Math Diversion 1010

P. Reany

January 17, 2026

> Self-education is, I firmly believe, the only
> kind of education there is.
> — Isaac Asimov

```
Source: http://iws.collin.edu/dkatz/Intermediate_Algebra
     /Mixture_Problems.pdf
Title:  A Mixed-Rate Problem
 Presenter: Patrick
```

1 Problem

Your recipe calls for 2 cups of regular flour and one-half tablespoon of baking powder. But your pantry only has a cup of regular flour and a cup of self-rising flour, which is 4% baking powder. How much regular flour should we add to the self-rising flour to get a mixture with the desired concentration of baking powder?

2 Solution

There are a number of issues to deal with prior to writing conservation equations. First, let's get ourselves a single measuring unit. There are 16 tablespoons in one cup. Therefore, one-half tablespoon is 1/32 cup. Second, The question tells us to maintain a certain 'concentration', but I prefer to think of it as a proportion. That is, the final mix is to have the same ratio of regular flour to baking powder as was called for in the recipe. This is just common sense. Let R be the percentage of regular flour in the final mix. Let B be the percentage of baking powder in the final mix.[1] Then

$$\frac{R}{B} = \frac{32\,\text{tablespoons}}{\frac{1}{2}\,\text{tablespoon}} = \frac{64}{1}\,. \tag{1}$$

[1] Taking the ratio of the percent R to the percent P gives the same value as taking the actual amount of regular wheat in the final mix to the actual amount of baking powder in the final mix.

My third issue is to make sense of the claim that self-rising flour is 4% baking powder. What is the other 96% of the flour? For simplicity sake, I'm going to assume that it's all regular flour.

Now, if I understand the original problem correctly, we use all the self-rising flour and some of the regular flour, but none of the baking powder. That is a simple problem, which the reader can solve if he or she wants to.

However, I propose solving a more interesting problem: Knowing me, I'd mix the one cup of regular four, the 1/2 tablespoon of baking powder, and the 1 cup of self-rising flour (mistaking it for regular flour) and then realize my mistake of thinking that the self-rising flour was regular. Then I would realize that the self-rising flour already has baking powder in it and then I have to calculate how much more regular flour I must borrow from my neighbor to add into the mixing bowl to maintain proper proportion given in (1).

Question: How much more regular flour should I add to the mixing bowl?

As you can see in the figure below, I have placed an x below the regular-flour rectangle. We'll solve for x and then subtract off 1 cup from it, since we already have 1 cup of regular flour in the mix.

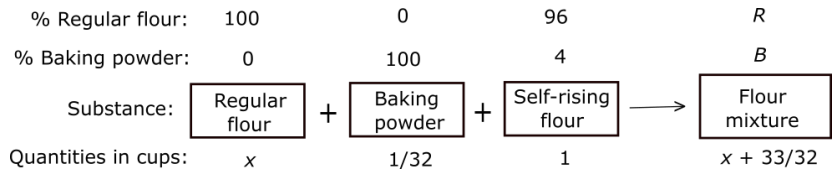

Figure 1. I have already included the conservation of dry ingredients (by volume) in the final flour mix.

Let's balance on regular flour first.

$$1.00(x) + 0(1/32) + .96(1) = \frac{R}{100}(x + 33/32)\,. \tag{2}$$

Now, let's balance on baking powder.

$$0(x) + 1.00(1/32) + .04(1) = \frac{B}{100}(x + 33/32)\,. \tag{3}$$

Since we have to connect back to (1), let's divide (2) by (3), and simplify as we go, to get

$$\frac{x + .96}{1/32 + .04} = \frac{R}{B} = \frac{64}{1}\,. \tag{4}$$

The solution is $x = 3.6$ cups. That means that we must add 2.6 more cups of regular flour into the mix to restore the proper ratio of regular flour to baking powder as given in the baking instructions.