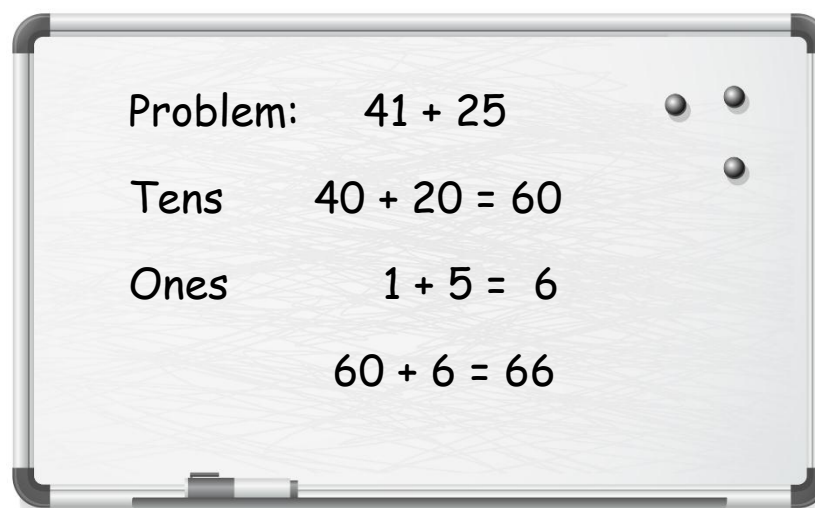# Agriculture
Developing mental partitioning strategies for addition

Content and alignment

People working in the agricultural sector are often required to mentally add or subtract numbers in a variety of situations. While pencil and paper methods are useful, as are calculators, these tools are not always available or appropriate under the circumstances. Accuracy is important for two reasons. First, inaccurate calculations can lead to waste, rework, and even accidents. Second, making mistakes with addition and subtraction is often embarrassing, and can have a detrimental effect on a person's confidence. The activity described below can be used in training courses to support the development of these skills.

Intent

This resource is designed to develop learners' mental partitioning strategies. Partitioning strategies can be described as *the process of breaking larger numbers into smaller ones in order to make adding and subtracting easier*. Below is an example:

Problem: 41 + 25

Tens   40 + 20 = 60

Ones   1 + 5 = 6

              60 + 6 = 66

The ability to partition numbers mentally gives learners a huge advantage in addition and subtraction. It allows them to partition larger number in a variety of ways that make the task easier. More information about the strategies and the rationale behind partitioning can be found in The Learning Progressions for Adult Numeracy (page 23). It is well worth reviewing.

This resource is designed for learners who have not engaged in this type of activity before and describes whole-class activities. As you progress you may want to utilise peer work to a greater degree.

Rationale

A great way to help your learners develop partitioning skills is for them to share their own strategies with each other. Therefore, the sequence below makes use of whole-class discussions and emphasises learners explaining how they solve various addition or subtraction problems. The rationale behind this is two-fold. First, the learners are introduced to a variety of different strategies. Often, if the strategy described by another learner makes sense to them, and appears easier than their own, they will adopt the strategy themselves. Consequently, they replace less effective strategies with more effective and broaden their repertoire. Second, the act of verbally explaining one's own strategy, forces learners to mentally reflect on the process in detail. This helps them to make sense of the strategy.

Sequence

The content below is provided in a sequence that can be used in almost any training situation. There are three parts to this sequence:

1. Engage learners in strategy use
2. Explore a range of strategies
3. Evaluate the strategies.

1. Engage learners in strategy use

Step one: Write an equation on the board in the form of a word problem. Contextualised problems are good, but keep the problem simple. Your leaners' assessment results can be used to determine problems of appropriate difficulty levels. However, the objective of this activity is to elicit strategies and encourage discussion, so the problem should not be difficult for learners to solve.

For example:

> *Carl sheared 26 sheep and Doug 32. How many sheep did they shear in total?*

Step two: Ask the learners to solve the problem individually without using a calculator or pencil and paper. Give them a few minutes, and don't proceed until all the learners appear to have completed the problem.

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Note: If you notice learners using paper or calculators, let them do so. They may simply be checking if they are correct or are feeling worried that an incorrect answer will make them look foolish. They may remain quiet throughout the sequence. This is fine, so long as they are watching the process.

Step Three: The learners will most likely be interested in knowing if they are right or wrong. To move the discussion from the answer to the strategy, it is often useful to write the answer on the board before beginning the next step. This allows the learners to relax and now engage in the discussion.

2. Explore a range of strategies

Step one: Ask the learners to think about how they solved the problem, or tried to solve the problem. Ask for a volunteer to come to the whiteboard and demonstrate their method. If no one volunteers ask a learner to explain their thinking from their seat.

Typical responses may include:

> *I just took the 20 and added it to the 30. That's 50. And then the 2 and the 6. That's 8. 58!*

> *I went 26 plus 30 is 56. And then added the 2. That makes 58.*

Step two: Discuss the strategies with the class. Rearticulate them to the learners in a very clear way. For example, in response to the first strategy above:

> *Okay, so you broke each of the numbers into tens and ones. You added the tens first, 20 plus 30. And then you added the ones, 2 plus 6 is 8. And then you added those two together.*

Ask others if they understand how this worked and then if others solved it in the same way. Allow learners to talk about this process.

Step three: Repeat the process by asking the class if anybody solved it differently. Have them explain how they did it. Again, encourage the learners to write their process on the board. If not, do it for them.

The board should now contain several strategies. Use these as the content for number three below.

3. Evaluate the strategies

Step one: At the end of the above conversation you should have several strategies written on the whiteboard. Ask the learners which of these they most prefer and why.

Step two: Write another problem on the board that shares similar features to the first problem. Avoid the temptation to make the numbers larger or the question harder. Instead use similar numbers to those first used. If you suspect your learners lack confidence or struggled with the previous activity

then keeping the sum of your 'ones' below 10 will make it easier. Otherwise, by making the ones exceed 10, learners will have to add a step to their strategy.
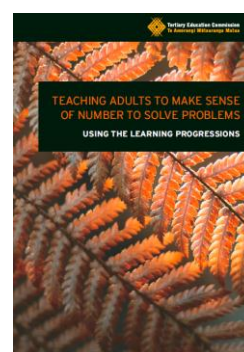
For example:

Anika sheared 39 sheep and Tamati 27. How many did they shear all together?

Repeat the process described in the second part. And be sure to ask learners to evaluate the strategies. Once learners have practised the strategy for addition, you can give them a problem involving subtraction and follow the same sequence.

Further options

Once the learners are beginning to understand and discuss strategies, it can be very useful to have a format with which to describe them. Number lines are a great way to do this. Number lines are easy to use and make thinking about adding and subtracting easy. A full description for using number lines to develop additive thinking are available in: Teaching adults to make sense of number to solve problems: Using the Learning Progressions.

Included in the book are resources for learners at step 3 (page 22) and step 4 (page 25) of the Learning Progressions.

Summary

Partitioning strategies are an essential skill if learners are to be able to mentally add and subtract larger quantities. However, progress often happens quickly if learners are able to share and learn from each other. The result, in most cases, is learners who are more confident, enthused and capable.