

EXPLORING METRICS

A 4-H CONSUMER EDUCATION PROJECT

Museum
of
Measurment

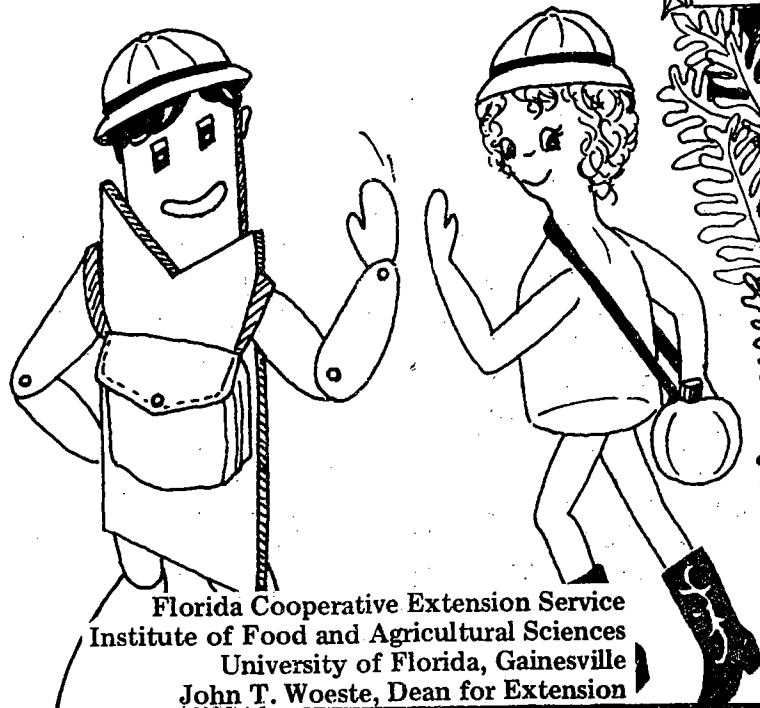
Metric
Ruler



NAME _____
CLUB _____

Equipment And
Supplies

Metric
Mountain



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EXPLORING METRICS

In this project you will:

- * Visit a land where only metric units are used
- * Learn the commonly used metric units
- * Practice using metric units
- * Visit a measurement museum to learn about our customary units

To complete this project you will:

- * Make a meter stick
- * Practice using metric units
- * Teach someone about the metric system
- * Make cookies using metric measurements

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OBJECTIVES

For 4-Hers to:

- * become familiar with commonly used metric units.
- * learn to use metric units for weighing and measuring.
- * develop a positive attitude toward using metric units.
- * learn why the U.S. is gradually adopting the metric system.

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TABLE OF CONTENTS

contents	page
Project Requirements.....	2
Exploring Metrics (introduction).....	3
Preparing For Your Journey (measurement standards).....	3
Understanding Our Measurement System.....	5
Museum of Measurement (Development of our Customary System).....	6
Enter The Land of Metrics (Basic Units).....	7
The Language of Metrics (Prefixes).....	9
Climbing Metric Mountain.....	15
Metric Temperature.....	17
Welcome Back (Conclusion).....	19
Instructions for Making Metric Units.....	21
Appendix A: Tables of Metric Units.....	23
Appendix B: Answers to Questions.....	25

EXPLORING METRICS

America is going metric. This change in the way things are measured is part of a worldwide trend that America can no longer ignore. About 95 percent of the world's population lives in countries that are either metric or are changing to the metric system.

Why change to the metric system? Because, as you will see in this project, the metric system is simple, logical, and convenient. Our present system of weights and measurements is confusing. The metric system will make it easier for the United States to trade with other nations. Scientists and many other people who must use precise measurements will find it easier to do their work. Consumers will find it easier to comparison shop and math will even be easier for students like you.

In this project you will become an adventurer. You will explore the Land of Metrics. How do you feel when you visit a new and different place for the first time? Excited? Scared? Adventurous? Or, are you a little worried that you may not know the way to do things correctly? As you go into the Land of Metrics you may have some of these feelings, but as a real explorer, you will not be afraid to try things that are new or different.

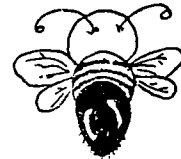
When going to a place that is strange or different, it helps to have a friend with you. In the Land of Metrics you will meet three new friends. They will travel with you on your journey. Your new friends will be:



Millie Liter



Hector Meter



Buzzy Gram

PREPARING FOR YOUR JOURNEY

Every explorer knows that a successful expedition begins with good preparation. Before you begin your journey you need to learn about a basic principle of measurement called a "standard."

Understanding Standards

To better understand measurements and standards, play the following game with your friends or classmates. Follow the instructions carefully and in the order listed.

- * Draw a straight line several feet long. This will be your "starting line."
- * Ask all players to stand beside the starting line, facing the line.
- * Ask each player to take 5 giant steps forward and to mark the place where he or she stopped.

Did all of the players move the same distance from the starting line? _____

Measure the distance that each person traveled from the starting line. What was the: longest distance? _____ shortest distance? _____

Why was there so much variation in these distances?

- * Ask each player to find a long stick and to return to the starting line. Players, using their sticks for measuring, will move forward 5 stick-lengths.

Did all of the players move the same distances this time? _____ Why? _____

- * Choose one stick to be the standard. Carefully cut all of the other sticks to exactly the same length as the standard. Have all players return to the starting line and move forward 5 stick-lengths.

Did all players move the same distance this time? _____ Why? _____

Why is it important to use a standard measurement to describe distances? _____

Why is a standard important in buying or selling?

UNDERSTANDING OUR MEASUREMENTS SYSTEM

The system of weights and measurements now used in the U.S. is called the inch-pound or the "customary system." We use this system because of custom or tradition. It was the one our ancestors brought to this country. At one time our system was called the English System. That term is not correct now because England has adopted the metric system.

You and your friends say that you understand our measurement system. How well do you know it? Test your knowledge by answering the following questions.

- * Which weighs more, a pound of feathers or a pound of gold? _____ (If you said they weight the same you are wrong. A pound of feathers is heavier than a pound of gold. Find out why. Hint: investigate troy and avoirdupois weights.)

- * Is "8 ounces" a weight or a volume? _____ How could this create confusion in measuring or in labeling? _____

- * Wind speed is measured by knots and by miles-per-hour. Which is faster, 5 knots or 5 miles per hour? _____

- * Citrus is sold by boxes, bushels, $\frac{4}{5}$ bushels, and pounds. How can you compare the prices of citrus sold by these different measurements? _____

- * How many gallons are in a barrel? _____

- * The height of a horse is measured in hands? How long is a hand? _____

Before entering the Land of Metrics, let's find out how our measurement system was developed by visiting the Museum of Measurements. Hector and Millie will join us.

MUSEUM OF MEASUREMENT

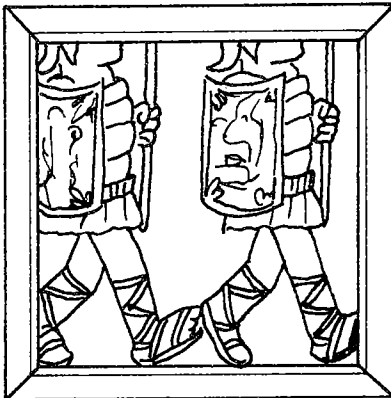
PEOPLE HAVE ALWAYS MEASURED THINGS AROUND THEM. Primitive people used things that were easily available such as sticks, stones, and parts of their bodies.



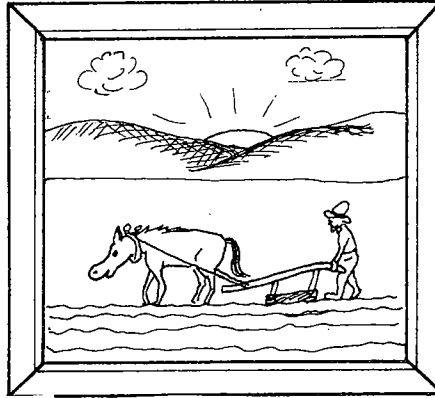
Egyptians called the distance from the elbow to the middle finger a "cubit." The cubit was used in building the pyramids and Noah's Ark.



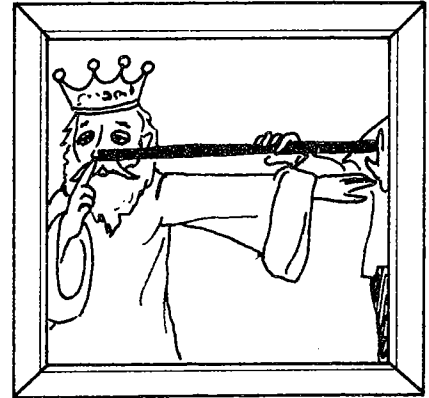
The Greeks established the "foot" as their fundamental unit of length. Legend says this unit was based on the length of Hercules' foot.



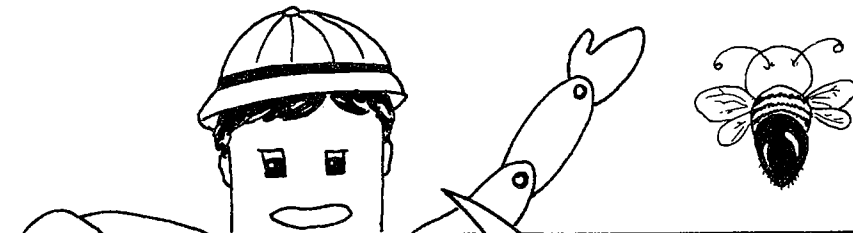
The mile came from a measurement of 1,000 paces or double steps of Roman soldiers.



An acre is the area one man can plow in one day.



King Henry I of England stretched out his arm and ruled that the distance from his nose to his finger was a yard.



Different measurement systems caused much confusion as people tried to trade with each other and to share information. Units were inconsistent, even within one system, for example, 12 inches make a foot while 3 feet make a yard. About 200 years ago there was a revolution in France. It was a time of change so people decided it was a good time to develop a better measurement system, called the metric system. It has since been adopted by almost every nation.

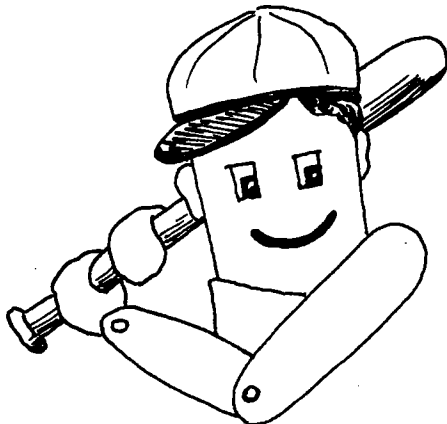
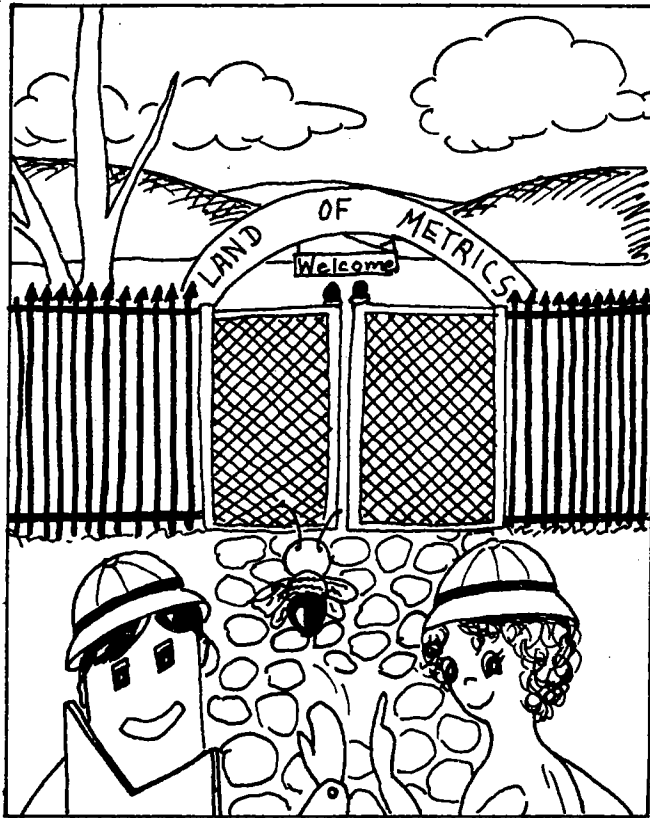
ENTER THE LAND OF METRICS

You are now ready to enter the Land of Metrics. Millie Liter, Hector Meter, and Buzzy Gram will serve as your guides.

There are some things that you can't take with you into the Land of Metrics. You must leave behind your old ways of measuring. Pounds and ounces, feet and inches, and quarts and gallons will not help you in this new land. Here you will find new and better measurement tools.

Your New Equipment

The three basic units of measurement of the Metric system are:



METER



LITER

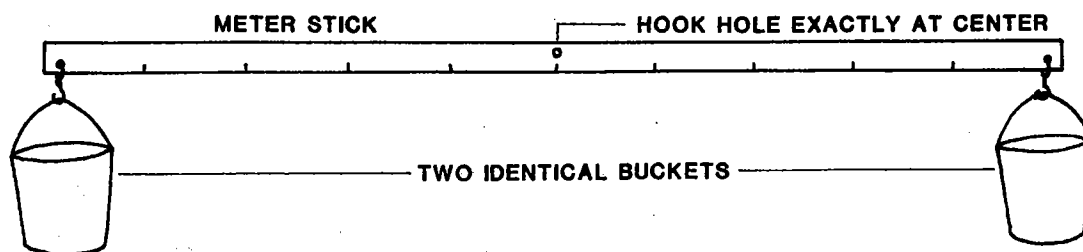


GRAM

Meter is the metric unit for length or distance. The developers of the metric system decided to base the units of measurement on nature because it would not change. The meter was to be one-millionth of the length of a line drawn from the North Pole to the Equator, but you can think of it as a little longer than the distance from the floor to the top of your kitchen counter. A meter is a little more than the width of a doorway. It is about the length of a man's stride or a little longer than a baseball bat.

A **liter** is the measure for volume. A liter is a little more than a quart. In Florida, gasoline is sold by the liter. Some soft drinks are now sold in liter bottles.

A **gram** is the metric unit for weight. A small paper clip weights about one gram, and so does a playing card.



It's fun to build your own measuring equipment. By building a balance you can weigh things in metric units. To build a balance:

- * Select a measuring stick; straight, small board; or a rod for your balance.
- * Locate the exact center of the stick. To do this measure carefully or lift the stick with a heavy cord, moving it back and forth until it balances. Mark the center where the string is located.
- * Drill a hole in the stick or notch it so the support cord will not slip. If you prefer, you can tape the cord to the center.
- * You need two identical containers, one for each end of the stick. Paper cups with a string through the top of each cup can be used. Hang one cup on each end of the balance. Coffee cans, paper bags, milk jugs, buckets, and other things may also be used for containers.
- * When a container is hung on each end of the stick, move one of the containers back and forth until it is balanced.
- * Place the item to be weighed in one container. In the other container place known weights until both containers are balanced. For example, if you want to weigh your ring place it in one container. In the other container place small paper clips until the containers balance. Count the paper clips. Since a small paper clip weighs a gram, this tells you the ring's weight in grams. Other known weights may be used instead of paper clips.

It's important to be able to estimate the weight or size of commonly used things. You know how to estimate in the inch-pound system. You need to learn to estimate in metric units. Let's practice by estimating the measurements of the following items. (Refer to the previous page for unit comparisons or see page 23).

Check the correct answer of each question.

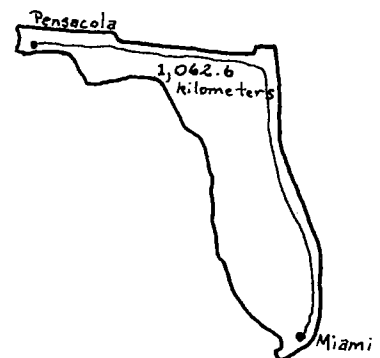
1. A football weighs about ____ 10 grams ____ 500 grams ____ 100 grams.
2. What is about a meter long? ____ a book ____ a shoe ____ a baseball bat.
3. What weights about 1 gram? ____ a brick ____ a bike ____ an envelope.
4. About how much does one egg weigh? ____ 1 gram ____ 60 grams ____ 400 grams.
5. A quart milk carton holds about: ____ 4 liters ____ 1 liter ____ 10 liters.
6. A gallon bucket holds about: ____ 10 liters ____ 4 liters ____ 1 liter.
7. The width of a door is about: ____ 1 meter ____ 15 meters ____ 10 meters.

(Check your answers by looking on page 25.)

You have learned three basic metric units: meter for length and distance, liter for volume, and gram for weight. Metric units are easy to use when you begin to think in metric terms. For example which units would you use to measure:

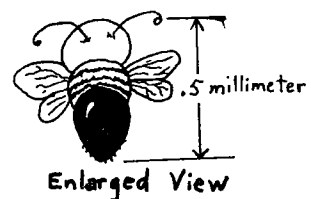
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|------------------------------|----------------------------|
| 1. Fabric for a shirt? _____ | 4. Length of a room? _____ |
| 2. A package of seeds? _____ | 5. A piece of candy? _____ |
| 3. A bottle of milk? _____ | 6. Motor oil? _____ |

Measurement units larger than the base units are often needed. For example, it would be difficult to measure the distance from Miami to Pensacola in meters. Just imagine how big the number would be if you weighed yourself in grams!



Smaller units are also needed. How could you measure the length of an insect in meters? Suppose your favorite cookie recipe calls for a very small amount of baking powder - imagine trying to use a liter container for such measurements!

The metric system makes it easy to indicate small or large measurements. Prefixes are used along with the appropriate basic unit (liter, meter, or gram) to indicate any size measurement needed. Remember, a prefix is a letter or group of letters added to the front of a word to change its meaning.



Prefixes that make a basic unit smaller are:

milli = 1/1000 (0.001) of a gram, meter or liter

centi = 1/100 (0.01) of a gram, meter or liter

deci = 1/10 (0.1) of a gram, meter or liter



30 kilograms

Prefixes that make a basic unit larger are:

kilo = 1000 times a gram, meter or liter

hecto = 100 times a gram, meter or liter

deka = 10 times a gram, meter or liter



1 milliliter (or 20 drops)

Notice that the metric system is developed on base 10. It is similar to our money system which also uses base 10. For example, a dollar can be divided into 10 parts (dimes). A dime divides into 10 parts (10 cents). A cent divides into 10 parts (mills). Compare the relationship by completing the following statements. (For help refer to the tables on page 23.)

* a centimeter is _____ of a meter

* a cent is a _____ of a dollar

* a decimeter is _____ of a meter

* a dime is a _____ of a dollar

How well do you speak the "metric language" so far? Practice combining the basic metric units with the metric prefixes.

EXAMPLE: 1/100 meter = 1 centimeter

1/1000 meter = _____ 1 000 grams* = _____

1/1000 gram = _____ 1 000 meters = _____

0.001 liter = _____ 0.01 meters = _____

* NOTICE: There is no comma following the 1 in the 1,000. Commas are not used in metric units because in some countries commas and decimals are used in the same way.

In your trip through Metric Land the units that you will use most often are:

milligram	milliliter	millimeter
gram	liter	centimeter
kilogram		meter
		kilometer

Check your understand of these units by answering the following questions.

1 milligram = ___ gram	1 millimeter = ___ meter
1 kilogram = ___ grams	1 centimeter = ___ meter
1 milliliter = ___ liter	1 kilometer = ___ meters

It's important to understand each. You may see meter and liter spelled metre and litre. This is acceptable because most other countries use the "re" spelling.

Symbols (abbreviations) can be used for metric units instead of writing out the word. Generally, symbols are not capitalized. One exception is liter. Since a small "l" can be mistaken for a one (a number) the capital L is used.

Symbols: liter = L
gram = g
meter = m

Example: The ball rolled one meter -or- The ball rolled one m.
I drank a liter of milk -or- I drank a L of milk.

Symbols are also used for prefixes and are joined to the symbols of the base units.

Symbols: milliliter = mL	centimeter = cm
milligram = mg	millimeter = mm
kilogram = kg	kilometer = km

Example: I drank 250 milliliters of milk; I drank 250 mL of milk.
She traveled 350 kilometers; She traveled 350 km.

Symbols are never followed by a period unless it is the end of the sentence. Leave a space between the number and the symbol. Never add an "s" to the symbol, even when there are two or more units.

Examples: * The field was 30 m long.
* The candy weighs 50 g.
* It was 2 km to town.

