



Chapter 1

Measurement

Fractional mathematics is something that people use everyday. If you say “I am going to play for half an hour” or “one-fourth of our class has green eyes,” then you are talking in terms of fractions. Bakers, chefs and even kids use fractional mathematics in the kitchen. You use fractions to measure ingredients and to double recipes. In this chapter, you will explore fractions, measure the volume and weight of ingredients and practice your measurement skills.

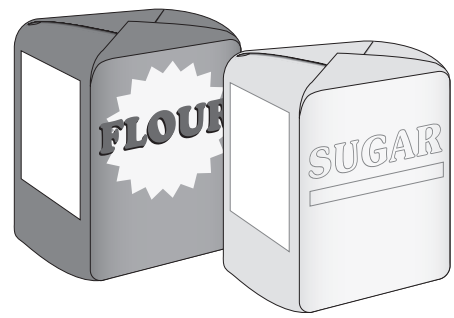
Welcome to the world of kitchen mathematics!

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Measuring Up



Did you know measuring is important when cooking and baking?

Using too much or too little of an ingredient can change how a food tastes and looks. Too much salt makes cookies taste salty. Not enough fat (like butter) makes cookies taste dry. Kitchen measuring tools and practices help chefs and bakers use the right amount of ingredients.

Dry ingredients like flour, sugar and salt are measured using dry measuring cups, measuring spoons or even a scale. Usually, dry measuring cup sets have a one-cup, one-half-cup, one-third-cup and one-fourth-cup. Each measuring cup is a part or a fraction of one whole cup. Measuring spoon sets usually have a tablespoon (tbsp), teaspoon (tsp) and the parts or fractions of a teaspoon.

To measure dry ingredients, you fill the cup or spoon to the very top. Then you level off by scraping a knife across the top. You need to pack some dry ingredients like brown sugar. To pack ingredients, you use a spoon to push or press the ingredient down into the measuring cup. When brown sugar is packed, you can dump it into a mixing bowl, and it will keep its shape.

Liquid ingredients like milk and water are measured using liquid measuring cups. Liquid measuring cups have fractions of a cup marked on the side. You pour the liquid into the cup until it matches the correct line. To measure small amounts of liquid, you use a measuring spoon. Fill the spoon to the very top, but do not let it overflow. The liquid in a full spoon will look round on top. The rounded look is called a **meniscus**.

DOODLE BUGS

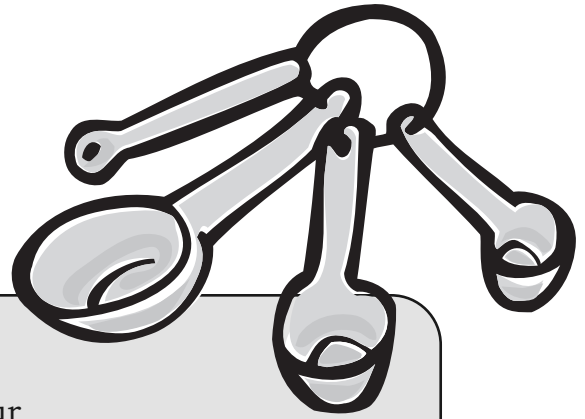
Circle three ingredients in the reading that you can measure with a dry measuring cup.

Draw a box around an ingredient in the reading you must pack into a dry measuring cup.

Which measuring tool would you use to measure $\frac{1}{2}$ cup of apple juice? (Circle one.)



SCIENTIFIC INQUIRY: **Cups, Spoons and Scales**



Your group will need:

- | | |
|--|-------------------------------------|
| 1 set dry measuring cups | 1 cup flour |
| 1 kitchen scale | 1/2 teaspoon baking soda |
| 1 small bowl (or medium bowl) | 1 teaspoon baking powder |
| 2 spoons | 1/2 teaspoon salt |
| 1 table knife (for leveling) | 1 cup chocolate chips (1/2 package) |
| 3 storage bags labeled 1, 2 & 3
(gallon-size resealable zipper) | 3/4 cup oats |
| 1 set measuring spoons | 3/4 cup packed brown sugar |

Your teacher will demonstrate how to measure dry ingredients. Then, your group will measure the dry ingredients needed to make chocolate chip oatmeal cookies. Read all the directions before you begin.

Measuring flour

1. Place the one-cup dry measure on the scale and zero the scale.
2. Place the one-cup dry measure in a bowl on the table.
3. Use a spoon to fill the one-cup dry measure with flour. Be sure to use good measuring techniques, such as leveling off.
4. Use the scale to measure the weight of one cup of flour.
5. Record the weight in ounces and grams in the Kitchen Measurement Facts table.
6. Pour the flour into zipper storage bag 1.

Measuring baking soda, baking powder and salt

1. Measure 1/2 teaspoon of baking soda, 1 teaspoon of baking powder and 1/2 teaspoon of salt.
2. Add the baking soda, baking powder and salt to bag 1.
3. Seal the bag and shake lightly to mix.

Measuring chocolate chips

1. Measure 1 cup of chocolate chips.
2. Use the scale to measure the weight of 1 cup of chocolate chips.
3. Record the weight in the Kitchen Measurement Facts table.
4. Place chocolate chips in bag 2.

SCIENTIFIC INQUIRY:

Cups, Spoons and Scales (continued)

Measuring oats

1. Measure $\frac{3}{4}$ cup of oatmeal.
2. Use the scale to measure the weight of $\frac{3}{4}$ cup of oatmeal.
3. Record the weight in the Kitchen Measurement Facts table.
4. Add the oatmeal to bag 2.
5. Seal the bag and shake lightly to mix.

Measuring brown sugar

1. Measure $\frac{3}{4}$ cup of brown sugar. Remember to use a spoon to pack the brown sugar into the measuring cup. Level off any extra ingredients.
2. Use the scale to measure the weight of $\frac{3}{4}$ cup of brown sugar.
3. Record the weight in the Kitchen Measurement Facts table.
4. Pour into bag 3 and seal the bag.

Kitchen Measurement Facts

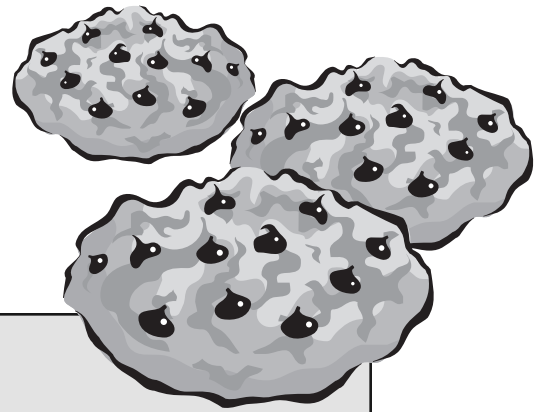
Ingredient	Weight in Ounces	Weight in Grams
1 cup of flour		
1 cup of chocolate chips		
$\frac{3}{4}$ cup of oatmeal		
$\frac{3}{4}$ cup of brown sugar		

Circle your answer:

Which is heavier? 1 cup of flour 1 cup of chocolate chips

One cup of oatmeal weighs (more than or less than) 1 cup of brown sugar.

SCIENTIFIC INQUIRY: **Liquid Measurement**



Your group will need:

- | | |
|---|------------------------------|
| 1 medium bowl (or large bowl) | Optional: eyedroppers |
| 1 set measuring spoons | 1 egg |
| 1 stirring spoon | 1/2 cup butter (softened) |
| 2 small spoons | 1 1/2 teaspoons water |
| Cookie sheet | 1/4 teaspoon vanilla extract |
| Storage bags 1, 2 & 3 from Cups, Spoons and Scales | |

Your teacher will demonstrate how to measure liquid ingredients and will preheat the oven to 350 degrees Fahrenheit. Then each group will make chocolate chip oatmeal cookies. Read all the directions before you begin.

Getting started

1. Your teacher will crack one egg and place it in your medium bowl.
2. Put 1/2 cup of butter (softened) into the medium bowl.

Measuring liquids

1. Measure 1 1/2 teaspoons of water and pour into the medium bowl.
2. Measure 1/4 teaspoon vanilla extract and pour into the medium bowl.

Mixing

1. Pour the brown sugar from bag 3 into the medium bowl.
2. Use the stirring spoon to mix all the ingredients together.
3. Add ingredients from bag 1 and stir until mixture is all one color.
4. Add ingredients from bag 2 and stir until mixture is all one color.

Preparing to bake

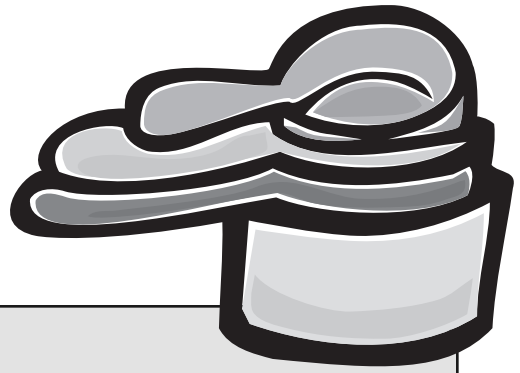
1. Take turns dropping spoonfuls of cookie dough onto the cookie sheet, leaving 1 to 2 inches between each clump.
2. Your teacher will bake your cookies in the oven for 12 minutes.

Tasting Time: (Circle your answer.)

My cookie looks:	good	ok	bad
My cookie tastes:	good	ok	bad

Did your group do a good job measuring the ingredients? Yes No
How can you tell?

WHILE YOU WAIT: Fractional Mathematics



Your group will need:

- | | |
|--------------------------|--------------------------------|
| 1 set dry measuring cups | Tray |
| 1 liquid measuring cup | 2 cups of water (in a pitcher) |

1. Fill the $\frac{1}{4}$ -cup with water. Pour the water into the liquid measuring cup. Count how many $\frac{1}{4}$ -cups it takes to fill the measuring cup up to the 1-cup line. Then pour the water back into the pitcher.

How many? _____

2. Fill the $\frac{1}{2}$ -cup with water. Pour the water into the liquid measuring cup. Count how many $\frac{1}{2}$ -cups it takes to fill the measuring cup up to the 1-cup line. Then pour the water back into the pitcher.

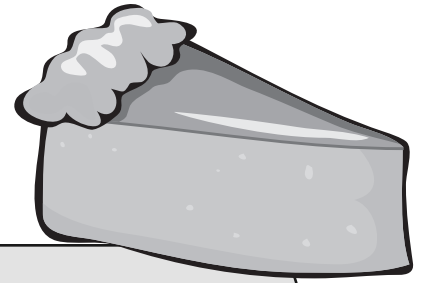
How many? _____

3. Fill the $\frac{1}{4}$ -cup with water. Pour the water into the liquid measuring cup. Count how many $\frac{1}{4}$ -cups it takes to fill the measuring cup up to the $\frac{1}{2}$ -cup line. Then pour the water back into the pitcher.

How many? _____

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} \text{ or } 1$$

TRY THIS AT HOME:
Oatmeal Cake



You will need:

1 cup quick oats
1 1/2 cups hot water
1 cup packed brown sugar
1 cup white sugar
1/2 cup butter
2 eggs

PREP TIME: 20 minutes

1 1/3 cups flour
1 teaspoon salt
1 teaspoon baking soda
1 teaspoon cinnamon
Help from an adult

For Frosting:

1/3 cup packed brown sugar 1/2 cup sweetened condensed milk
6 tablespoons melted butter 2/3 cup flaked coconut
1 teaspoon vanilla

Measure up a tasty treat!

1. In a small bowl, mix the oats and hot water. Let stand for 20 minutes.
2. Spray a 9 x 13 inch pan with cooking spray. Preheat the oven to 350 degrees Fahrenheit.
3. Pour the brown sugar, white sugar and butter into a large bowl and cream (mix) using a mixer. Add the eggs and beat until smooth.
4. Pour the flour, salt, baking soda and cinnamon into a medium bowl. Mix and add to the sugar and egg mixture. Add the soaked oats and mix.
5. Pour mixture into the 9 x 13 pan and bake in oven for 35-40 minutes. The cake is done when inserted toothpick comes out clean.
6. Prepare frosting while cake is baking. Mix the 1/3 cup brown sugar, melted butter, vanilla, sweetened condensed milk and coconut in a small bowl.
7. While cake is still warm, carefully spread frosting on top.

SERVING SIZE: 1/18 of cake

Fun Fact

Good measuring will lead to a tasty treat. Use dry measuring cups to measure the oats, sugar and flour. Remember to fill the cup up completely and level off with a flat edge. Be sure to pack the brown sugar down into the cup. Use liquid measuring cups to measure the water and sweetened condensed milk. Fill liquids up to the correct line on the cup. Do not confuse the teaspoon and tablespoon.

Proficiency Questions

Circle the best answer:

1. What is the object in the picture?

- a. a liquid measuring cup
- b. a dry measuring cup
- c. a liquid measuring spoon
- d. a dry measuring spoon



2. Which measuring cup is the smallest?

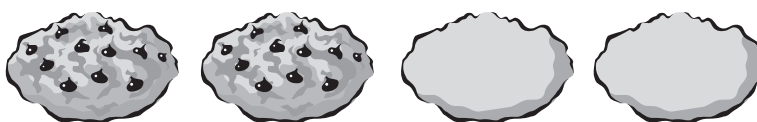
- a. $\frac{1}{4}$ cup
- b. $\frac{1}{2}$ cup
- c. 1 cup
- d. 2 cup

3. How do you measure 1 cup of brown sugar?

- a. pour the brown sugar into a liquid measuring cup
- b. sprinkle the brown sugar into the 1 cup dry measuring cup
- c. pack the brown sugar into the 1 cup dry measuring cup
- d. pour the brown sugar into a tablespoon

4. What fraction of the cookies are chocolate chip?

- a. $\frac{1}{4}$
- b. $\frac{2}{1}$
- c. $\frac{2}{2}$
- d. $\frac{1}{2}$



5. Which do you measure using a measuring cup?

- a. height
- b. length
- c. weight
- d. volume

6. If you don't have a one-cup dry measure, but you need 1 cup of flour, how can you measure 1 cup?

- a. fill the $\frac{1}{2}$ cup four times
- b. fill the $\frac{1}{8}$ cup four times
- c. fill the $\frac{1}{4}$ cup two times
- d. fill the $\frac{1}{2}$ cup two times