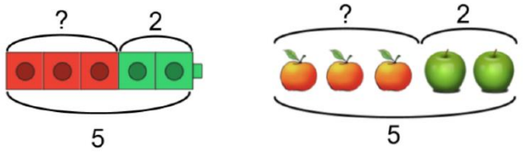
Year 2 Unit 3: Addition and subtraction word problems (2 weeks)

Before you start…

- *Can pupils identify the known and unknown values in addition and subtraction equations and when represented in part-whole models?*
- *How familiar are pupils, from Year 1 learning, with the additive structures explored in this unit?*

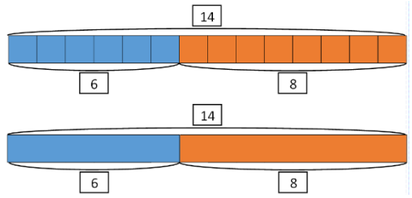
What are additive structures?

Some word problems may appear very similar in context and may involve the same calculation but their underlying structure is different. This unit focuses on addition and subtraction ('additive') structures including: ***combination and partitioning; augmentation and reduction; comparative addition; subtraction and difference****. Having an awareness of the different structures within a range of contexts will ensure that pupils continue to develop understanding of both addition and subtraction. Become familiar with these structures by reading the introduction of the Progression in Calculation document before teaching the unit.*



Why bar model?

The purpose of bar models are ***not*** *to 'find the answer' to a word problem. Instead, drawing a bar model supports pupils to identify the calculation to solve the problem. Often it is this aspect of interpreting word problems that pupils find challenging. Encourage pupils to ask themselves 'What do I know? What don't I know?'* ***Model building up bar models using known and unknown values instead of presenting completed bar models.***



Video: *Bar modelling – CPA progression*

Video: *Bar modelling – Combination and partitioning*

Video: *Bar modelling – Augmentation and reduction*

As this is the first time pupils are introduced to bar models, making them concretely (e.g. with cubes) is strongly encouraged to develop conceptual understanding. Where lessons suggest moving onto pictorial representations, adapt and continue to work concretely if pupils would benefit from doing so. Alternatively, if pupils are confident in solving one step word problems using bar modelling, adapt to include two step word problems later in the unit.

Moving from part-whole models to bar models

L1&2 Represent information as a bar model

Pupils use the familiar representation of cubes within a part-whole model to represent known and unknown values in word problems involving 'combination and partitioning' additive structures. Encourage pupils to apply the mental strategies from Unit 2 to solve the word problems. This learning is extended in lesson 2 to explore another pair of additive structures, 'augmentation and reduction'.

- ? *What connections to part whole understanding will pupils make by combining cubes from part-whole models to form horizontal bar models?*
- ? *What opportunities will you use to highlight the parallels in part-whole language within both part-whole models and bar models, to deepen understanding?*

Creating and labelling bar models

L3&4 Create and label bar models
L5 Sketch bar models

Pupils apply their learning of the additive structures from lesson 1 and 2, but now place cubes into 'segmented' bar model frames. Working in these frames supports pupils to begin visualising the 'bars' of bar models. This learning is developed in lesson 4 where numbers beyond 20 are introduced. Frames become more 'abstract' and non-segmented. Use this opportunity to emphasise how labelling each bar to represent its value is more efficient than segmenting. Once pupils are secure working with bar model frames, lesson 5 provides the opportunity to sketch bar models 'freehand'.

- ? *What questioning could promote number sense, encouraging pupils to consider the relative values in the word problems and reflecting this in the size of their drawn bars?*

There is one suggested consolidation lesson within this unit. You may wish to add in more consolidation lessons to explore additive structures and/or bar model representations further.

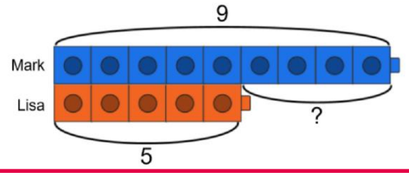
Smaller numbers are deliberately chosen to allow the focus to be on interpreting the additive structures, identifying known and unknown values and representing these in bar models. Calculations go beyond 20 at times but adapt to keep within 20 if required.

Comparison structures – no part-whole language?

Comparison structures involve a relationship between two quantities; their relationship is expressed as a difference. The structures vary by which of the values are known/unknown (the larger quantity, the smaller quantity and/or their difference). Part-whole language is not used here because the context contains not one single 'whole', but instead two separate quantities and it is the relationship between them being considered.

Video: *Bar modelling - Comparison structures*

Video: *Bar modelling – Two step word problems*



Developing understanding of additive structures

L8 Sketch bar models to represent word problems
L9 Identify suitable bar models to represent problems

In both lessons, pair work encourages dialogue around interpreting word problems. These have been deliberately designed to include the same numbers but different additive structures. In order to identify the calculation required, pupils continue to ask themselves 'what do we know? What do we not know?' to interpret the word problem and represent the known and unknown values using bar models. Mathematical thinking is further promoted as pupils sort and classify word problems in lesson 8 and in lesson 9, pupils match bar models to word problems.

- ? *What opportunities will you provide for pupils to justify their reasons and make connections across the different answers offered?*

Exploring comparison additive structures

L6&7 Represent comparative word problems using bar models

Comparison structures and their word problems are known to be the most challenging for pupils to interpret. Compared to 'part-whole' bar models experienced with the previous additive structures explored in this unit, comparative bar models look different. With this in mind, this lesson sequence has been designed to return back to building bar models concretely to deepen understanding. In lesson 6, the larger and smaller quantity are known but the difference is unknown – 'comparative addition and subtraction'. In lesson 7, pupils explore more challenging comparison word problems where the 'abstract' difference is known, one of the quantities is known but the other quantity is unknown – 'comparative difference'.

- ? *What time will you give pupils to discuss how positioning the two quantities, one above the other, allows the 'gap' (the difference) to be clearly seen?*
- ? *What opportunities will be provided for discussion around identifying and describing the value of the larger quantity, the smaller quantity and the difference? How can you encourage pupils to connect the identified value of 'how many more' and 'how many fewer' to 'the difference' and see these are different ways of describing the same value?*