Adapting a recipe

Describe the real-world problem

Chocolate mousse

185g of cooking chocolate

$\frac{1}{4}$ cup of hot water

1 teaspoon of vanilla essence

5 large eggs

$1\frac{1}{2}$ cups of cream

Melt chocolate. Beat eggs.
Whip cream. Fold all ingredients together. Chill in fridge for 1 hour.

Serves 4–6.

Specify the mathematical problem

Calculate the quantities of ingredients required to adapt the recipe to cater for 6 to 9 people.

Formulate the mathematical model

This is a very simple problem involving the adaptation of a published recipe. Most of us would adapt this recipe using the back of an envelope or even in our heads with possibly a calculator to help us. In doing so we would probably overlook that we have made assumptions that are so 'obvious' that we did not realise that we had made them.

Students should be encouraged to articulate the assumptions required and consider their solution in terms of the real-world problem.

Revisit the mathematical modelling framework, and encourage students to map out their response to the problem in the same structure.

Emphasise that the framework is cyclical, not strictly linear. Real-world modelling will often require that students return to earlier steps in the framework to consider new variables, source new data, reassess assumptions and test solutions.

Situational assumptions

Facilitate students' discussion of what assumptions they will need to make before creating a model. These might include:

- all ingredients are available
- all the people being served have uniform appetites
- serving size will be the same for the adapted recipe as it was for the original recipe.

Mathematical assumptions

new amount of ingredients = k × old amount of ingredients

k = new number of people ÷ old number of people

k = 6 ÷ 4 or k = 9 ÷ 6

k = $\frac{3}{2}$ or k = 1.5

Solve the mathematics

277.5 grams of cooking chocolate

$\frac{3}{8}$ cup of hot water

$1\frac{1}{2}$ teaspoon of vanilla essence

7.5 large eggs

$2\frac{1}{4}$ cups of cream

Interpret the solution

Students should consider the solution in real-world terms. How would you cook with half an egg? Rewrite the ingredients list, for example:

275 or 280 grams of cooking chocolate

almost half a cup of hot water

$1\frac{1}{2}$ teaspoons of vanilla essence

7 or 8 large eggs

2 and a bit cups of cream

Evaluate the model

The proof of the pudding is in the eating!

The exercise can be extended to apply the model to related problems.

What if there are two people coming to dinner? A dozen?

Or, working backwards: If I have half a carton of eggs with which to make mousse, how many people can I invite for dessert?

Consider whether the larger volume of mousse in the amended recipe might take longer to chill. If I have less time to prepare, how might I reduce chill time? (For example, use many smaller serving dishes instead of one large dish.)

Report the solution

Students should write out a report following the framework structure.

As an extension, students might research real-world shopping limitations. Can I buy exactly 275 grams of chocolate, 7 eggs, 2 cups of cream? How many blocks of chocolate, cartons of eggs, containers of cream would this recipe need? Students might visit supermarket websites to research product sizes, and write out a shopping list.