



## Problem of the Week

### Problem A and Solution

#### Baking for a Bunch

#### Problem

Samir wants to make treats for his class. There are 24 people in the class including Samir and his teacher. He has a two recipes: one for brownies and one for cookies. The brownie recipe makes enough for 12 people to eat. The cookie recipe makes 48 cookies.

#### *Brownies*

1 cup white sugar  
 $\frac{1}{2}$  cup butter  
 $\frac{1}{4}$  cup cocoa powder  
 $\frac{1}{4}$  teaspoon vanilla extract  
 $\frac{3}{4}$  cup all-purpose flour  
 $\frac{1}{2}$  teaspoon salt  
2 eggs

#### *Chocolate Chip Cookies*

2 cups all-purpose flour  
1 teaspoon baking soda  
1 teaspoon salt  
1 cup butter  
1 cup white sugar  
 $\frac{1}{2}$  cup brown sugar  
1 teaspoon vanilla extract  
2 eggs  
2 cups chocolate chips

Samir wants to bake exactly enough so each person gets one brownie and one cookie. Make a list showing the total amount of each ingredient he needs to do his baking.

#### Solution

Since Samir wants to make 24 brownies, and the recipe makes enough for 12, then he must double the brownie recipe, because  $12 \times 2 = 24$ . To double a number, you can either multiply it by 2 or you can add the number to itself.

Since he wants to make 24 cookies, and the recipe makes enough for 48, then he must cut the cookie recipe in half, because  $48 \div 2 = 24$ .

The most difficult calculation is probably determining the required amount of flour. You will need to double the amount from the brownie recipe ( $\frac{3}{4}$  cup) and add it to half the amount from the cookie recipe (2 cups). There are many ways to determine the result of  $\frac{3}{4} \times 2$  or  $\frac{3}{4} + \frac{3}{4}$ . For example, you can use fractions of geometric shapes such as circles or squares, or use money such as Canadian quarters. You could also literally use measuring cups with flour, sand, or some other measurable material.





Here is another way to think about the calculation.

Break up  $\frac{3}{4}$  into 3 separate quarters:  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$

Now, double this amount using addition:  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$

Group the first four quarters together and the last two quarters together:

$$\left(\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}\right) + \left(\frac{1}{4} + \frac{1}{4}\right)$$

When you add four quarters together you get a whole, or 1. When you add two quarters together you get a half ( $\frac{1}{2}$ ). So in this case the total is  $1\frac{1}{2}$  cups of flour required for the brownies. You also need half of the 2 cups of flour for the cookies. Half of 2 cups is 1 cup. So altogether you need  $1\frac{1}{2} + 1 = 2\frac{1}{2}$  cups of flour.

Here is a summary of the totals required for the rest of the ingredients:

Ingredient	Brownie Amount	Cookie Amount	Total
flour	$\frac{3}{4} \times 2 = 1\frac{1}{2}$ cups	$2 \div 2 = 1$ cup	$1\frac{1}{2} + 1 = 2\frac{1}{2}$ cups
white sugar	$1 \times 2 = 2$ cups	$1 \div 2 = \frac{1}{2}$ cup	$2 + \frac{1}{2} = 2\frac{1}{2}$ cups
butter	$\frac{1}{2} + \frac{1}{2} = 1$ cup	$1 \div 2 = \frac{1}{2}$ cup	$1 + \frac{1}{2} = 1\frac{1}{2}$ cups
cocoa powder	$\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ cup		$\frac{1}{2}$ cup
vanilla extract	$\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ teaspoon	$1 \div 2 = \frac{1}{2}$ teaspoon	$\frac{1}{2} + \frac{1}{2} = 1$ teaspoon
salt	$\frac{1}{2} + \frac{1}{2} = 1$ teaspoon	$1 \div 2 = \frac{1}{2}$ teaspoon	$1 + \frac{1}{2} = 1\frac{1}{2}$ teaspoons
eggs	$2 \times 2 = 4$ eggs	$2 \div 2 = 1$ egg	$4 + 1 = 5$ eggs
baking soda		$1 \div 2 = \frac{1}{2}$ teaspoon	$\frac{1}{2}$ teaspoon
brown sugar		$\frac{1}{2} \div 2 = \frac{1}{4}$ cup	$\frac{1}{4}$ cup
chocolate chips		$2 \div 2 = 1$ cup	1 cup





## Teacher's Notes

It is very important for students to have a solid understanding of fractions and how to do calculations with them. Their ability to work with fractions tends to diminish once they are given a calculator to work with, and this can be problematic in later mathematics classes.

A calculator is a great tool for computing results given numbers. However, when students are working with algebraic expressions that involve fractions, a calculator may not be able to help. For example, a calculator cannot help you simplify an expression like:

$$\frac{(x + 1)}{3} + \frac{(x - 5)}{2}$$

Understanding and practising adding, subtracting, multiplying and dividing fractions early will make a difference for students in high school and beyond.

