What Is This Module About?

We often deal with measurements in our everyday lives. For example, in order to know what clothes would fit us, we measure our height, the length of our arms, and even our waistline. When we want to build something, we specify its length, width and height. When we travel, we estimate how fast we can get to where we are going by finding out the distance between our starting point and destination.

This module is all about lengths and distances. Through it you can learn how to measure the sizes of objects and the distances between places. It is divided into three lessons:

Lesson 1 — *Measuring Length Using the Metric System*

Lesson 2 — *Measuring Length Using the English System*

Lesson 3 — *Let's Convert Units*

What Will You Learn From This Module?

After studying this module, you should be able to:

- estimate the lengths of objects and the distances between places using nonstandard measurement tools;
- measure and record the lengths of objects using metric and English units of measurements;
- measure and record the distances between places using metric and English units of measurements;
- convert smaller units of length to bigger units and vice versa; and
- convert metric units of measurements to English units and vice versa.

Let's See What You Already Know

Before beginning with the first lesson, take the following test. This will determine what you already know about the topic.

1. The Statue of Liberty is 45,300 millimeters high. What is the height of the statue in meters?

   _____

   _____

2. The Marianas Trench is about 6.8 miles deep. What is its depth in feet?

   _____

   _____

3. Mayon volcano is 9,991 feet high. What is its height in centimeters?

   _____

   _____

4. Dindo Pumaren stands 68 inches tall. Olsen Racela stands 5.75 feet tall. Jimuel Torion is 170.18 centimeters tall. Who among the three basketball players is the tallest? Express their heights in inches.

   _____

   _____

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on pages 47–49.

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 means 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 now go to the next page to begin Lesson 1.

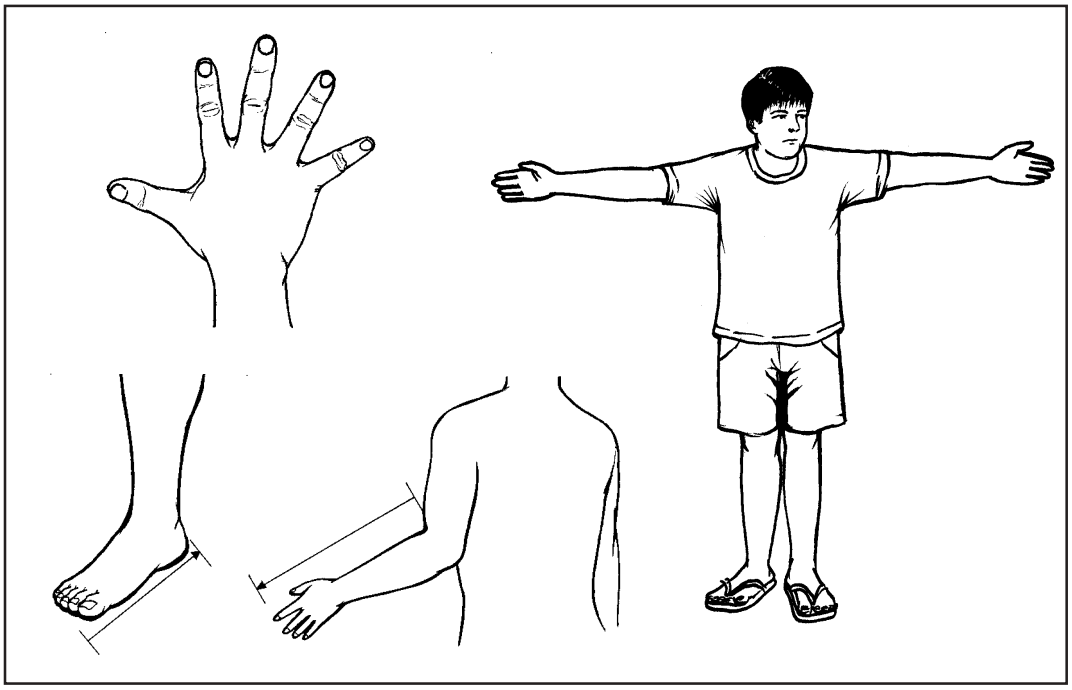
LESSON 1

Measuring Length Using the Metric System

How do you know that an object is big or small? How do you know how far a place is? In this lesson, you will learn how to measure the lengths of objects. You will also learn how to measure distances between places. You will do these by using the metric system of measurement.

After studying this lesson, you should be able to:

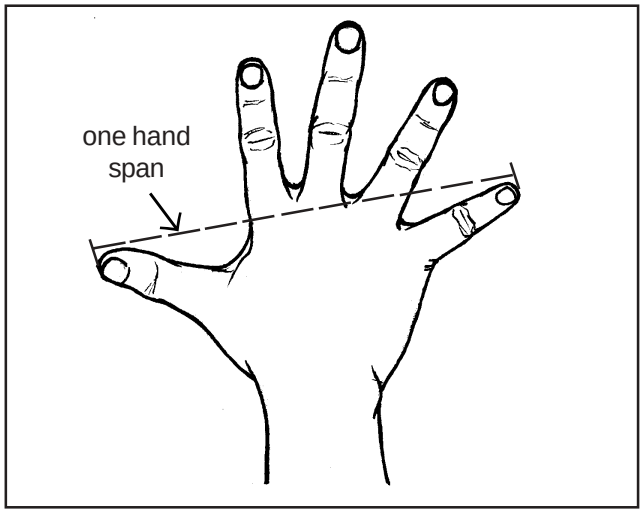
- estimate the lengths of objects by using nonstandard measurement tools;
- measure and record the lengths of objects using the metric system;
- measure and record the distances between places using the metric system; and
- convert smaller units of length to bigger units and vice versa using conversion factors.



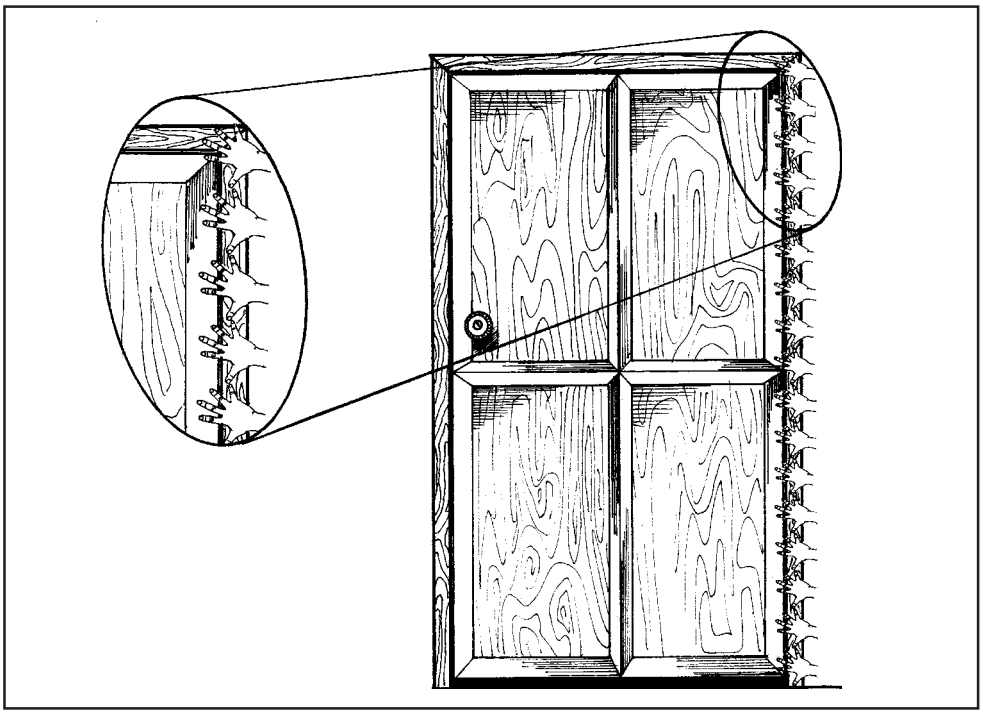
Let's Try This

You can measure the lengths of objects or the distances between places by using parts of your body as a measuring tool. Let us try measuring things around the house using the **hand span.**

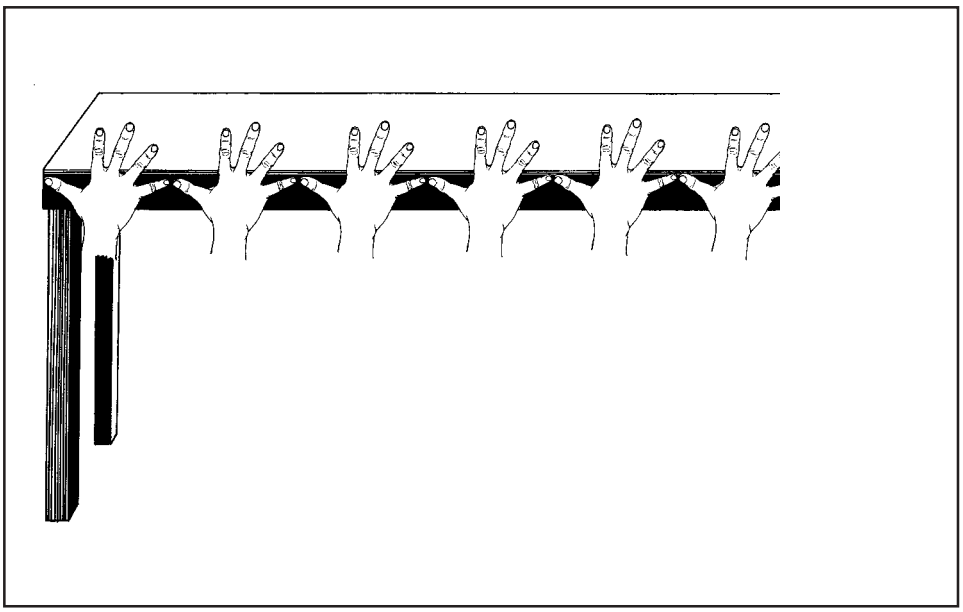
To make a hand span, spread out your fingers. The length of the hand span is measured from the tip of the thumb to the tip of the little finger.



To measure the length of an object using the hand span, place your outstretched hand at one end of the object. Then move your hand along the object, always beginning the next hand span at the point reached by your little finger. Count how many hand spans you are able to make from one end of the object to the other. Record your results.



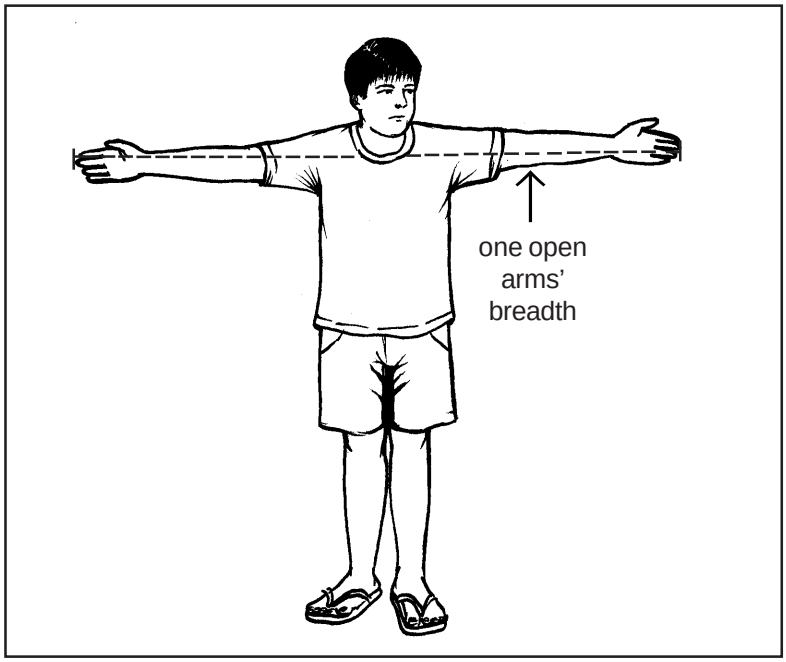
If the end of the object does not measure exactly one hand span, express the length in fraction. For example, the length of a table can measure 6 ½ hand spans or the length of a window can measure 8 ¾ hand spans.



Try measuring some objects in your house using your hand span. Below is a list of objects you can measure. An example is given to guide you. Write your measurements in the blanks.

Object	Length	Width	Height
Bed	8 hand spans	4 hand spans	2 hand spans
Door	**********	_____	_____
Table	_____	_____	_____
Refrigerator	_____	_____	_____
Window	_____	**********	_____

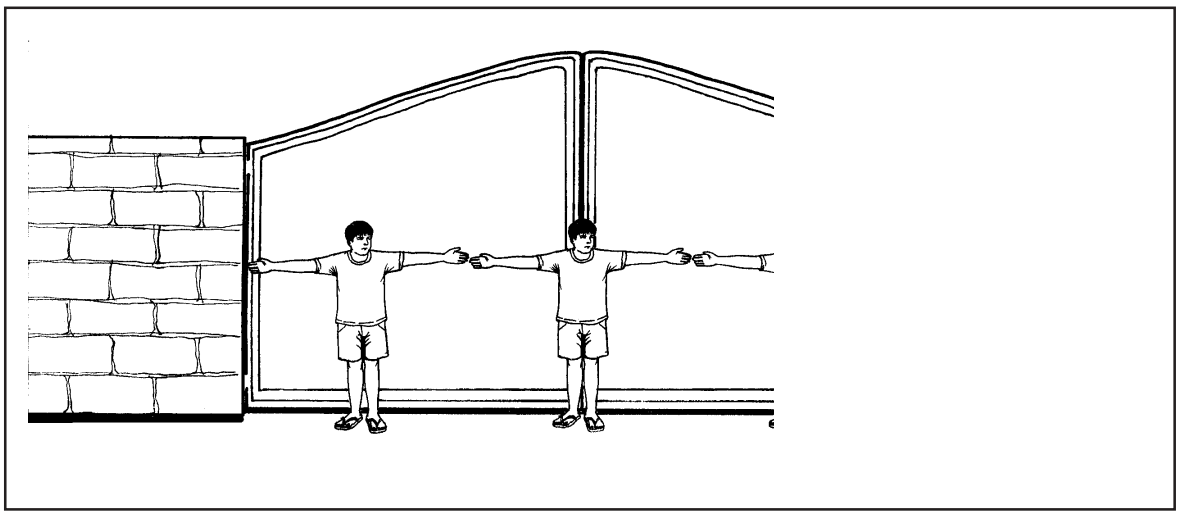
Another method of measuring the length of objects is by the **open arms' breadth.** This is determined by opening your arms sidewards as in the picture below.



The length of an open arms' breadth is from the tip of the middle finger of one arm to the tip of the middle finger of the other arm, while the arms are outstretched. The open arms' breadth can be used to measure objects or things that are big or long.

Try measuring one side of the fence or wall surrounding your house. How many open arms' breadth is it?
_____. Now try measuring the length of one side of your house. How many open arms' breadth is it?
_____.

In the picture below, the gate measures 3 open arms' breadths.



Like with the hand span, if the end of the object does not measure exactly one open arms' breadth, express the length in fraction. For example, the length of a wall may measure 5 ½ open arm's breadths or the length of a fence may measure 8 ¾ open arms' breadths.

Now what if you want to measure the distance between two places? Can you think of a way to do this using parts of your body? Think about this for a while and write your answer below.

_____

_____

A convenient way of measuring the distance between two places is by measuring the number of steps you make from one place to another. For a more accurate measurement, make sure that the path you take is straight and that your steps are even.

Is there a school, store, a church or any other landmark near your house? Can you measure the distance between your home and this landmark? How many steps do you need to travel from your house to this place? Go and find out, then write your answer here: _____.

With the help of your body, you can measure the lengths of objects and the distances between places.

Let's Review

How can you measure the lengths of objects and the distances between places using certain parts of your body? Give specific examples.

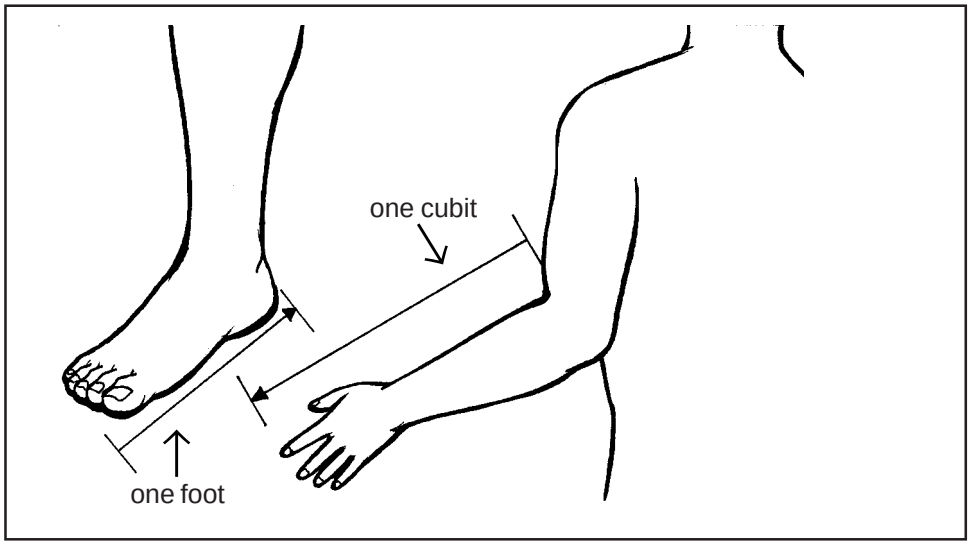
_____

_____

Compare your answer with the one in the *Answer Key* on page 49.

Let's Learn

In ancient times, people measured the lengths of objects with the use of the human body. For example, the Egyptians used the **cubit** to measure length. A **cubit** is based on the length of the arm from the elbow to the outstretched fingertips. Another example is the **foot** which is based on the length of a human foot from the tip of the toes to the heel.



But since the size of body parts varies among people, some problems arose. A cubit based on a short-armed person's arm is different from that based on the arm of a long-armed person. Because of this problem, people began to argue about how long a cubit should really be. Traders, for example, often fought over the proper lenght of goods, like a cubit of cloth.

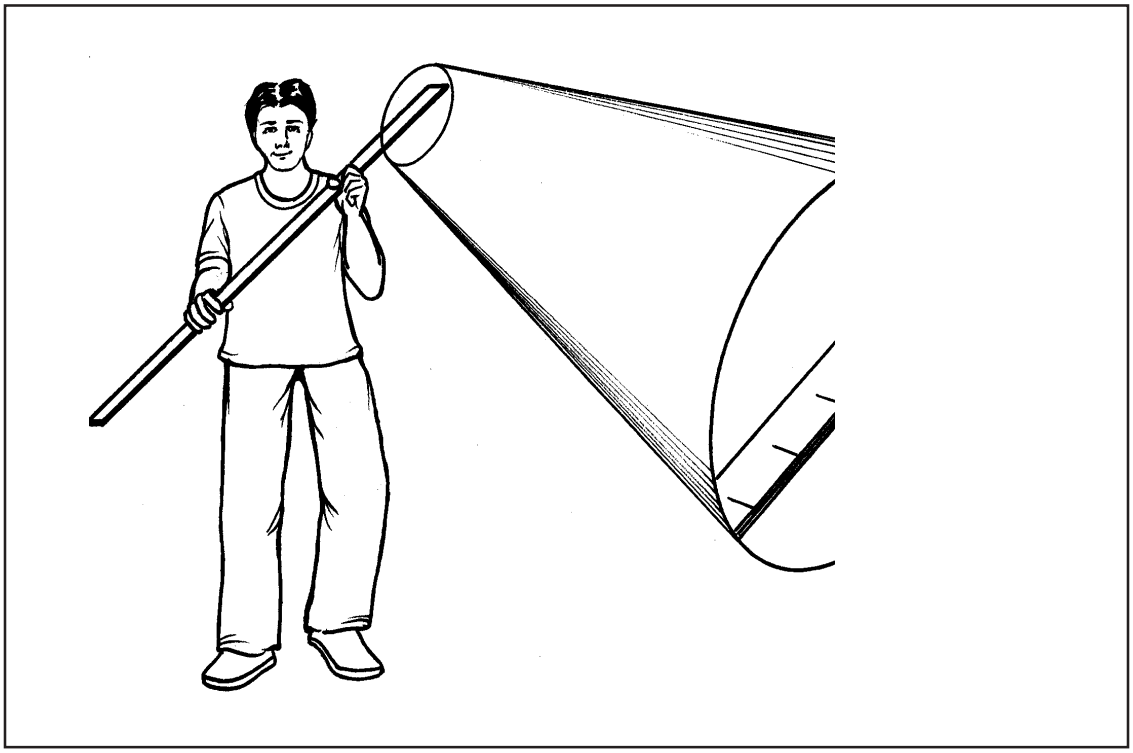
To solve the problem, people began to think of other ways of measuring length. They soon agreed on using standard systems of measurement.

This made length more accurate. People no longer based the cubit on the length of the arm. They based it on a royal master cubit made of black marble. People checked their measuring sticks against the master cubit regularly. This made measuring sticks uniform and equal.

In modern times, people use the metric system and the English system. These are standards that are agreed upon by many countries. Systems of measurement should meet two important conditions: that the units are convenient and that they are consistent.

The Metric System

In the metric system, the standard unit of length is the **meter (m).** You can use a meter stick for measuring the length of objects.



The metric system allows the sizes of the units to be made bigger or smaller by the use of appropriate prefixes. On the following page is a list of prefixes with their symbols used for the metric system. The multiplying factors are also given.

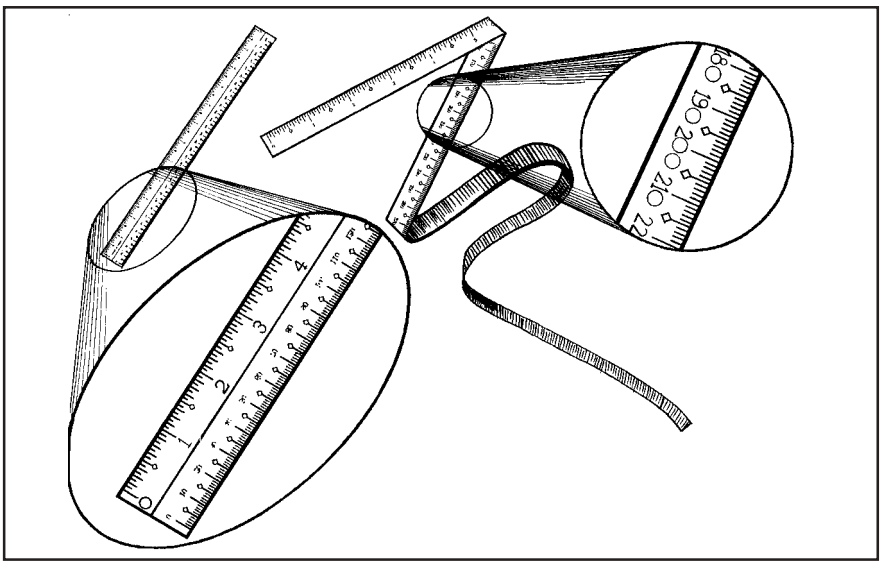
Prefix	Symbol	Meaning
mega	[M]	a million times
kilo	[k]	a thousand tin
hecto	[h]	a hundred tim
deca	[da]	ten times
deci	[d]	one tenth of
centi	[c]	one hundredth
milli	[m]	one thousandt
micro	[μ]	one millionth c

Using these prefixes for the meter we have:

megameter	(Mm)
kilometer	(km)
hectometer	(hm)
decameter	(dam)
decimeter	(dm)
centimeter	(cm)
millimeter	(mm)
micrometer	(μm)

The metric system is easier and simpler to use because it uses the decimal system, which is based on multiples of ten. This makes computations and conversions a lot easier.

There are common measuring devices used to measure length in the metric system. These are the **meter stick,** the **ruler** and the **measuring tape.** Look for rulers and measuring tapes with gradations in millimeters (mm) and/ or centimeters (cm).

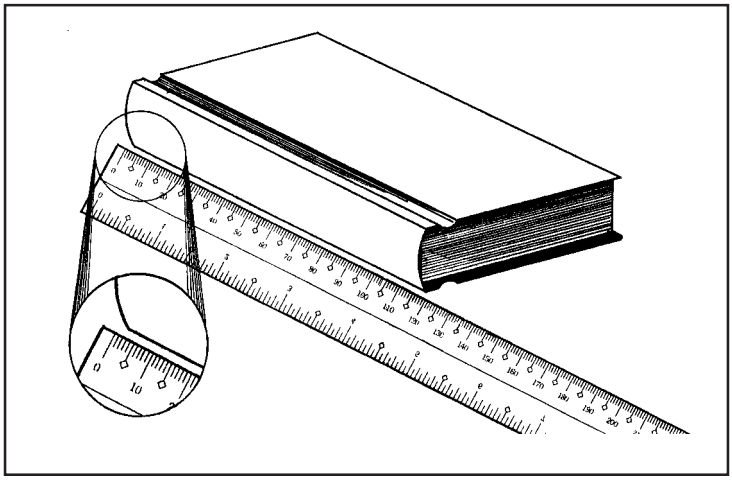


Observe the gradations of the ruler in centimeters and that in millimeters. Do you notice the similarity? For gradations expressed in centimeters, the count is 1, 2, 3, 4, 5 and so on. For gradations expressed in millimeters, the count is 10, 20, 30, 40, 50 and so on. These marked gradations are actually equal in length. This means that 1 cm = 10 mm, 2 cm = 20 mm, and so on.

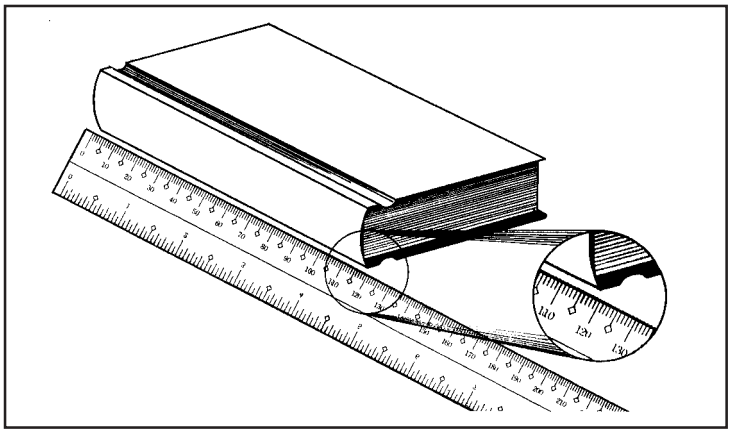
So if you need to measure length in centimeters using a ruler with gradations in millimeters, just remove the zero from the digit. Thus, 10 millimeters is 1 centimeter, 200 millimeters becomes 20 centimeters, and so on.

In the opposite case, if you need to measure length in millimeters using a ruler with gradations in centimeters, just add zero at the end of the numbers. Thus 1 centimeter is 10 millimeters, 30 centimeters is 300 millimeters, and so on.

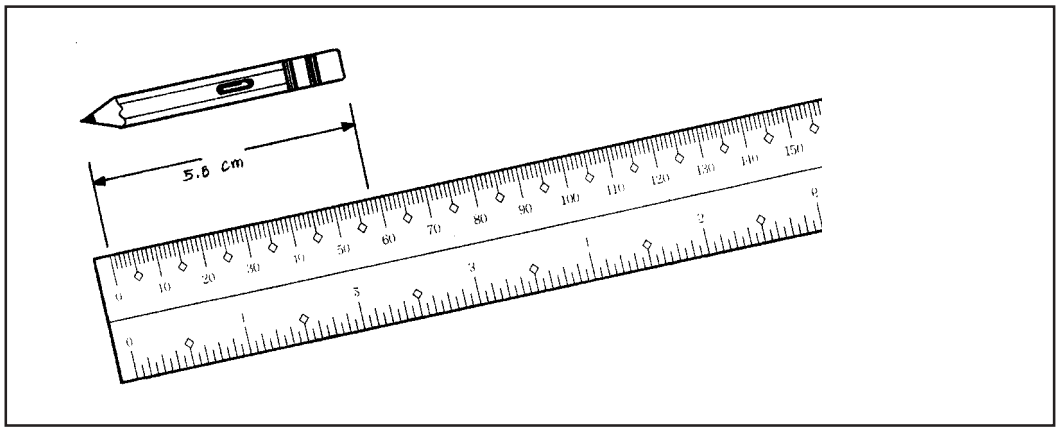
To measure an object using the meter stick, ruler or measuring tape, place the zero mark of the gradation on one end of the object to be measured.



With the zero mark fixed on one end of the object, measure the length by reading where the gradations on the ruler meet the other end of the object.



For measurements in centimeters, if your measurements do not fall exactly on the centimeter gradations, include decimals in your measurement. For example, the measurement of the pencil in the picture on the next page should read *5.8 centimeters.*



Let's Try This

For this activity, you will need the following:

1. ruler with centimeter and millimeter readings
2. meter stick
3. tape measure

Try measuring some objects in your house using the ruler or meter stick. Below is a list of objects in your house that you can measure. An example is given to guide you. Write your measurements in the blanks.

Object	Length	Width	Height
Bed	180 centimeters	90 centimeters	45 centimeters
Door	**********	_____	_____
Table	_____	_____	_____
Refrigerator	_____	_____	_____
Window	_____	**********	_____

To measure long lengths or distances, you can use the tape measure. Can you measure one side of your fence? How long is it when measured in centimeters? _____. How about one side of your house? How long is it in centimeters? _____.

Let's Review

Explain why it is better to use measuring instruments like the ruler, the meter stick and the tape measure rather than using the parts of the body for measuring lengths and distances.

_____

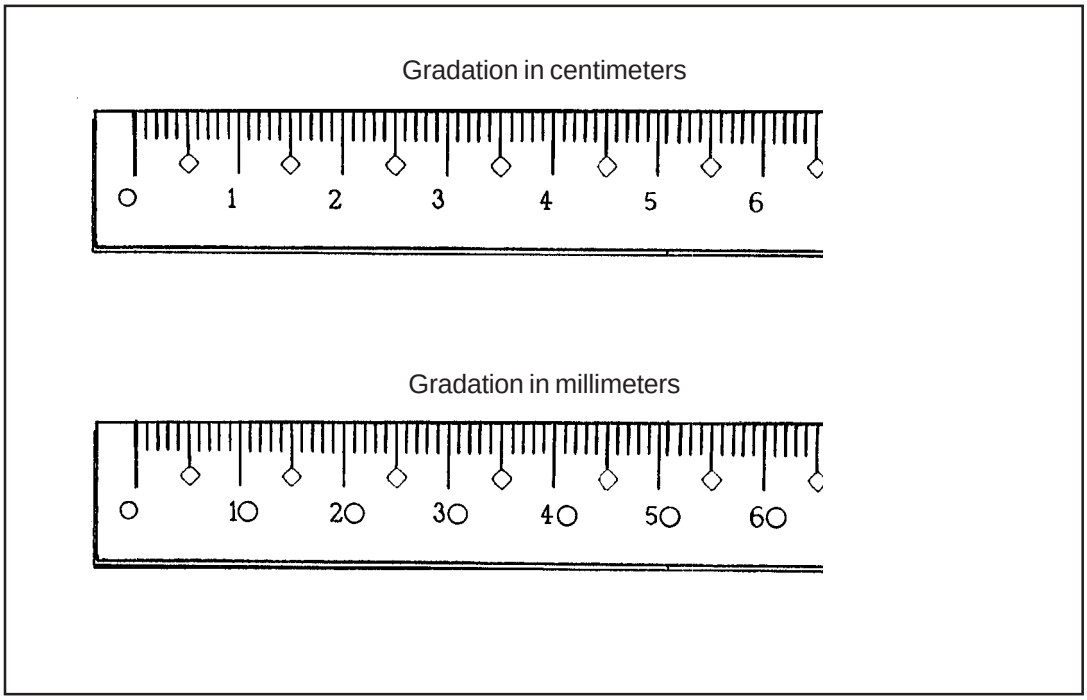
_____

_____

Compare your answer with the one in the *Answer Key* on pages 49–50.

Let's Study and Analyze

Have you seen a ruler or a meter stick? Did you notice the units of length indicated on them? Some rulers and meter sticks are gradated in centimeters while others are gradated in millimeters.



How do you convert measurements from centimeters to millimeters and vice versa? You can convert from one unit to another using the **conversion factors** in the list below.

Units	Symbol	Conversion Factor	
kilometer	km	1 kilometer	= 1,000 meters
hectometer	hm	1 hectometer	= 100 meters
decameter	dam	1 decameter	= 10 meters
meter		m	
decimeter	dm	10 decimeters	= 1 meter
centimeter	cm	100 centimeters	= 1 meter
millimeter	mm	1,000 millimeters	= 1 meter

A **conversion factor** is the value or ratio you must multiply with a number to change it from one unit of measure to another. Hence, you can convert centimeters to meters or meters to kilometers.

Conversion factors are expressed in ratio form. For example, *1 meter = 100 centimeters* should be expressed this way:

$$\frac{1\,\text{meter}}{100\,\text{centimeters}} \quad \text{or} \quad \frac{100\,\text{centimeters}}{1\,\text{meter}} \quad \begin{matrix} \leftarrow \text{numerator} \\ \leftarrow \text{denominator} \end{matrix}$$

Notice that there are two possible arrangements for the conversion factor ratio. The examples on the next page will help you decide which among the two possible arrangements you should use.

To convert one unit to another, you should convert the current unit of measure into meters first if it is not in meters yet. After converting the units into meters, convert it, then, to the desired unit of measure.

It is suggested that you memorize these conversion factors so that you will have an easier time solving the conversion problems.

Following are some sample problems and their solutions to help you understand what we have discussed.

PROBLEM 1 Convert 14 centimeters to meters.

SOLUTION:

You should first convert centimeters into meters:

STEP 1 The conversion factor is: 1m = 100 cm. There are two possible arrangements for the conversion factor in ratio form:

$$\frac{1\,\text{m}}{100\,\text{cm}} \quad \text{or} \quad \frac{100\,\text{cm}}{1\,\text{m}}$$

In order to cancel the cm units, choose the one where the 100 cm is in the denominator.

STEP 2 Multiply the conversion factor by 14 centimeters.

$$14\,\cancel{\text{cm}} \times \frac{1\,\text{m}}{100\,\cancel{\text{cm}}} = \boxed{0.14\,\text{m}}$$

← The cm unit is in the denominator; it cancels out.

PROBLEM 2 Convert 3 decameters to millimeters.

SOLUTION:

You should first convert decameters into meters:

STEP 1 The conversion factor is: 1 decameter = 10 meters.

Conversion factor in ratio form: $\frac{10\,\text{m}}{1\,\text{dam}}$

STEP 2 Multiply 3 decameters by the conversion factor.

$$3\,\cancel{\text{dam}} \times \frac{10\,\text{m}}{1\,\cancel{\text{dam}}} = 30\,\text{meters}$$

Then you can convert from meters to millimeters:

STEP 3 The conversion factor is: 1 meter = 1,000 millimeter.

Conversion factor in ratio form: $\frac{1{,}000\,\text{mm}}{1\,\text{m}}$

STEP 4 Multiply 30 meters by the conversion factor.

$$30\,\cancel{\text{m}} \times \frac{1{,}000\,\text{mm}}{1\,\cancel{\text{m}}} = \boxed{30{,}000\,\text{mm}}$$

Let's Solve This Problem

Now that you know how to convert from one metric unit to another, let us try solving some of these conversion problems. Let us do it step by step.

1. Aling Senyang needs 1.5 meters of cloth. She does not have a meterstick or a measuring tape in meters. She only has a ruler with centimeter readings. How many centimeters should she measure in order to get 1.5 meters of cloth?

   SOLUTION:

   You should convert 1.5 meters to centimeters.

   a. What is the conversion factor?

   _____

   _____

   b. Multiply 1.5 meters by the conversion factor.

   1.5 m $\times$ $\boxed{\quad\quad}$ = _____

2. Mang Boyet needs to deliver 3 decameters of copper wire to a customer. However, he does not have a measuring instrument that measures in decameters. All that he has is a measuring tape whose measuring units are centimeters. How many centimeters does Mang Boyet need in order to get 3 decameters of copper wire?

   SOLUTION:

   You need to convert 3 decameters into centimeters.

   a. But first, you need to convert decameters into meters. What is the conversion factor for converting decameters to meters?

   _____

   _____

   b) Now you can multiply 3 decameters with the conversion factor.

   3 dam $\times$ $\boxed{\quad\quad}$ = _____ m

c) Now that the units are in meters, you can easily convert it to centimeters. Do you know what the conversion factor is?

_____

d) Next, you must multiply your answer in (b) with the conversion factor in (c) to get the equivalent units in centimeters.

___ m × $\frac{\quad\quad}{\quad\quad}$ = _____ cm

Compare your answers with those in the *Answer Key* on pages 50–51.

7 – 11 Good! You can now move on to the next lesson.

0 – 6 You should study this lesson again. Make sure to review the parts or sections that you did not understand well.

Let's See What You Have Learned

Let us see if you have understood this lesson well. Take the test below to determine how much you have learned about the topics discussed. Good luck!

1. Find a rectangular dining table. Measure its length and width in terms of hand spans and centimeters. (2 points)

**********	**Measurement in hand spans**	**Measurements in centimeters**
Length	_____	_____
Width	_____	_____

2. Which do you think is a more reliable and convenient way of measuring length—hand spans or centimeters? Explain your answer. (2 points)

_____

_____

3. Manang Lucia needs a roll of aluminum foil for the food she is going to cook for a party. She needs 30 sheets of aluminum foil, each 40 centimeters long. How many meters of aluminum foil does Manang Lucia need to produce the 30 sheets of aluminum foil? (3 points)

SOLUTION:

4. How long is 7 hectometers expressed in millimeters? (4 pts.)

SOLUTION:

That wasn't so difficult, was it? Now compare your answers with those in the *Answer Key* on pages 51–52.

Let's Remember

- It is more reliable to use standard measurement systems than non-standard measurement tools.
- You can conveniently convert one metric unit to another through the use of conversion factors.
- A conversion factor is the value or ratio you need to multiply a number by to change it from one unit of measure to another.

Measuring Length Using the English System

We have learned in the first lesson how to measure length and distance using the metric system. In this lesson, we will learn how to do the same using the English system.

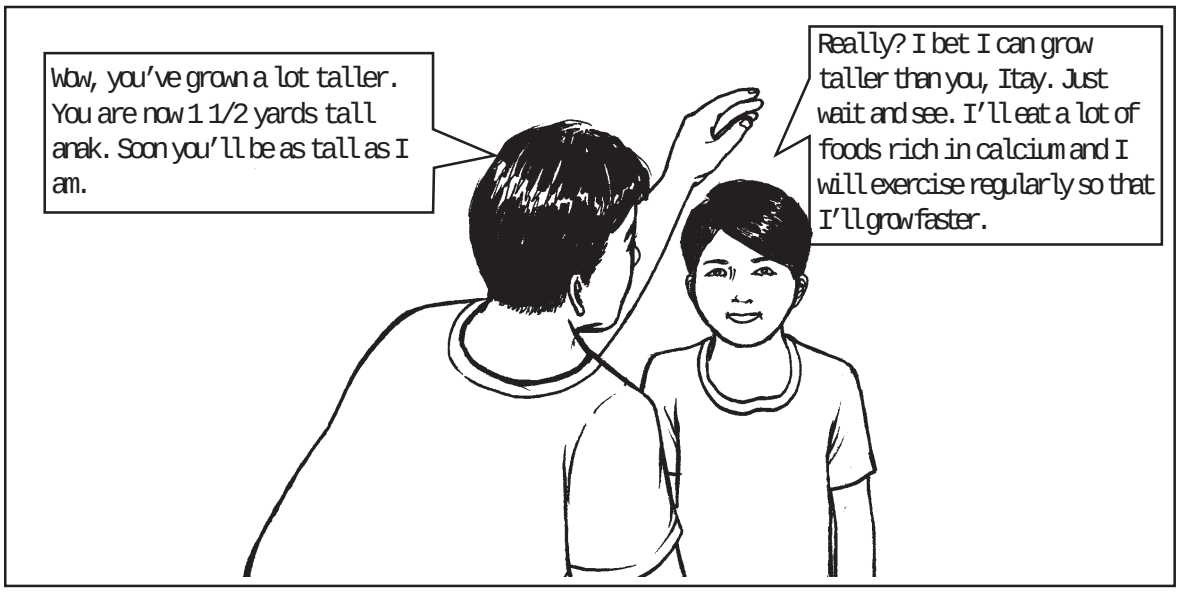
After studying this lesson, you should be able to:

- measure and record the lengths of objects using the English system of measurements;
- measure and record distances between places using the English system of measurements; and
- convert smaller units of length to bigger units and vice versa.

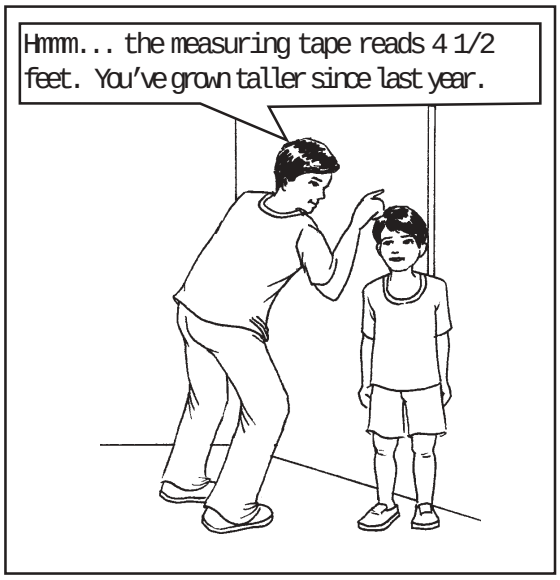
Let's Read

How Tall Am I Really?

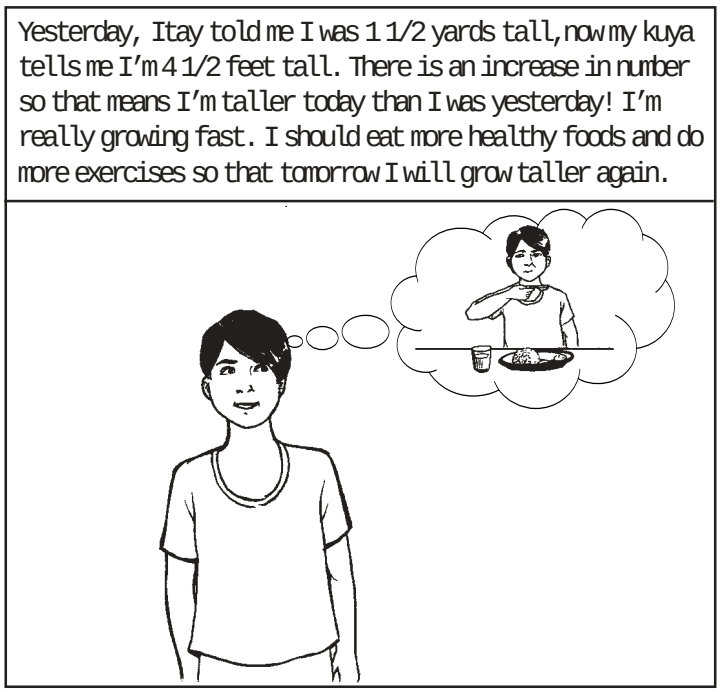
Bong wanted to know how tall he was. He was excited about growing as tall as the grown-ups. And so Bong approached his father and asked him to measure his height…



Bong was able to sleep soundly that night. He was so happy to learn how tall he was. He imagined that he will grow a little bit taller when he wakes up in the morning. When he awoke, he was certain that he grew taller. So Bong asked his *kuya* to measure his height…



Bong thought about what he heard from his kuya. He thought…



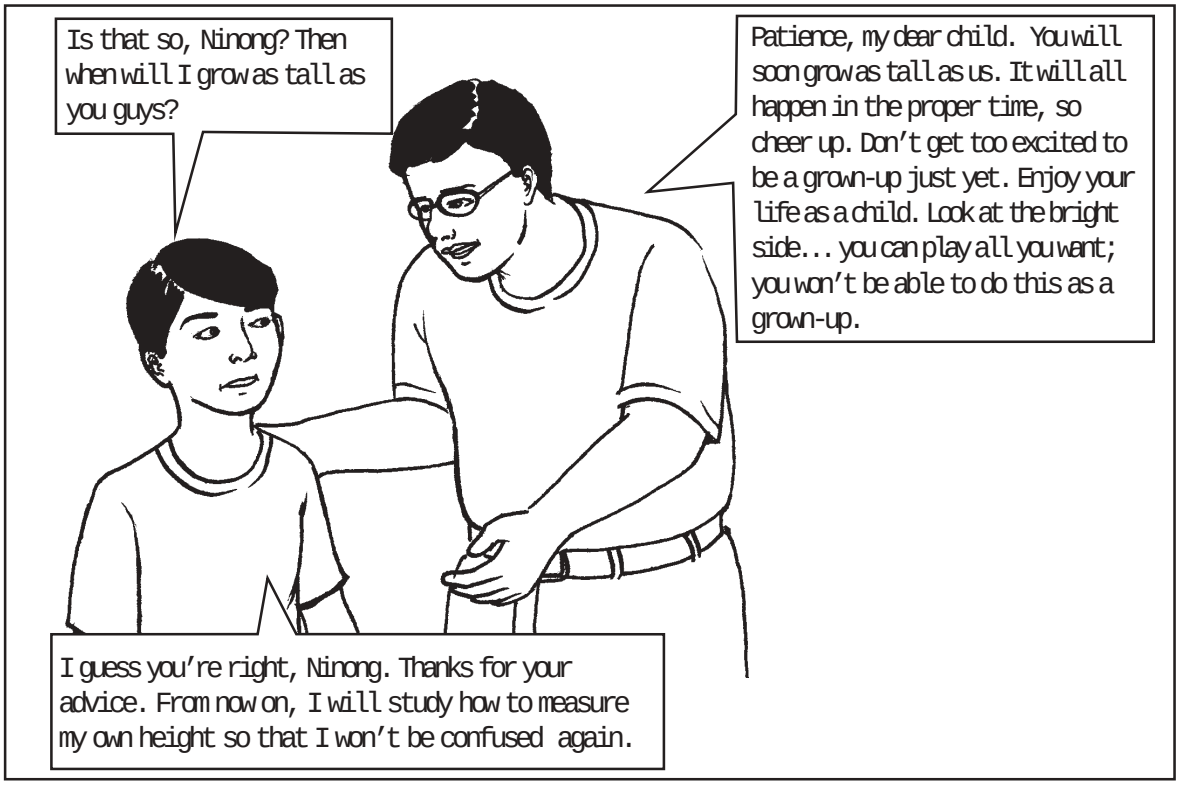
With excitement Bong waited again for tomorrow. He felt so good about himself, and what's more, he felt really tall. Again he slept well that night and when he awoke, he was very sure that he had grown taller. And so he went to his mother and asked her to measure his height…

After hearing what his mother said Bong thought to himself...

And so Bong visited his favorite ninong, Mr. Ato. Bong was so excited to tell his ninong about what happened to him…

Ninong Ato thought for a while. He took a good look at his godson and laughed….

Upon learning this, Bong frowned and became sad….



Let's Review

Why did Bong think he was growing taller every day? Did he in fact grow tall? Explain.

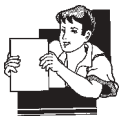
_____

_____

_____

_____

Compare your answer with the one in the *Answer Key* on page 52.



Let's Learn

The English system, also known as the U.S. Customary System of Units, has been used in the United States and in many European countries for hundreds of years now. This system was developed over a period of more than a thousand years.

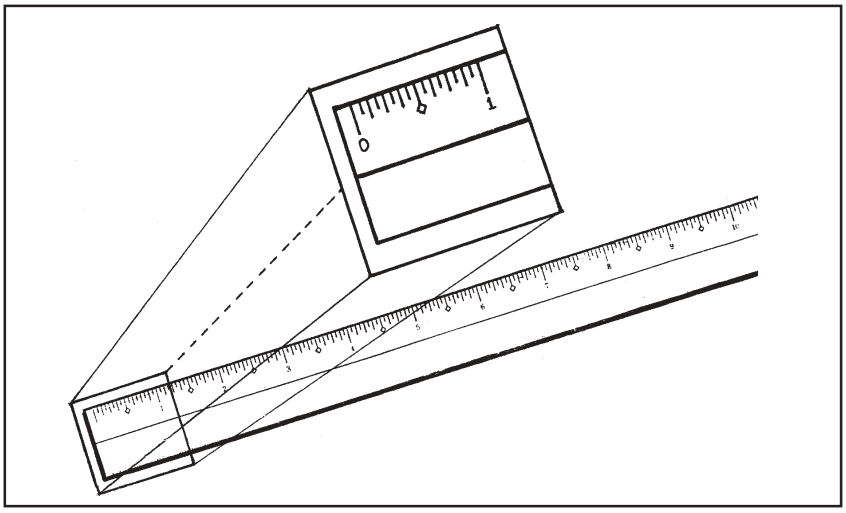
The English system is elaborate and uses more than one unit of measure for length. This can often lead to confusion. But since many countries use the English system, it is important for you to know how to use this system of measurement.

For measuring length, the English system uses the following units:

inch	yard
foot	mile

The Inch (in.)

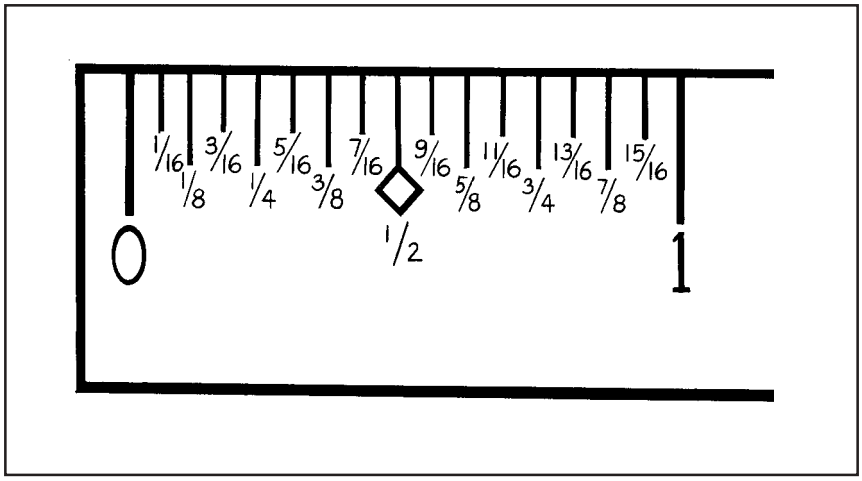
Look at the portion of the ruler below. How many gradations does an inch have?



Notice that there are 16 gradations in one inch. Each gradation is $1/16^{th}$ of an inch. The gradations of an inch are:

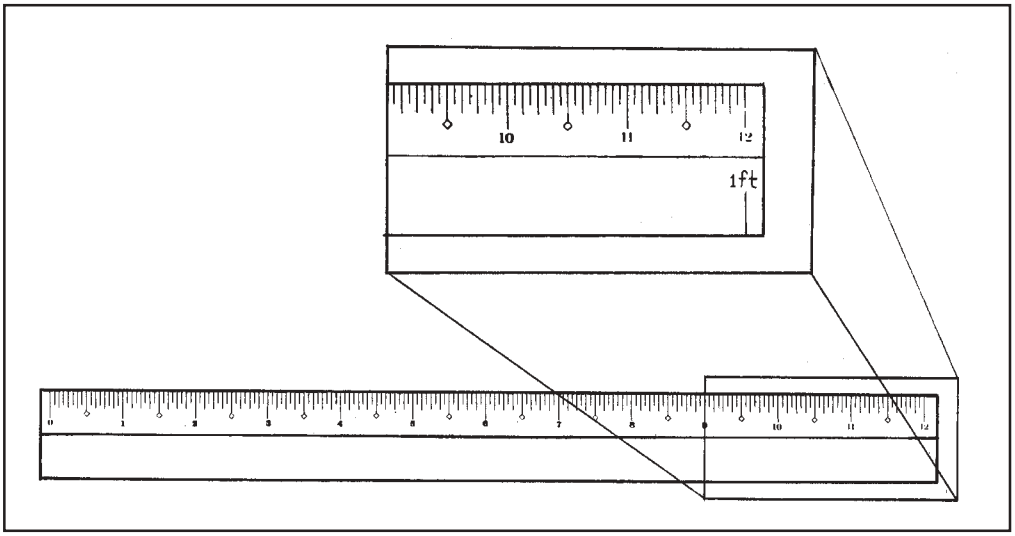
0, 1/16 inch, 2/16 inch, 3/16 inch, 4/16 inch, 5/16 inch, 6/16 inch, 7/16 inch, 8/16 inch, 9/16 inch, 10/16 inch, 11/16 inch, 12/16 inch, 13/16 inch, 14/16 inch, 15/16 inch, 1 inch.

Some of the fractions can be simplified so the measurements will read: 0, 1/16 inch, 1/8 inch, 3/16 inch, 1/4 inch, 5/16 inch, 3/8 inch, 7/16 inch, ½ inch, 9/16 inch, 5/8 inch, 11/16 inch, ¾ inch, 13/16 inch, 7/8 inch, 15/16 inch, 1 inch.



The Foot (ft.)

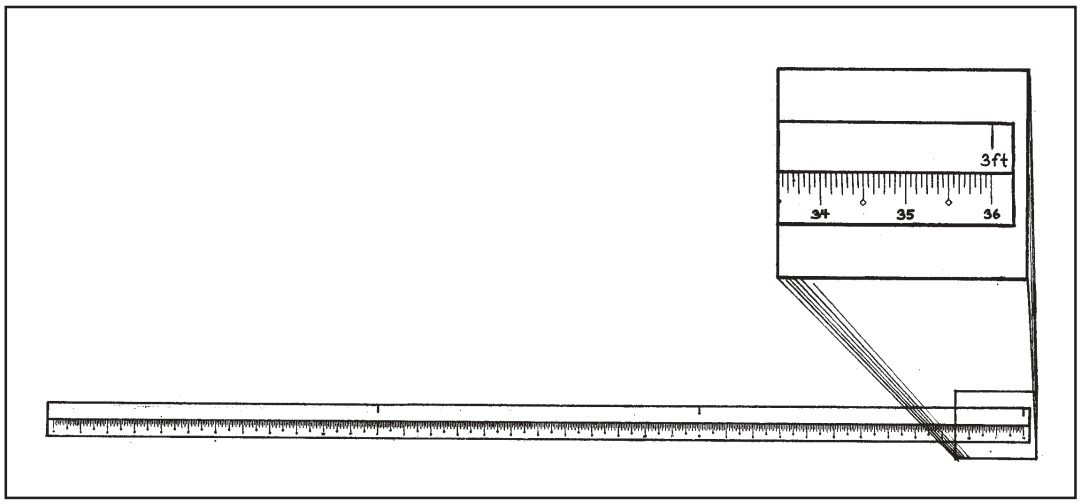
Look at the ruler below. It is 12 inches long. This is equivalent to 1 foot.



When an object cannot be measured in whole foot units, the measurements are expressed in feet and inches; i.e. 5 feet and 6 inches, 4 feet and 11 inches, etc. This is usually how people measure their height.

The Yard (yd.)

Look at the illustration of a yardstick below. One yard is equivalent to 36 inches; it is also equivalent to 3 feet.



The yard is usually used for measuring objects of great length like rolls of cloth, sheets of aluminum or coils of wire. It may also be used to measure short distances.

The Mile (mi.)

The mile is used to measure long distances. It is equivalent to 5,280 feet. It may also be used to measure the lengths of rivers or the depths of oceans.

Let's Try This

For this activity, you will need the following materials:

1. ruler with gradations in inches
2. yardstick
3. tape measure with gradations in feet, inches, and/or yards.

With the use of these measuring instruments, measure some objects in your house. On the following page is a list of objects that you can measure. An example is given to guide you.

Measurements in inches:

Object	Length	Width	Height
Bed	71 inches	35 1/2 inches	17 1/2 inches
Door	**********	_____	_____
Table	_____	_____	_____
Refrigerator	_____	_____	_____
Window	_____	**********	_____

Measurements in feet:

Object	Length	Width	Height
Bed	5 feet and 11 inches	2 feet and 11 1/2 inches	1 foot and 5 1/2 inches
Door	**********	_____	_____
Table	_____	_____	_____
Refrigerator	_____	_____	_____
Window	_____	**********	_____

Measurements in yards:

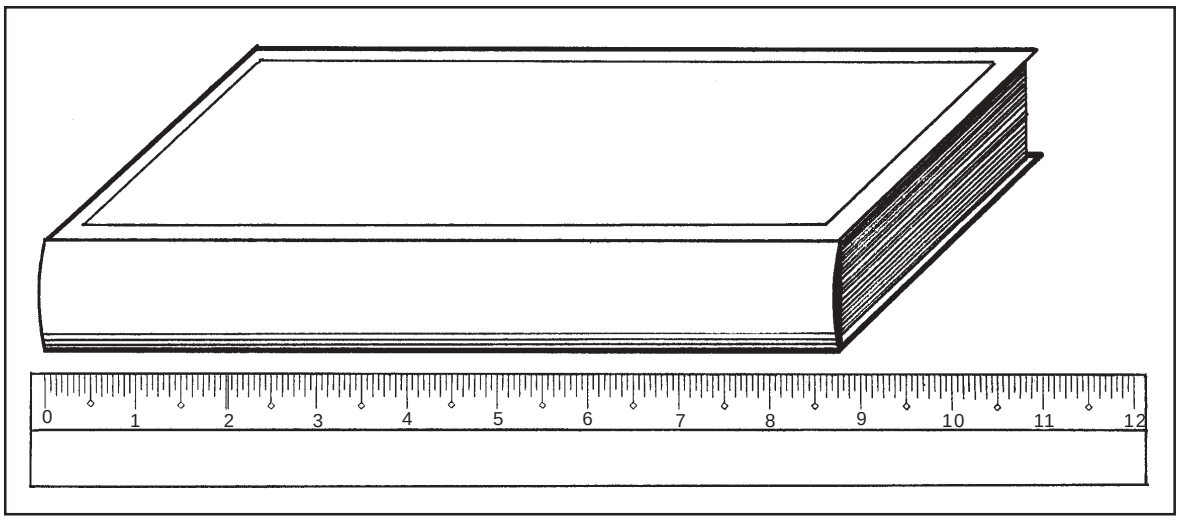
Object	Length
One side of the house	8 yards
One side of a fence	_____
Gate	_____

Let's Review

1. Write the equivalent units of measure for the following English system units:

Unit of Measure	Equivalent Units
1 foot	_____ inches
1 yard	_____ feet
1 mile	_____ feet

2. Look at the picture of a book below. How long is the book in inches?



_____

Compare your answers with those in the *Answer Key* on pages 52–53.

Let's Study and Analyze

Conversion Factors

It is important that you know how to convert one English system unit to another. For units of length these are the conversion factors you need to memorize:

Unit of Measure	Equivalent Units
1 foot	12 inches
1 yard	3 feet
1 mile	5,280 feet

Let us practice solving some conversion problems:

PROBLEM 1 Convert 60 inches to feet.

SOLUTION:

STEP 1 The conversion factor is: 1 foot = 12 inches.

$$\text{Conversion factor in ratio form: } \frac{1\,\text{ft.}}{12\,\text{in.}}$$

STEP 2 Multiply 60 inches by the conversion factor.

$$60\,\text{in.} \times \frac{1\,\text{ft.}}{12\,\text{in.}} = \boxed{5\,\text{ft.}}$$

PROBLEM 2 The distance from Mang Lino's house to the hospital is 3.5 miles. How long is the distance if expressed in yards?

SOLUTION:

We need to convert miles into feet and from there we can easily convert the units to yards.

STEP 1 The conversion factor for converting miles to feet is: 1 mile = 5,280 feet.

$$\text{Conversion factor in ratio form: } \frac{5{,}280\,\text{ft.}}{1\,\text{mi.}}$$

STEP 2 Multiply 3.5 miles by the conversion factor.

$$3.5\,\text{mi.} \times \frac{5{,}280\,\text{ft.}}{1\,\text{mi.}} = \boxed{18{,}480\,\text{ft.}}$$

Now that the units are expressed in feet, it could easily be converted into yards.

STEP 3 The conversion factor for converting yards to feet is: 1 yard = 3 feet.

$$\text{Conversion factor in ratio form: } \frac{1\,\text{yd.}}{3\,\text{ft.}}$$

STEP 4 Multiply 18,480 ft. by the conversion factor.

$$18{,}480\,\text{ft.} \times \frac{1\,\text{yd.}}{3\,\text{ft.}} = \boxed{6{,}160\,\text{yd.}}$$

Let's Review

Edgar is 67.2 inches tall, Richard is 5.5 feet tall and Alberto is 2 yards tall. Who is the tallest among the three?

SOLUTION:

We won't know who among the three is the tallest unless we compare their heights using the same unit. Let us compare these in feet.

Edgar's height in feet:

a. We need to convert 67.2 inches to feet. The conversion factor is:

_____

b. Multiply 67.2 inches by the conversion factor in (a).

67.2 in. $\times$ $\boxed{\quad\quad}$ = _____

Richard's height in feet: 5.5 feet (given)

Alberto's height in feet:

c. We need to convert 2 yards to feet. The conversion factor is:

_____

d. Multiply 2 yards by the conversion factor in (c).

2 yd. $\times$ $\boxed{\quad\quad}$ = _____

e. Now that the heights of Edgar, Richard and Alberto are all expressed in feet, you can easily compare these. Who among the three is the tallest?

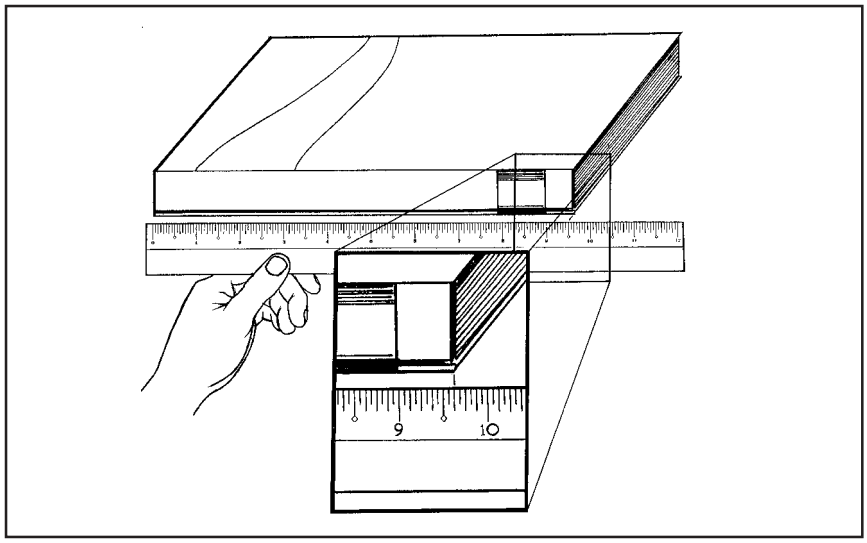
_____

Compare your answers with those in the *Answer Key* on page 53.

Let's See What You Have Learned

You have come to the last part of this lesson. Let us now see how much you have understood and learned. Answer the following test questions. Good luck!

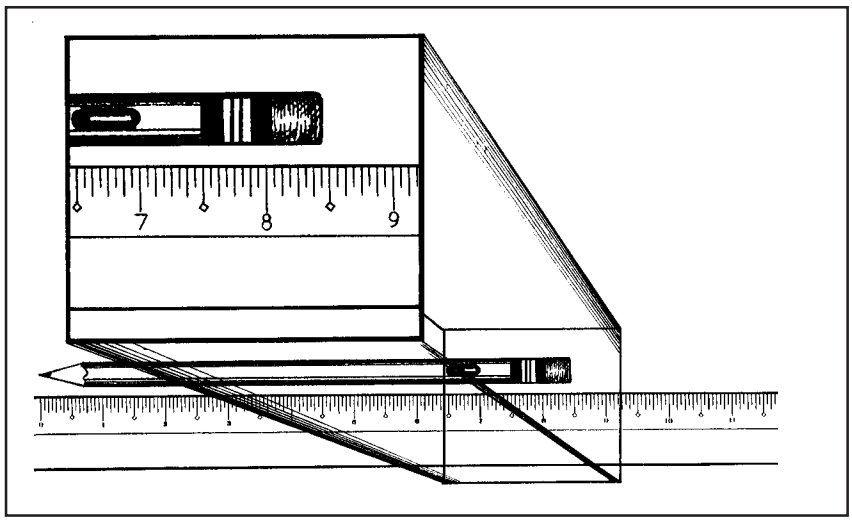
1. What is the length of the book in the picture below? (1 point)



_____

_____

2. What is the measurement of the pencil in the picture below? _____(1 point)



3. Anne is 66 inches tall. Liza measures 5.25 feet in height. Maria is 1.9 yards tall. Who among the three is the shortest? Compare their heights in feet. (5 points)

SOLUTION:

4. Sonny was able to climb 8,500 feet up the mountain, Carlos was able to climb 2,800 yards and Raul was able to climb 1.6 miles. Who was able to climb up the highest? Compare the heights in feet. (5 points)

SOLUTION:

Compare your answers with those in the *Answer Key* on pages 54–56.

If your test score is from:

11–12	Excellent! You have understood this lesson very well. You may now turn to the next page to study the next lesson.
8–10	Good! Review only the items which you did not get correctly.
4–7	Review the topics which you did not understand.
0–3	You have to study this lesson again.

Let's Remember

The following are the conversion factors for switching from one English unit to another:

Unit of Measure	Equivalent Units
1 foot	12 inches
1 yard	3 feet
1 mile	5,280 feet

LESSON 3

Let's Convert Units

You have learned about the metric and English systems of measurement in the first two lessons. In this lesson, we will now learn how to convert English units to metric units and vice versa.

After studying this lesson, you should be able to:

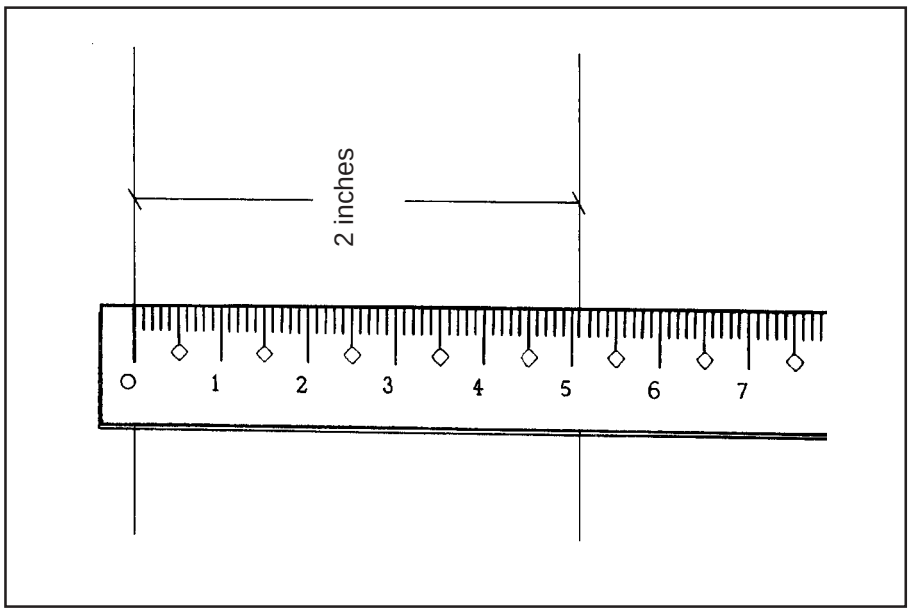
- convert units from the metric system to the English system and vice versa; and
- solve math problems involving the conversion of units.

Let's Try This

For this activity, you need a ruler with gradations in inches and centimeters. We will try to know the equivalent length in centimeters of a measurement expressed in inches. An example is shown to guide you.

EXAMPLE:

Draw a line measuring 2 inches. How long is it in centimeters?



The line measures 5.1 centimeters long.

Now try drawing lines with the following measurements in inches and try measuring the equivalent lengths in centimeters.

1) 1 ¼ inches
   Equivalent in centimeters: _____

2) 2 1/8 inches
   Equivalent in centimeters: _____

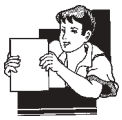
3) 3 5/16 inches
   Equivalent in centimeters: _____

Were you able to measure the lengths in centimeters?

(One and one-fourth) inches should be equivalent to about 3.2 centimeters.

(Two and one-eighth) inches should be equivalent to about 5.4 centimeters.

(Three and five-sixteenth) inches should be equivalent to about 3.3 centimeters.



Let's Learn

There are conversion factors you can use to find out the equivalent measurements in the English and metric systems. The table below shows these:

English	Metric System
1 inch	2.54 centimeters
3.28 feet	1 meter
1.09 yards	1 meter
1 mile	1.61 kilometers

It is strongly suggested that you memorize these conversion factors.

Let's Study and Analyze

Let us now look at some problems involving the conversion of metric units to English units and vice versa.

PROBLEM 1 Convert 4.5 inches to centimeters.

SOLUTION:

STEP 1 You need to convert 4.5 inches to centimeters. The conversion factor is: 1 inch = 2.54 centimeters.

Conversion factor in ratio form: $\dfrac{2.54\,\text{cm}}{1\,\text{in.}}$

STEP 2 Multiply 4.5 inches by the conversion factor.

$$4.5\,\text{in.} \times \frac{2.54\,\text{cm}}{1\,\text{in.}} = \boxed{11.43\,\text{cm}}$$

PROBLEM 2 Convert 8.05 kilometers to miles.

SOLUTION:

STEP 1 You need to convert 8.05 kilometers to miles. The conversion factor is: 1 mile = 1.61 kilometers.

Conversion factor in ratio form: $\dfrac{1\,\text{mi.}}{1.61\,\text{km}}$

STEP 2 Multiply 8.05 kilometers by the conversion factor.

$$8.05\,\text{km} \times \frac{1\,\text{mi.}}{1.61\,\text{km}} = \boxed{5\,\text{miles}}$$

PROBLEM 3 A customer needed 3.5 meters of cloth. However, the store owner has a measuring tape with gradations in inches only. How many inches are equivalent to 3.5 meters?

SOLUTION:

There is no direct conversion from meters to inches. You should first convert meters into feet, and from feet, you can convert to inches.

STEP 1 You need to convert 3.5 meters to feet. The conversion factor from meters to feet is:

1 meter = 3.28 feet

Conversion factor in ratio form: $\frac{3.28\,\text{ft.}}{1\,\text{m}}$

STEP 2 Multiply 3.5 meters with the conversion factor.

$$3.5\,\text{m} \times \frac{3.28\,\text{ft.}}{1\,\text{m}} = 11.48\,\text{ft.}$$

STEP 3 You can now convert from feet to inches. The conversion factor from feet to inches is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{12\,\text{in.}}{1\,\text{ft.}}$

STEP 4 Multiply 11.48 feet with the conversion factor.

$$11.48\,\text{ft.} \times \frac{12\,\text{in}}{1\,\text{ft.}} = \boxed{137.76\,\text{cm}}$$

Let's Review

1. How many yards are there in 14 meters?

SOLUTION:

a. To convert from meters to yards, multiply 14 meters by the conversion factor. What is the conversion factor? (1 point)

_____

b. Now multiply 14 meters by the conversion factor in (a). (1point)

14 m $\times$ $\frac{\quad\quad}{\quad\quad}$ = _____

2. The length of the Mississippi River is 2,340 miles. What is its length in kilometers?

SOLUTION:

a. You need to convert 2,340 miles to kilometers. What is the conversion factor? (1 point)

_____

b. Multiply 2,340 miles by the conversion factor in (a). (1 point)

2,340 mi. $\times$ $\frac{\quad\quad}{\quad\quad}$ = _____

3. The Philippine Trench is 10,057 meters deep. How deep is it in inches?

SOLUTION:

a. There is no direct conversion from meters to inches. You must convert meters to feet, and then you can convert this to inches. What is the conversion factor? (1point)

_____

b. Multiply 10,057 meters by the conversion factor. (1 point)

10,057 m × $\frac{\quad}{\quad}$ = _____

c. Now that the depth is expressed in feet, you can readily convert it to inches. What is the conversion factor? (1 point)

_____

d. Multiply your answer in (b) by the conversion factor in (c) to get the equivalent measurement in inches. (1 point)

_____ × $\frac{\quad}{\quad}$ = _____

Compare your answers with those in the *Answer Key* on pages 56–57.

Let's See What You Have Learned

You have come to the last part of this lesson. Let us see how much you have understood and learned. Answer the following test questions. Good luck!

1. Draw lines with the following measurements in inches and then measure the equivalent lengths in centimeters.

   a. 3 3/8 inches
   Equivalent in centimeters: _____ (1 point)

   b. 1 1/8 inches
   Equivalent in centimeters: _____ (1 point)

2. The average depth of the Pacific Ocean is 12,925 feet while that of the Atlantic Ocean is 3.58 kilometers. Which of the two oceans is deeper? Compare their depths in feet. (5 points)

SOLUTION:

3. The Taal volcano is 11,808 inches high. Express its height in meters. (4 points)

SOLUTION:

4. Convert 421.64 cm to inches. (2 points)

SOLUTION:

5. Convert 519.93 yards to meters. (2 points)

SOLUTION:

Compare your answers with those in the *Answer Key* on pages 57–60.

If your test score is from:

13–15 Excellent! You have understood this lesson very well.

8–12 Good! Review only the items which you did not get correctly.

0–7 You have to study this lesson again.

Let's Remember

The following are the conversion factors for converting units from the Metric system to the English system and vice versa:

English System	Metric System
1 inch	2.54 centimeters
3.28 feet	1 meter
1.09 yards	1 meter
1 mile	1.61 kilometers

Let's Sum Up

- It is more reliable to use standard measurement systems than non-standard measurement tools;
- You can conveniently convert one metric unit to another through the use of conversion factors.

	Units	Symbol	Conversion Factor	
1	kilometer	km	1 kilometer	= 1,000 meters
2	hectometer	hm	1 hectometer	= 100 meters
3	decameter	dam	1 decameter	= 10 meters
4	meter	m		
5	decimeter	dm	10 decimeters	= 1 meter
6	centimeter	cm	100 centimeters	= 1 meter
7	millimeter	mm	1,000 millimeters	= 1 meter

- The following are the conversion factors for changing one English unit to another:

Unit of Measure	Equivalent Units
1 foot	12 inches
1 yard	3 feet
1 mile	5,280 feet

- The following are the conversion factors for converting units from the metric system to the English system and vice versa:

English	Metric System
1 inch	2.54 centimeters
3.28 feet	1 meter
1.09 yards	1 meter
1 mile	1.61 kilometers

What Have You Learned?

Congratulations for making it this far. You have reached the final part of the module. All you need to do is take one last test. This will determine how much you understood from the module. Do your best and good luck!

1. How many decimeters are there in 23 hectometers? (4 points)

SOLUTION:

2. Mang Berto needs a coil of electric wire 6.5 meters long. But he does not have a measuring instrument in meters. He has a ruler with gradations in centimeters only. How many centimeters of electric wire should Mang Berto measure to get 6.5 meters? (2 points)

SOLUTION:

3. Boyet stands 66 inches tall, Asiong stands 5.7 feet tall and Pecto stands 1.8 yards tall. Who is the tallest among the three? Compare their heights in feet. (5 points)

SOLUTION:

4. Mount Kanlaon is 8,070 feet high. Express its height in centimeters. (4 points)

SOLUTION:

5. The Amazon River is 6,440 kilometers long. How long is it in miles? (2 points)

SOLUTION:

Compare your answers with those in the *Answer Key* on pages 60–63.

If your score is from:

15–17	Excellent! You have understood this module very well. You may now study the next one.
11–14	Good. Review only the items which you did not get right.
6–10	Review the lessons which you did not understand.
0–5	You have to study this module again.

Answer Key

A. Let's See What You Already Know *(page 2)*

1. **Answer: 45.3 meters**

SOLUTION:

STEP 1 You need to convert 45,300 millimeters to meters. The conversion factor is: 1 meter = 1,000 millimeters

Conversion factor in ratio form: $\frac{1\,\text{m}}{1{,}000\,\text{mm}}$

STEP 2 Multiply 45,300 millimeters by the conversion factor.

$$45{,}300\,\cancel{\text{mm}} \times \frac{1\,\text{m}}{1{,}000\,\cancel{\text{mm}}} = \boxed{45.3\,\text{meters}}$$

$$\begin{array}{r} 45.3 \\ 1{,}000\overline{)\,45{,}300.0} \\ \underline{\;4\,000\;} \\ 5\,300 \\ \underline{\;5\,000\;} \\ 3\,000 \\ \underline{\;3\,000\;} \\ 0 \end{array}$$

2. **Answer: 35,904 feet**

SOLUTION:

STEP 1 You need to convert 6.8 miles to feet. The conversion factor is:

1 mile = 5,280 feet

Conversion factor in ratio form: $\frac{5{,}280\,\text{ft.}}{1\,\text{mi.}}$

STEP 2 Multiply 6.8 miles by the conversion factor.

$$6.8 \cancel{\text{mi.}} \times \frac{5{,}280\,\text{ft.}}{1\cancel{\text{mi.}}} = \boxed{35{,}904\,\text{ft.}}$$

3. **Answer: 304,525.68 cm**

SOLUTION:

STEP 1 First, you should convert 9,991 feet to inches. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{12\,\text{in.}}{1\,\text{ft.}}$

STEP 2 Multiply 9,991 feet by the conversion factor.

$$9{,}991 \cancel{\text{ft.}} \times \frac{12\,\text{in.}}{1\cancel{\text{ft.}}} = \boxed{119{,}892\,\text{in.}}$$

STEP 3 Now that the measurements is expressed in inches, you can easily convert it to centimeters. The conversion factor is:

1 inch = 2.54 centimeters

Conversion factor in ratio form: $\frac{2.54\,\text{cm}}{1\,\text{in.}}$

STEP 4 Multiply 119,892 inches by the conversion factor.

$$119{,}892 \cancel{\text{in.}} \times \frac{2.54\,\text{cm}}{1\cancel{\text{in.}}} = \boxed{304{,}525.68\,\text{cm}}$$

4. **Answer: Olsen Racela is the tallest player among the three basketball players. His height is 69 inches.**

SOLUTION:

The height of each basketball player should be expressed in inches.

To convert Olsen Racela's height to inches:

STEP 1 You need to convert 5.75 feet to inches. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{12\,\text{in.}}{1\,\text{ft.}}$

STEP 2 Multiply 5.75 feet by the conversion factor.

$$5.75\,\text{ft} \times \frac{12\,\text{in.}}{1\,\text{ft}} = \boxed{69\,\text{inches}}$$

To convert Jimuel Torion's height to inches:

STEP 1 You need to convert 170.18 centimeters to inches. The conversion factor is:

1 inch = 2.54 cm

Conversion factor in ratio form: $\frac{1\,\text{in.}}{2.54\,\text{cm}}$

STEP 2 Multiply 170.18 cm by the conversion factor.

$$170.18\,\text{cm} \times \frac{1\,\text{in.}}{2.54\,\text{cm}} = \boxed{67\,\text{inches}}$$

$$\frac{170.18\,\text{in}}{2.54} \quad \rightarrow \quad 254\overline{)17{,}018}\ \begin{array}{r} 67 \\ 1\,524 \\ \hline 1778 \\ 1778 \\ \hline 0 \end{array}$$

Now compare the heights of the three basketball players. Olsen Racela is the tallest among the three since he stands 69 inches tall.

B. Lesson 1

Let's Review (page 7)

I can use some parts of my body to measure lengths and distances. For example, I can use my hand to measure length. I can also use my feet (through the length of my steps) to measure long distances.

Let's Review (page 13)

Using parts of the human body as standards of measurement is problematic. People have different sizes of body parts so measurements differ from one person to another.

Measuring instruments use measurement standards that are uniform and consistent. This eliminates the confusion that often arises when using body parts as measurement tools.

Let's Solve This Problem (pages 16–17)

1. **Answer: 150 centimeters**

SOLUTION:

You should convert 1.5 meters into centimeters.

a. The conversion factor is:

1 meter = 100 centimeters

Conversion factor in ratio form: $\frac{100\,\text{cm}}{1\,\text{m}}$

b. Multiply 1.5 meters by the conversion factor.

$$1.5\,\cancel{\text{m}} \times \frac{100\,\text{cm}}{1\,\cancel{\text{m}}} = \boxed{150\,\text{cm}}$$

2. **Answer: 3,000 cm**

SOLUTION:

a. You need to convert 3 decameters to meters first. The conversion factor is:

1 decameter = 10 meters

Conversion factor in ratio form: $\frac{10\,\text{m}}{1\,\text{dam}}$

b. Now you can multiply 3 decameters by the conversion factor.

$$3\,\cancel{\text{dam}} \times \frac{10\,\text{m}}{1\,\cancel{\text{dam}}} = 30\,\text{m}$$

c) Now you can easily convert from meters to centimeters.

1 m = 100 cm

Conversion factor in ratio form: $\frac{100\,\text{cm}}{1\,\text{m}}$

d. Multiply 30 meters by the conversion factor.

$$30 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = \boxed{3{,}000 \text{ cm}}$$

Let's See What You Have Learned (pages 18–19)

1. This is a sample answer:

**********	**Measurement in hand spans**	**Measurements in centimeters**
Length	9 hand spans	198 centimeters
Width	4 hand spans	88 centimeters

2. Measuring length in centimeters is more reliable and convenient than using hand spans. The measurement gradations in centimeters are exact and consistent unlike in hand spans. Measuring in hand spans may create confusion because people have different hand sizes.

3. **Answer: 12 meters**

SOLUTION:

STEP 1 30 sheets of aluminum foil are needed, each 40 centimeters in length. The total length of the aluminum foil in centimeters is:

$30 \times 40 = 1{,}200$ centimeters

STEP 2 Convert 1,200 centimeters to meters. The conversion factor is:

1 meter = 100 centimeters

Conversion factor in ratio form: $\frac{1 \text{ m}}{100 \text{ cm}}$

STEP 3 Multiply 1,200 centimeters by the conversion factor.

$$1{,}200 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} = 12 \text{ m}$$

$$\begin{array}{r} 12 \\ 100\overline{)1{,}200} \\ \underline{100} \\ 200 \\ \underline{200} \\ 0 \end{array}$$

4. **Answer: 700,000 millimeters**

SOLUTION:

STEP 1 First, you need to convert 7 hectometers into meters before finally converting the measurement to millimeters. The conversion factor is:

1 hectometer = 100 meters

Conversion factor in ratio form: $\frac{100\,\text{m}}{1\,\text{hm}}$

STEP 2 Multiply 7 hectometers by the conversion factor.

$$7\,\cancel{\text{hm}} \times \frac{100\,\text{m}}{1\,\cancel{\text{hm}}} = 700\,\text{m}$$

STEP 3 Now that the measurement is in meters, you can easily convert it to millimeters. The conversion factor is:

1 m = 1,000 millimeters

Conversion factor in ratio form: $\frac{1{,}000\,\text{mm}}{1\,\text{m}}$

STEP 4 Multiply 700 meters by the conversion factor.

$$700\,\cancel{\text{m}} \times \frac{1{,}000\,\text{mm}}{1\,\cancel{\text{m}}} = \boxed{700{,}000\,\text{mm}}$$

C. Lesson 2

Let's Review (page 23)

Bong thought he was growing taller every day because the numerical values used to measure his height were expressed in different units of measurements. He did not in fact grow taller.

Let's Review (pages 27–28)

1.

Unit of Measure	Equivalent Units
1 foot	12 inches
1 yard	3 feet
1 mile	5280 feet

2. **Answer: 8 ¾ inches**

Let's Review (page 30)

Answer: Alberto is the tallest; he is 6 feet tall.

SOLUTION:

To calculate Edgar's height in feet:

a. You need to convert 67.2 inches to feet. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{1\,\text{ft.}}{12\,\text{in.}}$

b. Multiply 67.2 inches by the conversion factor.

$$67.2\,\text{in.} \times \frac{1\,\text{ft.}}{12\,\text{in.}} = \boxed{5.6\,\text{feet}}$$

$$\begin{array}{r} 5.6 \\ 12\overline{)\,67.2} \\ \underline{60} \\ 72 \\ \underline{72} \\ 0 \end{array}$$

Alberto's height in feet:

c. Convert 2 yards to feet. The conversion factor is:

1 yard = 3 feet

Conversion factor in ratio form: $\frac{3\,\text{ft.}}{1\,\text{yd.}}$

d. Multiply 2 yards by the conversion factor.

$$2\,\text{yd.} \times \frac{3\,\text{ft.}}{1\,\text{yd.}} = \boxed{6\,\text{feet}}$$

e. Edgar is 5.6 feet tall. Richard is 5.5 feet tall. Alberto is 6 feet tall. Alberto is the tallest among the three.

Let's See What You Have Learned (pages 31–33)

1. The book is 9 5/8 inches long.

2. The pencil is 8 7/16 inches long.

3. **Answer: Liza is the shortest among the three. She is 5.25 feet tall.**

SOLUTION:

You won't know who among the three is the shortest unless you compare their heights in the same unit. Try comparing them in feet because inches and yards can readily be converted to feet.

To calculate Anne's height in feet:

a. You need to convert 66 inches to feet. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{1\,\text{ft.}}{12\,\text{in.}}$

b. Multiply 66 inches by the conversion factor.

$$66\,\cancel{\text{in.}} \times \frac{1\,\text{ft.}}{12\,\cancel{\text{in.}}} = \boxed{5.5\,\text{ft.}}$$

$$\begin{array}{r} 5.5 \\ 12\overline{)\,66.0} \\ \underline{60} \\ 60 \\ \underline{60} \\ 0 \end{array}$$

To calculate Maria's height in feet:

c. You need to convert 1.9 yards to feet. The conversion factor is:

1 yard = 3 feet

Conversion factor in ratio form: $\frac{3\,\text{ft.}}{1\,\text{yd.}}$

d. Multiply 1.9 yards by the conversion factor in (c).

$$1.9 \cancel{\text{yd.}} \times \frac{3\,\text{ft.}}{1\cancel{\text{yd.}}} = \boxed{5.7\,\text{ft.}}$$

e. Now that the heights of Anne, Liza and Maria are all expressed in feet, you can easily compare their heights. Liza is the shortest among the three. She is 5.25 feet tall.

4. **Answer: Sonny climbed the highest at 8,500 feet.**

SOLUTION:

You won't know who among the three climbers climbed up the highest unless you compare the heights in the same unit. You must compare them in feet as stated in the instructions.

To calculate the Height of Carlos' climb (in feet):

a. You need to convert 2,800 yards to feet. The conversion factor is:

1 yard = 3 feet

Conversion factor in ratio form: $\frac{3\,\text{ft.}}{1\,\text{yd.}}$

b. Multiply 2,800 yards by the conversion factor.

$$2{,}800 \cancel{\text{yd.}} \times \frac{3\,\text{ft.}}{1\cancel{\text{yd.}}} = \boxed{8{,}400\ \text{ft.}}$$

To calculate Height of Raul's climb expressed in feet:

c) We need to convert 1.6 miles to feet. The conversion factor is:

1 mile = 5,280 feet

Conversion factor in ratio form: $\frac{5{,}280\,\text{ft.}}{1\,\text{mi.}}$

d) Multiply 1.6 miles with the conversion factor.

$$1.6 \cancel{\text{mi.}} \times \frac{5{,}280\,\text{ft.}}{1\cancel{\text{mi.}}} = \boxed{8{,}448\,\text{ft.}}$$

e. Now that the heights that Sonny, Carlos and Raul climbed are all expressed in feet, you can easily compare them. Sonny climbed the highest, at 8,500 feet.

D. Lesson 3

Let's Review (pages 38–39)

1. **Answer: 15.26 yards**

SOLUTION:

a. Convert 14 meters to yards. The conversion factor is:

1 meter = 1.09 yards

Conversion factor in ratio form: $\frac{1.09\text{ yd.}}{1\text{ m}}$

b. Now multiply 14 meters by the conversion factor.

$$14\cancel{\text{ m}} \times \frac{1.09\text{ yd.}}{1\cancel{\text{ m}}} = \boxed{15.26\text{ yards}}$$

2. **Answer: The Mississippi River is 3,767.4 kilometers long.**

SOLUTION:

a. Convert 2,340 miles to kilometers. The conversion factor is:

1 mile = 1.61 kilometers

Conversion factor in ratio form: $\frac{1.61\text{ km}}{1\text{ mi.}}$

b. Multiply 2,340 miles by the conversion factor.

$$2{,}340\cancel{\text{ mi.}} \times \frac{1.61\text{ km}}{1\cancel{\text{ mi.}}} = \boxed{3{,}767.4\text{ km}}$$

3. **Answer: The Philippine Trench is 395,843.52 inches deep.**

SOLUTION:

a. You must convert 10,057 meters to feet, then you can convert it to inches. The conversion factor is:

1 meter = 3.28 feet

Conversion factor in ratio form: $\frac{3.28\text{ ft.}}{1\text{ m}}$

b. Multiply 10,057 meters by the conversion factor.

$$10{,}057 \cancel{\text{m}} \times \frac{3.28\,\text{ft.}}{1\,\cancel{\text{m}}} = 32{,}986.96\ \text{ft.}$$

c. Now that the depth is expressed in feet, you can readily convert it to inches. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{12\,\text{in.}}{1\,\text{ft.}}$

d. Multiply 32,986.96 feet by the conversion factor.

$$32{,}986.96 \cancel{\text{ft.}} \times \frac{12\,\text{in.}}{1\,\cancel{\text{ft.}}} = \boxed{395{,}843.52\,\text{inches}}$$

Let's See What You Have Learned (pages 39–42)

1. a. Three and three-eighth inches is equivalent to about 8.6 centimeters.

   b. One and one-eighth inches is equivalent to about 2.9 centimeters.

2. **Answer: The Pacific Ocean is deeper than the Atlantic Ocean.**

   SOLUTION:

   The depths should be expressed in the same unit. Let us compare the depths in feet.

   To calculate the depth of the Atlantic Ocean in feet:

   a. There is no direct conversion from kilometers to feet. You have to convert the kilometers to meters first. The conversion factor is:

   1,000 meters = 1 kilometer

   Conversion factor in ratio form: $\frac{1{,}000\,\text{m}}{1\,\text{km}}$

   b. Multiply 3.58 kilometers by the conversion factor.

$$3.85 \cancel{\text{km}} \times \frac{1{,}000\ \text{m}}{1\,\cancel{\text{km}}} = 3{,}850\ \text{m}$$

c. Now that the depth is expressed in meters, you can easily convert it to feet. The conversion factor is:

3.28 feet = 1 meter

Conversion factor in ratio form: $\frac{3.28\,\text{ft.}}{1\,\text{m}}$

d. Multiply 3,850 meters by the conversion factor.

$$3{,}850\ \cancel{\text{m}} \times \frac{3.28\ \text{ft.}}{1\ \cancel{\text{m}}} = \boxed{12{,}628\ \text{ft.}}$$

e. You can now compare the depths of the two oceans since both of them are expressed in feet. The Pacific Ocean is deeper than the Atlantic Ocean.

Pacific Ocean		Atlantic Ocean
12,925 feet	>	12,628 feet

3. **Answer: Taal Volcano is 300 meters high.**

SOLUTION:

You must first convert the inches to feet. When the measurement is already expressed in feet you can easily convert it to meters.

a. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{1\,\text{ft.}}{12\,\text{in.}}$

b. Multiply 11,808 inches by the conversion factor.

$$11{,}808\ \cancel{\text{in.}} \times \frac{1\,\text{ft.}}{12\ \cancel{\text{in.}}} = 984\,\text{ft.}$$

$$\begin{array}{r} 984 \\ 12\overline{)11{,}808} \\ \underline{108} \\ 100 \\ \underline{96} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

c. Now that the height is expressed in feet, you can easily convert it to meters. The conversion factor is:

1 meter = 3.28 feet

Conversion factor in ratio form: $\frac{1\,\text{m}}{3.28\,\text{ft.}}$

d. Multiply 984 feet by the conversion factor.

$$984\,\cancel{\text{ft.}} \times \frac{1\,\text{m}}{3.28\,\cancel{\text{ft.}}} = \boxed{300\ \text{m}}$$

$$\frac{984\ \text{m}}{3.28} \quad \rightarrow \quad 328\overline{)98{,}400}\ \begin{array}{r} 300 \\ 984 \\ \hline 0 \\ 0 \\ \hline 0 \end{array}$$

4. **Answer: 166 inches**

SOLUTION:

a. Convert 421.64 centimeters to inches. The conversion factor is:

1 inch = 2.54 centimeters

Conversion factor in ratio form: $\frac{1\,\text{in.}}{2.54\,\text{cm}}$

b. Multiply 421.64 centimeters by the conversion factor.

$$421.64\,\cancel{\text{cm}} \times \frac{1\,\text{in.}}{2.54\,\cancel{\text{cm}}} = \boxed{166\ \text{in.}}$$

$$\frac{421.64\,\text{in.}}{2.54} \quad \rightarrow \quad 254\overline{)42{,}164}\ \begin{array}{r} 166 \\ 254 \\ \hline 1676 \\ 1524 \\ \hline 1524 \\ 1524 \\ \hline 0 \end{array}$$

5. **Answer: 477 meters**

SOLUTION:

a. Convert 519.93 yards to meters. The conversion factor is:

1 meter = 1.09 yards

Conversion factor in ratio form: $\frac{1\,\text{m}}{1.09\,\text{yd.}}$

b. Multiply 519.93 yards by the conversion factor.

$$519.93\,\cancel{\text{yd.}} \times \frac{1\,\text{m}}{1.09\,\cancel{\text{yd.}}} = \boxed{477\,\text{m}}$$

$$\frac{519.93\,\text{m}}{1.09} \quad \rightarrow \quad 109\overline{)51{,}993}\ \begin{array}{r} 477 \\ 436 \\ \hline 839 \\ 763 \\ \hline 763 \\ 763 \\ \hline 0 \end{array}$$

E. What Have You Learned? *(pages 43–45)*

1. **Answer: 23,000 decimeters**

SOLUTION:

a. You need to convert the hectometers to meters first before finally converting the measurement to decimeters. The conversion factor is:

100 meters = 1 hectometer

Conversion factor in ratio form: $\frac{100\,\text{m}}{1\,\text{hm}}$

b. Multiply 23 hectometers by the conversion factor:

$$23\,\cancel{\text{hm}} \times \frac{100\,\text{m}}{1\,\cancel{\text{hm}}} = 2{,}300\,\text{m}$$

c. Now that the measurement is expressed in meters, you can easily convert it to decimeters. The conversion factor is:

1 meter = 10 decimeters

Conversion factor in ratio form: $\frac{10\,\text{dm}}{1\,\text{m}}$

d. Multiply 2,300 meters by the conversion factor.

$$2{,}300\,\text{m} \times \frac{10\,\text{dm}}{1\,\text{m}} = \boxed{23{,}000\,\text{dm}}$$

2. **Answer: 650 centimeters**

SOLUTION:

a. You need to convert 6.5 meters to centimeters. The conversion factor is:

1 meter = 100 centimeters

Conversion factor in ratio form: $\frac{100\,\text{cm}}{1\,\text{m}}$

b. Multiply 6.5 meters by the conversion factor. (1 point)

$$6.5\,\text{m} \times \frac{100\,\text{cm}}{1\,\text{m}} = \boxed{650\,\text{cm}}$$

3. **Answer: Asiong is the tallest among the three, with a height of 5.7 feet.**

SOLUTION:

In order to solve this problem, you need to express the heights in the same unit. As provided in the question, we have to compare their heights in feet.

To calculate Boyet's height in feet:

a. You need to convert 66 inches to feet. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{1\,\text{ft.}}{12\,\text{in.}}$

b. Multiply 66 inches by the conversion factor.

$$66 \text{ in.} \times \frac{1 \text{ ft.}}{12 \text{ in.}} = \boxed{5.5 \text{ ft.}}$$

$$12\overline{)66.0} \quad 5.5$$
$$\underline{60}$$
$$60$$
$$\underline{60}$$
$$0$$

To calculate Pecto's height in feet:

c. You need to convert 1.8 yards to feet. The conversion factor is:

1 yard = 3 feet

Conversion factor in ratio form: $\frac{3 \text{ ft.}}{1 \text{ yd.}}$

d. Multiply 1.8 yards by the conversion factor.

$$1.8 \text{ yd.} \times \frac{3 \text{ ft.}}{1 \text{ yd.}} = \boxed{5.4 \text{ ft.}}$$

e. Now that the heights of the three are all expressed in feet, you can easily compare them. Asiong is the tallest among the three, with a height of 5.7 feet.

4. **Answer: Mount Kanlaon is 245,973.6 centimeters high.**

SOLUTION:

First, you need to convert 8,070 feet to inches. When the measurement is already expressed in inches, you can easily convert it to centimeters.

a. The conversion factor is:

1 foot = 12 inches

Conversion factor in ratio form: $\frac{12 \text{ in.}}{1 \text{ ft.}}$

b. Multiply 8,070 feet by the conversion factor.

$$8{,}070\,\text{ft.} \times \frac{12\,\text{in.}}{1\,\text{ft.}} = 96{,}840\,\text{in.}$$

c. Now that the measurement is expressed in inches, you can easily convert it to centimeters. The conversion factor is:

1 inch = 2.54 centimeters

Conversion factor in ratio form: $\frac{2.54\,\text{cm}}{1\,\text{in.}}$

d. Multiply 96,840 meters by the conversion factor.

$$96{,}840\,\text{in.} \times \frac{2.54\,\text{cm}}{1\,\text{in.}} = \boxed{245{,}973.6\,\text{cm}}$$

5. **Answer: The Amazon River is 4,000 miles long.**

SOLUTION:

a. Convert 6,440 kilometers to miles. The conversion factor is:

1 mile = 1.61 kilometers

Conversion factor in ratio form: $\frac{1\,\text{mi.}}{1.61\,\text{km}}$

b. Multiply 6,440 kilometers by the conversion factor.

$$6{,}440\,\text{km} \times \frac{1\,\text{mi.}}{1.61\,\text{km}} = \boxed{4{,}000\,\text{mi.}}$$

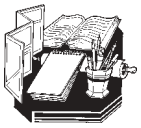
$$\frac{6{,}440\ \text{mi.}}{1.61} \quad \rightarrow \quad 161\overline{)\,644{,}000}\ \ 4000$$

$$\underline{644}$$

$$0$$

$$\underline{0}$$

$$0$$



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