

Calculation Policy – Years 3 and 4

Tuesday 25th September 2018



National Curriculum 2014

- Became statutory in September 2014
- Expectations have been raised.
- The government expects children to be performing addition and subtraction calculations using formal written methods by the end of Year 3.
- From the 2019 to 2020 academic year onwards, schools in England will be required to administer an online multiplication tables check to year 4 pupils.

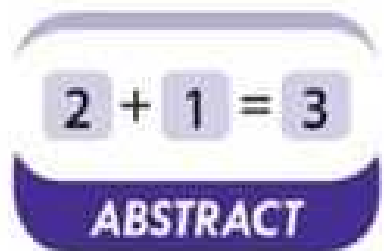
Why are methods different today?

- A desire to do something different to counter the nation's phobia around mathematics
- Development of understanding of effective methods to teaching mathematics since the mid-1990s
- Exploration of effective approaches from some of the most successful education systems in the world
- Extensive research and trialling

There is no “right” way to work

- Methods selected will depend upon the situation and the numbers involved, including when to use calculators. Efficiency is as important as accuracy.
- Children make decisions about methods and draw on a range of strategies and approaches when applying maths in context.
- Children in the same class could be using different methods to others depending on their ability, confidence and stage of mathematical development.

Concrete, Pictorial, Abstract



- Concepts are introduced through hands on experiences.
- Pupils visualise the concept and represent it pictorially through models like number lines.
- Children then move onto abstract numbers and symbols when they have context to understand what they mean.

Addition



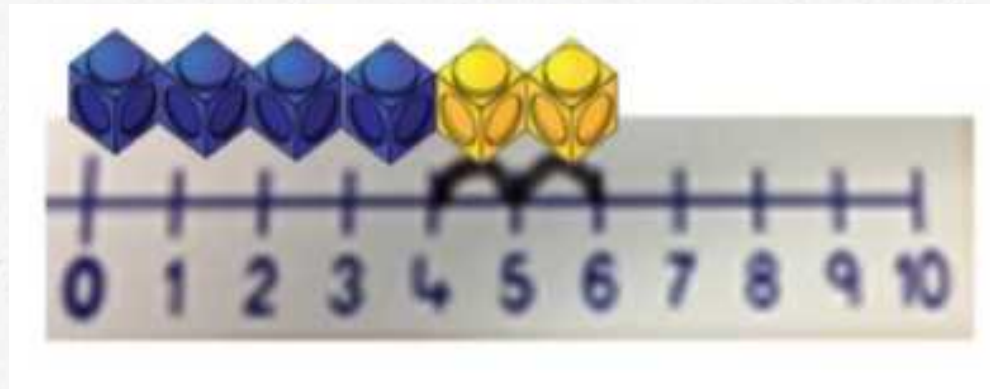
Stage 1

Using practical apparatus (Numicon, Multilink) and illustrations. This begins in Early Years Foundation Stage (Reception) and is consolidated into Year One.



Stage 2

Using practical apparatus, pen and paper jottings (horizontally), working towards the number line.

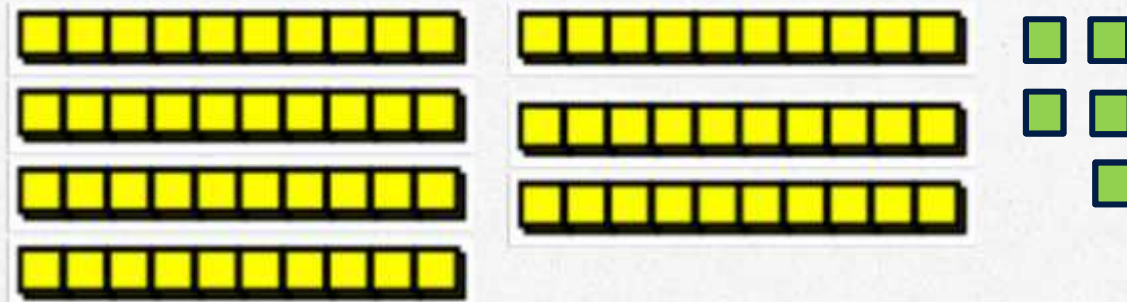


Stage 2

$$\underline{42 + 33}$$

$40 + 30 = 70$ (collect the 'tens' together)

$2 + 3 = 5$ (collect the 'ones' together – note the change in terminology from 'units' to 'ones').



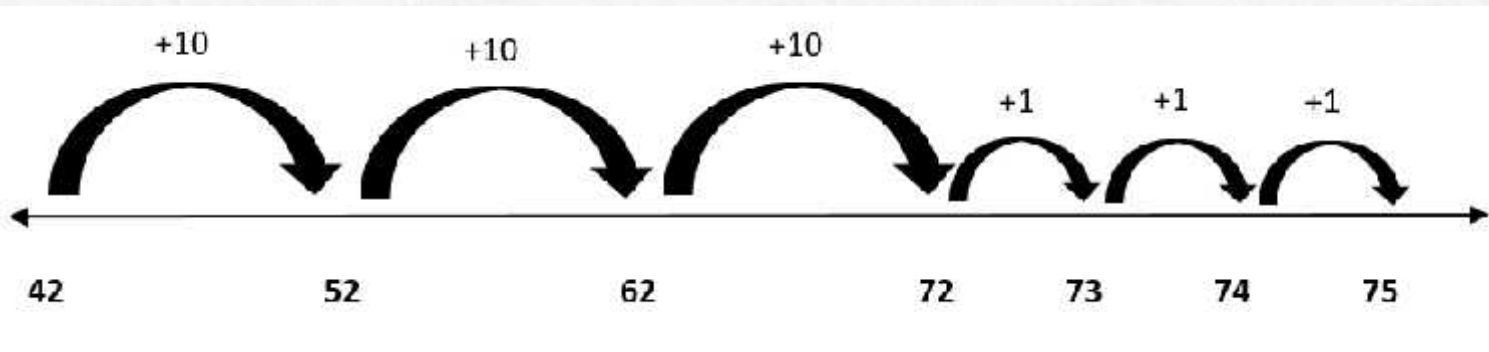
$70 + 5 = 75$ (add the totals together)

Stage 2

Using a number line for $T0 + T0$ (number square to help).

$$\underline{42 + 33}$$

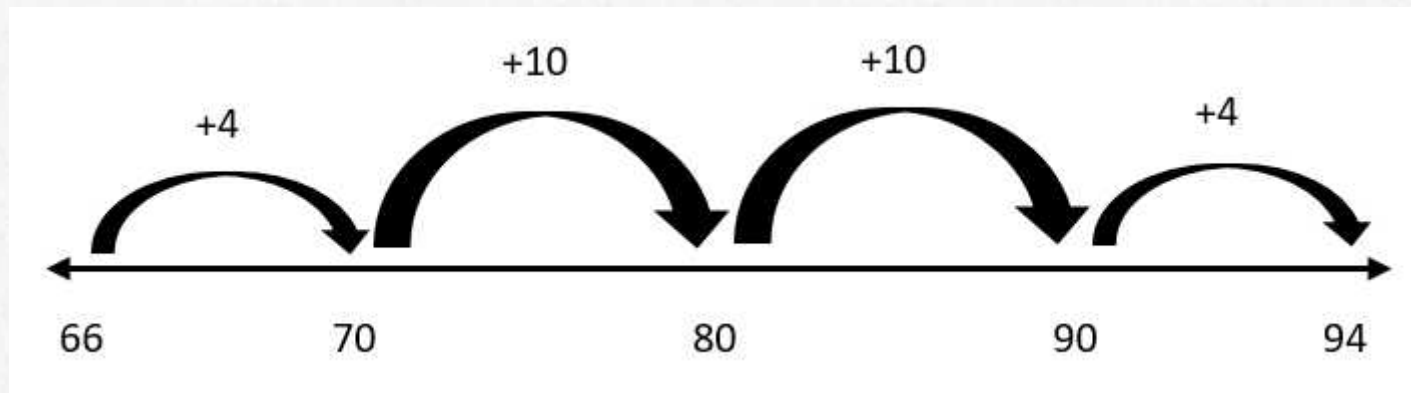
Start at 42. Jump forward in tens 3 times. Then jump forward in ones three times.



Stage 2

Children would continue to consolidate the use of number lines at this stage, moving towards jumping to the next ten:

$$66 + 28$$

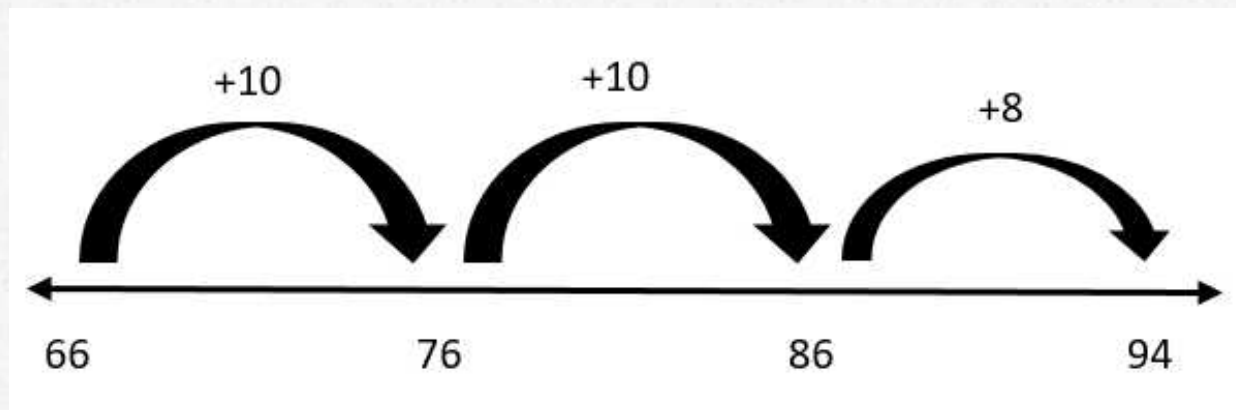


$$66 + 28 = 94$$

Stage 2

They could continue to use the method shown at Year 2.

$$66 + 28 =$$



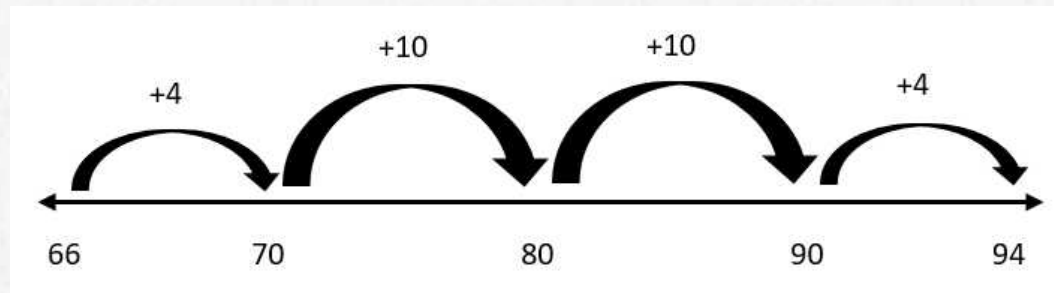
Either of these methods are ok at this stage. It really depends on what works best for individual children.

Over to you:

Try using a number line to solve one of these calculations:

$$54 + 42$$

$$46 + 38$$



Stage 2

Some children will be very confident with partitioning the digits, and adding together.

$$66 + 28 =$$

$$60 + 20 = 80$$

$$6 + 8 = 14$$

$$80 + 14 = 94$$

Stage 2

Alternatively, children may prefer to work out this calculation as follows:

$$66 + 28 =$$

$$66 + 20 = 86$$

$$86 + 8 = 94$$

$$66 + 28 = 94$$

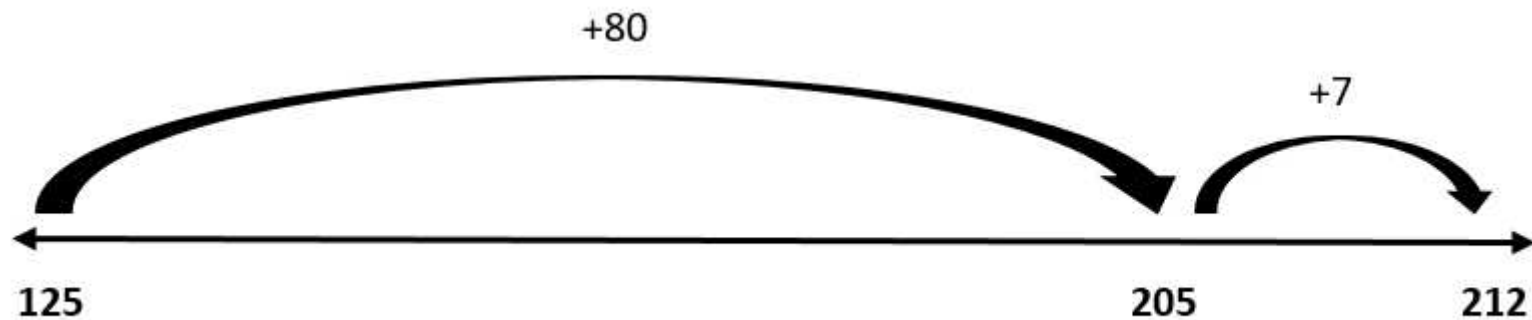
At this stage, children should be working out calculations horizontally, not looking at more formal vertical methods.

Stage 2

Children will continue to use horizontal methods (number line), but coming up against questions of a more difficult nature.

$$125 + 87$$

Here, the children could do eight jumps of ten. However, many children should now be confident enough to add this all in one go.



Over to you:

Try using partitioning or a number line to solve one of these calculations:

$$54 + 39$$

$$62 + 45$$

$$112 + 37$$

$$66 + 28 =$$

$$60 + 20 = 80$$

$$6 + 8 = 14$$

$$80 + 14 = 94$$

Stage 3

Once children are confident with horizontal methods, we would move into vertical methods.

Expanded Partitioning Method

This is set out vertically, in a similar fashion to the traditional form of addition.

$$\begin{array}{r} 215 \\ + \underline{133} \end{array}$$

Stage 3

215

133 +

8 (5 + 3)

Start by adding together the least significant digits (the ones).

Stage 3

215

133 +

8 (5 + 3)

40 (10 + 30)

Then, add together the tens (10 + 30). Ensure these are referred to as tens, and not '1' + '3'.

Stage 3

215

133 +

8 (5 + 3)

40 (10 + 30)

300 (200 + 100)

After this, add together the hundreds (200 + 100), again ensuring they are referred to as 'hundreds'.

Stage 3

215

133 +

8 (5 + 3)

40 (10 + 30)

300 (200 + 100)

348

Then, add together each column.

$$8 + 0 + 0 = 8, \quad 40 + 0 = 40, \quad 300 + 0 = 300$$

Over to you:

Try using expanded partitioning to solve one of these calculations:

$$342 + 145$$

$$481 + 518$$

$$215$$

$$\underline{133} +$$

$$8 (5 + 3)$$

$$40 (10 + 30)$$

$$\underline{300} (200 + 100)$$

$$348$$

Stage 4

Once children are confident in using these methods, they can then begin to use the **traditional vertical method**. It is important that they do not use this method until they are fully confident in their application of place value, and are secure in the methods talked through so far.

It is expected that children will begin to use this method towards the end of Year 3, but for some children, they will reach this stage at a later point.

Stage 4

$$\begin{array}{r} 215 \\ + \underline{133} \\ \hline 348 \end{array}$$

This method is quite straightforward. However, it becomes more difficult when children are asked to carry digits.

5 (ones) + 3 (ones) = 8 ones

1 (ten) + 3 (tens) = 4 tens

2 (hundreds) + 1 (hundred) = 3 (hundreds)

Stage 4

226

+193

419

1

Start with the least significant digits (ones) $6 + 3 = 9$.

Add the tens ($2 + 9 = 11$). Because the answer is a two digit number, it has to be carried under the hundreds.

Add the hundreds ($2 + 1 = 3$, + the '1' being carried = 4)

Stage 4

This method can be extended to larger numbers...

$$\begin{array}{r} 2763 \\ + \underline{1438} \\ \hline 4201 \\ \underline{111} \end{array}$$

Stage 4

... and decimal numbers.

$$\begin{array}{r} 124.90 \\ + \underline{117.25} \\ \hline 242.15 \\ 11 \end{array}$$

Possible problems with vertical methods

- Children must ensure that they line up the digits appropriately e.g. ones under ones, tens under tens. If they don't, they will end up adding the incorrect amounts together.
- This can be a problem if a child's presentation is poor.
- Children may not remember to add the 'carried' digit, or place the carried digit in the incorrect column.

Over to you:

Try using the vertical column method to solve one of these calculations:

$$1254 + 2633$$

$$4586 + 2448$$

$$127.4 + 392.7$$

$$\begin{array}{r} 226 \\ + \underline{193} \\ \hline 419 \\ 1 \end{array}$$

Espresso, Purple Mash and RM Easimaths

Please see the log-in information within your child's homework diary for access to these resources.



To conclude...

The aim is that children will master the formal methods during KS2.

If they do not grasp it but can use non-standard methods efficiently this does not always point to a major problem.

It is about having a toolbox of formal, informal and mental methods at the child's disposal to use where appropriate, depending on the context.

To conclude...

It is essential that parents appreciate the approaches being used in school and back these up at home. If children are doing one thing at home and another at school, the child can easily become confused.

When working on addition, subtraction, multiplication and division in class, teachers will let parents know via the weekly slip in the homework diary which methods are currently being covered in class.

The Government Expectation

Addition and Subtraction:

- By the end of Year 3, children to be adding and subtracting numbers with up to three digits, using formal written methods of columnar addition and subtraction.

Multiplication:

- By the end of Year 4, children to be multiplying two and three digit numbers by a one digit number using formal written layout.

Division:

- By the end of Year 5, children to be dividing numbers up to 4 digits by a one digit number using the formal written method of short division and interpret remainders appropriately for the context.

The Government Expectation

These are general expectations for progress. Some children will take longer to progress to these levels than others.

It is very important that children do not jump up towards more formal methods too early, without having fully worked through the stages outlined within this presentation.