

Measurement Skills

COOKING requires measurement skills. If a recipe calls for 175 mL of milk, but you have only a standard measuring cup, how can you be sure you're adding the correct amount? To follow a recipe accurately, cooks need to understand customary and metric measurements and be able to convert between the two. In this case, you would know that 175 mL equals $\frac{3}{4}$ c. If you simply guessed and added 2 cups of milk, the recipe likely would be ruined. In this unit, you will learn more about measurements and equivalencies commonly used in cooking and baking.



Objective:



Identify measurement units and tools.

Key Terms:



baker's balance scale
customary units
digital scale

ladle
metric units
scoop

volume
weight

Measurement Skills

Customary units are the standard units of measurement used mainly in the United States for volume, weight, temperature, and length. **Metric units** are the standard units of measurement used mainly in countries other than the United States for volume, weight, temperature, and length. Metric units are based on powers of 10.

Volume is the amount of space an item or an ingredient takes up. The customary volume units and their abbreviations are teaspoon (tsp. or t.), tablespoon (Tbsp. or T.), cup (c.), fluid ounce (fl. oz.), pint (pt.), quart (qt.), and gallon (gal.). Metric units and abbreviations are milliliter (mL) and liter (L).

Weight is a measurement of the heaviness of an object or an ingredient. The customary weight units and abbreviations are ounce (oz.) and pound (lb. or #). The metric weight units and abbreviations are milligram (mg), gram (g), and kilogram (kg).

In the United States, temperature is measured in degrees Fahrenheit ($^{\circ}\text{F}$). The freezing point of water is 32°F . The boiling point of water is 212°F . In countries that use the metric system, temperature is measured in degrees Celsius ($^{\circ}\text{C}$). On the Celsius scale, the freezing point of water is 0°C , and the boiling point of water is 100°C .

Customary units of length and their abbreviations are inch (in.), foot (ft.), and yard (yd.). Metric units and abbreviations are millimeter (mm), centimeter (cm), and meter (m).

Using the proper tools is important to ensure you are measuring ingredients accurately. To measure a dry ingredient, such as sugar or baking soda, fill the proper measuring spoon or nested measuring cup with the ingredient. Customary units for dry measuring cups include $\frac{1}{4}$ c., $\frac{1}{3}$ c., $\frac{1}{2}$ c., and 1 c. Metric units for measuring cups include 50 mL, 125 mL, and 250 mL. When the spoon or cup is filled, level off the top with the straight edge of a spatula. Make sure the entire amount of the ingredient is removed from the measuring spoon or cup by using a scraper or a rubber spatula.

A measuring cup for liquid ingredients is made of glass or plastic and has a spout. Place the measuring cup on a level surface, pour the liquid into the cup, and check the measurement at eye level. Customary units for measuring cups include 1 c., 2 c., 1 qt., and 2 qt., although each cup is able to measure smaller amounts. Metric units for measuring cups include 250 mL and 500 mL.



FIGURE 1. The boiling point of water is 212°F , which is the equivalent of 100°C .

EQUIVALENCIES IN COOKING

There may be times when you are reading a recipe that lists metric measurements for ingredients when you have only customary measuring cups. Likewise, if you have no $\frac{1}{8}$ -cup measuring cup, you may need to measure that amount using a tablespoon. In either case, you need to know the equivalencies for volume to make accurate measurements. Just as important is understanding the equivalencies for weight and temperature when cooking.

Volume equivalencies for customary and metric dry ingredients are shown in Table 1.

TABLE 1. Volume Equivalencies for Customary and Metric Dry Ingredients

Measure	Customary	Metric
1 tsp.	—	5 mL
1 Tbsp.	3 tsp.	15 mL
$\frac{1}{8}$ c.	2 Tbsp.	30 mL
$\frac{1}{4}$ c.	4 Tbsp.	50 mL
$\frac{1}{3}$ c.	$5\frac{1}{3}$ Tbsp.	75 mL
$\frac{1}{2}$ c.	8 Tbsp.	125 mL
$\frac{2}{3}$ c.	$10\frac{2}{3}$ Tbsp.	150 mL
$\frac{3}{4}$ c.	12 Tbsp.	175 mL
1 c.	16 Tbsp. = 8 fl. oz.	250 mL
1 fl. oz.	2 Tbsp.	29.574 mL
1 pt.	2 c. = 16 fl. oz.	473 mL
1 qt.	2 pt. = 4 c. = 32 fl. oz.	951 mL
$\frac{1}{2}$ gal.	2 qt. = 8 c. = 64 fl. oz.	1.89 L
1 gal.	4 qt. = 16 c. = 128 fl. oz.	3.8 L

Weighing ingredients always provides a more accurate ingredient amount than measuring volume, especially for ingredients such as flour, which may be packed tightly or sifted lightly into a measuring cup. There are 16 ounces in a pound; so if you need $\frac{1}{4}$ pound of butter for a recipe, carefully weigh out 4 ounces. You can also convert customary units to metric units, and vice versa, if necessary. One ounce is equal to 28.35 grams, and 1 kilogram is equal to 2.21 pounds.

Temperature can be converted between Fahrenheit and Celsius. To change from Fahrenheit to Celsius, subtract 32 from the Fahrenheit temperature, and then multiply by $\frac{5}{9}$. To change from Celsius to Fahrenheit, multiply the Celsius temperature by $\frac{9}{5}$, and then add 32.

$$72^{\circ}\text{F} = 22^{\circ}\text{C} \quad (72 - 32 = 40 \times \frac{5}{9} = 22.22, \text{ which is rounded down to } 22)$$

$$35^{\circ}\text{C} = 95^{\circ}\text{F} \quad (35 \times \frac{9}{5} = 63 + 32 = 95)$$

MEASURING TOOLS

A **scoop**, or disher, is used to serve a soft food, such as ice cream, mashed potatoes, or butter. You can use a scoop to control the size of a portion, such as the amount of tuna salad that goes onto a sandwich. Numbers on the scoop indicate how many level scoops equal 1 quart. If

the scoop has a number 8, for example, it would take 8 scoops to equal 1 quart. Larger scoops have smaller scoop numbers. Common scoop sizes include:

- ◆ #6 = $\frac{2}{3}$ c.
- ◆ #8 = $\frac{1}{2}$ c.
- ◆ #10 = $\frac{3}{8}$ c.
- ◆ #12 = $\frac{1}{3}$ c.
- ◆ #16 = $\frac{1}{4}$ c.
- ◆ #100 = 2 tsp.

A **ladle** measures volume in fluid ounces and is used for serving soups, sauces, and gravies. The number of ounces a ladle holds is stamped on the handle. Common ladle sizes include 12, 8, and 4 ounce.

You need a scale to measure weight. A **baker's balance scale** has two platforms that use a counterbalance to measure the weight. A **digital scale** is spring loaded and provides a digital readout of the weight.

MEASURING METHODS

For accuracy, some ingredients need to be measured in specific ways. For example, it is necessary to spoon flour lightly from its container into a measuring cup rather than scooping the flour out of the container with the measuring cup. Be careful not to shake down or pack the flour. Then use a spatula or straightedge to level off the measure. If a recipe calls for a heaping cup, create a moderate heap, and do not level it off. One cup of accurately measured all-purpose flour should weigh about 112 grams.

Granulated sugar should be spooned into a cup and leveled with a straightedge. Brown sugar should usually be packed into the measuring cup. The sugar should retain the shape of the cup when it is removed. Powdered sugar is usually sifted into the measuring cup and then leveled with a straightedge.

Use only a liquid measuring cup for liquids and oils. View the measuring cup at eye level as you pour in the liquid to get an accurate measurement. The measurement should be on the line, not above or below it. Flavorings, such as vanilla



FIGURE 2. Nested plastic measuring cups are often used to measure dry ingredients, such as flour or sugar.

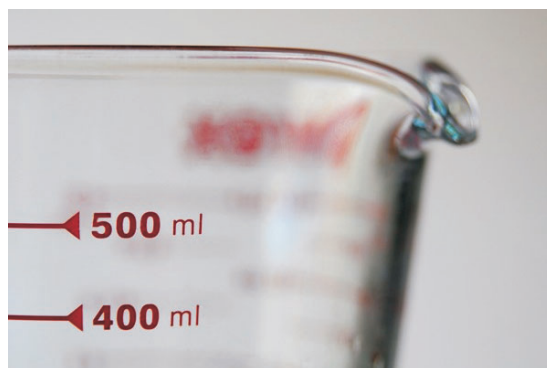


FIGURE 3. A glass or plastic measuring cup with a spout should be used to measure liquids and oils.



UNDER INVESTIGATION...

LAB CONNECTION: Measuring Flour

In this unit, you have learned that using proper tools is important in getting accurate measurements. Now it is time to put that theory to the test. Does it really matter what type of tool you use to measure flour? Conduct a simple experiment to find out. You will need a scale, a sifter, a tablespoon, a writing utensil, paper, a straightedge, a 1-cup measuring cup for dry ingredients, and a 1-cup measuring cup for liquid ingredients. You will then measure 1 cup of flour in a variety of ways and weigh the flour from each method individually. Record the weight, and clear the scale after each measurement. See if and how the weight of the flour differs.

- First, measure 16 tablespoons of flour onto the scale, and weigh it.
- Second, lightly spoon flour into the measuring cup for dry ingredients. Dump the contents onto the scale, and weigh it.
- Third, sift flour into the same measuring cup. Dump the contents onto the scale, and see if sifting affects the weight.
- Fourth, use the same measuring cup, but dip it into the flour container, and scoop out 1 cup. Pack it down, and level it off with a straightedge. Dump the contents onto the scale, and weigh it.
- Finally, scoop flour into a measuring cup meant for liquids, and then dump and weigh the contents.

Compare your findings. Were the weights equal? If not, which one was heaviest (meaning it contained the most flour)? Which was lightest?

extract, should be measured away from the mixing bowl. If you spill extra flavoring into the mixture, you may ruin the whole recipe.

Some butter, margarine, and shortening have measuring marks on their wrappers. One-fourth pound of butter is equal to $\frac{1}{2}$ cup. You can use the liquid displacement method to measure bulk solid fats. If you need 1 cup of shortening, for example, fill a 2-cup measuring cup with 1 cup of water. Then add shortening until the water reaches the 2-cup level. Pour off the water, and you will be left with 1 cup of the shortening.

Herbs often need to be packed into the measuring cup to avoid large air gaps. Read the recipe carefully to determine if such ingredients should be measured before or after chopping. If you measure after chopping, place them into the measuring cup, and level them off.

Summary:



Customary units are the standard units of measurement used mainly in the United States for volume, weight, temperature, and length. Metric units are the standard units of measurement used mainly in countries other than the United States for

volume, weight, temperature, and length. You can convert measurements for volume and weight from customary to metric, and vice versa, when you know some common equivalencies. It is important to use the proper measurement tools, such as scoops and scales. Measure dry ingredients with a measuring cup designed for that purpose. Use a graduated measuring cup with a spout for liquids.

Checking Your Knowledge:



1. What are customary units of measure?
2. What are the metric units of measure?
3. How do you properly measure dry ingredients?
4. How do you properly measure liquid ingredients?
5. What are the customary and metric measurement equivalencies?

Expanding Your Knowledge:



Interview a cook or baker about the importance of accurate measurements. Do some recipes require less accuracy than others? Find out whether the cook measures every ingredient every time or whether he or she occasionally “eyeballs it” to estimate the amount. Ask the cook to show you or describe the measuring tools he or she uses daily.

Web Links:



Baking Measurements

<http://www.kswheat.com/assets/Baking%20Labs%20-%201/Baking%20Labs%203/Baking%20measurements%20and%20substitutions.pdf>

Flour Conversions

<http://convert-to.com/flour-types-volume-weight-amounts-conversion>

Measuring Cups and Spoons

<http://www.creative-cake-decorating.com/measuring-cups-and-spoons.html>