Emma is making a milkshake:
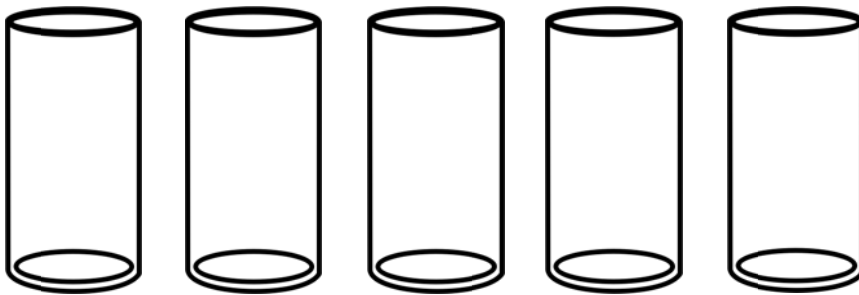
Emma is making milkshakes. She uses:

- ½ cup banana (this is one banana)
- 1 ½ cups milk
- ½ cup ice cream (this is two scoops)
- ½ cup yoghurt

Questions:

1. How much volume will the milkshake make altogether? Draw it onto the cups beneath and work out the total volume. Label each part or colour it using a different colour.

Explain what you did:

2. Each person needs 1 ½ cups of milkshake to fill up a large glass. How many people does Emma's recipe feed? Explain how you worked it out:

3. Rewrite the recipe so that it makes enough for:
    a. 4 people:

    b. 6 people:

    c. 1 person:

Back-to-Front Maths

4. Emma had: 6 bananas, 5 cups of milk, 1 ½ cups of ice cream, 2 ½ cups of yoghurt. How many people could she make milkshakes for? Make sure that you keep the ingredients in the right quantities. Explain your answer, using drawings if you want to.

5. Out of the ingredients above, what would be left over?

6. If Emma wanted to make enough milkshake to feed another two people, what else would she need? What would be left over now?

Tips for teachers:

Coding scheme:

If you use **level 1 suggestions** draw a blue star next to the question. These prompts are designed to help a student get started on the problem if they don't have any ideas to try or if they are worried about being wrong. The students can still be at an A level.

If you use **level 2 suggestions** draw a red star next to the question. These prompts are designed to use questions to lead students along the right path, such as to re-evalute their own thinking if they have made an error, or to suggest a method to start working it out. It is not appropriate to direct or correct students for this level. The students can still be at a B level, but not an A.

If you need to go **further than these** do so, but draw a black star next to the question. This is the stage at which the teacher can correct students, or direct them to use a particular approach (e.g. telling the student the steps of the problem and having them act it out and then counting the result together). The students can still be at a C level, but not a B.

Differentiation: Change the milk to 1 cup. Omit the yoghurt. Change question 2 to be 1 cup of milkshake per person.

For questions 1–4: Problem Solving

Level 1: Students can still be an A overall for Problem Solving with these prompts

1. Rephrase the question as much as you like. Ask the student to explain what they are doing.
2. Why don't you try drawing it?
3. Ask students to write a number sentence about the ingredients, or count the fractions and write down the numbers.
4. Can you please check that you have answered the question that is being asked? (reread it)
5. Did you know how milkshake there would be before drawing the pictures, or did you work it out while you were drawing? How did you know? Write that down in the bit where it says to explain your thinking.
6. Q3: Do you need more or less of the ingredients? How much more or less?
7. Q4: How did you know how many people it would feed? Which of the numbers told you?
8. You can explain that the ingredients given are not necessarily in the right proportion to each other like they are in the original recipe, and so you might have some left over.

Level 2: Students can still be a B overall for Problem Solving with these prompts

1. Start drawing ½ cup of banana in one of the cups. Then say that we are going to put the milk on top of this. Ask if it will all fit. Ask the student to draw it, and then keep drawing the other ingredients using as many cups as they need.
2. Ask redirection questions for when students have missed the point of the question: E.g. *Have you remembered that each person needs 1 ½ cups of milkshake?*
3. Prompt the students to put the fractions together into glasses rather than using one glass for each ingredient. E.g. *There is still half a cup here of space, can we put something else in there with it to fill it up?*

4. Q3: Ask students to write a number sentence to describe what they are doing. Ask them what operation they would need to use.
5. Q4: Ask if we should just use all of the available ingredients or if we should only use some of them. Check that the student understands to keep ingredients in the original ratios. Ask how many serves of each ingredient there are (e.g. *We have 6 bananas, how many lots of the recipe would that make?* So how many people would that feed?*)

A student can still be a C overall for Problem Solving with more directed help or correction.
For example:

•   Directed help working on the total volume: *Let's draw the ingredients in each cup to work out how there is. Now, we need ½ cup banana, let's draw that in the first cup. Now, you keep going for me.*

•   Directed help answering the questions: *How many cups does Emma's recipe make altogether? So if each person needed one and a half cups, how many people could we feed? Let's circle 1 ½ of the cups and see what is left… Yes, we can feed two people… So if we now need to feed 4 people, what do you think we would have to do to our ingredients?*

•   Correction: *You have forgotten to keep your ingredients in the same ratios as the original recipe. It would be changing the recipe to suddenly use twice as much banana but not twice as much milk. If you double one ingredient you have to double the others too.*

For questions 4–6: Understanding

Level 1: Students can still be an A overall for Understanding with these prompts

1. You can rephrase the questions so that the student understands, without emphasising particular words or phrases.
2. You can ask the student what they are meant to be drawing or counting. Make sure that this is not done in a correcting tone.
3. You can explain that the ingredients given are not in the right proportion to each other as the original recipe, and so you might have some left over.
4. Q4: How did you know how many people it would feed? Which of the numbers told you?

Level 2: Students can still be a B overall for Understanding with these prompts

1. Let's work it out. What ingredient do we have the least of? How many people will that feed? So make sure that you keep the other quantities in the same ratio (use the amount to feed that number of people).
2. You can ask the student to draw quantities in cups, or draw the left over quantities.
3. You can ask the student how much of each ingredient they would need, and then how much is missing.
4. Q4: Ask if we should just use all of the available ingredients or if we should only use some of them. Check that the student understands to keep ingredients in the original ratios. Ask how many serves of each ingredient there are (e.g. *We have 6 bananas, how many lots of the recipe would that make?* So how many people would that feed?*)

Marking scheme:

Problem Solving / Thinking and Reasoning: Questions 1-4
A: Student answered questions 1-4 with minimal errors using only level 1 prompts. Student also wrote number sentences and created diagrams to explain his/her working.
B: Student answered questions 1-4 with minimal errors using only level 1 prompts. Student may also have written number sentences or created diagrams to explain his/her working.
C: Student successfully answered questions 1-3, but needed more than level 2 prompting. Student partly answered question 4, but became stuck and could not work out the complete answer.
D: Student successfully answered questions 1 and 2, but only partly answered question 3 even with more than level 2 prompting.
E: Student struggled to answer questions 1 and 2, even with direct teacher prompting and correction.

Reasoning / Communicating: This may include their actions, their pictures, spoken sentences (including counting and explanations), and written numbers. Make sure that you ask students about their process.

A: Student demonstrates clear and accurate mathematical reasoning for each question. The student's process requires no interpretation on the part of the teacher. It is logical, structured and detailed enough to easily follow. The student's process included counting or writing number sentences with the fractions (the operations may have been used in non-standard, informal ways). The student's work clearly showed that he/she checked his/her answers to prove that they were correct before submitting them.
B: Student demonstrates a coherent and accurate mathematical process for each question. The student's process is easy to understand, but could benefit from more detail, from being more logically structured, or from checking or proving the answers. The student's process included counting or writing number sentences with the fractions (the operations may have been used in non-standard, informal ways).
C: Student demonstrates a sound mathematical process for each question. The student's process requires interpretation on the part of the teacher, but is mathematically valid once understanding has been reached. The student's process may have included counting or writing number sentences with the fractions, but is more likely to have used less formal methods.
D: Student demonstrates a disjointed mathematical process. The student's process as they have demonstrated it, will not work consistently. They may have attempted to use formal operations but used them incorrectly (e.g. ½ + ½ = ¼).
E: Student did not demonstrate a valid mathematical process. They may have attempted to use operations with the fractions, but done so in a manner that did not reflect the requirements of the question (used the wrong operations).

Understanding / Reflecting: Questions 4-6
A: Student answered questions fairly easily by making connections between them. For each question they adapted a previous answer, or worked backwards through the problem. For all questions they used only level 1 prompts.

B: Student made some connections between the questions but required some level 2 prompting to do so by the teacher. They adapted what they had originally calculated to work out answers, or worked backwards through the problems.

C: Student correctly answered question 4 using level 2 prompts or more, and attempted questions 5 and 6.   The student tended not to make connections between the questions. They did not use their previous calculations or a logical system to help them come up with the new answers, but used trial and error to work out each question from start to finish.

D: Student partly answered questions 4-6 because of an invalid or highly inefficient mathematical process. They may have attempted to use formal operations but used them incorrectly (e.g. ½ + ½ = ¼).

E: Student struggled to answer question 3 even with direct teacher prompting and correction. They may have attempted to use operations with the fractions, but done so in a manner that did not reflect the requirements of the question (used the wrong operations).