
Children should count regularly, on and back, in steps of 2, 3, 5 and 10. Counting forwards in tens from any number should lead to adding multiples of 10.
Number lines should continue to be an important image to support mathematical thinking, for example to model how to add 9 by adding 10 and adjusting.





Some children may begin to use a formal columnar algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

$$\begin{array}{r} 247 \\ +125 \\ \hline 372 \\ \hline 10 \end{array}$$

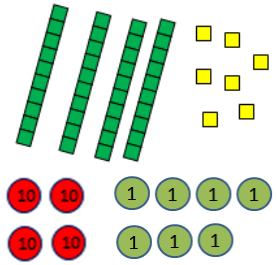
Mental Strategies
Children should continue to count regularly, on and back, now including multiples of 4, 8, 50, and 100, and steps of 1/10.

The number line should continue to be used as an important image to support thinking, and the use of informal jottings should be encouraged. This will help to develop children's understanding of working mentally. Children should continue to partition numbers in different ways.

They should be encouraged to choose the mental strategies which are most efficient for the numbers involved, e.g.
Add the nearest multiple of 10, then adjust such as 63 + 29 is the same as 63 + 30 – 1;
counting on by partitioning the second number only such as 72 + 31 = 72 + 30 + 1 = 102 + 1 = 103

Manipulatives can be used to support mental imagery and conceptual understanding. Children need to be shown how these images are related e.g.

What's the same? What's different?

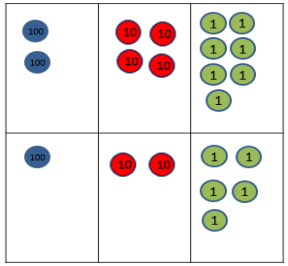
How many altogether? How many more to make…? I add …more. What is the total? How many more is… than…? How much more is…? One more, two more, ten more… What can you see here? Is this true or false? What is the same? What is different?	Children should practice addition to 20 to become increasingly fluent. They should use the facts they know to derive others, e.g. using 7 + 3 = 10 to find 17 + 3= 20, 70 + 30 = 100 They should use concrete objects such as bead strings and number lines to explore missing numbers – 45 + __ = 50. As well as number lines, 100 squares could be used to explore patterns in calculations such as 74 +11, 77 + 9, encouraging children to think about 'What do you notice?' where partitioning or adjusting is used. Children should learn to check their calculations, by using the inverse. They should continue to see addition as both combining groups and counting on. They should use Dienes to model partitioning into tens and ones and learn to partition numbers in different ways e.g. 23 = 20 + 3 = 10 + 13. **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, ones, partition Near multiple of 10, tens boundary, More than, one more, two more… ten more… one hundred more **Questions for Mastery and Reasoning** How many altogether? How many more to make…? How many more is… than…? How much more is…? Is this true or false? If I know that 17 + 2 = 19, what else do I know? (e.g. 2 + 17 = 19; 19 – 17 = 2; 19 – 2 = 17; 190 – 20 = 170 etc.). What do you notice? What patterns can you see?	 **Vocabulary** Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, column subtraction, exchange *See also Y1 and Y2* **Questions for Mastery and Reasoning** If you add odd + odd = even What do you notice? What patterns can you see? When comparing two methods alongside each other: What's the same? What's different? Look at this number in the formal method; can you see where it is in the expanded method / on the number line?

Addition at Ravensbury

Year 4

Written methods (progressing to 4-digits)

Expanded column addition modelled with place value counters, progressing to calculations with 4-digit numbers.

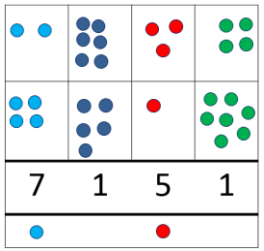


200 + 40 + 7
100 + 20 + 5
300 + 60 +12 = 372

247
+125
12
60
300
372

Compact written method

Extend to numbers with at least four digits.



2634
+4517
7151

Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Extend to up to two places of decimals (same number of decimals places) and adding several numbers (with different numbers of digits).

72.8

Year 5

Written methods (progressing to more than 4-digits)

As year 4, progressing when understanding of the expanded method is secure, children will move on to the formal columnar method for whole numbers and decimal numbers as an efficient written algorithm.

172.83
+ 54.68
227.51
1 1 1

Place value counters can be used alongside the columnar method to develop understanding of addition with decimal numbers.

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. Children should practise with increasingly large numbers to aid fluency

e.g. 12462 + 2300 = 14762

Mental Strategies

Children should continue to count regularly, on and back, now including steps of powers of 10.
The number line should continue to be used as an important image to support thinking, and the use of informal jottings should be encouraged where appropriate.
Children should continue to partition numbers in different ways.

They should be encouraged to choose from a range of strategies:

- Counting forwards and backwards in tenths and hundredths: 1.7 + 0.55
- Reordering: 4.7 + 5.6 – 0.7, 4.7 – 0.7 + 5.6 = 4 + 5.6
- Partitioning: counting on or back - 540 + 280, 540 + 200 + 80
- Partitioning: bridging through multiples of 10:
- Partitioning: compensating: 5.7 + 3.9, 5.7 + 4.0 – 0.1

Year 6

Written methods

As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency with columnar method to be secured.
Continue calculating with decimals, including those with different numbers of decimal places

Mental Strategies

Consolidate previous years.
Children should experiment with order of operations, investigating the effect of positioning the brackets in different places, e.g. 20 – 5 x 3 = 5; (20 – 5) x 3 = 45

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.

Vocabulary

See previous years

+ 54.6 127.4 1 1 **Mental Strategies** Children should continue to count regularly, on and back, now including multiples of 6, 7, 9, 25 and 1000, and steps of 1/100. The number line should continue to be used as an important image to support thinking, and the use of informal jottings should be encouraged where appropriate. Children should continue to partition numbers in different ways. They should be encouraged to choose from a range of strategies: • Counting forwards and backwards: 124 – 47, count back 40 from 124, then 4 to 80, then 3 to 77 • Reordering: 28 + 75, 75 + 28 (thinking of 28 as 25 + 3) • Partitioning: counting on or back: 5.6 + 3.7, 5.6 + 3 + 0.7 = 8.6 + 0.7 • Partitioning: bridging through multiples of 10: 6070 – 4987, 4987 + 13 + 1000 + 70 • Partitioning: compensating – 138 + 69, 138 + 70 - 1 • Partitioning: using 'near' doubles - 160 + 170 is double 150, then add 10, then add 20, or double 160 and add 10, or double 170 and subtract 10 • Partitioning: bridging through 60 to calculate a time interval – What was the time 33 minutes before 2.15pm? • Using known facts and place value to find related facts. **Mental methods** should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. **Vocabulary** add, addition, sum, more, plus, increase, sum, total, altogether, double, near double, how many more to	• Partitioning: using 'near' double: 2.5 + 2.6 is double 2.5 and add 0.1 or double 2.6 and subtract 0.1 • Partitioning: bridging through 60 to calculate a time interval: It is 11.45. How many hours and minutes is it to 15.20? • Using known facts and place value to find related facts. **Vocabulary** Tens of thousands boundary, *Also see previous years* **Questions for Mastery and Reasoning** What do you notice? What's the same? What's different? Can you convince me? How do you know?	

make..? how much more? ones boundary, tens boundary, hundreds boundary, thousands boundary, tenths boundary, hundredths boundary, inverse, how many more/fewer? Equals sign, is the same as. **<u>Questions for Mastery and Reasoning</u>** What do you notice? What's the same? What's different? Can you convince me? How do you know?		