Additive Reasoning

This document is part of a set that forms the subject knowledge content audit for Key Stage 1 and Key Stage 2 maths. Each document contains: audit questions with tick boxes that you can select to show how confident you are (1 = not at all confident, 2 = not very confident, 3 = fairly confident, 4 = very confident), exemplifications; explanations; and further support links. At the end of each document, there is space to type notes to capture your learning and implications for practice. The document can then be saved for your records.

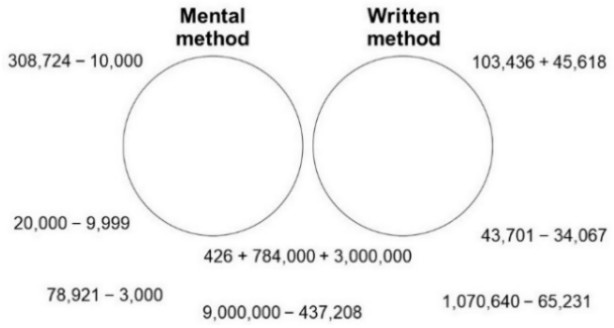
Question 8

How confident are you that you understand and can support children to select appropriate and efficient strategies, dependent on context?

1 ☑ 2 ☐ 3 ☐ 4 ☐

How would you respond …?

a. Sort these calculations, giving a reason for your choice.



b. What strategies could you use to solve the problem?

Daisy is spending her birthday money. She buys a new t-shirt for £12.99, a baseball cap for £5.49 and some sunglasses for £6.99. How much change does she get from two £20 notes?

Responses

Note your responses to the questions here before you engage with the rest of this section:

Did you notice that…?

a. When considering the calculations, some are more suited to mental calculation due to the numbers involved. Sometimes, there is not always a clear 'best' method and flexibility is required.

For example, **308,724 – 10,000** draws upon understanding of place value and unitising. The ten thousands are being decreased by 1. However, there are no digits in the ten thousands column, making this slightly trickier to perform mentally. Children will need to mentally partition 300,000 to be able to subtract 10,000.

Some are more suited to formal written methods, such as those with different digits in every column or those that require regrouping or exchanging. For example, **103,436 + 45,618**.

More than one approach could be used. For example, when calculating **20,000 – 9,999**, the difference could be found by adding on, or the calculation could be adjusted, i.e. **20,000 – 10,000 + 1**.

b. The aim of this type of question is for children to carefully consider the numbers in each of the calculations and draw upon the range of different strategies they know when discussing efficient calculations.

Rounding the numbers when mentally adding them and then adjusting, will enable efficient calculation.

£13 + £7 + £5.50 = £25.50

This can be adjusted and decreased by 3p to £25.47. Finding the difference by adding on could be used to calculate the change.

Mental or written strategies

Developing fluency in calculation is essential to allow the children to think flexibly and adapt their mathematical understanding to a range of different contexts. Children need to be able to recognise when different strategies are the most efficient, adapt them to different contexts and use a range of strategies rather than seeing them as separate rote entities.

There is sometimes a misconception that mental calculation is solely the rapid recall of known number facts and a preconception that mental strategies need to be done solely in the head; this is not the case. Informal jottings can be used to keep track of the information needed when calculating.

As discussed in Question 5, children should develop a range of mental strategies, considering the relationships between the numbers they are working with. Teach these strategies and identify opportunities for applying them, to develop children's confidence and fluency. It is important that they can recognise when numbers are suited to different approaches, rather than relying on a rote strategy. Confidence in a range of mental calculations is a prerequisite when introducing written column methods.

As children develop written algorithms for column addition and subtraction, there can be a tendency to abandon previous mental strategies in favour of always using written algorithms. It is important that children spend time thinking about when column methods are not necessary and when other methods would be more efficient to use.

For example, to calculate 776 – 200, it would be more efficient for children to use their understanding of place value to mentally subtract from the hundreds, rather than using the column algorithm. Spend some time discussing and sorting calculations, according to whether they are best suited to the column method or a mental strategy, while considering the different strategies the children are familiar with.

Fluent calculation requires the flexibility to move between mental and written methods, according to the specific numbers in the calculation. Consider the question, *'A charity aims to raise £200,000. So far, it has raised £158,436. How much more does the charity need to raise to reach its target amount?'*

In this instance, both mental and written approaches present some challenges. The numbers are not suited to efficient mental calculation and a formal written method is also problematic, as it involves exchanging through so many zeros.

Children could apply a different strategy, such as the **same difference**, applying the generalisation that if the minuend and subtrahend both decrease by a given amount, the difference remains the same.

This allows the children to easily solve the subtraction calculation without the need for exchanging.

Mental and written calculations can be used in conjunction with each other, particularly when working with multi-step or more complex problems. They do not need to be seen as separate entities but part of an overall range of strategies that can be drawn upon to support efficient and fluent calculation.

Common errors in this area may include:

- overreliance on column methods for calculation
- not applying different strategies to different contexts
- an inability to identify which strategy is the most efficient
- using a favourite strategy, whether it is appropriate or not.

What to look for

Can a child:

- discuss and give reasons for the use of different strategies to calculate?

Links to supporting materials:

NCETM Primary Professional Development materials, Spine 1: Number, Addition and Subtraction

- Topic 1.30: Composition and calculation: numbers up to 10,000,000

Notes:

Key learning from support material and self-study:

What I will focus on developing in my classroom practice: