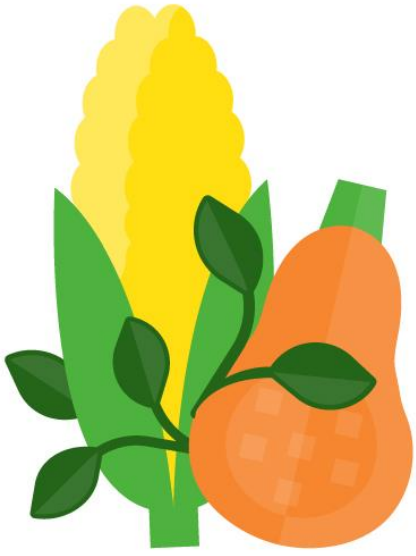
Appendix 1
Kitchen Math Booklet



All About Measuring in the Kitchen

What is a Unit?

A unit is a standard amount use to express a measurement. Units often come in systems; two common systems are the **imperial system** and the **metric system**. Different countries use different systems for expressing a measurement. For example, in Canada we measure temperature in degrees Celsius (°C) and distance in kilometres (km), while our American neighbours measure it in degrees Fahrenheit (°F) and distance in miles (mi).

When measuring food items, we typically measure the **volume** of the food. Recipes can be written in both the imperial system (teaspoon, tablespoon, cups, pints, quarts, gallons) or the metric system (millilitres or litres), which is why it is important to understand both.

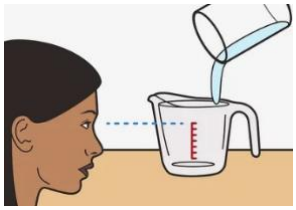
The right equipment for the job

There are three major pieces of equipment that are used to measure the volume of ingredients: (1) liquid measuring cups, (2) dry measuring cups, and (3) measuring spoons. Picking the right piece of equipment is based on if the food is a liquid ingredient, a dry ingredient, and the volume you are looking to measure.

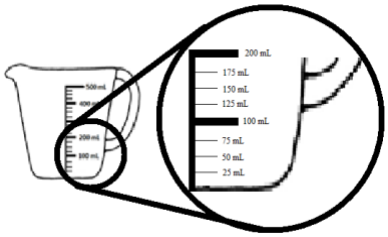
Liquid Measuring Cups

A liquid measuring cup is designed to measure the volume of liquid needed for a recipe, like water, milk, oil, or broth. Liquid measuring cups are typically made of glass and have a handle and a spout.

How to measure using a liquid measuring cup:



a. Place the measuring cup on a flat surface. Add the liquid to the desired measure.
b. Squat down to eye level with the measuring cup and, once the liquid stays still, make sure it is at the level of the mark you want.
c. Don't hold the measuring cup to check if it's level; if you move your hand, you won't be able to tell if you have the correct measurement.



When looking closely at the metric measurements on the liquid measuring cup, you will notice that inbetween each 100 mL there are three small dashes. These dashes indicate an addition of 25 mL.

Dry Measuring Cups

Dry measuring cups are used to measure dry ingredients, like flour, oats, or rice. They come in 4 standard sizes: 1 cup (250 mL), ½ cup (125 mL), ⅓ cup (80 mL), and ¼ cup (60 mL). The imperial measurements are first, followed by the metric measurements in brackets. Most foods should not be packed into a measuring cup, especially not flour. However, brown sugar is an exception and should always be packed down.

How to measure using a dry measuring cup:

a. Spoon ingredients into the measuring cup until it is overfilled.
b. Use the back of a butterknife to level it off.

Measuring Spoons

Measuring spoons can be used to measure both dry and liquid ingredients. However, they should **only be used to measure small amounts of ingredients**, like vanilla, baking soda, salt, or spices. Just like dry measuring cups, they come in standardized sizes.

To measure small amounts of dry ingredients, overfill the spoon and level using the back of a butterknife. To measure small amounts of liquid ingredients, pour in the liquid to the brim – be careful not to spill!

Note: find these answers in the previous article.

	Liquid Measuring Cup	Dry Measuring Cup	Measuring Spoons
1. Are these tools used for measuring liquid ingredients, dry ingredients, or both?			
2. List 3 examples of foods that you might measure using these tools.			
3. What are the steps you take to measure correctly?			

Fractions & the Imperial System

CUPS
1 cup (250 mL)
½ cup (125 mL)
⅓ cup (80 mL)
¼ cup (60 mL)
SPOONS
1 Tbsp (15 mL)
1 tsp (5 mL)
½ tsp (2.5 mL)
¼ tsp (1.25 mL)
⅛ tsp (0.67 mL)

Take a look at the bracketed numbers in the table. You will notice that the measurements are in metric (millilitres → mL) and are organized from a large volume at the top of the table, to a small volume of ingredients at the bottom of the table. If you were to convert these numbers to their imperial equivalents, you will get the unbracketed number in cups, Tbsp (tablespoons), or tsp (teaspoons).

The imperial system often uses **fractions** to show the volume. A fraction is a number that is less than one-whole. Commonly used fractions in cooking include one-half (½), one-third (⅓), one-quarter (¼) and one-eigth (⅛).

Sometimes we are asked to measure quantities that don't have '1' as the numerator or we don't have the correct measuring cup. If we were asked to measure two-thirds (⅔)'s of a cup, we would use our ⅓ measuring cup twice:

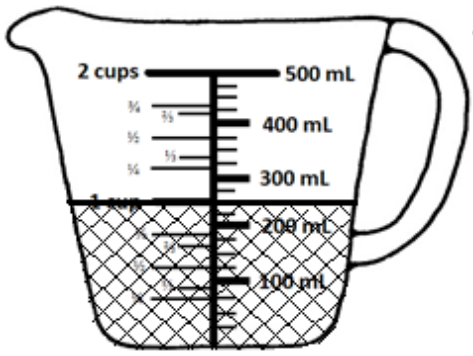
$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$

If we are asked to measure three-quarters (¾) of a cup, we could do this one of two ways:

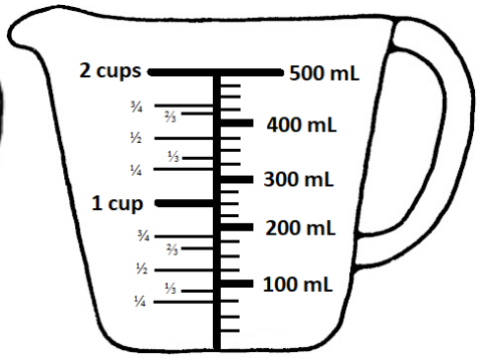
$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4} \qquad \text{OR} \qquad \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$$

Liquid Measuring Cups

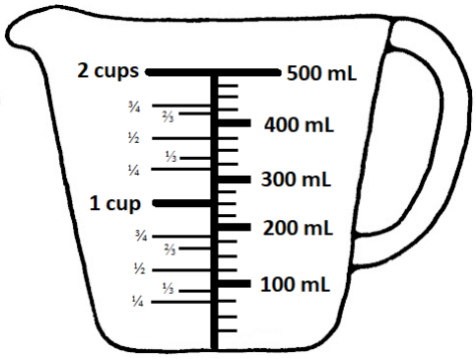
Instructions: Colour in the liquid measuring cup with the correct volume of 'liquid'!



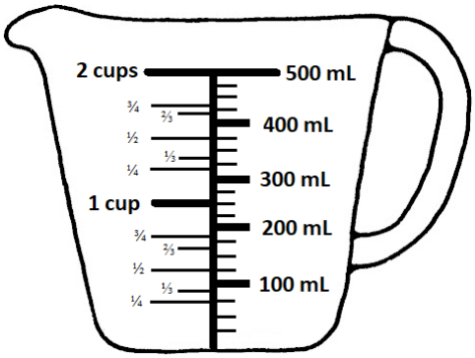
Example: 1 cup



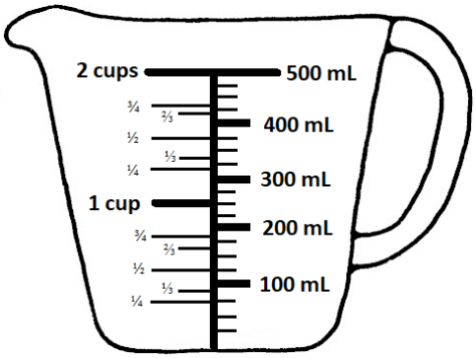
1 ½ cup of yellow



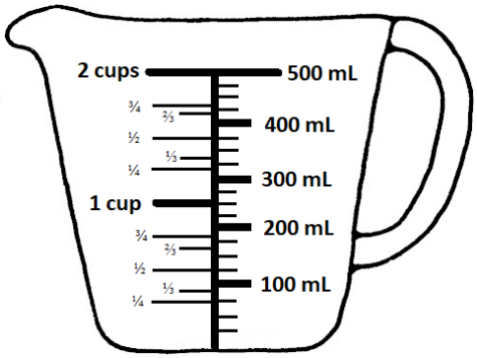
¾ cup of red



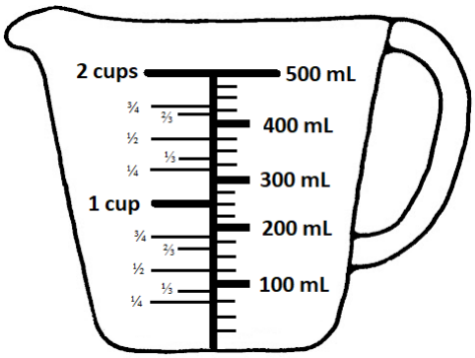
⅓ cup of green



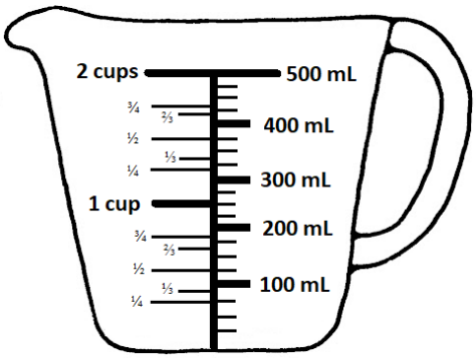
⅔ cup of orange



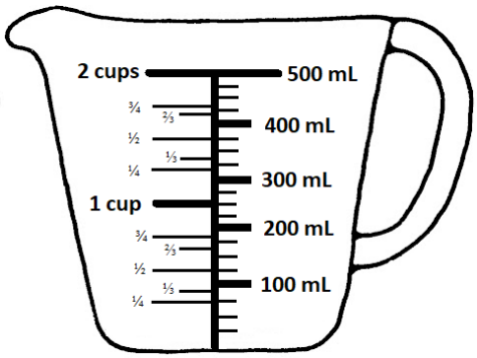
¼ cup purple



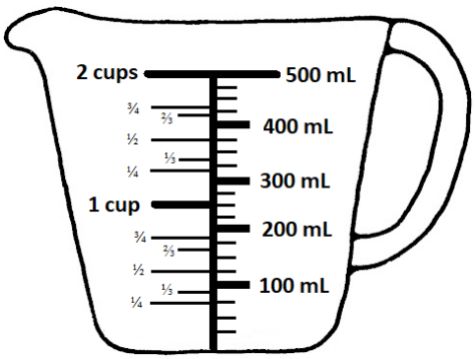
300 mL of pink



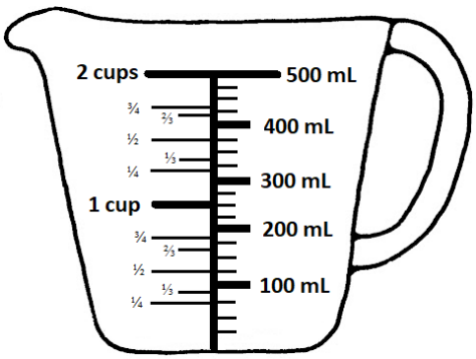
450 mL of blue



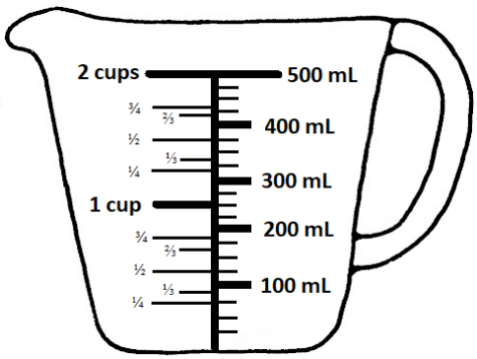
75 mL of black



425 mL of tan



25 mL of brown



175 mL of grey

Dry Measuring Cups & Spoons

Instructions: Using your math skills, determine which measuring cups you will need to measure the appropriate amount. Get as close to the number as you can with the measuring cups, and then use the measuring spoons. Remember, you only have the standard-sized cups and spoons to get the job done!

CUPS	SPOONS
1 cup (250 mL)	**1 Tbsp (15 mL)**
½ cup (125 mL)	**1 tsp (5 mL)**
⅓ cup (80 mL)	**½ tsp (2.5 mL)**
¼ cup (60 mL)	**¼ tsp (1.25 mL)**
	⅛ tsp (0.67 mL)

Example 1: Measure 2 ⅔ cups	*Example 2: Measure 460mL*
1 cup	1 cup (250 mL)
1 cup	½ cup (125 mL)
⅓ cup	⅓ cup (80 mL)
⅓ cup +	1 tsp (5 mL) +
2 ⅔ cup	**465 mL**

1. How do you measure **1 ¼ cup**?	2. How do you measure **¾ cup**?	3. How do you measure **½ cup**?
4. How do you measure **⅔ cup**?	5. How do you measure **20 mL**?	6. How do you measure **30 mL**?
7. How do you measure **7.5 mL**?	8. How do you measure **63.75 mL**?	9. How do you measure **345.67 mL**?

Kitchen Volume Unit Conversion

Most of the time, recipes are only in one unit: metric or imperial, not both. Similarily, measuring cups may also only give you the measurements in one unit. On occasion, you may be required to convert a recipe from imperial to metric, or vice-versa, to address this issue.

To convert a recipe, we simply use a volume conversion chart, like the one here. Conversion charts show the imperial measurements (in teaspoobs,

Below is a recipe for some delicious carrot muffins. Go through the ingredient list and convert the list of ingredients from one unit of measurement to the other. An example is provided for question one.

Ingredients:

2 large eggs

1. (__7.5___mL) 1 and ½ teaspoon baking powder
2. (_____ mL) 2 and ¼ cups all-purpose flour
3. (_____ mL) 1 and ½ cups carrots, grated
4. (_____ mL) 1 teaspoon baking soda
5. (_____ mL) ½ teaspoon salt
6. (_____ mL) 2 teaspoon cinnamon
7. (_____ mL) ½ teaspoon allspice
8. (_____ teaspoon) 2.5 mL nutmeg
9. (_____ cup) 80 mL vegetable oil
10. (_____ teaspoon) 5 mL vanilla extract
11. (____ cup + ___ cup) 310 mL brown sugar, packed
12. (_____ cup) 250 mL milk
13. (____ teaspoon + ____ teaspoon) 10 mL vinegar

Imperial	Metric
¼ teaspoon	1.25 mL
½ teaspoon	2.5 mL
1 teaspoon	5 mL
1 Tablespoon	15 mL
¼ cup	60 mL
⅓ cup	80 mL
½ cup	125 mL
⅔ cup	160 mL
¾ cup	180 mL
1 cup	250 mL
4 cups	1 L
8 cups	2 L

Scaling a Recipe

Whether you're making enough food for a potluck or modifying a recipe to serve just one person, scaling a recipe is an important skill to master. When we scale a recipe we are changing how many servings, or, how much the recipe yields.

To scale a recipe, you first need to determine how much **more** or **less** you are scaling your recipe by. For example, if you have a recipe for 12 muffins but are looking to only make 6 (half), then in turn, you will need to measure out only half the amount of each ingredient. On the other hand, if you are looking to make 36 muffins (three times as much), then you will need 3 times the volume of ingredients. Below a table highlights what a puffed wheat recipe would look like if you scaled it multiple ways:

Ingredient	Standard Recipe	Halved (½)	Doubled (x2)	Tripled (x3)	Quadrupled (x4)
Puffed Wheat	3 cups	1 ½ cup	6 cups	9 cups	12 cups
Vanilla	½ tsp	¼ tsp	1 tsp	1 ½ tsp	2 tsp
Corn Syrup	¼ cup	⅛ cup	½ cup	¾ cup	1 cup
Brown Sugar	⅓ cup	⅙ cup	⅔ cup	1 cup	1 ⅓ cup
Cocoa	2 Tbsp	1 Tbsp	4 Tbsp	6 Tbsp	8 Tbsp
Margarine	3 Tbsp	1 ½ Tbsp	6 Tbsp	9 Tbsp	12 Tbsp

1. A recipe calls for 3 cups of oats. You are looking to scale this recipe in half. How many cups of oats will you need?

2. You are looking to quadruple a recipe for lasagna. One recipe calls for 1 lb of ground beef. How much ground beef will you need to purchase?

3. You are chatting with a friend who made a huge dish of pancit for a potluck. They used 6 small head of cabbage. However, you are only looking to make a third (⅓) of the recipe. How many heads of cabbage will you need?

4. Below is a table with a recipe for one yogurt parfaits. Determine how much you will need of each item to scale it appropriately.

Ingredient	Standard Recipe	Halved (½)	Doubled (x2)	Tripled (x3)	Quadrupled (x4)
Yogurt	1 cup (250 mL)				
Berries	¼ cup (60 mL)				
Granola	2 Tbsp (30 mL)				