

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 3

How confident are you that you understand and can support children to use finding the difference as a model for comparison?

1

2

3

4

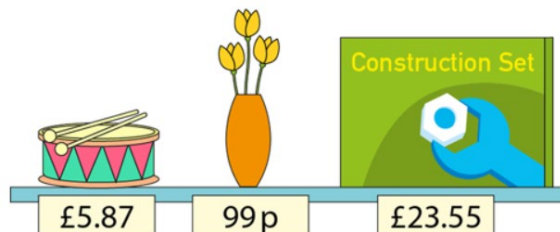
How would you respond ...?

- a. What is the purpose of the arrow in this diagram? Can you write a word problem to accompany this diagram?



- b. Jamil says that this question includes the word 'more', so it is an addition question. What misconception might he have?

A construction set costs £23.55 and a drum costs £5.87. How much more does the construction set cost?



Responses

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

Did you notice that...?

- a. In this bar model, the difference in the lengths of the bars can be seen as the bars are placed underneath each other. Each bar represents a discrete quantity that is being compared. The arrow in the diagram represents the difference between the two amounts.
- When writing a word problem, two quantities need to be compared. For example, 'George collected 18 conkers and Bella collected 65 conkers. How many fewer conkers did George collect than Bella?'
- b. The context of a word problem must be considered for children to identify which operation to use. The language alone cannot be relied on. The word 'more' can mean an addition in questions, for example 'There are 3 cars and 4 more arrive. How many are there now?' However, the word 'more' is also used when comparing amounts. It is therefore important that children expose the structure of the problem through a representation, such as a bar model.

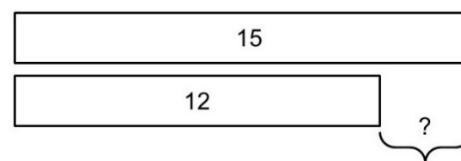
Subtraction as difference

The 'difference' structure involves the comparison of two values: the difference being the 'gap' between the two values. While both the partitioning and reduction structures are concerned with the 'whole', this is not relevant in the difference structure.

In these types of problem, we have two known amounts represented by two bars. In the following problem each person's age can be represented by a bar with the difference shown in the gap between the two bars.

John is 15 and William is 12, how much younger is William than John?

Representing the problem in this way enables the children to visually see the difference between the two bars so they can interpret what the question is asking, expose the comparison structure and decide how to express the calculation. For example, it could be written as either: $12 + ? = 15$ or $15 - 12 = ?$



This interpretation of the diagram allows children to choose an appropriate strategy to find the solution. For example, they may choose to 'count on', rather than subtract. Starting at 12, children will count on 3 to reach 15 and work out that the difference between 12 and 15 is 3. It is important that children are able to recognise when it is appropriate to apply this strategy.

Enabling children to identify when known facts can be used will develop their fluency. For instance, do they need to do a calculation to find the solution or can they draw on their known number facts? They will know that 2 and 3 make 5, so should apply this fact when calculating the difference between 12 and 15. Applying their known facts in different ways will develop their flexibility when working with numbers.

It is important to give children time to discuss the efficiency of the strategy they have chosen, comparing the strategy they have used with their peers and giving them opportunities to consider why some strategies may be more appropriate than others.

Note that in these types of problem, discrete data is represented by the bars. A small gap is left between the bars to show the quantities that are being compared.

Using this representation means children make fewer errors when deciding on which calculation to use, especially as the language can be confusing. In the question, 'How many more?', children may focus on the word 'more', believing they need to do an addition calculation instead of finding the difference.

Common errors in this area may include:

- children relying on linguistic clues and not identifying the correct structure
- adding together the values in the calculation.

What to look for

Can a child:

- use a bar model to identify the structure of finding the difference?
- use either subtraction as difference, counting on, or known number facts to find the difference?

Subject Knowledge Audit (Key Stage 1 and 2 Mathematics)

Links to supporting materials:

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

- Topic 1.12: Subtraction as difference

Notes:

Key learning from support material and self-study:

What I will focus on developing in my classroom practice: