

## Appendix

# E

# Converting English and Metric Recipes

**In this chapter, you will learn the following to World Class standards:**

- Knowing the English to Metric Conversion
- Making the Mathematical Conversion Between Systems
- Converting an English Units Recipe to Metric Units
- Converting an Metric Units Recipe to English Units
- Solve Real Kitchen Exercises

# Lesson E-1: Converting an English Unit Recipe to Metric

In chapter 5, we decreased recipes for smaller numbers of meals and we increased the list of ingredients for larger parties. Both techniques are very useful to culinarians, so we can adjust a standard recipe and efficiently provide the correct amount of sustenance for the people eating from our kitchens. In this segment of the textbook, we will convert recipes to Metric units and then reverse our efforts by translating Metric recipes to English units.

The following table shows the comparison of volume, weight and length measurements and the conversion factors used between the two systems. We will refer to the table throughout the translation process.

English to Metric Conversions			
	English	Metric	Conversion
<b>Volume</b>	Gallon, half gallon, quart, pint, cup, 1/2 cup, 1/4 cup, fluid ounce, tablespoon, teaspoon	Kiloliter, Liter, milliliter	1 Liter = 33.81 fl. oz. 1 tbsp = 15 ml 1 tsp = 5ml 1 cup = 236.6 ml
<b>Weight</b>	Pound, ounce, ton	Kilogram, gram	28.35 grams = 1 oz 2.205 lbs = 1 kg
<b>Length</b>	Inches, feet, yards, miles	Kilometers, meters, centimeters, millimeters	2.54 cm = 1 inch, 39.37 inches = 1 meter 1 mile = 1.609 km

In an English recipe, we will see volumes such as gallons, quarts, pints, cups, fluid ounces, tablespoons and teaspoons. The metric unit we will switch to is Liters. Although there are several reasonable prefixes available for kitchen size measurements, the most popular is the milliliter (mL) and the Liter (L) itself. The liter contains 33.81 fluid ounces, which is very close to the U.S. quart of 32 fluid ounces. The abbreviation for the liter is capital “L” and for the milliliter “mL”.

In other ingredients in our formulations is the English weight unit such as pounds and ounces. The metric unit that we will make the adaptation to is the kilogram (kg) or gram (g). The **gram** is the standard unit of mass in the metric system. In the U.S., we measure a product by weight using the pound in the English system, and the rest of the people in the world measures by mass using grams. Now, this difference is of no consequence on the planet Earth since we have the same gravity, however the difference would be

dramatically changed when serving meals on the International Space Station. In other words, the pound is gravity driven and the gram is not.

There are 28.35 grams in an ounce and we measure 2.205 lbs in a kilogram. The most common uses of the metric volume measurement is the kilogram (kg) and gram (g) The abbreviation for the gram is a lower case “g” and for kilogram “kg”.

The next consideration that happens from meal to meal is for us to convert English lengths to Metric. We will find that we have a measurement in inches or feet and we will need to change the length to millimeters (mm), centimeters (cm) or meters. The abbreviation for the meter is a lower case “m”, kilometer is “km”, centimeter is “cm” and millimeter is “mm”.

## Lesson E-2

# Converting between English and Metric Systems

When we need to convert from one system of measurement to another, we need a method to help us accomplish the task. The technique we will utilize is called the Unit – Factor method. In our first example, we will change 2 ½ gallons to liters. Place the 2 ½ gallons in the numerator over 1 in the denominator of the first fraction.

$$\frac{2\frac{1}{2} \text{ gal}}{1}$$

Since we know that one gallon equals 128 fluid ounces from chapter 2, we write 1 gallon in the denominator of the next fraction and the 128 fluid ounces in the numerator. In every case, each successive fraction in the conversion process, the numerator will be equivalent to the denominator.

$$\frac{2\frac{1}{2} \cancel{\text{gal}}}{1} \times \frac{128 \text{ fl.oz.}}{1 \cancel{\text{gal}}}$$

Now, we see that the gallons cross or divide each other and we have fluid ounces remaining, so we write 33.81 fluid ounces on the bottom of the next fraction and 1 liter at the top. We cross the fluid ounces out and the unit we have left is the liter.

$$\frac{2\frac{1}{2} \cancel{\text{gal}}}{1} \times \frac{128 \cancel{\text{fl.oz.}}}{1 \cancel{\text{gal}}} \times \frac{1 \text{ liter}}{33.81 \cancel{\text{fl.oz.}}}$$

## Math for Culinary Professionals

Now that we have the unit we desire, we compute the answer by multiplying across the top to get 320 and we multiply across the bottom to get 33.81. Divide 320 by 33.81 and we have 9.46465543 on our calculator. We round to a tenth of a liter and the six on the hundredths place is five and above, so we round the four up to five.

$$\frac{2\frac{1}{2}\cancel{gal}}{1} \times \frac{128\cancel{fl.oz}}{1\cancel{gal}} \times \frac{1\cancel{liter.}}{33.81\cancel{fl.oz}} = \frac{320}{33.81} = 9.5\text{liters}$$

When doing the work throughout the textbook and in our career, we do not have to cross out the units as shown in this example. We know that the units divide out and the numerator in last fraction is the unit we will write with the numeric value.

### Converting Pounds to Kilograms

When chef gives us the weight of a commodity such as 5 pounds of cheddar cheese and we would like to convert the measurement to kilograms, we need to divide the measurement by 2.205 since there are 2.205 pounds in a kilogram. In the conversion below, we can see the steps to change the pounds to kilograms.

$$\frac{5lb}{1} \times \frac{1kg}{2.205lb} = \frac{5}{2.205} = 2.28kg$$

So the formula for converting pounds to ounces is:

$$\frac{\text{_____} lb}{1} \times \frac{1kg}{2.205lb} = \text{_____} kg$$

And all we have to do is insert the pounds or pounds-decimal and divide by 2.205 to get the number of kilograms.

### Converting Ounces to Grams

At this moment, the executive chef wants four-ounce servings of cream cheese for the hors d'oeuvres, and we want to convert the ounces to grams. In this conversion, we will multiply the four ounces by a factor of 28.35 to get grams.

$$\frac{4oz}{1} \times \frac{28.35g}{1oz} = \frac{113.4}{1} = 113.4g$$

So the formula for converting ounces to grams is:

$$\frac{\text{---} \text{ oz}}{1} \times \frac{28.35 \text{ g}}{1 \text{ oz}} = \text{---} \text{ g}$$

Now that we have an idea about how to convert from one unit to another, we can attempt to convert our first recipe from English to Metric units.

## Lesson E-3: Converting a Recipe from English Units to Metric Units

The first recipe we will convert together is for Roasted Red Pepper / Fire Roasted Tomatoes Soup.

### Roasted Red Pepper / Fire Roasted Tomatoes Soup<sup>1</sup> – makes 20 – 1 cup servings

<b>2 tbsp</b>	<b>Olive oil</b>
<b>1</b>	<b>Lg. red onion, diced</b>
<b>8-10</b>	<b>Roasted red peppers (6 ½ c)</b>
<b>6</b>	<b>Garlic cloves</b>
<b>1 c</b>	<b>Dry white wine</b>
<b>10</b>	<b>Fire roasted tomatoes, chopped (4 ¼ c)</b>
<b>8 c</b>	<b>Chicken broth</b>
<b>2 tsp</b>	<b>Worcestershire sauce</b>
<b>2 tsp</b>	<b>Cayenne pepper</b>
<b>1 tbsp</b>	<b>Balsamic vinegar</b>

In this initial and simple calculation, we will change the Olive Oil from 2 tablespoons to milliliters (mL). We begin by writing the 2T in fraction format over 1 as shown below.

$$\frac{2T}{1}$$

Then we know from reviewing the conversion table that 1T equals 15 mL. Using the Unit Factor method, we write a multiplication sign (×), then add a second fraction with the denominator of T. The numerator will be milliliters (mL). Early in a culinary mathematician's career, we can flip the milliliters and tablespoons, which will result in an incorrect answer. In every case, the unit of measure in the denominator should match the numerator of the preceding fraction, so they can cross out during the computation.

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<sup>1</sup> Roasted Red Pepper / Fire Roasted Tomatoes Soup recipe by Ron Olzak, Chef Apprentice at the Columbus Culinary Institute

## Math for Culinary Professionals

$$\frac{2T}{1} \times \frac{\text{mL}}{1T}$$

Place the correct numeric value from the conversion table in the formula as shown below.

$$\frac{2T}{1} \times \frac{15 \text{ mL}}{1T}$$

Ingredients using counts convert to the same value throughout the world. One large red onion is the same in Europe, Africa, South America and Australia as in the United States.

As we can see below the new Metric amount is shown on the right side of the chart.

<b>Ingredient</b>	<b>English Amt.</b>	<b>Calculation</b>	<b>Metric Amount</b>
<b>Olive oil</b>	<b>2 tbsp</b>	$\frac{2T}{1} \times \frac{15 \text{ mL}}{1T}$	<b>30 mL</b>
<b>Lg. red onion</b>	<b>1</b>		<b>1 lg. red onion</b>
<b>Roasted red peppers</b>	<b>9</b>		<b>9 roasted red pepper</b>
<b>Garlic cloves</b>	<b>6</b>		<b>6 garlic cloves</b>
<b>Dry white wine</b>	<b>1 c</b>	$\frac{1c}{1} \times \frac{236.6 \text{ mL}}{1c}$	<b>236.6 mL</b>
<b>Fire roasted tomatoes</b>	<b>10</b>		<b>10 fire roasted tomato</b>
<b>Chicken broth</b>	<b>8 c</b>	$\frac{8c}{1} \times \frac{236.6 \text{ mL}}{1c} \times \frac{1L}{1000 \text{ mL}}$	<b>1.893 L</b>
<b>Worcestershire sauce</b>	<b>2 tsp</b>	$\frac{2 \text{ tsp}}{1} \times \frac{5 \text{ mL}}{1 \text{ tsp}}$	<b>10 mL</b>
<b>Cayenne pepper</b>	<b>2 tsp</b>	$\frac{2 \text{ tsp}}{1} \times \frac{5 \text{ mL}}{1 \text{ tsp}}$	<b>10 mL</b>
<b>Balsamic vinegar</b>	<b>1 tbsp</b>	$\frac{1T}{1} \times \frac{15 \text{ mL}}{1T}$	<b>15 mL</b>

As, we can see above, we convert the chicken broth to Liters by dividing the milliliters by 1000. 1863 milliliters equals 1.893 Liters.

## Practice Problems

Chef Bennett wants us to convert the Crostinis recipe from English to Metric

### For Portabellas:

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20 ea.      Portabella Mushrooms

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1 ½ Cups    Balsamic Vinaigrette

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### Feta Cheese Spread:

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3 - 5.2 oz.  
Wheels      Boursin Cheese

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¾ cup      Feta Cheese

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¼ cup      Heavy Cream

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### Red Pepper/Onion Marmalade:

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1 ea.      Red Pepper

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1 ea.      White Onion

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1 ½ Cups    Rice Wine Vinegar

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1 ½ Cups    Sugar

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## Lesson E-4

# Converting a Recipe from Metric Units to English Units

Chef Bennet now wants us to change the recipe for Roasted Garlic and Pine Nut Butter from Metric to English units. The recipe that yields 2.5 Liters is shown below and we will follow similar steps in the previous solution except, the final answers will be English units.



**Roasted Garlic and Pine Nut Butter**  
Yield: 2.5 Liters

### Ingredients:

1.36 kg	Butter (softened)
300 mL	Roasted Garlic
500 mL	Pine Nuts (toasted)
10 mL	Salt
10 mL	White Pepper

### Method:

Mix butter in a robot coupe until smooth. Add garlic, nuts, salt, and pepper. Serve at room temperature.

### To Roast Garlic:

Place garlic in a baking pan and cover with olive or salad oil. Cover tightly with aluminum foil. Roast at 375 degrees for 35-45 minutes until golden brown. Strain from the oil when cool and puree. You can save the flavored oil for dressings, dipping, or sautéing.

In this initial and simple calculation, we will change the Butter from 1.36 kg to pounds (lb). We begin by writing the 1.36 kg in fraction format over 1 as shown below.

$$\frac{1.36 \text{ kg}}{1}$$



## Math for Culinary Professionals

Then we know from reviewing the conversion table that 1 kg equals 2.205 lb. Using the Unit Factor method, we write a multiplication sign ( $\times$ ), then add a second fraction with the denominator of kg. The numerator will be pounds (lb). In every case, the unit of measure in the denominator should match the numerator of the preceding fraction, so they can cross out during the computation.

$$\frac{1.36 \text{ kg}}{1} \times \frac{\text{lb}}{\text{kg}}$$

Place the correct numeric value from the conversion table in the formula as shown below.

$$\frac{1.36 \text{ kg}}{1} \times \frac{2.205 \text{ lb}}{1 \text{ kg}}$$

As we can see below the new Metric amount is shown on the right side of the chart.

<b>Ingredient</b>	<b>Org. Amt.</b>	<b>Calculation</b>	<b>New Amount</b>
<b>Butter</b>	<b>1.36 kg</b>	$\frac{1.36 \text{ kg}}{1} \times \frac{2.205 \text{ lb}}{1 \text{ kg}}$	<b>3.0 lbs</b>
<b>Roasted Garlic</b>	<b>300 mL</b>	$\frac{300 \text{ mL}}{1} \times \frac{1 \text{ c}}{236.6 \text{ mL}} = 1.268 \text{ c}$	<b>1¼ c + ¾ tsp + 1 dash</b>
<b>Pine Nuts (toasted)</b>	<b>500 mL</b>	$\frac{500 \text{ mL}}{1} \times \frac{1 \text{ c}}{236.6 \text{ mL}} = 2.113 \text{ c}$	<b>2 c + 5½ tsp</b>
<b>Salt</b>	<b>10 mL</b>	$\frac{10 \text{ mL}}{1} \times \frac{1 \text{ tsp}}{5 \text{ mL}} = 2 \text{ tsp}$	<b>2 tsp</b>
<b>White Pepper</b>	<b>10 mL</b>	$\frac{10 \text{ mL}}{1} \times \frac{1 \text{ tsp}}{5 \text{ mL}} = 2 \text{ tsp}$	<b>2 tsp</b>

When we get answers like 1.268 cups, we could make the recipe 1¼ cups + ¾ tsp + 1 dash to be exact, however we could convert the answer to 1¼ cup. The same solution could be made for the 2.113 cups of pine nuts and change the final total to 2 cups. After making the converted recipe, we can determine the correct English measurements that will be easy to gauge and have the correct taste.

## Practice Problems

Chef Bennett wants us to convert the recipe for RonJohn's Meatloaf<sup>2</sup> from Metric to English.

### **RonJohn's Meatloaf: Serves 8**

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1 kg	Buffalo meat
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2 ea.	Large Egg
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125 mL	Italian bread crumbs
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125 mL	Red onion
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2	Cloves minced garlic
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3 mL	Dried oregano
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3 mL	Dried basil
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170 g	Prosciutto ham
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230 g	Provolone cheese
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250 mL	BBQ sauce
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30 mL	Mrs. Dash Seasoning
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<sup>2</sup> RonJohn's Meatloaf recipe by Ron Olzak, Chef Apprentice at the Columbus Culinary Institute