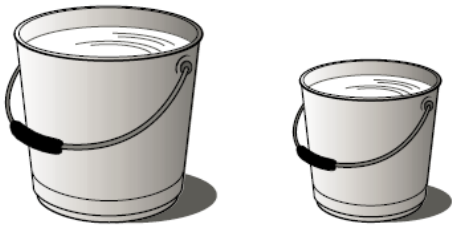
Bucket Problem

- Rosie and Her Mother are Camping
- They have a 5-litre bucket and a 3-litre bucket.



5 litres 3 litres

- They need exactly 1 litre of water.
- How can Rosie use the two buckets to get her mother 1 litre of water?

Teacher's Notes

- What is it we are trying to find out?
  - Allow time for pairs of pupils to discuss the problem. Make sure that all understand the need to measure accurately 1 litre of water – filling a bucket to 'about a third' is not good enough. The buckets may only be completely filled or completely emptied, and no water is spilt.
- How do you think Rosie can solve this problem?
  - Establish that Rosie will need to fill buckets to ensure she is working as accurately as possible and that she will need to use her knowledge of addition and subtraction (finding the difference between two numbers).
- What amounts of water can Rosie get by filling the two buckets?
  - Agree that filling the large bucket will give Rosie 5 litres, filling the small bucket will give her 3 litres, and so she can end up with 3 litres, 5 litres or 3 + 5 = 8 litres.
- How can Rosie measure 2 litres accurately?
  - Agree that this can be done by filling the 5-litre bucket and pouring 3 litres from it into the small bucket. This leaves 2 litres in the large bucket.
  - Ask pupils to suggest an appropriate way to record the data they are generating.
  - Discuss their suggestions. Agree that to show how much water is in each bucket would be a useful way to approach the problem and to record what is happening.
- How can Rosie measure 7 litres?
  - Ask the class to discuss this in pairs for two to three minutes, then take suggestions. Establish that by emptying the small bucket, pouring the 2 litres from the large bucket into it, then filling the large bucket, Rosie has 7 litres.
  - Helping pupils to realise that the contents of the buckets can be discarded may be an important step on the way to solving the problem.
  - Discuss the recording methods that pupils have chosen. Choose one or two pairs to describe their recording methods to the whole class.

- Are any methods proving to be better than others?
  - Agree that a table similar to the one below would be a useful record.

Action	Big Bucket	Small Bucket
Fill big bucket	5 litres	
Fill small bucket from big bucket	2 litres	3 litres
Empty small bucket	2 litres	0 litres
Pour water from big bucket into small bucket	0 litres	2 litres
Fill big bucket	5 litres	2 litres

- How can Rosie measure 3 litres in her 5-litre bucket?
  - Confirm this can be done simply by filling the small bucket and pouring all contents into the large bucket – not by guesswork.

Action	Big Bucket	Small Bucket
Fill small bucket		3 litres
Fill big bucket from small bucket	3 litres	0 litres

  - Help pupils to realise that knowing an exact amount in a partially filled large bucket may be another useful strategy to help generate different totals.

- If Rosie were to fill the small bucket again, how much water would there be in each bucket?

Action	Big Bucket	Small Bucket
Fill small bucket		3 litres
Fill big bucket from small bucket	3 litres	0 litres
Fill small bucket	3 litres	3 litres

- How much more can Rosie put in the large bucket?
  - Establish that the big bucket has a capacity of 5 litres and contains 3 litres, so that 2 more litres can be added.

Action	Big Bucket	Small Bucket
Fill small bucket		3 litres
Fill big bucket from small bucket	3 litres	0 litres
Fill small bucket	3 litres	3 litres
Fill big bucket from small bucket	5 litres	1 litre

- So how much water is left in the small bucket? (1 litre)

- How many steps did it take us to get this answer? (Four steps) Ask the pairs now to discuss:

- Starting with 5 litres in the big bucket and 1 litre in the small bucket, how can Rosie measure 4 litres of water?
  - Establish that it is possible to empty the 5 litre bucket, pour 1 litre from the small bucket into the big bucket, fill the small bucket, then pour the 3 litres from the small bucket to the big bucket, giving 4 litres.
  - Set the class a similar problem:

- Rosie has two buckets that hold 4 litres and 7 litres.
  - What amounts of water can she measure?