**Imperial and U.S. Systems of Measurement**

Canada used the U.S. and imperial systems of measurement until 1971 when the S.I. or metric system was declared the official measuring system for Canada, which is now in use in most of the world, with the United States being the major exception. However, “declaring” and “truly adopting” are not always the same.

Because of Canada’s strong ties to the United States, a lot of our food products come from across the border, and many Canadian producers also sell in the U.S. market. This is one of the main reasons Canadians need to know how to work in both systems. Most Canadian packages include both Canadian and U.S. or imperial measurements on the label, and many suppliers still quote prices in cost per pound instead of cost per kilogram.

The most commonly used units of measurement in the U.S. and imperial systems are shown in Table 6.

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| **Table 6: U.S. and imperial units of measurement** | | |
| **Type of Measurement** | **Unit** | **Abbreviation** |
| Weight | Pound | lb. or # |
| Weight | Ounce | oz. |
| Volume | Gallon | gal. |
| Volume | Quart | qt. |
| Volume | Pint | pt. |
| Volume | Cup | c. |
| Volume | Fluid ounce | fl.oz. or oz. |
| Volume | Tablespoon | Tbsp. or tbsp. |
| Volume | Teaspoon | tsp. |
| Length | Mile | m. |
| Length | Yard | yd. |
| Length | Foot | ft. or  ′ |
| Length | Inch | in. or  ″ |

**Note:** There is sometimes confusion about the symbol #. When # is used in front of a number, such as in #10, the # is read as the word *number*. Thus, #10 is read as *number 10*. When the # follows a number, the # is read as *pounds*. Thus, 10# is read as *10 pounds*.

**Differences between the U.S. and Imperial Systems**

The only difference between the imperial system and the U.S. system is in volume measurements. Not only are the number of ounces in pints, quarts, and gallons all larger in the imperial system, the size of one fluid ounce is also different, as shown in the table in Table 7.

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| **Table 7: Differences between U.S. and imperial volume measurements** | | | | |
| **Unit of Measurement** | **Imperial System** | **Metric Equivalent** | **U.S. System** | **Metric Equivalent** |
| 1 ounce | 1 (fluid) oz. | 28.41 mL | 1 (fluid) oz. | 29.57 mL |
| 1 gill | 5 (fluid) oz. | 142.07 mL | Not commonly used |  |
| 1 cup | Not commonly used |  | 8 (fluid) oz. | 236.59 mL |
| 1 pint | 20 (fluid) oz. | 568.26 mL | 16 (fluid) oz. | 473.18 mL |
| 1 quart | 40 (fluid) oz. | 1.137 L | 32 (fluid) oz. | 946.36 mL |
| 1 gallon | 160 (fluid) oz. | 4.546 L | 128 (fluid) oz. | 3.785 L |

Where you will notice this most is with any liquid products manufactured in Canada; these products will show the metric conversion using imperial measurement, but any products originating in the United States will show the conversion using U.S. measurements. For example, if you compare 12 fl. oz. bottles or cans of soft drinks or beer, you will see that American brands contain 355 mL (12 fl. oz. U.S.) and Canadian brands contain 341 mL (12 fl. oz. imperial).

If you are using a recipe written in cups and ounces, always verify the source of your recipe to determine if it has been written using the U.S. or imperial system of measurement. The difference in volume measurements can be quite noticeable when producing large quantities.

If the recipe is from the United States, use U.S. measurements for the conversion, if the recipe originated in the United Kingdom, Australia, or any other country that was once part of the British Empire, use imperial for the conversion.

**Converting between Units in the Imperial and U.S. Systems**

On occasion, you may need to convert between the various units of volume and between units of volume and units of weight in the U.S. system. To do this, you must know the equivalents for each of the units as shown in Table 8.

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| **Table 8: Equivalent measures within the U.S. and Imperial system** | |
| **Types of Measurement** | **Conversion** |
| Weight | 1 pound = 16 ounces |
| Volume (U.S.) | 1 gallon = 4 quarts or 128 (fluid) ounces |
| Volume (U.S.) | 1 quart = 2 pints or 4 cups or 32 (fluid) ounces |
| Volume (U.S.) | 1 pint = 2 cups or 16 (fluid) ounces |
| Volume (U.S.) | 1 cup= 8 (fluid) ounces or 16 tablespoons |
| Volume (U.S.) | 1 (fluid) ounce = 2 tablespoons |
| Volume (U.S.) | 1 tablespoon = 3 teaspoons |
| Volume (imperial) | 1 gallon = 4 quarts or 160 (fluid) ounces |
| Volume (imperial) | 1 quart = 2 pints or 40 (fluid) ounces |
| Volume (imperial) | 1 pint = 20 (fluid) ounces |
| Volume (imperial) | 1 gill = 5 (fluid) ounces or 10 tablespoons |
| Volume (imperial) | 1 (fluid) ounce = 2 tablespoons |
| Volume (imperial) | 1 tablespoon = 3 teaspoons |
| Length | 1 mile = 1760 yards |
| Length | 1 yard = 3 feet |
| Length | 1 foot = 12 inches |

**Note:** One fluid ounce (usually called, simply, *ounce*) of water weighs approximately one ounce*.*

To convert from one unit to another, you either divide or multiply, depending on whether you are converting a smaller unit to a larger one, or a larger unit or to a smaller one.

Converting Smaller to Larger Units

To convert from a smaller to a larger unit, you need to divide. For example, to convert 6 tsp. to tablespoons, divide the 6 by the number of teaspoons in one tablespoon, which is 3 (see Table 8).

6 tsp    = \_\_ tbsp.

6 ÷ 3       = 2

6 tsp.   = 2 tbsp.

To convert ounces to cups, you need to divide by 8 since there are 8 oz. in 1 cup. For example, if you need to convert 24 oz. to cups, you have to divide 24 by 8.

24 oz.  = \_\_ cups

24 ÷ 8     = 3

24 oz.  = 3 cups

Converting Larger to Smaller Units

To change larger units to smaller, you have to multiply the larger unit by the number of smaller units in that unit. For example, to convert quarts to pints, you have to multiply the number of quarts by 2 because there are 2 pts. in 1 qt. Therefore, to convert 6 qts. to pints you need to multiply:

6 qts.   = \_\_ pts.

6 × 2    = 12

6 qts.   = 12 pts.

To convert cups to tablespoons, you need to multiply by 16 since there are 16 tbsp. in 1 cup.

3/4 cup            = \_\_ tbsp.

16 × 3/4           = 12

3/4 cup            = 12 tbsp.

**Converting between Metric and Imperial/U.S. Measurement Systems**

You can convert between metric and imperial or U.S. measurements with straightforward multiplication or division if you know the conversion **ratios.** Table 9.1 and 9.2 are a good reference, but there are also many online converters or apps available to make this task easier.

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| **Table 9.1: Convert from metric to imperial/U.S.** | | |
| **When you know** | **Divide by** | **To get** |
| millilitres | 4.93 | teaspoons |
| millilitres | 14.79 | tablespoons |
| millilitres | 28.41 | fluid ounces (imperial) |
| millilitres | 29.57 | fluid ounces (U.S.) |
| millilitres | 236.59 | cups |
| litres | 0.236 | cups |
| millilitres | 473.18 | pints (U.S.) |
| litres | 0.473 | pints (U.S.) |
| millilitres | 568.26 | pints (imperial) |
| litres | 0.568 | pints (imperial) |
| millilitres | 946.36 | quarts (U.S.) |
| litres | 0.946 | quarts (U.S.) |
| millilitres | 1137 | quarts (imperial) |
| litres | 1.137 | quarts (imperial) |
| litres | 3.785 | gallons (U.S.) |
| litres | 4.546 | gallons (imperial) |
| grams | 28.35 | ounces |
| grams | 454 | pounds |
| kilograms | 0.454 | pounds |
| centimetres | 2.54 | inches |
| millimetres | 25.4 | inches |
| Celsius (Centigrade) | multiply by 1.8 and add 32 | Fahrenheit |

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| **Table 9.2: Convert from imperial/U.S. to metric** | | |
| **When you know** | **Multiply by** | **To get** |
| teaspoons | 4.93 | millilitres |
| tablespoons | 14.79 | millilitres |
| fluid ounces (imperial) | 28.41 | millilitres |
| fluid ounces (U.S.) | 29.57 | millilitres |
| cups | 236.59 | millilitres |
| cups | 0.236 | litres |
| pints (U.S.) | 473.18 | millilitres |
| pints (U.S.) | 0.473 | litres |
| pints (imperial) | 568.26 | millilitres |
| pints (imperial) | 0.568 | litres |
| quarts (U.S.) | 946.36 | millilitres |
| quarts (U.S.) | 0.946 | litres |
| quarts (imperial) | 1137 | millilitres |
| quarts (imperial) | 1.137 | litres |
| gallons (U.S.) | 3.785 | litres |
| gallons (imperial) | 4.546 | litres |
| ounces | 28.35 | grams |
| pounds | 454 | grams |
| pounds | 0.454 | kilograms |
| inches | 2.54 | centimetres |
| inches | 25.4 | millimetres |
| Fahrenheit | subtract 32 and divide by 1.8 | Celsius (Centigrade) |

Table 10 lists the most common U.S. measurements and metric units of measure, and their equivalents used in professional kitchens. Table 11 presents the conversion factors.

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| --- | --- | --- |
| **Table 10: Common Metric and U.S. conversions** | | |
| **Measurement type** | **Unit** | **Equivalent** |
| Length | 1 inch | 25.4 millimetres |
| Length | 1 centimetre | 0.39 inches |
| Length | 1 metre | 39.4 inches |
| Volume | 1 fluid ounce (U.S.) | 29.57 millilitres |
| Volume | 1 cup | 237 millilitres |
| Volume | 1 quart | 946 millilitres |
| Volume | 1 millilitre | 0.034 fluid ounces |
| Volume | 1 litre | 33.8 fluid ounces |
| Weight | 1 ounce | 28.35 grams |
| Weight | 1 pound | 454 grams |
| Weight | 1 gram | 0.035 ounce |
| Weight | 1 kilogram | 2.205 pounds |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 11: Metric and U.S. Equivalents and Conversions** | | | |
| **Measurement type** | **To convert** | **Multiply by** | **Result** |
| Length | Inches to millimeters | 25.4 | 1 inch = 25.4 mm |
| Length | Inches to centimetres | 2.54 | 1 inch = 2.54 cm |
| Length | Millimetres to inches | 0.03937 | 1 mm = 0.03937 in. |
| Length | Centimetres to inches | 0.3937 | 1 cm = 0.3937 in. |
| Length | Metres to inches | 39.3701 | 1m = 39.37 in. |
| Volume | Quarts to litres | 0.946 | 1 qt. = 0.946 L |
| Volume | Litres to fluid ounces (U.S.) | 33.8 | 1 L = 33.8 oz. |
| Volume | Quarts to millilitres | 946 | 1 qt. = 946 mL |
| Volume | Millilitres to ounces | 0.0338 | 1 mL = 0.0338 oz. |
| Volume | Litres to quarts | 1.05625 | 1 L = 1.05625 qt. |
| Weight | Ounces to grams | 28.35 | 1 oz. = 28.35 g |
| Weight | Grams to ounces | 0.03527 | 1 g = 0.03527 oz. |
| Weight | Kilograms to pounds | 2.2046 | 1 kg = 2.2046 lb. |

**Soft Conversions**

Many times, cooks will use what are called “soft conversions” rather than exact conversions, especially in small batch recipes where a slight variation can be tolerated, as it is often difficult to measure very fine quantities using liquid measures. This is a shortcut that can be used if you are faced with only a set of metric measuring tools and a U.S. recipe (or vice versa). Table 12 lists the common soft conversions.

|  |  |
| --- | --- |
| **Table 12: Soft conversions** | |
| **Metric** | **U.S. Measurements** |
| 1 millilitre | 1/4 teaspoon |
| 2 millilitres | 1/2 teaspoon |
| 5 millilitres | 1 teaspoon |
| 15 millilitres | 1 tablespoon |
| 30 millilitres | 1 fluid ounce |
| 250 millilitres | 1 cup |
| 500 millilitres | 1 pint |
| 1 litre | 1 quart |
| 4 litres | 1 gallon |

**Types of Measurements Used in the Kitchen**

There are three types of measurements used to measure ingredients and to serve portions in the restaurant trade. Measurement can be by volume, by weight, or by **count.**

Recipes may have all three types of measurement. A recipe may call for 3 eggs (measurement by count), 250 mL of milk (measurement by volume), and 0.5 kg of cheese (measurement by weight).

There are formal and informal rules governing which type of measurement should be used. There are also specific procedures to ensure that the measuring is done accurately and consistently.

Number or Count

Number measurement is only used when an accurate measurement is not critical and the items to be used are understood to be close in size.

For example, “3 eggs” is a common measurement called for in recipes, not just because 3 is easy to count but also because eggs are graded to specific sizes. Most recipes call for large eggs unless stated otherwise.

Numbers are also used if the final product is countable. For example, 24 premade tart shells would be called for if the final product is to be 24 filled tart shells.

Volume

Volume measurement is usually used with liquids or fluids because such items are awkward to weigh. It is also used for dry ingredients in home cooking, but it is less often used for dry measurement in the industry.

Volume is often the measure used when portioning sizes of finished product. For example, portion scoops are used to dole out vegetables, potato salad, and sandwich fillings to keep serving size consistent. Ladles of an exact size are used to portion out soups and sauces.

Often scoops and ladles used for portioning are sized by number. On a scoop, such a number refers to the number of full scoops needed to fill a volume of one litre or one quart. Ladles are sized in millilitres or ounces.

Weight

Weight is the most accurate way to measure ingredients or portions. When proportions of ingredients are critical, their measurements are always given in weights. This is particularly true in baking where it is common to list all ingredients by weight, including eggs (which, as mentioned earlier, in almost all other applications are called for by count). Whether measuring solids or liquids, measuring by weight is more reliable and consistent.

Weighing is a bit more time consuming and requires the use of scales, but it pays off in accuracy. Digital portion scales are most commonly used in industry and come in various sizes to measure weights up to 5 kg (11 lbs.). This is adequate for most recipes, although larger operations may require scales with a larger capacity.

The reason weight is more accurate than volume is because it takes into account factors such as density, moisture, and temperature that can have an effect on the volume of ingredients. For example, 250 mL (1 cup) of brown sugar (measured by volume) could change drastically depending on whether it is loosely or tightly packed in the vessel. On the other hand, 500 grams (17.63 oz.) of brown sugar, will always be 500 grams (17.63 oz.).

Even flour, which one might think is very consistent, will vary from location to location, and the result will mean an adjustment in the amount of liquid needed to get the same consistency when mixed with a given volume.

Another common mistake is interchanging between volume and weight. The only ingredient that will have the same volume and weight consistently is water: 1 L of water = 1 kg of water.

There is no other ingredient that can be measured interchangeably because of gravity and the density of an item. Every ingredient has a different density and different gravitational weight, which will also change according to location. This is called **specific gravity.** Water has a specific gravity of 1.0. Liquids that are lighter than water (such as oils that float on water) have a specific gravity of less than 1.0. Those that are heavier than water and will sink, such as molasses, have a specific gravity greater than 1.0. Unless you are measuring water, remember not to use a volume measure for a weight measure, and vice versa.

Example 4

1 L water = 1 kg water

1 L water + 1 L canola oil = 2 L of water and oil mixture (volume)

1 L water + 1 L canola oil = 1.92 kg (weight)

In order to convert your existing recipes that only call for volume measurement to weight, you will need to measure each ingredient by volume, weigh it, and then record the amount in your recipe. There are also tools that can help with this conversion.

* [Aqua-calc: Online Food Calculator](http://www.aqua-calc.com/calculate/food-volume-to-weight) is an online calculator has an extensive database of foods and can convert from volume to weight in both the metric and U.S. measuring systems.
* [Lee Valley Kitchen Calculator](http://www.leevalley.com/en/garden/page.aspx?c=&cat=2,40733,40734&p=58726) is a conversion calculator has the capacity to convert between weight and volume. It comes with an attached list of ingredients and their specific gravitational weights. It is, however, a list of only the most common ingredients and will not likely cover everything that a commercial kitchen uses.