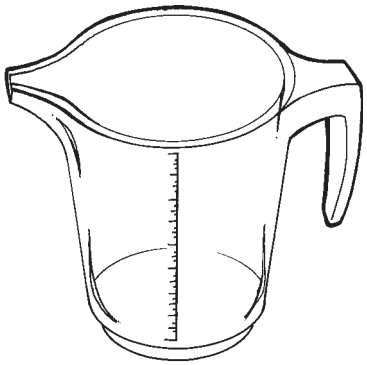
What Is This Module About?

Do you enjoy shopping or going to the market? Is it hard for you to choose what to buy? Sometimes, you see that there are different quantities available of one product. Do you know exactly which quantity you should buy? Do you make estimates by thinking about how much your family will need?

There are many things that you should know when you are buying food or when you are cooking. One of these is the correct use of measuring tools and equipment. When you are cooking, for example, you should measure the correct amounts of ingredients to ensure that the food tastes good. You should also measure the right amount of medicine that you will give your child. This is important because the doctor's prescription for your sick child should be strictly followed.

one pint



470 mL

Which of the two can contain more?

In this module, you will learn how to deal with the situations described above. You will learn how to measure the contents of a container. You will also learn how to check if two containers hold the same amount especially if they use different units of measurement.

This module is divided into three lessons:

Lesson 1 — *How Much?*

Lesson 2 — *Are They Equal?*

Lesson 3 — *Which Is the Better Buy?*

To understand the contents of this module better, you must have some background knowledge of the basic mathematical operations — addition, subtraction, multiplication and division. This will help you perform the activities more easily. So recall your previous lessons on the said processes.

What Will You Learn From This Module?

After studying this module, you should be able to:

- demonstrate how to measure the contents of a container;
- use measuring tools and equipment to compute the volumes of containers;
- convert one unit of measurement of volume to another; and
- apply what you have learned about computing volumes to everyday situations.

Let's See What You Already Know

Before you start studying this module, try to answer this test first. They will help you find out how much you already know about the topics to be discussed.

Write the letter of your answer in the blank before each number.

_____ 1. This quantity refers to the amount that a container can hold.
   a. length
   b. volume
   c. arm's length
   d. weight

_____ 2. One liter is equal to
   a. 5 milliliters
   b. 1 pint
   c. 1,000 milliliters
   d. 1/10 of a gallon

_____ 3. Which one does not belong to the group?
   a. kilometer
   b. liter
   c. gallon
   d. pint

_____ 4. The contents of one teaspoon is equal to _____.
   a. 5 milliliters
   b. 3 milliliters
   c. 1 milliliter
   d. 10 milliliters

_____ 5. The contents of one tablespoon is equal to _____.
   a. 10 milliliters
   b. 15 milliliters
   c. 5 milliliters
   d. 25 milliliters

_____ 6. One gallon of ice cream is equal to _____.
   a. 4 liters of ice cream
   b. 1 liter of ice cream
   c. 3.8 liters of ice cream
   d. 2 liters of ice cream

_____ 7. One liter of soft drink is equal to two 500-milliliter bottles of soft drink.
   a. True
   b. False

_____ 8. Three teaspoons of cough syrup is equal to one tablespoon of cough syrup.
   a. True
   b. False

_____ 9. Which is greater?
   a. 1 gallon
   b. 1 liter

_____10. Which is the better buy?
   a. a 355-milliliter bottle of soft drink at ₱10
   b. an 8-ounce bottle of soft drink at ₱9

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 24 to find out.

If all your answers are correct, very good! This shows that you already know much about the topic. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This only goes to show that this module is for you. It will help you understand important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may go now to the next page to begin Lesson 1.

How Much?

This lesson will show you how you can measure the amount that a container holds. When we measure the contents or the amount that a container holds, we say that we are measuring **volume.** At the end of this lesson, you will be able to measure volume using ordinary units of measurement. But first, read the comic strip below to give you an idea of what this lesson is all about.

At a carinderia...

The comic strip above showed us how important it is to know how to measure volume. This knowledge can help you in many of your daily activities such as cooking. It can, as shown in the comic strip, ensure that whatever you prepare will taste good.

Let's Try This

You will need the following materials for this activity.

One cup	Water
One teaspoon	One-pint ice cream container
One tablespoon	One-half gallon ice cream container
Marking pen or pencil	

You will conduct a short investigation for this lesson. To help you record the information that you will gather, make a table like the one below. Closely follow the instructions so you can avoid mistakes.

Table 1

Volume	
One tablespoon	Equivalent to _____ teaspoons
One cup	Equivalent to _____ tablespoons
One pint	Equivalent to _____ cups
One-half gallon	Equivalent to _____ pints

1. Get your teaspoon and tablespoon. Use the teaspoon to fill the tablespoon with water.

   How many teaspoons did you use to fill the tablespoon with water? Record your answer in Table 1.

2. Now, get your tablespoon and cup. Use the tablespoon to fill the cup with water.

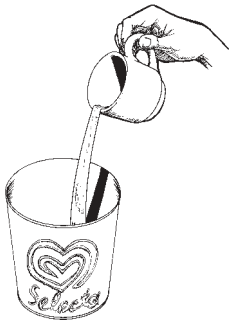
   How many tablespoons did you use to fill the cup with water? Record your answer in Table 1.

   Reminder: Be very careful that you do not spill water when you fill the tablespoon and cup.

3. For this step, get your cup, one-pint ice cream container and marking pen or pencil. Use the cup to fill the one-pint ice cream container with water. Each time you pour one cup of water, mark the level of water on the ice cream container. Use your marking pen or pencil. Do this until you have filled the one-pint container.

Look at the picture below to see how this is done.

Record in Table 1 how many cups of water you used to fill the one-pint ice cream container.



1-pint ice cream container

Count how many cups of water you used to fill one pint.

How many cups did you use to fill the one-pint container with water? Record your answer in Table 1.

4. For this step, get your one-pint ice cream container, one-half gallon ice cream container and marking pen or pencil. Use the one-pint container to fill the one-half gallon container with water. Each time you pour one pint, mark the level of water on the half-gallon container. Do this until you have filled up the half-gallon container.

   How many pints did you use to fill the one-half gallon container with water? Record your answer in Table 1.

To know how much a container holds or to measure its volume, you need to use units of measurement. The units of measurement that you used in this investigation are **teaspoon, tablespoon, cup** and **pint.** After using these units, you are now familiar with how much each of them can contain. For example, you found out that one cup is equivalent to 16 tablespoons.

Did you notice that to measure the volume of the bigger containers, you used the smaller containers? The smaller containers were your units of measurement.

The volumes that you recorded were based on the units that you used. Below is a list of the units of measurement that you can use to measure volume.

liter	gallon	cup	quart
milliliter	teaspoon	tablespoon	pint

Now, go back to your answers in Table 1. Check them using the information in the table below.

Volume	
One tablespoon	Equivalent to 3 teaspoons
One cup	Equivalent to 16 tablespoons
One pint	Equivalent to 2 cups
One-half gallon	Equivalent to 4 pints

Did you get the right answers?

You can use the information that you gained from this lesson so you can be a smart buyer. You can keep them in mind, for example, when you buy ice cream. Find out the price of a pint of ice cream and one-half gallon of ice cream. Then compute the price of 4 pints of ice cream and compare this with the price of a half-gallon of ice cream. If 4 pints are cheaper than a half-gallon, you may decide to buy 4 pints instead of a half-gallon.

Let's Try This

Visit a store and take a look at the products being sold in it. List down the goods that are measured using the units of volume found in the table above.

Product	*Unit of Measurement Used*

The following table lists down examples of food items sold in a store.

Product	*Unit of Measurement Used*
Ice cream	Pints or gallons
Soy sauce	Gallons or liters
Catsup	Liters, milliliters or fluid ounces

The unit of measurement most often used for liquids is the **liter**. The liter may be used instead of the pint, gallon or quart. One liter can be divided into one thousand equal parts. Each of these parts is called a **milliliter**. A milliliter is used to measure smaller quantities as compared to the liter. For example, soft drinks are usually measured in milliliters while gasoline is measured in liters.

Let's Review

Fill in the blanks with the correct answers. Choose the answers from the words or phrases inside the box.

tablespoon	volume	half gallon
gallon	cup	pint

1. Sixteen (16) tablespoons are equivalent to one (1) _____.
2. Three (3) teaspoons will make one (1) _____.
3. The amount that a container holds is its _____.
4. The _____, which holds 2 cups, is a common measure of volume for ice cream.
5. Eight (8) pints will make one (1) _____.

Have you answered all the items above? If so, you can compare your answers with those in the *Answer Key* on pages 24–25. Did you get all the correct answers? If yes, good! You are ready for the next lesson. If you had some wrong answers, just review this lesson, especially the table on page 7.

Let's Remember

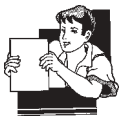
- **Volume** refers to the amount of the contents of a specific container.
- **Volume** can be measured with the use of common units of measurement such as teaspoons, tablespoons, cups and pints.
- The most common metric unit used to measure volume is the **liter**. However, **milliliters** are more commonly used for smaller quantities.
- 1 liter = 1,000 milliliters

Are They Equal?

In Lesson 1, you learned how to measure volume. You did this by using ordinary units of measurement found at home like cups and tablespoons.

Lesson 2 will focus on units of measurement for volume and their equivalents in other units. You will learn how to convert a smaller unit of measurement to a bigger one such as milliliters to liters and vice versa. You will also learn how to convert one unit of measurement to another, for example, liters to gallons (metric to English unit).

Always remember that it is easier to compare quantities of goods if they are of the same unit. This is the reason why this lesson is important. It will be useful when you compare the prices of products that use different units of measurement for volume. It will also be useful when you prepare ingredients in cooking and when you measure medicine doses.



Let's Learn

Table 2 lists units of measurement for volume and their equivalents in other units. You can use the equivalent measurements as conversion factors.

Table 2

Unit of Volume	*Equivalent*
1 teaspoon (tsp.)	5 milliliters (mL)
1 tablespoon (tbsp.)	15 milliliters
1 fluid ounce (fl. oz.)	30 milliliters
1 cup (c.)	0.24 liter (L) or 240 milliliters
1 pint (pt.)	0.47 liter or 470 milliliters
1 quart (qt.)	0.95 liter or 950 milliliters
1 gallon (gal.)	3.8 liters
1 liter (L)	1,000 milliliters

A conversion factor is the value or ratio you must multiply to a number to change from one unit of measure to another. Hence you can convert volume from teaspoons to its equivalent measure in milliliters or from gallons to its equivalent measure in liters.

Conversion factors are expressed in ratio form. For example, the equivalent measures of 1 teaspoon = 5 milliliters should be expressed this way:

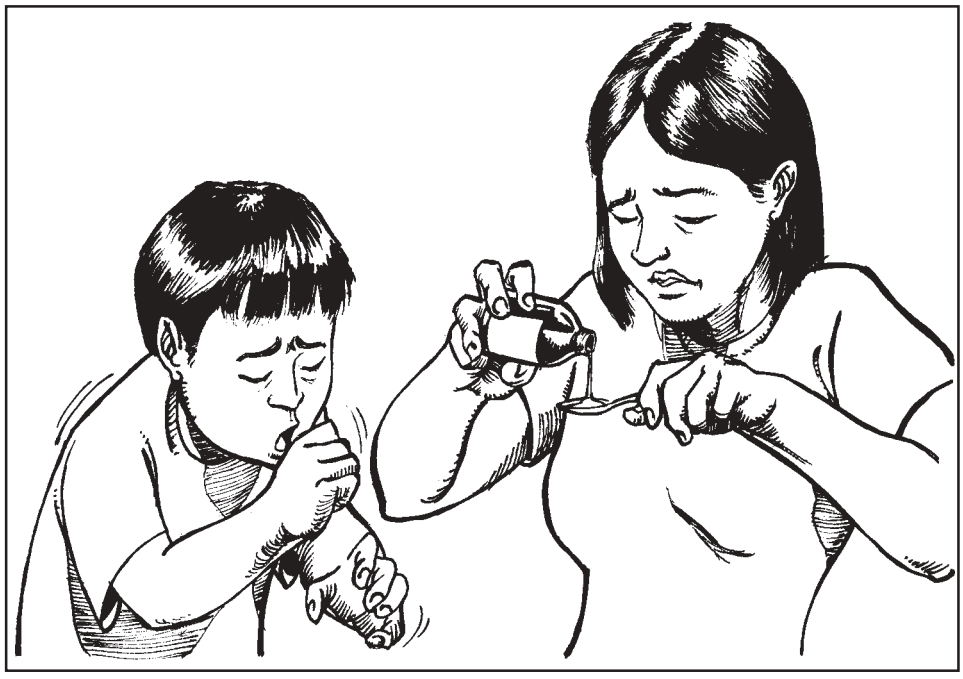
$$\frac{1\text{ teaspoon}}{5\text{ milliliters}} \text{ or } \frac{5\text{ milliliters}}{1\text{ teaspoon}} \quad \begin{matrix} \leftarrow \text{numerator} \\ \leftarrow \text{denominator} \end{matrix}$$

Notice that there are two possible arrangements for the conversion factor ratio. The activity that follows will illustrate which between the two possible arrangements you should use.

Let's Try This

In this activity, you will need your knowledge of basic mathematical operations (addition, subtraction, multiplication and division).

Let us say that you have to give your child some medicine. The doctor's prescription tells you that you should give him/her 10 milliliters (10 mL) of cough medicine. You then find out that you have no measuring tool in milliliters. What will you do?



That's easy! Look at Table 2. Find out how many milliliters are equivalent to one teaspoon (1 tsp). The table tells you that there are 5 milliliters (5 mL) in one teaspoon (1 tsp).

Knowing this, you already have an idea of what you should do. You can use a teaspoon to give your child the 10 milliliters (10 mL) of cough medicine that he/she needs.

The only question left is: How many teaspoons are there in 10 milliliters (10 mL)?

Step 1

You need to convert 10 milliliters to its equivalent measure in teaspoons. What is the conversion factor from milliliters to teaspoons?

$$1 \text{ tsp.} = 5 \text{ mL}$$

Expressing this in ratio form we have:

$$\frac{1\,\text{teaspoon}}{5\,\text{milliliters}} \text{ or } \frac{5\,\text{milliliters}}{1\,\text{teaspoon}}$$

In order to cancel the milliliter units, choose the ratio where the 5 milliliters is in the denominator:

$$\frac{1\,\text{teaspoon}}{5\,\text{milliliters}}$$

Step 2

Multiply 10 milliliters with the conversion factor in Step 1. (This is called cross multiplication.)

$$10\,\cancel{\text{mL}} \times \frac{1\,\text{tsp.}}{5\,\cancel{\text{mL}}} = \frac{10\,\text{tsp}}{5} = 2\,\text{tsp.}$$

You should give your child 2 teaspoons of cough medicine.

Let's Review

Now, try to give practical solutions to the following problems. Be sure to give the equivalents of the given measurements.

1. The recipe for *sinigang* tells you that you should use 0.6 liter of water. You do not have a measuring tool in liters or milliliters. All you have is a measuring cup. How many cups will you need for the recipe?

_____

_____

_____

_____

2. You are baking a cake. The recipe says you should use one and one-half pints of chocolate syrup for the icing. But you don't have a measuring tool in pints for this. All you have is a measuring cup. How many cups of chocolate syrup will you need?

_____

_____

_____

_____

3. Your little sister's medical prescription says she should take 8 milliliters of her vitamins once a day. You don't have a measuring tool in milliliters for this. All you have is a teaspoon. How many teaspoons of vitamins will you give your sister?

_____

_____

_____

_____

Compare your answers with those found in the *Answer Key* on pages 25–26.

Let's Think About This

As stated earlier, it is easier to compare volumes if the same unit of measurement is used. So how do you convert smaller units of volume to bigger ones, e.g., milliliters to liters and vice versa? For example, your mother asked you to buy three-quarters of a liter of mineral water. When you arrived at the store, you found out that they only sold mineral water in milliliters. How many milliliters of mineral water are you going to buy then?

First, you have to remember that one liter (1 L) is made up of 1,000 milliliters (1,000 mL). You can write this as:

$$1\text{ L} = 1{,}000\text{ mL}$$

You need to know how much ¾ (three quarters) of 1 liter is. Since you know that 1 L = 1,000 mL, you can conclude that ¾ of 1 liter is equivalent to ¾ (three quarters) of 1,000 mL. You will then have:

$$\tfrac{3}{4} \times 1{,}000\text{ mL} = \frac{3 \times 1{,}000\text{ mL}}{4} = \frac{3{,}000\text{ mL}}{4}$$

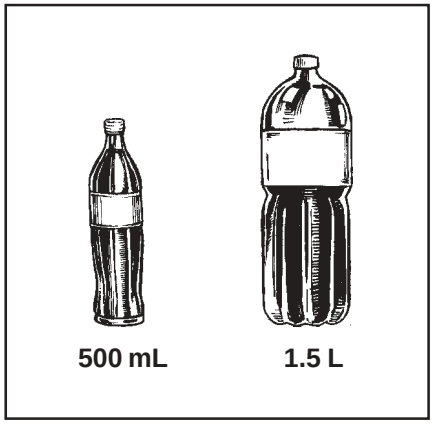
The next step is to divide 3,000 mL by 4.

Using the process of division, you will get:

$$
\begin{array}{r}
750\ \text{mL} \\
4\overline{)3000\ \text{mL}} \\
28 \\
\hline
20 \\
20 \\
\hline
00 \\
0 \\
\hline
\times
\end{array}
$$

The answer is 750 mL. You should then buy 750 mL of mineral water. This is equivalent to three quarters of a liter (¾ L), which is the quantity of mineral water your mother asked you to buy.

The same steps can be followed in converting smaller units of measurement to bigger ones, as in milliliters to liters. Here is an example. If you were asked to buy a case of 500 milliliter bottles of soft drink but the store only had 1.5-liter bottles in stock, how many 1.5-liter bottles of soft drink will you buy instead?



To help you understand the problem better, let us write down the given data and what is being asked.

You want to buy a case of 500-mL bottles of soft drink.
What is available in the store are 1.5-L bottles.

We know that there are 24 bottles in a case. So:

A case of 500-mL bottles (what you want to buy) = 24 × 500 mL bottles

Doing the multiplication,

24 × 500 mL bottles = 12,000 mL

This amount (12,000 mL) is the total volume of soft drink you want to buy. It is equivalent to one case (or 24 bottles) of soft drink.

Now what can be bought from the store are 1.5-L bottles of soft drink. The question is, how many of these bottles should you buy to get an amount equal to 12,000 mL? In other words, how many 1.5-L bottles are equal to 12,000 mL?

You see here that we are dealing with two measurements: 1.5 L and 12,000 mL. Notice that they are in different units. One is in liters (L) while the other is in milliliters (mL). To be able to solve our problem, we must convert one of them such that they both have the same unit of measurement.

Let us look again at the two figures: 1.5 L and 12,000 mL

Do you remember that there are 1,000 mL in 1 L? Based on this, we can convert 12,000 mL into liters. We can find out how many liters are equivalent to 12,000 mL.

Here is how to do it:

You need to convert 12,000 milliliters to its equivalent measure in liters.

Step 1: a) What is the conversion factor from milliliters to liters?

1 liter = 1,000 milliliters

Step 2: b) Multiply 12,000 milliliters with the conversion factor in (a). To cancel out the milliliter units, make sure that the milliliters unit of the conversion factor is in the denominator. (This process is called cross multiplication.)

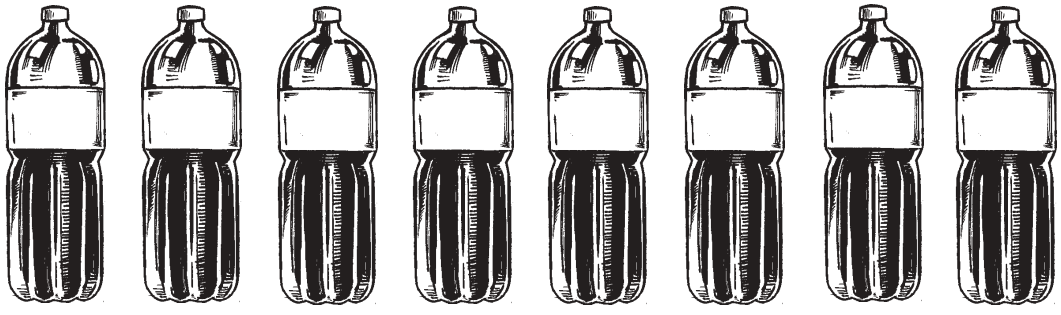
$$12{,}000\,\cancel{\text{mL}} \times \frac{1\,\text{L}}{1{,}000\,\cancel{\text{mL}}} = \frac{12{,}000\,\text{L}}{1{,}000} = 12\,\text{L}$$

So now we know that 12,000 mL = 12 L. This is the total volume of soft drink you wish to buy.

Now, let us go back to the store. What it has are 1.5-L bottles of soft drink. How many of these should you buy to get a total of 12 L?

$$\textit{how many bottles}? = \frac{12\,\text{L}}{1.5\,\text{L}}$$

$$\textit{how many bottles}? = 8\,\text{bottles}$$



Eight (8) 1.5-L bottles of soft drink = 12 liters

You will then have to buy eight 1.5-liter bottles of soft drink to meet the required 12,000 mL of soft drink you were asked to buy.

After learning about these, you will find the task of converting units of measurement very easy as long as you remember their equivalents in other units.

Let's Try This

Now try your hand at solving the following problem by applying what you have just learned. You went to the store to buy some spaghetti sauce. The recipe book said you need half a liter of sauce for a kilo of spaghetti. But the store only sold spaghetti sauce in 400-mL cans. How many cans of spaghetti sauce will you buy then? Show your solution and answer in the space below.

Compare your answer with the one in the *Answer Key* on page 27.

Let's Solve This Problem

Now, try to answer the following questions. Write your solutions in the spaces provided. Follow the example given in Lesson 2 and use Table 2 (page 9) as a guide to the units of measurement and their equivalents.

1. How many pints are there in a gallon of ice cream?

2. How many ounces are there in a liter of soft drink?

3. How many cups of milk do you need to fill a one-liter container?

4. Is one liter of cooking oil equivalent to one-half gallon of cooking oil? Explain your answer.

5. How many 500-mL bottles of soft drink is equivalent to a single 2-liter bottle of soft drink?

6. How many liters of shampoo is equivalent to 2,500 milliliters?

Now, compare your answers with those in the *Answer Key* on pages 27–31. If you got all the correct answers, great! If not, just study carefully the solutions given to understand the computation involved.

Let's Try This

1. Visit a store and take a look at the products being sold in it. List down some products that are sold using the units of volume found in Table 2. An example is ice cream, which is measured in milliliters, gallons or pints.

   _____

   _____

   _____

   _____

   _____

   _____

2. Choose two products of the same kind but of different brands and measured in different units. For example, you can find two containers of cooking oil. Make sure that their volumes are expressed in different units. One may be in liters, and the other in gallons. Compare the two containers. Which one contains more cooking oil? For example, one container may contain 2 liters of cooking oil and the other, one gallon, but they have the same price. It will be safe to assume that the one-gallon can contains more cooking oil than the 2-liter container and is therefore a better buy. This is because one gallon is equal to 3.8 liters.

Given below are sample answers to this. Just add two more products to the list.

Product	*Units of Measurement*	*Which contains more?*
Dr. Black's Soy Sauce	1/2 gal	
Dr. White's Soy Sauce	2.5 L	✓
Terrific Shampoo	200 mL	
Wonderful Shampoo	7 fl. oz.	✓

In the first example above, the two products are *Dr. Black's* soy sauce and *Dr. White's* soy sauce. We compared them and found out that *Dr. White's* contains more. In the second example, it is *Wonderful Shampoo* which contains more than *Terrific Shampoo*. How did we determine these answers? Read on to find out.

In choosing which of the products to buy, you need to know which of them has more contents. In the first example, you have to remember that:

$$1 \text{ gal.} = 3.8 \text{ L}$$

With this, you can then conclude that $\frac{1}{2}$ gallon is equivalent to $\frac{1}{2}$ of 3.8 liters. You then have:

$$\begin{aligned} \tfrac{1}{2} \times 3.8 \text{ L} &= \frac{1 \times 3.8 \text{ L}}{2} \\ &= \frac{3.8 \text{ L}}{2} \\ &= 1.9 \text{ L} \end{aligned}$$

Now you can see that *Dr. Black's* soy sauce contains only 1.9 liters. If you compare this with *Dr. White's* soy sauce, you will see that the latter contains more and is therefore a better buy at the same price.

In the second example, you need to remember that:

30 mL = 1 fl. oz.

With this, you can then convert the volume of *Wonderful Shampoo* into milliliters by multiplying 7 by 30 mL. You will then have:

$7 \times 30 \text{ mL} = 210 \text{ mL}$

You now know that the contents of *Wonderful shampoo* is equivalent to 210 mL. When you compare this with the contents of *Terrific Shampoo*, you will see that it contains more than the latter. And so buying *Wonderful Shampoo* would be a wiser choice.

Give other examples to complete the chart. Then check which the better buy is and explain why. You may provide solutions similar to the ones presented.

Let's Remember

- It is easier to compare volumes of particular objects if they are in the same unit of measurement.
- **Cross multiplication** is the method used in converting one unit of measurement to another.
- Conversion factors can be used to convert volume from one unit of measurement to another.

Which Is the Better Buy?

Now that you have learned how to convert one unit of measurement to another (from metric to English units of measurement, from smaller to bigger units of measurement and vice versa), you are now ready to compare prices of objects measured in different units of volume. By doing this, you will be able to save money when buying things that you need.

Let's Study and Analyze

If, for example, you need a cup of soy sauce for your *adobo* but you do not have any in stock. You then decide to go to the store to buy some. When you reach the store, you see a 2-liter bottle of *Dr. Black's* soy sauce sold at ₱30 and a half-gallon bottle of *Dr. White's* soy sauce sold at ₱35. Which is the better buy?

Which is the better buy?

First, you have to remember that:

1 gallon = 3.8 liters

Then find out how many liters a half gallon contains. Do this by:

$\frac{1}{2} \times 3.8 \text{ liters} = 1.9 \text{ liters}$

After knowing this, you can now compare the contents of the products being sold in the store. Thus:

2 liters *Dr. Black's* = ₱30 is _?_ than 1.9 liters *Dr. White's* = ₱35

You may now conclude that *Dr. Black's* soy sauce is **cheaper** and is therefore the better buy compared to *Dr. White's* soy sauce.

In the first example, it is easy to determine which is the better buy. But what if *Dr. Black's* soy sauce is sold at ₱38 instead of ₱30 while *Dr. White's* soy sauce is still sold at the same price? Which would be a better buy then?

Just like in the first example, you have to remember that:

1 gallon = 3.8 liters

From the first example, you can see that $\frac{1}{2}$ gallon is equivalent to 1.9 liters. Therefore, you can compare the two product in this way:

2 L of *Dr. Black's* soy sauce = ₱38 ? than 1.9 L of *Dr. White's* soy sauce = ₱35

But how will you determine which of the two is the better buy? The answer is simple. All you have to do is determine the products' cost per unit. How? You have to determine how much a liter of each product costs by dividing their prices by their corresponding volumes, as in:

Dr. Black's soy sauce: ₱38 ÷ 2 L = ₱19 per liter

Dr. White's soy sauce: ₱35 ÷ 1.9 L = ₱18.42 per liter

You can then conclude that *Dr. White's* soy sauce at ₱18.42 per liter is a better buy than *Dr. Black's* soy sauce at ₱19 per liter.

Let's Solve This Problem

Solve the following problems that deal with comparing volumes. Write your solutions in the box provided after each number.

1. A jeepney driver passed by a Speed gasoline station and saw that one liter of diesel gasoline is sold at ₱14. He usually buys gasoline from a Plus gasoline station at ₱49.50 per gallon. Do you think he should patronize the Speed gasoline station instead to save money?

2. Your family buys mineral water from a PureWater store at ₱50 per 10 liters. You passed by another store which sells mineral water at ₱9 per gallon. Will you be able to save money if you will buy from this store instead?

3. You need to buy a bottle of shampoo at the store. Two brands of similar quality are available. One bottle contains 320 mL and costs ₱60. The other bottle contains 10 fl. oz. and costs ₱50. Which bottle of shampoo gives better value for your money?

Compare your answers with those found in the *Answer Key* on pages 32–33. Did you get all the correct answers? If yes, good! If not, study carefully the solutions given.

Let's Remember

- Knowing how to convert units of measurement for volume from one unit to another can help you save money.

Well, this is the end of the module! Congratulations for finishing it. Did you like it? Did you learn something useful from it? A summary of the main points is given on the next page to help you remember them better.

Let's Sum Up

You have learned from this module that:

- various units can be used in measuring the volumes of different materials;
- common household items such as teaspoons, tablespoons and cups can be used in measuring volume;
- the most commonly used units of measurement for volume are the liter and milliliter; and
- knowing how to convert volumes from one unit to another is useful in your daily life.

What Have You Learned?

Now that you have finished this module, why don't you find out how much you have learned. Answer the questions below. Write your answers in the blanks provided.

A. Which one has the bigger volume?

1. 1 pint or 450 ml _____
2. 1 tablespoon or 2 teaspoons _____
3. 2 cups or 0.72 liter _____
4. ½ gallon or 3 quarts _____
5. 1 cup or 20 tablespoons _____
6. 3 cups or 1 pint _____

B. Which is the better buy?

1. A 350-mL bottle of soft drink at ₱ 10.50 or a 12-fl. oz. bottle at ₱ 7.20? _____

   _____
2. A 330-mL bottle of mineral water at ₱ 9.90 or a 12-fl. oz. bottle at ₱ 14.40? _____

   _____
3. 4 pints of ice cream at ₱ 99.64 or ½ gallon of ice cream at ₱ 95.00?

   _____

   _____

C. Answer the following.

1. The quantity that gives the amount a container holds is called _____.
2. There are _____ milliliters in one liter.
3. You can compare two quantities of goods if both of them are in the _____ unit of measurement.
4. Knowing how to transform one unit of measurement from one unit of volume to another can help you _____ the prices of products.
5. You will be able to _____ money by comparing the prices of products of the same quality.

Check your answers using the *Answer Key* on pages 33–37.

If you got:

0 — 3	Study carefully the entire module again.
4 — 7	Go back and study the parts of the module that you did not understand.
8 — 11	Very good! Just review the parts that you did not get right.
12 — 14	Excellent! You have learned a lot from this module. You can now move on to the next one.

Answer Key

A. Let's See What You Already Know *(pages 2–3)*

1. **(b)** The amount a container can hold is called volume. Length (a) refers to how long something is. Arm's length (c) is used to measure length. And weight (d) refers to how heavy something is.
2. **(c)** One liter is equal to 1,000 milliliters.
3. **(a)** Kilometer is a unit of length while all the others (b, c and d) are units of volume.
4. **(a)** One teaspoon is equal to 5 milliliters.
5. **(b)** One tablespoon is equal to 15 milliliters.
6. **(c)** One gallon is equal to 3.8 liters of ice cream.
7. **(a)** Since 1 liter is equal to 1,000 mL and 2 × 500 mL is also equal to 1,000 mL, we can conclude that a 1-L bottle of soft drink is equal to two 500-mL bottles of soft drink.
8. **(a)** True. Three teaspoons is equal to one tablespoon.
9. **(a)** Since 1 gallon is made up of 3.8 L, it is easy to conclude that 1 gallon is greater than 1 liter.
10. **(a)** Since 1 fl. oz. = 30 mL, an 8-fl. oz. bottle would contain (8 × 30 mL) 240 mL. If you compare the cost per unit of the two bottles, you will see that the 355-mL bottle at ₱10 is a better buy (₱10 ÷ 355 mL = ₱0.028169 per mL or ₱0.03) per mL than the 240-mL bottle at ₱9 (₱9 ÷ 240 mL = ₱0.0375 per mL or ₱0.04 per mL).

B. Lesson 1

Let's Review (page 8)

1. cup. The table on page 7 shows that 16 tablespoons make 1 cup.
2. tablespoon. The same table also shows that 3 teaspoons are equivalent to 1 tablespoon.
3. volume
4. pint. A pint is equivalent to 2 cups.
5. gallon. The table on page 7 shows that 4 pints are equivalent to $\frac{1}{2}$ gallon. Thus, 8 pints will make 1 gallon.

Solution:

4 pints = ½ gallon

To get the equivalent of 8 pints, multiply both side by 2, as follows:

4 pints	=	½ gallon
× 2		× 2
8 pints	=	1 gallon

You will learn more about this as you study the next lessons.

C. Lesson 2

Let's Review (pages 11–12)

1) Answer: You will need 2.5 cups for the recipe.

Solution: Since you do not have measuring tools in liters, convert the 0.6 liters into its equivalent measure in cups. When you have computed for the value, measure how many cups you need according to your computation.

Step 1

a) Convert 0.6 liters to cups. What is the conversion factor?

$$1 \text{ cup} = 0.24 \text{ L}$$

Expressing this in ratio form we have:

$$\frac{1 \text{ cup}}{0.24 \text{ L}}$$

Step 2

b) Multiply 0.6 liters with the conversion factor in (a).

$$0.6 \text{ L} \times \frac{1 \text{ c.}}{0.24 \text{ L}} = \frac{0.6 \text{ c.}}{0.24} = 2.5 \text{ cups}$$

$$0.24\overline{)0.6} = 24\overline{)60.0}$$

$$\begin{array}{r} 2.5 \\ 24\overline{)60.0} \\ -\,48 \\ \hline 120 \\ -\,120 \\ \hline 0 \end{array}$$

2) Answer: You will need 3 cups of chocolate syrup for the recipe.

Solution: Since you do not have measuring tools in pints, convert the 1 ½ pints or 1.5 pints into its equivalent measure in cups. When you have computed for the value, measure how many cups you need according to your computation.

Step 1

a) Convert 1.5 pints to cups. What is the conversion factor?

1 pint = 2 cups

Expressing this in ratio form we have:

$$\frac{2\text{ cups}}{1\text{ pint}}$$

Step 2

b) Multiply 1.5 pints with the conversion factor in (a).

$$1.5\cancel{\text{pt.}} \times \frac{2\text{ c.}}{1\cancel{\text{pt.}}} = \frac{3\text{ c.}}{1} = 3\text{ cups}$$

3) Answer: You should give your sister a little more than one and one half of vitamins a day.

Solution: Since you do not have measuring tools in milliliters, convert the 8 milliliters into its equivalent measure in teaspoons. When you have computed for the value, measure how many teaspoons you need according to your computation.

Step 1

a) Convert 8 milliliters to teaspoons. What is the conversion factor?

1 teaspoon = 5 milliliters

Expressing this in ratio form we have:

$$\frac{1\text{ tsp.}}{5\text{ mL}}$$

Step 2

b) Multiply 8 milliliters with the conversion factor in (a).

$$8\cancel{\text{mL}} \times \frac{1\text{ tsp.}}{5\cancel{\text{mL}}} = \frac{8\text{ tsp.}}{5} = 1.6\text{ teaspoons}$$

Let's Try This (page 15)

You need to buy 2 cans of spaghetti sauce to meet the required amount in the recipe.

Solution:

$$400 \text{ mL} = 1 \text{ can}$$

$$1{,}000 \text{ mL} = 1 \text{ L}$$

$$\textit{how many mL?} = \tfrac{1}{2} \text{ L}$$

$$\textit{how many mL?} = \tfrac{1}{2} \times 1{,}000$$

$$\textit{how many mL?} = 500 \text{ mL}$$

The recipe needs 500 mL of spaghetti sauce. There is only 400 mL in a can. You need to buy 2 cans of spaghetti sauce then. You will have 400 mL left over in one of the cans, which you may store for future use.

Let's Solve This Problem (pages 15–16)

1) Answer: 8.09 pints

Solution: There is no direct conversion from gallons to pints. You can first convert gallons to its equivalent in liters. From liters you can easily convert to pints.

Step 1

a) What is the conversion factor from gallons to liters?

1 gallon = 3.8 liters

Step 2

b) There are 3.8 liters in 1 gallon. Now that you know its equivalent in liters, you can now convert from liters to pints. What is the conversion factor from liters to pints?

1 pint = 0.47 liters

Expressing this in ratio form we have:

$$\frac{1 \text{ pint}}{0.47 \text{ liters}}$$

Step 3

c) Multiply 3.8 liters with the conversion factor in (b). Round off your answer to two decimal places.

$$3.8 \cancel{\text{L}} \times \frac{1 \text{ pt.}}{0.47 \cancel{\text{L}}} = \frac{3.8 \text{ pt.}}{0.47} = 8.085 \text{ pints or } 8.09 \text{ pints}$$

$$0.47\overline{)3.80} = 470\overline{)380.000}$$

$$\begin{array}{r} 8.085 \\ 470\overline{)380.000} \\ -\,376 \\ \hline 40 \\ -\,0 \\ \hline 400 \\ -\,376 \\ \hline 240 \\ -\,235 \\ \hline 5 \end{array}$$

2. Answer: 33.33 fluid ounces

   Solution: There is no direct conversion from liters to ounces. You can first convert liters to its equivalent in milliliters. From milliliters, you can easily convert to ounces.

   Step 1

   a) What is the conversion factor from liters to milliliters?

   $$1 \text{ liter} = 1{,}000 \text{ milliliters}$$

   Step 2

   b) There are 1,000 milliliters in 1 liter. Now that you know its equivalent in milliliters, you can now convert from milliliters to ounces. What is the conversion factor from milliliters to ounces?

   $$1 \text{ fl. oz.} = 30 \text{ ml}$$

   Expressing this in ratio form we have:

   $$\frac{1 \text{ fl. oz.}}{30 \text{ mL}}$$

   Step 3

   c) Multiply 1,000 milliliters with the conversion factor in (b). Round off your answer to two decimal places.

   $$1{,}000 \cancel{\text{mL}} \times \frac{1 \text{ fl. oz.}}{30 \cancel{\text{mL}}} = \frac{1{,}000 \text{ fl. oz.}}{30} = 33.33 \text{ fl. oz.}$$

$$
\begin{array}{r}
33.333 \\
30\overline{)1000.000} \\
-\,90 \\
\hline
100 \\
-\,90 \\
\hline
100 \\
-\,90 \\
\hline
100 \\
-\,90 \\
\hline
100 \\
-\,90 \\
\hline
10
\end{array}
$$

3. Answer: 4.17 cups

Step 1

a) You should convert 1 liter to its equivalent in cups. What is the conversion factor from liters to cups?

1 cup = 0.24 liters

Expressing this in ratio form we have:

$$\frac{1\,\text{cup}}{0.24\,\text{L}}$$

Step 2

b) Multiply 1 liter with the conversion factor in (a). Round off your answer to two decimal places.

$$1\,\text{L} \times \frac{1\,\text{c.}}{0.24\,\text{L}} = \frac{1\,\text{cup}}{0.24} = 4.17\ \text{cups}$$

$$
0.24\overline{)1.00} \;=\; 24\overline{)100.000}
\begin{array}{r}
4.166 \\
-\,96 \\
\hline
40 \\
-\,24 \\
\hline
160 \\
-\,144 \\
\hline
160 \\
-\,144 \\
\hline
16
\end{array}
$$

4. Answer: No. ½ gallon is equivalent to 1.9 liters, which is greater than 1 liter.

Solution: You need to compare both quantities in the same units. Compare them in liter units.

Step 1

a) You need to convert one-half gallon to liters. What is the conversion factor?

1 gallon = 3.8 liters

Expressing this in ratio form we have:

$$\frac{3.8\ \text{L}}{1\ \text{gallon}}$$

Step 2

b) Multiply ½ or 0.5 gallon with the conversion factor in (a).

$$0.5\ \cancel{\text{gal.}} \times \frac{3.8\ \text{L}}{1\ \cancel{\text{gal.}}} = \frac{1.9\ \text{L}}{1} = 1.9\ \text{L}$$

Step 3

c) Now compare the two quantities:

0.5 gal.	?	1 liter
1.9 liter	>	1 liter

The two quantities are not equal.

5. Answer: Four 500-ml bottles is equivalent to a 2-liter bottle of soft drink.

Solution: To find out how many 500-mL bottles are equivalent to a 2-liter bottle of soft drink, you should first convert 2 liters to its equivalent in milliliters.

Step 1

a) What is the conversion factor from liters to milliliters?

1 liter = 1,000 milliliters

Expressing this in ratio form we have:

$$\frac{1{,}000\ \text{mL}}{1\ \text{L}}$$

Step 2

b) Multiply 2 liters with the conversion factor in (a).

$$2\,\cancel{\text{L}} \times \frac{1{,}000\text{ mL}}{1\,\cancel{\text{L}}} = \frac{2{,}000\text{ mL}}{1} = 2{,}000\text{ mL}$$

Step 3

c) To determine how many 500-ml bottles are equivalent to a 2,000-ml bottle, divide 2,000 ml by 500 mL.

$$\frac{2{,}000\text{ mL}}{500\text{ mL}} = 4$$

Therefore, four 500-mL bottles is equivalent to 2,000 mL.

6. Answer: 2.5 liters is equivalent to 2,500 mL of shampoo.

Solution:

Step 1

a) You need to convert 2,500 milliliters to its equivalent measure in liters. What is the conversion factor?

1 liter = 1,000 milliliters

Expressing this in ratio form we have:

$$\frac{1\text{ L}}{1{,}000\text{ mL}}$$

Step 2

b) Multiply 2,500 milliliters with the conversion factor in (a).

$$2{,}500\,\cancel{\text{mL}} \times \frac{1\text{ L}}{1{,}000\,\cancel{\text{mL}}} = \frac{2{,}500\text{ L}}{1{,}000} = 2.5\text{ L}$$

$$\begin{array}{r} 2.5 \\ 1000\overline{)\,2500.0} \\ -\,2000 \\ \hline 5000 \\ -\,5000 \\ \hline 0 \end{array}$$

D. Lesson 3

Let's Solve This Problem (pages 20–21)

1. Answer: No, because he actually saves money by buying from his usual station.

   Solution:
   Speed—1 L = ₱14
   Plus—1 gal = ₱49.50
   1 gal = 3.8 L
   ₱14 × 3.8 L = ₱53.20 (Cost of 1 gal of diesel at Speed Gasoline Station)

   Since ₱49.50 per gallon (Plus) < ₱53.20 per gallon (Speed), the driver actually saves money by buying from his usual gas station.

2. Answer: Yes, they can save as much as ₱2.63 per liter of mineral water.

   Solution:
   PureWater—10 L = ₱50
   Other store—1 gal = ₱9
   1 gal = 3.8 L
   Pure Water—10 L = ₱50
   Other store—3.8 L = ₱9 (since 1 gal. = 3.8 L)

   Cost per unit: Pure water → ₱50 ÷ 10 L = ₱5 per liter
   Other store → ₱9 ÷ 3.8 L = ₱2.37 per liter

   Since the price of water in the other store is smaller than the price of water in your usual store, you can save money if you buy from the other store instead.

3. Answer: The 10-fl. oz. shampoo is the better buy.

   Solution:
   Shampoo 1—320 mL = ₱60
   Shampoo 2—10 fl. oz. = ₱50
   1 fl. oz. = 30 mL
   Shampoo 1—320 mL = ₱60
   Shampoo 2—300 mL = ₱50 (since 1 fl. oz. = 30 mL, 10 × 30 mL = 300 mL)

Cost per unit: Shampoo 1 → ₱60 ÷ 320 mL = ₱0.1875 per mL or ₱0.19 per mL

Shampoo 2 → ₱50 ÷ 300 mL = ₱0.1666667 per mL or ₱0.17 per mL

Since the cost of shampoo 2 per unit (₱0.17 per mL) is smaller than the cost of Shampoo 1 per unit (₱0.19 per mL), you will get a better price by buying Shampoo 2.

E. What Have You Learned? *(pages 22–23)*

A. 1. Answer: 1 pint

Solution: 1 pint = 470 mL

1 pint ? 450 mL

470 mL > 450 mL

2. Answer: 1 tablespoon

Solution: 1 tablespoon = 3 teaspoons

1 tablespoon ? 2 teaspoons

3 teaspoons > 2 teaspoons

3. Answer: 0.72 liter

Solution: 1 cup = 0.24

1 cup ? 0.72 L

0.24 L < 0.72 L

4. Answer: 3 quarts

Solution: 1 gallon is = 3.8 L → ½ gallon = ½ × 3.8 L = 1.9 L

1 quarts = 0.95 L → 3 quarts = 3 × 0.95 L = 2.85 L

1/2 gallon ? 3 quarts

1.9 L < 2.85

5. Answer: 20 tablespoons

Solution: 1 cup = 16 tablespoons

1 cup ? 20 tablespoons

16 tablespoons < 20 tablespoons

6. Answer: 3 cups

Solution: 1 pint = 2 cups

3 cups $\underline{?}$ 1 pint

3 cups > 2 cups

B. 1) Answer: 12-fl. oz. bottle of soft drink.

Solution:

a) 350-mL bottle = ₱10.50 cost per mL of soft drink:

$$\frac{₱10.50}{350\text{ mL}} = \frac{₱0.03}{\text{mL}}$$

$$350\overline{)10.50}\quad 0.03$$

$$10.50$$

$$0$$

b) Convert 12 fl. oz. to its equivalent in mL. What is the conversion factor?

1 fl. oz. = 30 mL

Expressing this in ratio form we have:

$$\frac{30\text{ mL}}{1\text{ fl. oz.}}$$

c) Multiply 12 fl. oz. with the conversion factor in (b).

$$12\ \cancel{\text{fl. oz.}} \times \frac{30\text{ mL}}{1\ \cancel{\text{fl. oz.}}} = 360\text{ mL}$$

d) 360 mL = ₱7.20 cost per mL of soft drink:

$$\frac{₱7.20}{360\text{ mL}} = \frac{₱0.02}{\text{mL}}$$

e) Compare the cost per mL of soft drink in (a) & (d). Which is cheaper?

(a) $\underline{?}$ (d)

$$\frac{₱0.03}{\text{mL}} > \frac{₱0.02}{\text{mL}}$$

Therefore, the 12-fl. oz. soft drink is the better buy.

2) Answer: The 330-mL bottle of mineral water is a better buy.

Solution: 330-mL bottle = ₱9.90

a) cost per mL:

$$\frac{₱9.90}{330\text{ mL}} = \frac{₱0.03}{\text{mL}}$$

$$\begin{array}{r} 0.03 \\ 330\overline{)9.90} \\ -\ 0 \\ \hline 990 \\ -\ 990 \\ \hline 0 \end{array}$$

b) Convert 12 fl. oz. to its equivalent in mL. What is the conversion factor?

1 fl. oz. = 30 mL

Expressing this in ratio form we have:

$$\frac{30\text{ mL}}{1\text{ fl. oz.}}$$

(c) Multiply 12 fl. oz. with the conversion factor in (b).

$$12\ \cancel{\text{fl. oz.}} \times \frac{30\text{ mL}}{1\ \cancel{\text{fl. oz.}}} = \frac{360\text{ mL}}{1} = 360\text{ mL}$$

(d) 360 mL = ₱14.40 cost per mL:

$$\frac{₱14.40}{360\text{ mL}} = \frac{₱0.40}{\text{mL}}$$

$$\begin{array}{r} 0.04 \\ 360\overline{)14.40} \\ \underline{14.40} \\ 0 \end{array}$$

(e) Compare the cost per mL of mineral water in (a) & (d). Which is cheaper?

(a) ? (d)

$$\frac{₱0.03}{\text{mL}} < \frac{₱0.04}{\text{mL}}$$

Therefore, the 330-mL bottle of mineral water is the better buy.

3) Answer: ½ gallon of ice cream is the better buy.

Solution:

a) Convert 4 pints to its equivalent in liters. What is the conversion factor?

$$1 \text{ pint} = 0.47 \text{ liters}$$

Expressing this in ratio form we have:

$$\frac{0.47 \text{ L}}{1 \text{ pt.}}$$

b) Multiply 4 pints with the conversion factor in (a).

$$4 \cancel{\text{pt.}} \times \frac{0.47 \text{ L}}{1 \cancel{\text{pt.}}} = \frac{1.88 \text{ L}}{1} = 1.88 \text{ L}$$

c) 1.88 L = ₱99.64 cost per liter:

$$\frac{₱99.64}{1.88 \text{ L}} = \frac{₱53}{\text{L}}$$

$$\begin{array}{r} 53 \\ 188\overline{)9964} \\ -\,940 \\ \hline 564 \\ -\,564 \\ \hline 0 \end{array}$$

d) Convert ½ gallon to its equivalent in liters. What is the conversion factor?

$$1 \text{ gallon} = 3.8 \text{ L}$$

Expressing this in ratio form we have:

$$\frac{3.8 \text{ L}}{1 \text{ gallon}}$$

e) Multiply ½ or 0.5 gallons with the conversion factor in (d).

$$0.5 \cancel{\text{gal.}} \times \frac{3.8 \text{ L}}{1 \cancel{\text{gal.}}} = \frac{1.9 \text{ L}}{1} = 1.9 \text{ L}$$

f) 1.9 L = ₱95.00 cost per liter:

$$\frac{₱95.00}{1.9\ \text{L}} = \frac{₱50}{\text{L}}$$

g) Compare the cost per liter of ice cream in (c) & (f).

(c) ? (f)

$$\frac{₱53.00}{\text{L}} > \frac{₱50.00}{\text{L}}$$

Therefore, the ½ gallon of ice cream is the better buy.

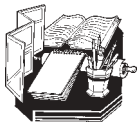
C. 1. volume

2. 1,000

3. same

4. compare

5. save



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