Preston Primary School Academy – Calculation methods

Addition

Year 1

- **Solve one step addition problems, and missing number problems.**

+ = 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

- **Add one digit and two-digit numbers to 20, including zero.**

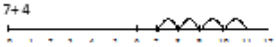
Counting and Combining sets of Objects

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

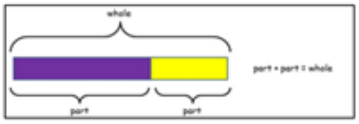
Understanding of counting on with a number track.

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

7+ 4



Singapore Bar Method



Year 2

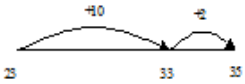
Missing number problems e.g. 14 + 5 = 10 + □ 32 + □ + □ = 100 35 = 1 + □ + 5

- **Add numbers mentally, including two two-digit numbers, and a two digit number and ones and tens.**

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.

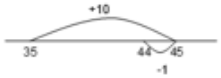
The steps in addition often bridge through a multiple of 10 e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5.

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



- **Use expanded column addition**

Towards a Written Method

Partitioning in different ways and recombine

Use dienes or sticks of tens unfix cubes, to manipulate how to partition two digit numbers and recombine. 47+25 =

47 25 60 + 12

Year 3

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

- **Add numbers mentally including a three-digit number with ones, tens or hundreds.**

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.

- **Add numbers with up to three digits, using column addition.**

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 regrouping between tens and ones.

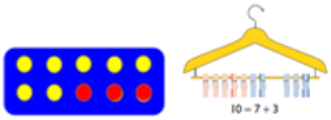
Year 1	Year 2	Year 3
	Leading to regrouping: 72 **Expanded written method** 40 + 7 + 20 + 5 = 40+20 + 7 + 5 = 60 + 12 = 72 40 + 7 + 20 + 5 60 + 12 = 72	Some children may begin to use a formal columnar algorithm, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method. 247 +125 372 1

Addition

Year 1

Mental Strategies (addition and subtraction)

- Children should experience regular counting on from different numbers in 1s and in multiples of 2, 5 and 10.
- Children should memorise and reason with number 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 =
- Use a hundred square. Children to realise it is a number track that has been cut up and repositioned. Children can count in tens using a 100 square.
- Children should begin to understand addition as combining groups and counting on.

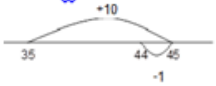
Vocabulary

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

Year 2

Mental Strategies

- Children should count on regularly, 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.



- Children should practise 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.
- When bridging 10 children should be able to identify multiples of ten and recognise which 2 multiple of tens any two digit number lies between e.g. place 37 on the correct multiples of ten no line. How many more to 40?
- 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.

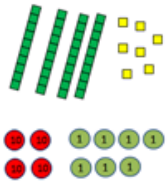
Vocabulary

+, 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

Year 3

Mental Strategies

- Children should continue to count on regularly, 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?



Vocabulary

Hundreds, tens, ones, estimate, partition, recombine, difference, near multiple of 10 and 100, inverse, rounding, column addition, regroup

See also Y1 and Y2

Generalisations

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

(Links between addition and subtraction)

When introduced to the equals sign, children should see it as signifying equality. They should become used to seeing it in different positions.

Some Key Questions

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?

Near multiple of 10, tens boundary, More than, one more, two more… ten more… one hundred more

Generalisation

- Noticing what happens when you count in tens (the digits in the ones column stay the same)
- Odd + odd = even; odd + even = odd; etc
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems. This understanding could be supported by images such as this.

Some Key Questions

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?

Generalisations

Noticing what happens to the digits when you count in tens and hundreds.

Odd + odd = even etc. (see Year 2)

Inverses and related facts – develop fluency in finding related addition and subtraction facts.

Develop the knowledge that the inverse relationship can be used as a checking method.

Key Questions

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?