

## Bake It To Scale! Algebra in the Kitchen

Welcome! Today, we're mixing math with something delicious - baking! We'll explore how algebra, specifically ratios and equations, is essential for adjusting recipes.

### Materials Needed:

- Pencil or Pen
- Notebook or Paper
- Calculator (optional, for checking work)
- Favorite Cookie Recipe (we'll use a sample one)
- Measuring Cups and Spoons (conceptual use)

### The Recipe Challenge

Imagine you have a delicious chocolate chip cookie recipe that makes 24 cookies, but you only want to make 12 cookies for yourself today. Or maybe you need to make 36 cookies for a bake sale! How do you adjust the ingredients?

#### Original Recipe (Makes 24 cookies):

- 2 cups Flour
- 1 cup Butter
- 3/4 cup Sugar
- 1/2 cup Brown Sugar
- 2 Eggs
- 1 tsp Vanilla Extract
- 1/2 tsp Baking Soda
- 1 cup Chocolate Chips

### Using Ratios

To scale a recipe, we use ratios. The ratio represents the relationship between the desired yield (how many cookies you want) and the original yield (how many the recipe makes).

#### Scenario 1: Making 12 Cookies

Desired Yield: 12 cookies

Original Yield: 24 cookies

Ratio:  $12 / 24 = 1/2$

This means we need  $1/2$  of every ingredient. Let's calculate the new amount for Flour:

Original Flour: 2 cups

New Flour = Original Flour \* Ratio

New Flour = 2 cups \*  $(1/2) = 1$  cup

**Your Turn (Scenario 1):** Calculate the amount needed for Butter and Sugar using the  $1/2$  ratio.

*Butter:*  $1 \text{ cup} * (1/2) = ?$

*Sugar:*  $3/4 \text{ cup} * (1/2) = ?$

## Setting up Equations

We can represent this with a linear equation. Let 'O' be the original amount of an ingredient, 'N' be the new amount, and 'S' be the scaling factor (our ratio).

$$N = O * S$$

### Scenario 2: Making 36 Cookies

Desired Yield: 36 cookies

Original Yield: 24 cookies

Scaling Factor (S) = Desired Yield / Original Yield = 36 / 24

Simplify the fraction:  $36/24 = (12 * 3) / (12 * 2) = 3/2$

So, we need  $3/2$  times the original amount of each ingredient.

Let's calculate the new amount for Brown Sugar:

Original Brown Sugar (O):  $1/2$  cup

Scaling Factor (S):  $3/2$

New Brown Sugar (N) =  $O * S$

$N = (1/2 \text{ cup}) * (3/2)$

$N = 3/4$  cup

**Your Turn (Scenario 2):** Calculate the new amount needed for Eggs and Chocolate Chips using the  $3/2$  scaling factor.

Eggs:  $2 \text{ eggs} * (3/2) = ?$

Chocolate Chips:  $1 \text{ cup} * (3/2) = ?$

## Dealing with Tricky Units

Sometimes scaling results in awkward measurements. What if you needed  $1/8$  of a cup? It's helpful to know conversions:

- 1 cup = 16 Tablespoons (Tbsp)
- 1 Tablespoon = 3 Teaspoons (tsp)

Example: If a scaled recipe needs  $1/8$  cup of an ingredient.

$(1/8 \text{ cup}) * (16 \text{ Tbsp} / 1 \text{ cup}) = 16/8 \text{ Tbsp} = 2 \text{ Tbsp}$ .

## Practice Problems

1. Your recipe calls for  $1 \frac{1}{2}$  cups of milk and makes 12 servings. How much milk do you need for 18 servings? (Hint: Find the scaling factor first:  $18/12$ )
2. A brownie recipe making 16 brownies needs  $2/3$  cup cocoa powder. You want to make only 4 brownies. How much cocoa powder do you need? (Scaling factor:  $4/16$ )
3. You scaled a recipe and need 1.5 eggs. How would you handle this in reality? (Discuss practical baking solutions).

## **Conclusion**

See? Algebra is super useful, even in the kitchen! By understanding ratios and setting up simple equations, you can confidently adjust any recipe. Now, maybe it's time to preheat the oven?