Problem of the Week
Problem A and Solution
Cupcake Bonanza

Problem

Archie, Lin, and Umar are making vanilla cupcakes for a bake sale. They need to make 8 dozen cupcakes using the recipe below.

Recipe to make 1 dozen vanilla cupcakes:

- 250 grams flour
- $2\frac{1}{2}$ grams salt
- 8 grams baking powder
- $\frac{1}{4}$ cup of butter
- 150 grams sugar
- 2 eggs
- 240 mL milk
- 5 mL vanilla

(a) How much of each ingredient do they need to make 8 dozen cupcakes?

(b) They have enough salt, baking powder, and vanilla already. They do not have any of the other ingredients. When they go to the store, they see the ingredients they need are sold in packages in the following sizes:

- Flour is sold in 1 kg bags.
- Butter is sold in 1 cup blocks.
- Sugar is sold in 2 kg bags.
- Eggs are sold by the dozen.
- Milk is sold in 1 L cartons.

How many of each package of the ingredients do they need to buy to have enough to make all of the cupcakes?

Solution

(a) Since the recipe makes 1 dozen cupcakes, to calculate how much of each ingredient we need to make 8 dozen cupcakes we must multiply the amount of each ingredient by 8. For the larger numbers, we can do this calculation by skip counting or multiple additions.

For example, calculating the amount of flour required we could
skip count: 250, 500, 750, 1000, 1250, 1500, 1750, 2000,
or do multiple additions: $250 + 250 + 250 + 250 + 250 + 250 + 250 + 250 = 2000$.

Another way we could calculate 8 times some number is to double the value 3 times. Notice that if we double the number 1, we get 2. If we double the number 2, we get 4. If we double the number 4, we get 8. If we follow this same procedure with any starting number, the result will be 8 times the original value. For example, if we double 250, we get 500. If we double 500, we get 1000. If we double 1000, we get 2000.

Using any of these procedures, we determine that $8 \times 250 = 2000$.

The total amount of each ingredient needed to make 8 dozen cupcakes is below.

- Flour: $250 \times 8 = 2000$ g. Since 1000 g = 1 kg, then 2000 g = 2 kg is needed.
- Salt: $2\frac{1}{2} + 2\frac{1}{2} = 5$ grams, so 2 dozen cupcakes require 5 grams. Thus, 8 dozen cupcakes require $4 \times 5 = 20$ grams.
- Baking powder: $8 \times 8 = 64$ grams required.
- Butter: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1$ cup, so 4 dozen cupcakes require 1 cup. Thus, 8 dozen cupcakes require 2 cups.
- Sugar: $150 \times 8 = 1200$ grams required.
- Eggs: $2 \times 8 = 16$ eggs required.
- Milk: $240 \times 8 = 1920$ mL required.
- Vanilla: $5 \times 8 = 40$ mL required.

(b) We can use the total amounts calculated in part (a) to determine how many packages of each ingredient they must buy.

- Since flour is sold in 1 kg bags and they need 2 kg of flour, then they need 2 bags of flour.
- Since butter is sold in 1 cup blocks, and they need 2 cups of butter, then they need 2 blocks of butter.
- Since sugar is sold in 2 kg bags, and 2 kg = 2000 g, then they need 1 bag of sugar to have at least 1200 g of sugar.
- Since eggs are sold by the dozen, and there are 12 eggs in 1 dozen and 24 eggs in 2 dozen, then they need 2 cartons of eggs to have at least 16 eggs.
- Since milk is sold in 1 L cartons, and since 1 L = 1000 mL and so 2 L = 2000 mL, then they need 2 cartons of milk.