

# Cooking in the Kitchen

## Working with Fractions

“When am I ever going to use this?”  
Using the concepts in this worksheet, you will be able to adjust recipe ingredients to make a larger or smaller batch of cookies.

**A** favorite chocolate chip cookie recipe of our family is shown below.

### Oatmeal Chocolate Chip Cookies

1½ cups sugar

2 cups brown sugar

4 cubes of butter

4 eggs beaten

2 Tablespoons vanilla

2½ cups flour

2 cups wheat flour

2 cups oatmeal

½ cup oat bran

1 teaspoon salt

1½ teaspoon soda

4 cups chocolate chips

Mix ingredients. Spoon onto cookie sheet.

Bake at 350 degrees for 9 minutes.

As shown in the recipe, various units of measure (teaspoons, tablespoons, cups) are used in making the cookies.

1. If we cut the recipe in half, how many cups of chocolate chips and how many cups of flour will be needed?

2. If a  $\frac{1}{2}$ -cup measure is used to measure the sugar and brown sugar for the original recipe, how many times will the  $\frac{1}{2}$ -cup measure need to be filled for each type of sugar?
3. One way to compare two different quantities is to calculate their ratio. That is, divide one quantity by the other. Calculate the ratio of sugar to brown sugar in the original recipe. Then explain what the ratio means. (Hint: You may find it helpful to use the answer from (2).)
4. We want to make as many cookies as possible but only have 3 cups of oatmeal available. If we plan to use all of the oatmeal, how much sugar and how much oat bran will we need?

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A favorite chocolate chip cookie recipe of our family is shown below.

Oatmeal Chocolate Chip Cookies	
1½ cups sugar	2 cups wheat flour
2 cups brown sugar	2 cups oatmeal
4 cubes of butter	½ cup oat bran
4 eggs beaten	1 teaspoon salt
2 Tablespoons vanilla	1½ teaspoon soda
2½ cups flour	4 cups chocolate chips

Mix ingredients. Spoon onto cookie sheet.  
Bake at 350 degrees for 9 minutes.

As shown in the recipe, various units of measure (teaspoons, tablespoons, cups) are used in making the cookies.

1. If we cut the recipe in half, how many cups of chocolate chips and how many cups of flour will be needed?

*To cut the recipe in half, we may divide the quantities by 2 or multiply them by ½. We will use both methods.*

$$\frac{(4 \text{ cups chocolate chips})}{2} = \frac{4}{2} \text{ cups chocolate chips}$$
$$= 2 \text{ cups of chocolate chips}$$

$$\frac{1}{2} \times (2\frac{1}{2} \text{ cups flour}) = \frac{1}{2} \times (\frac{5}{2} \text{ cups flour})$$
$$= \frac{1 \times 5}{2 \times 2} \text{ cups flour}$$
$$= \frac{5}{4} \text{ cups flour}$$
$$= 1\frac{1}{4} \text{ cups flour}$$

*Two cups of chocolate chips and 1¼ cups flour will be needed.*

2. If a  $\frac{1}{2}$ -cup measure is used to measure the sugar and brown sugar for the original recipe, how many times will the  $\frac{1}{2}$ -cup measure need to be filled for each type of sugar?

*Since two  $\frac{1}{2}$ -cup measures make up a whole cup, three  $\frac{1}{2}$ -cup measures are needed for the  $1\frac{1}{2}$  cups sugar and four  $\frac{1}{2}$ -cup measures are needed for the 2 cups of brown sugar.*

3. One way to compare two different quantities is to calculate their ratio. That is, divide one quantity by the other. Calculate the ratio of sugar to brown sugar in the original recipe. Then explain what the ratio means. (Hint: You may find it helpful to use the answer from (2).)

$$\begin{aligned} \frac{3 \frac{1}{2}\text{-cups of sugar}}{4 \frac{1}{2}\text{-cups of brown sugar}} &= \frac{3}{4} \times \frac{\frac{1}{2}\text{-cups of sugar}}{\frac{1}{2}\text{-cups of brown sugar}} \\ &= \frac{3}{4} \times \frac{\cancel{\frac{1}{2}\text{-cups of sugar}}}{\cancel{\frac{1}{2}\text{-cups of}} \text{ brown sugar}} \\ &= \frac{3 \text{ sugar}}{4 \text{ brown sugar}} \end{aligned}$$

*This means that for every 4 measures of brown sugar in the recipe, 3 measures of sugar should be added. This will be true whether cups,  $\frac{1}{2}$ -cups, tablespoons, or other type of measure is used.*

4. We want to make as many cookies as possible but only have 3 cups of oatmeal available. If we plan to use all of the oatmeal, how much sugar and how much oat bran will we need?

*We must determine by what proportion we are increasing the recipe. To do this, we divide the amount of oatmeal available by the amount shown in the recipe.*

$$\frac{3 \text{ cups oatmeal}}{2 \text{ cups oatmeal}} = \frac{3}{2} \text{ or } 1\frac{1}{2}$$

*We need  $1\frac{1}{2}$  times of each ingredient. The original recipe calls for  $1\frac{1}{2}$  cups sugar and  $\frac{1}{2}$  -cup of oat bran.*

$$\begin{aligned} 1\frac{1}{2} \times (1\frac{1}{2} \text{ cups sugar}) &= \frac{3}{2} \times \left(\frac{3}{2} \text{ cups sugar}\right) & 1\frac{1}{2} \times \left(\frac{1}{2} \text{ cup oat bran}\right) &= \frac{3}{2} \times \left(\frac{1}{2} \text{ cup oat bran}\right) \\ &= \frac{3 \times 3}{2 \times 2} \text{ cups sugar} & &= \frac{3 \times 1}{2 \times 2} \text{ cup oat bran} \\ &= \frac{9}{4} \text{ cups sugar} & &= \frac{3}{4} \text{ cup oat bran} \\ &= 2\frac{1}{4} \text{ cups sugar} & & \end{aligned}$$

*We need  $2\frac{1}{4}$  cups of sugar and  $\frac{3}{4}$  cup of oat bran.*

<i>Worksheet Title</i>	Cooking in the Kitchen: Multiplying Fractions				<i>Filename:</i>	m1002	
<i>Keywords</i>	Cookies, chocolate, recipe, fractions, multiplying fractions, ratio, mixed fractions, improper fractions						
<i>NCTM Standard</i>		Content Standards				Process Standards	
	X	Number and Operations				X	Problem Solving
		Algebra				X	Reasoning and Proof
		Geometry				X	Communication
	X	Measurement					Connections
	Data Analysis and Probability					Representations	
<i>Data Type</i>	Words						

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