

United States Metric Board

LEADER'S GUIDE FOR CONDUCTING A METRIC USAGE SEMINAR

Published by the

United States Metric Board

Office of Public Awareness
and Education

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Objectives:

The purpose of this booklet is to provide you with the background and tools to conduct a metric usage seminar based on hands-on learning opportunities for the participants.

The seminar consists of background on the metric system, learning metric terms and practicing making metric measurements.

The suggestions and exercises in this booklet are designed to help people learn to "think metric" in their daily lives: as consumers, as citizens and as workers. In addition, there is also a sample agenda which shows one useful and tested progression of events. Feel free to alter it to meet your own needs.

A Short History of the Metric System

The metric system was developed by the French nearly 200 years ago. The French replaced such measures as the inch (defined as three round and dry barleycorns laid end to end), the foot (36 barleycorns), the yard (the distance from the end of the nose of King Edgar, a deceased Anglo-Saxon monarch, to the tip of his outstretched hand), and the mile, which

was defined as the distance a Roman soldier traveled in 1000 paces.

The introduction of the metric system was an attempt to make measurement more precise, by developing constant uniform standards of weights and measures.

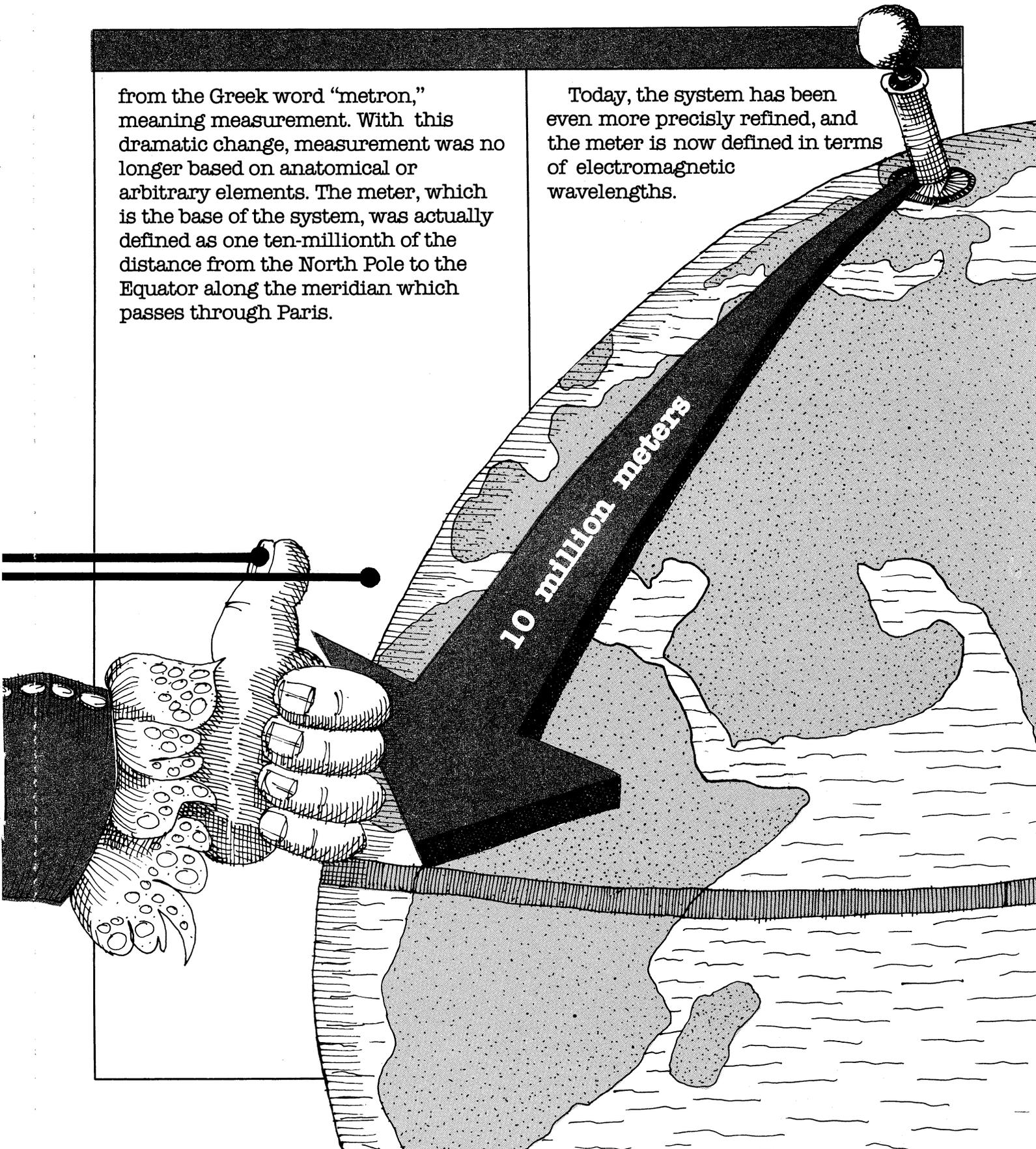
In 1791 the French National Assembly adopted the decimal system of measurement which we now call the metric system. The name is derived

1 yard

1 meter

from the Greek word "metron," meaning measurement. With this dramatic change, measurement was no longer based on anatomical or arbitrary elements. The meter, which is the base of the system, was actually defined as one ten-millionth of the distance from the North Pole to the Equator along the meridian which passes through Paris.

Today, the system has been even more precisely refined, and the meter is now defined in terms of electromagnetic wavelengths.



Metric Usage in the United States

Most Americans believe that America's current involvement with the metric system is of relatively recent origin. In fact, Presidents Thomas Jefferson and John Quincy Adams advocated the use of a decimal based measurement system when the United States was still in its infancy as a Republic.

The voluntary use of the metric system has been under way for many years, though the pace has been steadily accelerating in recent decades. In 1866, Congress authorized the use of the metric system in America and supplied each state with a set of metric weights and measures.

In 1875, the U.S. reinforced its continuing interest in the development of an internationally accepted metric system by becoming

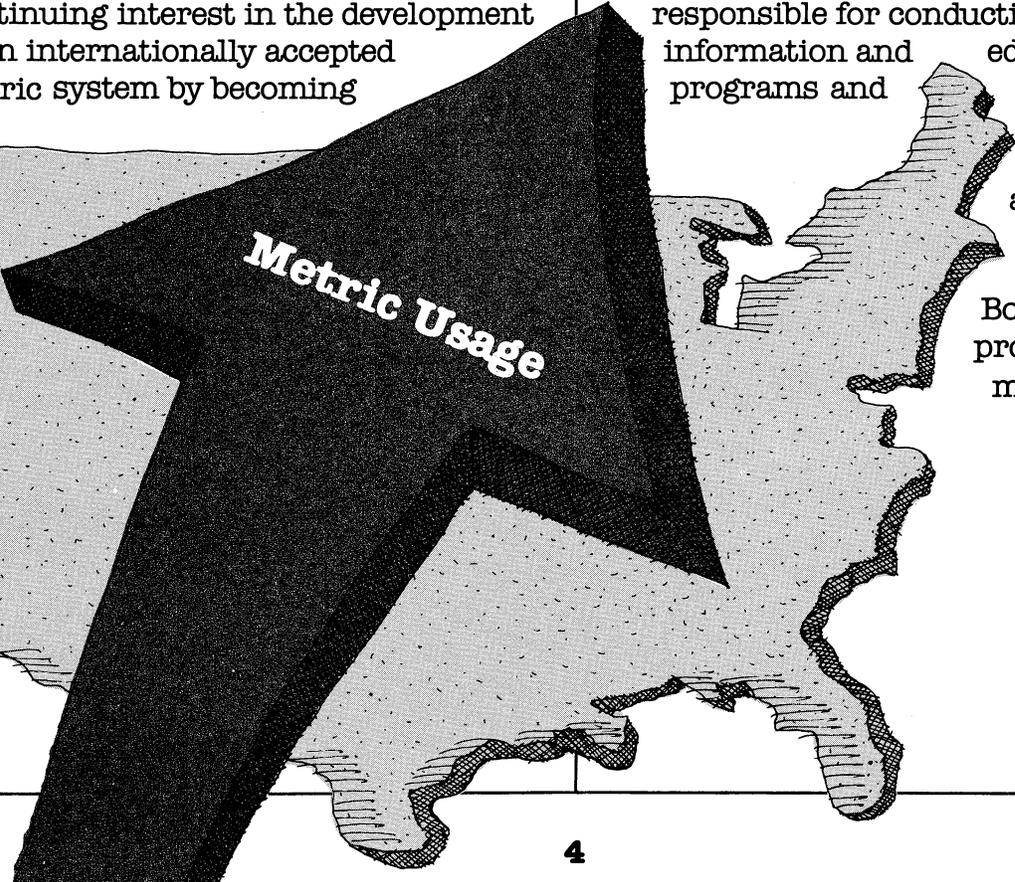
one of the original signatory nations to the "Treaty of the Meter."

In 1893, measurement standards were established which adopted the meter as the fundamental measurement in the United States, and since that time the customary measurements, such as the foot, pound and inch, have actually been defined in terms of the metric system.

When Congress passed the Metric Conversion Act of 1975, it declared that the purpose of the United States Metric Board is to "...coordinate and plan the increasing use of the metric system in the United States through a process of voluntary conversion." The Board is an independent Federal agency

responsible for conducting public information and education programs and

research, coordination and planning activities. It is not the role of the Board to promote metric usage.



Metric Usage

Why and Where Is Metric Usage Increasing?

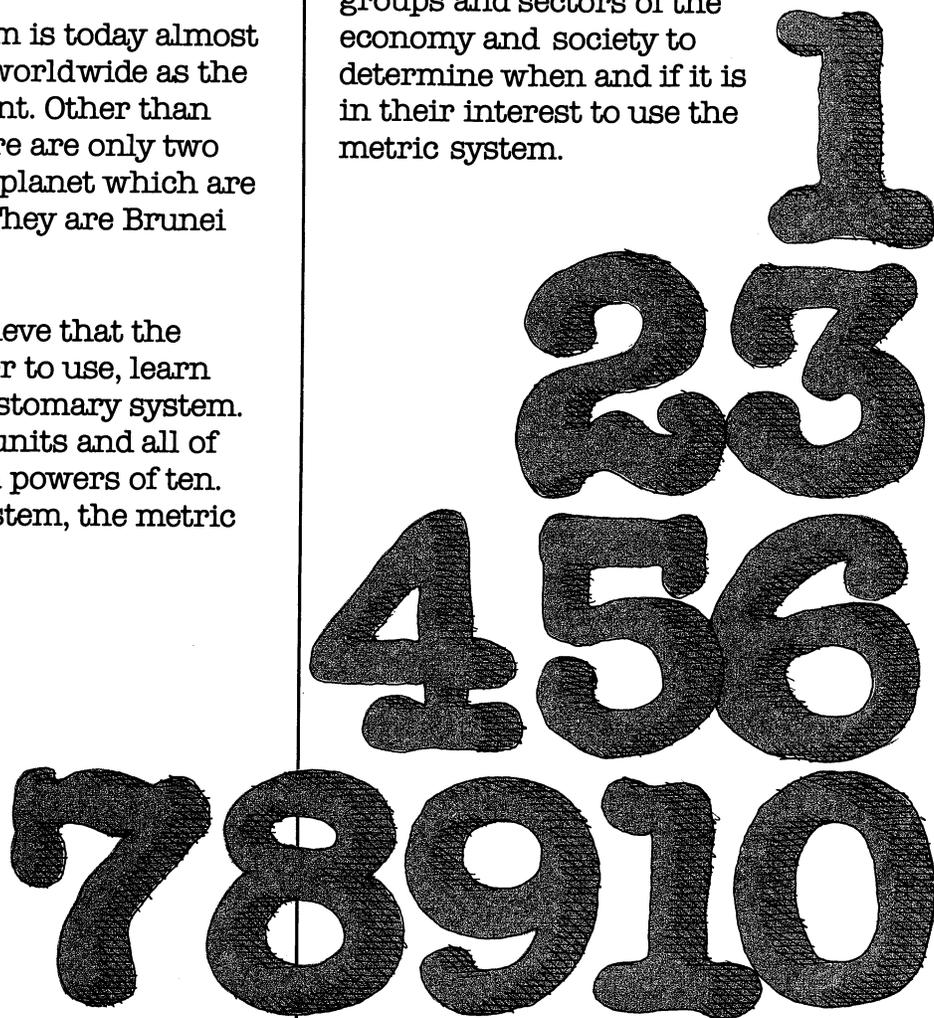
Metric usage in America is no longer merely inching along. It is steadily increasing. American companies have discovered that many of the goods they sell overseas have to be labeled in metric measure. Consequently, instead of producing products in different sizes for domestic and international trade, goods are being manufactured and labeled in metric. This includes pharmaceuticals, film, soft drinks, liquor, wine, automobiles, and machinery, to mention only a few.

The SI metric system is today almost universally accepted worldwide as the system of measurement. Other than the United States, there are only two other nations on this planet which are not officially metric. They are Brunei and South Yemen.

Many educators believe that the metric system is easier to use, learn and teach than the customary system. There are seven base units and all of them are expressed in powers of ten. Like our monetary system, the metric system is decimal.

In American schools and universities, in private industry, and in many aspects of our daily lives, metric usage is increasing steadily, but the use of the metric system in America is voluntary. When Congress passed the 1975 Metric Conversion Act, no date was established for conversion.

The Congress was quite specific in determining that there should be no timetable by which all things must be metric. Rather, it is up to individual groups and sectors of the economy and society to determine when and if it is in their interest to use the metric system.



Instructions to the Instructor

Philosophy

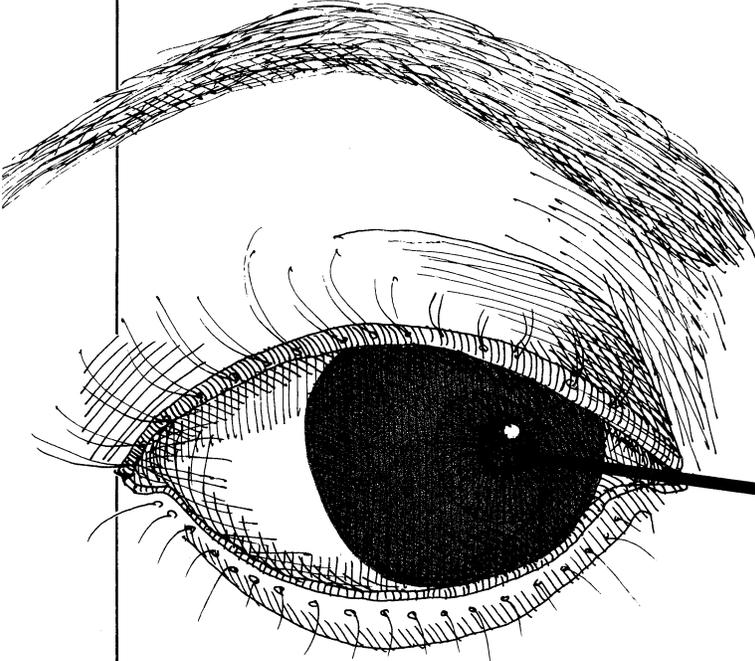
This booklet is based on the philosophy of learning by doing. Experience shows that people learn the metric system most easily when they are thinking metric, when they develop a metric eye for measurement.

In this booklet, the suggested activities have been designed to develop a metric eye. This is done through estimating, observing, and finally by measuring accurately.

Hints

A relaxed and easy atmosphere will facilitate learning. Introducing the seminar with enthusiasm, humor and a sense of fun will set the tone you want and reduce the anxiety level and resistance of participants.

Having a friend help you with the activities will also provide the kind of special attention which people often want in this kind of active learning situation.



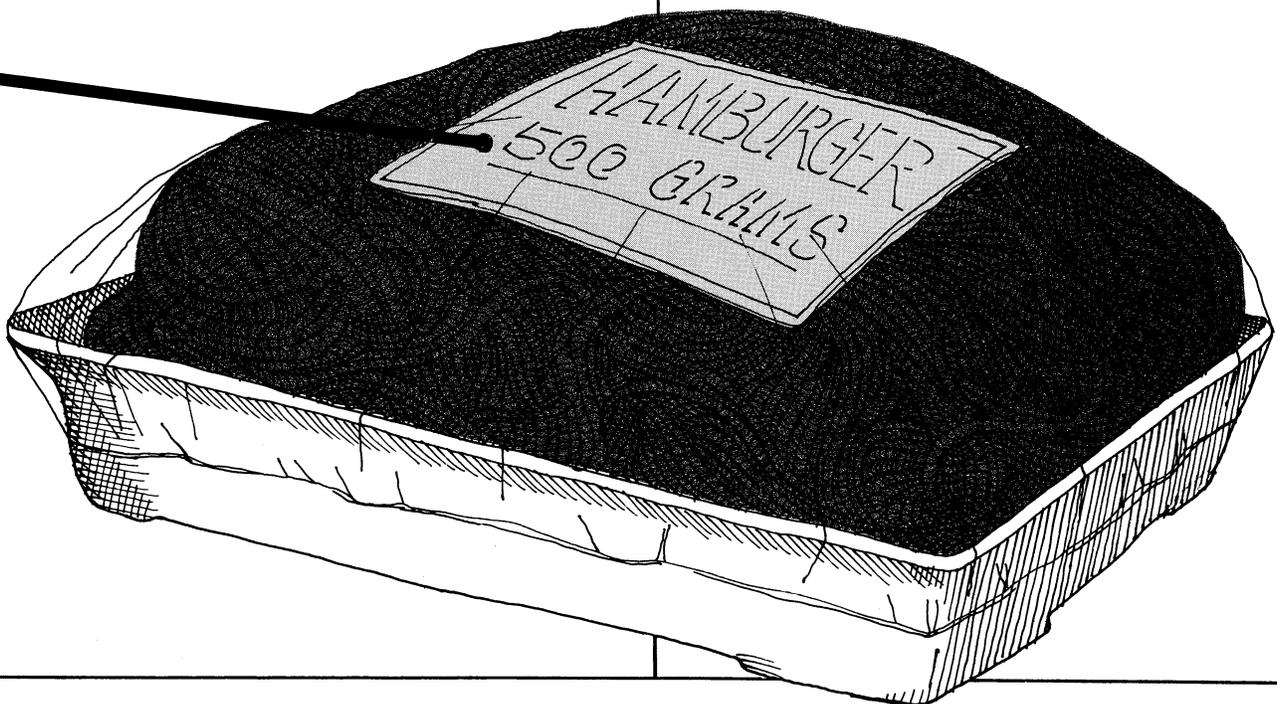
We make many measurements every day and rarely think about most of them: how hard we press the brake pedal in a car, the distance from a traffic light when we start to slow down, the size of a hamburger package we buy for dinner. Through practice we have honed our sense of size, distance, proportion, scale and measurement.

1/2 kilogram

The activities offered in this booklet are set up to be entertaining as well as educational. They take advantage of those everyday items with which people are familiar. When people are working with items they recognize and know well, their enthusiasm, receptivity and enjoyment will be greater and your tasks will be simpler.

Words of Warning: Avoid Conversion

When using the leader's guide, limit your references to the customary system. When people understand that they have to think metric, it is easier for them to do so. When questions do arise about conversion, suggest that they be held until the end of the session, at which time you can provide a conversion chart and enough information for them to make conversions easily.



Basic Teaching Materials

All of these materials are easily available from local hardware, grocery and stationery shops. In addition, many of them can be borrowed from local schools, libraries and universities. The complete set of materials will cost less than \$25.00.

Rulers and conversion cards are available free of charge from the United States Metric Board.

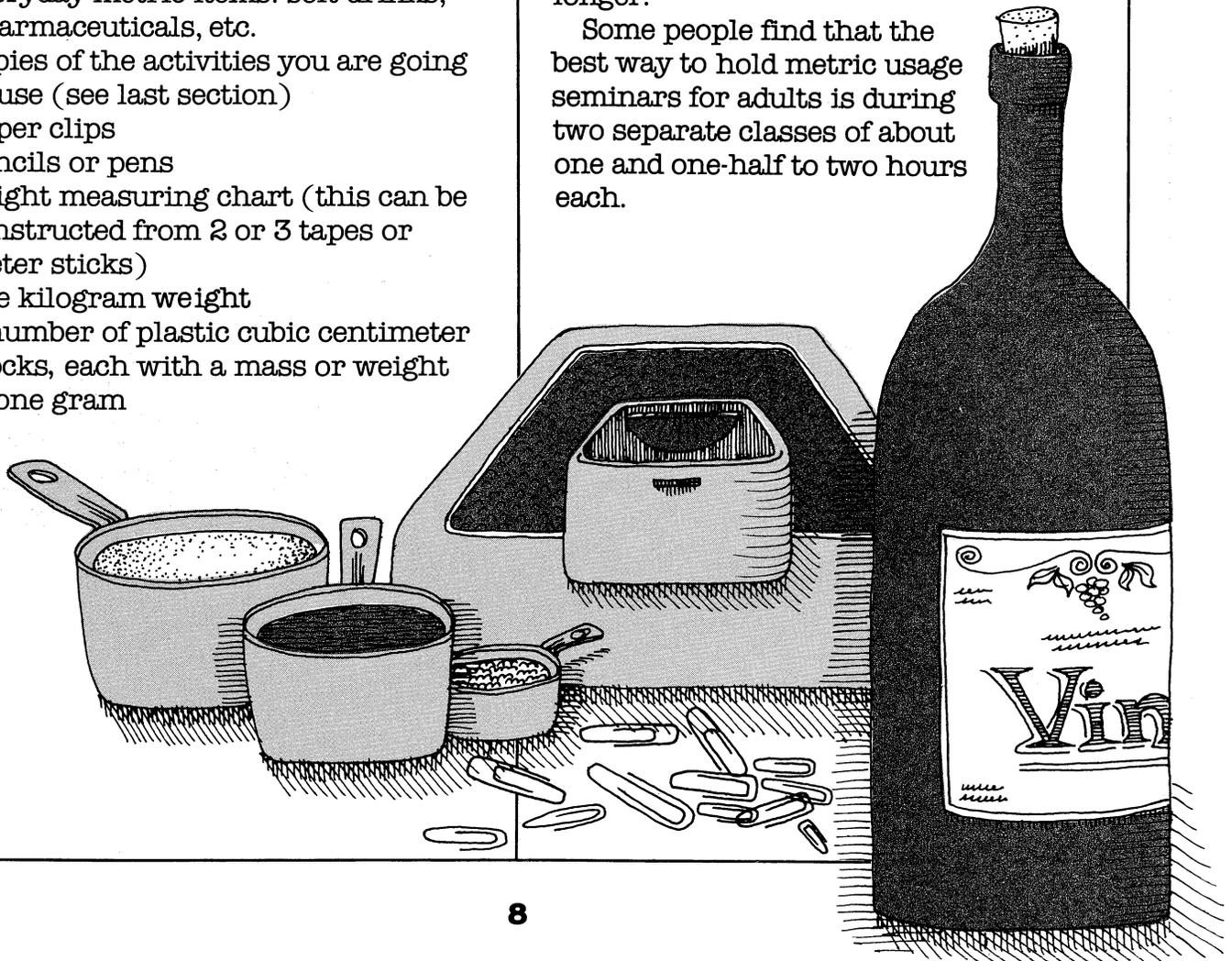
- meter sticks or measuring tapes
- bathroom scale: in kilograms
- metric rulers
- everyday metric items: soft drinks, pharmaceuticals, etc.
- copies of the activities you are going to use (see last section)
- paper clips
- pencils or pens
- height measuring chart (this can be constructed from 2 or 3 tapes or meter sticks)
- one kilogram weight
- a number of plastic cubic centimeter blocks, each with a mass or weight of one gram

- bucket of water
- graduated vessels to hold water
- ungraduated vessels to hold water
- metric measuring spoons and/or cups

The length of the program will depend on the needs and interests of the participants. Most people find that the basics of the metric system can be learned in a hands-on environment within several hours.

If you include films (many of which are available from your local or state library), your program will take longer.

Some people find that the best way to hold metric usage seminars for adults is during two separate classes of about one and one-half to two hours each.



Suggested Agenda for Metric Usage Seminar

All of the topics suggested on this agenda are briefly covered in this booklet and can be supplemented with additional materials available from the U.S. Metric Board and your public library.

You should feel free to alter this program to meet the special needs of your class.

I. **Introduction to SI metric and metric usage**

- A. Background history on measurement
- B. Background history on metrics in America
- C. Information on the increasing use of metrics in America
- D. Overview of the metric system

II. **Length: the meter m**

- A. Presentation of the meter: stick or tape or both
- B. Explanation of submultiples: millimeter (mm) and centimeter (cm)
- C. Practice in measuring
- D. Estimating exercise
- E. Height measuring exercise
- F. Any additional exercises
- G. Explanation of multiples: kilometer (km)

III. **Volume: the liter L**

- A. Presentation of the liter: liter vessels and examples from the marketplace
- B. Explanation of and examples of submultiples
- C. Liter comparison and pouring exercises

IV. **Weight or Mass: the kilogram kg**

- A. Explanation and presentation of the kilogram
- B. Explanation of submultiple: gram (g)
- C. Presentation of commercial products of submultiples: e.g. pharmaceuticals
- D. Comparison of kilogram and liter of water
- E. Explanation of relationship among liter, meter, kilogram
- F. Weighing of individuals on bathroom scale

V. **Temperature: degrees Celsius °C**

- A. Explanation of the Celsius scale
- B. Demonstration of the temperature with ice cubes, water and thermometers.
- C. Introduction of metric temperature poem for interpolation

VI. **Conclusion and Review**

- A. Review of base units
- B. Review of prefixes
- C. Review of symbols
- D. Sources for additional information

Activity Section

Included in this section are 12 activities which you may wish to use in conducting your usage seminar.

There are more activities here than you can possibly use in one program, so pick those which are most appropriate for your group and with which you personally are most comfortable.

You may reproduce or alter any of them to meet your needs and those of your participants.

1. Length

Choose any six items anywhere in the room. Guess their length in metric. Once you have listed the items and listed your estimates, measure them and see how close you came.

Item	Estimate	Measurement

2. Length

Estimate the length of these items to the nearest centimeter. Then measure them to see how close you came.

Length of your shortest finger

Length of a paper clip

Length of a cigarette

Width of a dollar bill

Diameter of a coin

3. Length

Estimate the length of these items to the nearest millimeter. Then measure them to see how close you came.

Width of your watch face

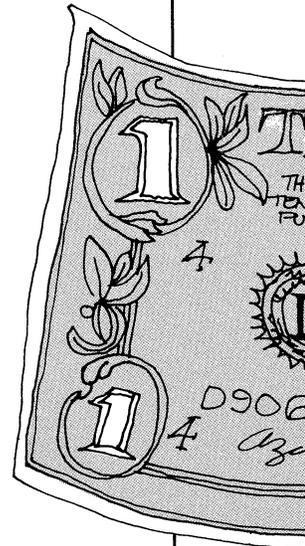
Length of a cigarette

Length of a fingernail

Length of a pen or pencil

Width of a necktie

Thickness of a coin



4. Volume

Pour different amounts of water into any vessel which is not graduated. Guess the volume of water and then find the true amount.

5. Volume

Estimate each of these volumes of water. Pour what you think is that amount into an ungraduated vessel. Then check the true measurement.

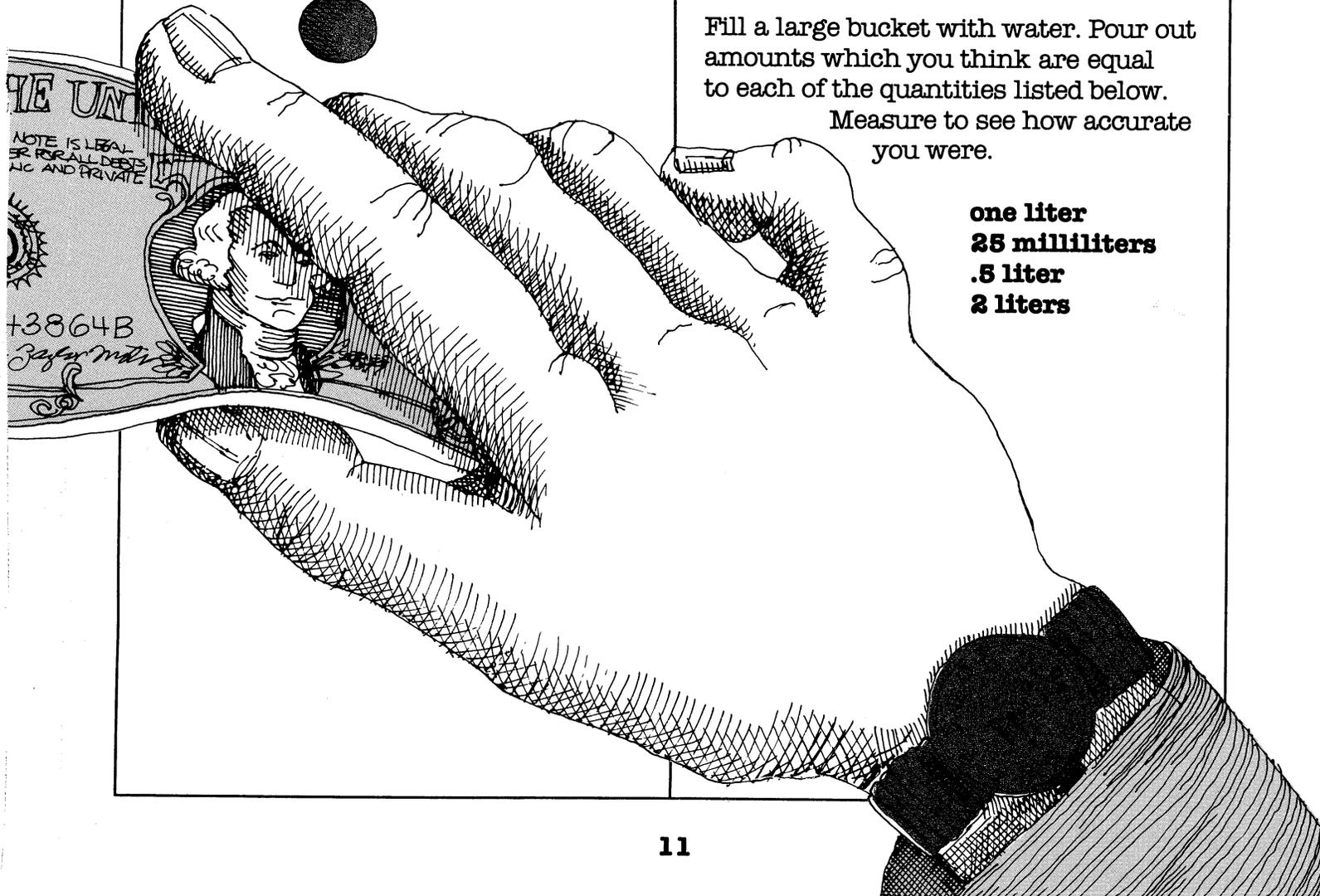
250 milliliters
50 milliliters
750 milliliters

6. Volume

Fill a large bucket with water. Pour out amounts which you think are equal to each of the quantities listed below.

Measure to see how accurate you were.

one liter
25 milliliters
.5 liter
2 liters



More Activities

7. Temperature

Use this poem to interpolate what you think certain temperatures are in degrees Celsius.

Thirty is hot
Twenty is nice
Ten is cool
Zero is ice.

8. Temperature

What would you guess each of these temperatures to be?

Weather for down parkas and gloves
Normal body temperature
Water boils
Water freezes

Some Metric Units You'll Need to Know

Metric Unit	Symbol	Measures
meter	m	linear dimension, length, distance, thickness, etc.
gram	g	weight (technically, mass)
liter	L	volume
degrees Celsius	°C	temperature

9. Temperature

Use a thermometer to check the temperature of a glass of water at room temperature. Place some ice in the water and check the temperature every 20 seconds. Record the changes.

Then take the thermometer and hold it in your hand for at least a minute. Does it register normal body temperature?

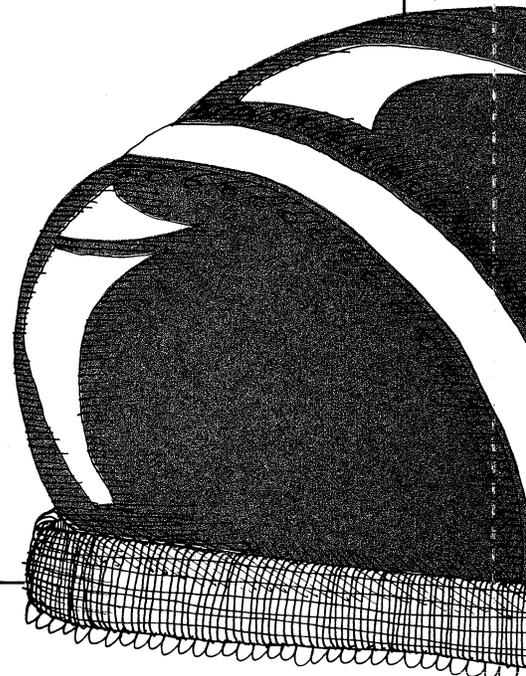
10. Weight or Mass

You know that a kilogram has a mass of 10% more than 2 pounds. Without using paper and pencil, estimate how much you weigh in kilograms and then check your accuracy on a scale.

11. Weight or Mass

Hold a kilogram to see how it feels. Then pick up some of the following objects and estimate what they weigh.

Your shoes
A large book
A chair



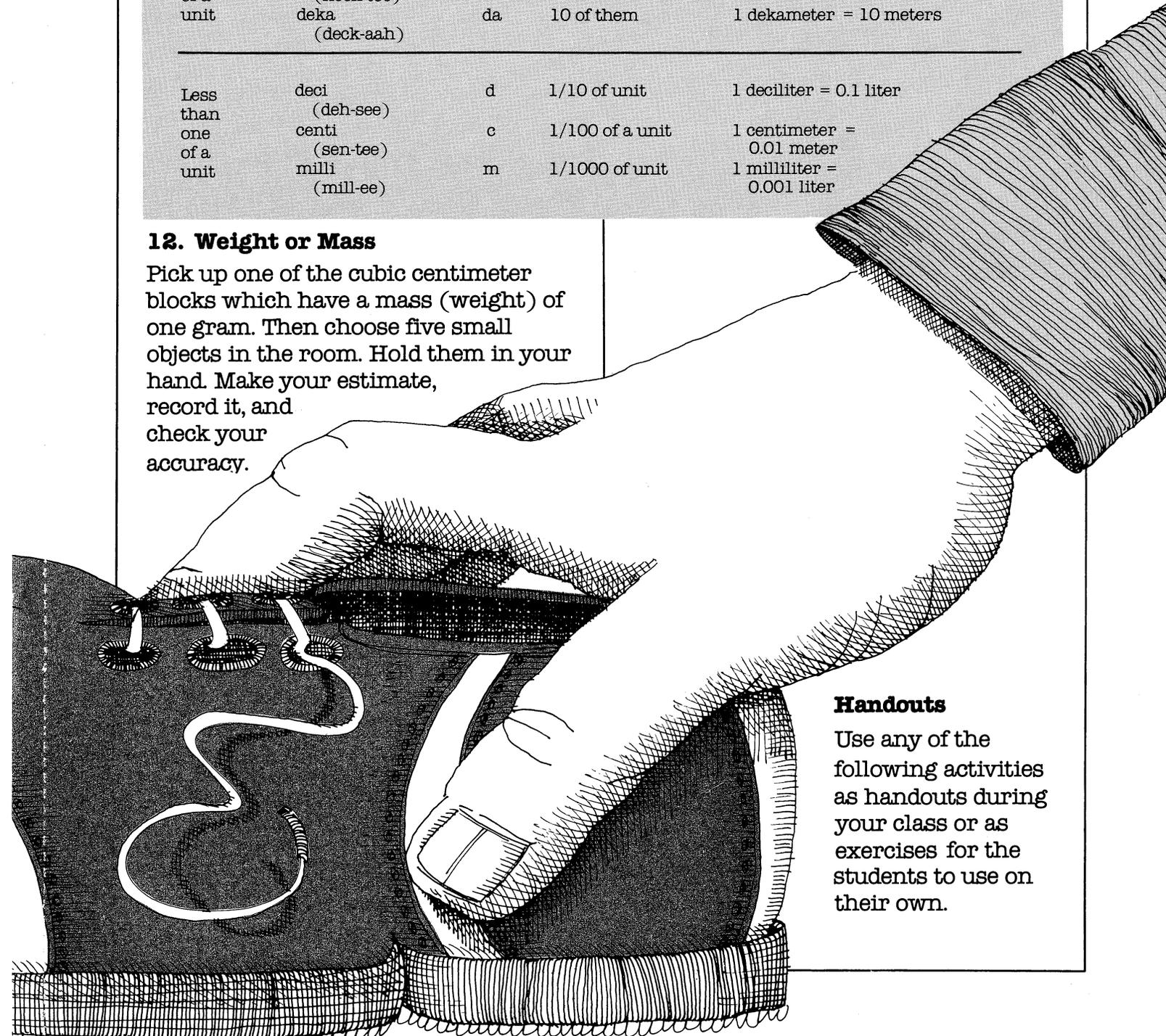
	Prefix	Symbol	Relation to Unit	Example
More than one of a unit	kilo (kill-o)	kg	1000 of them	1 kilogram = 1000 grams
	hecto (heck-toe)	h	100 of them	1 hectometer = 100 meters
	deka (deck-aah)	da	10 of them	1 dekameter = 10 meters
Less than one of a unit	deci (deh-see)	d	1/10 of unit	1 deciliter = 0.1 liter
	centi (sen-tee)	c	1/100 of a unit	1 centimeter = 0.01 meter
	milli (mill-ee)	m	1/1000 of unit	1 milliliter = 0.001 liter

12. Weight or Mass

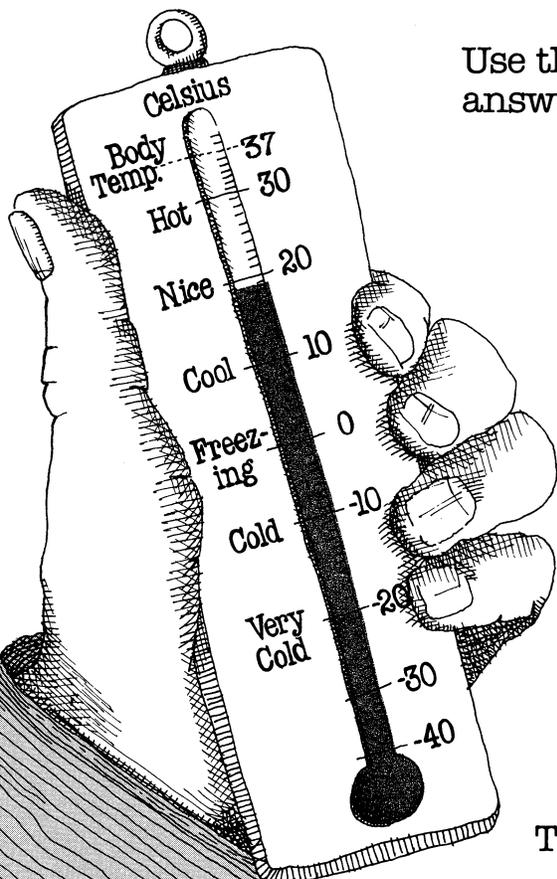
Pick up one of the cubic centimeter blocks which have a mass (weight) of one gram. Then choose five small objects in the room. Hold them in your hand. Make your estimate, record it, and check your accuracy.

Handouts

Use any of the following activities as handouts during your class or as exercises for the students to use on their own.



How Hot Is It in Metric?



Use the following chart and poem to answer the questions written below.

To figure what kind of day it will be (metrically speaking), remember the following poem:

Thirty is hot
Twenty is nice
Ten is cool
Zero is ice

Try the following questions:

At thirty-five degrees Celsius, what would you wear outside?

If you visited a friend in Nome, Alaska, in December, what might the temperature be at midnight? _____

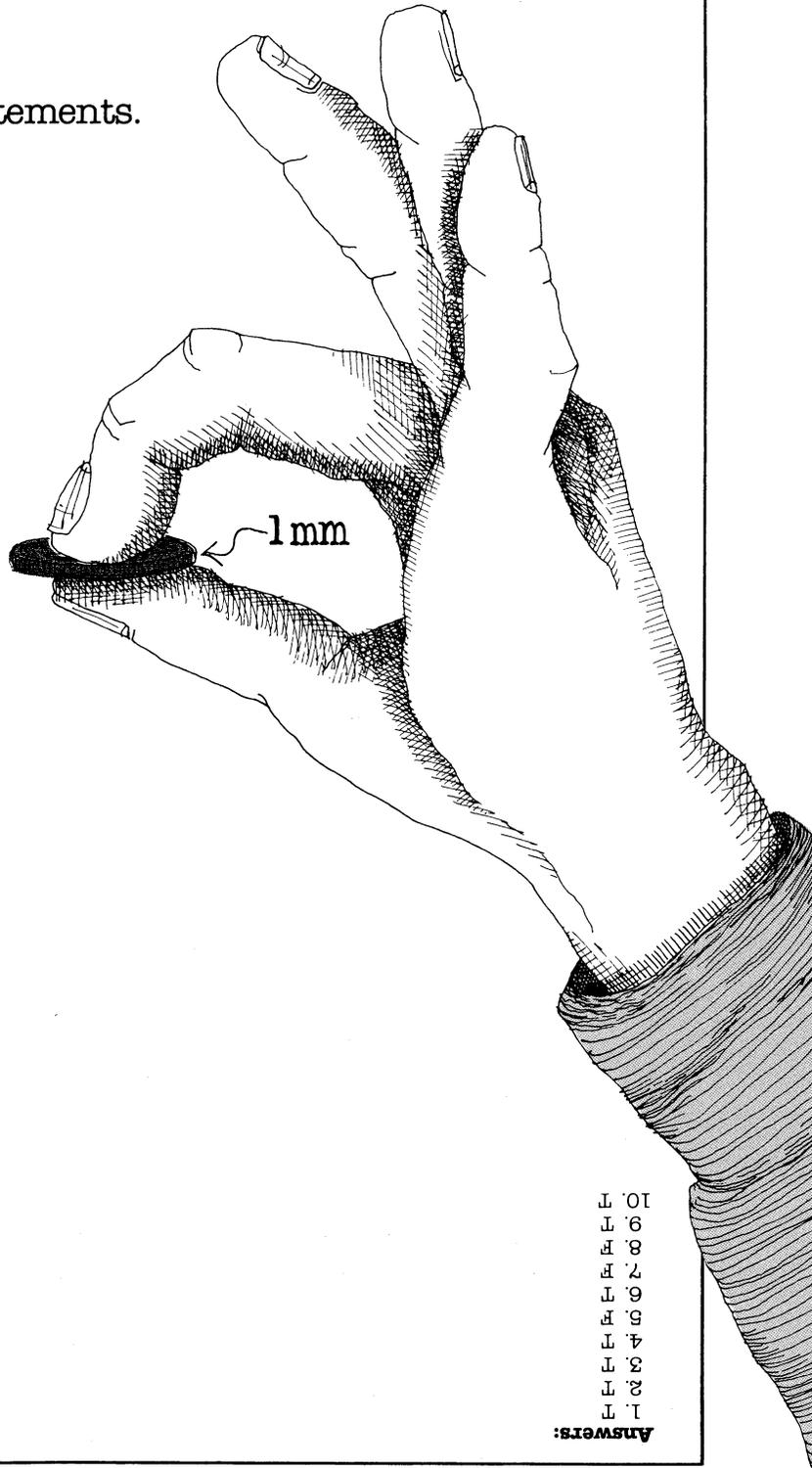
What is the temperature at noon during your favorite season of the year? _____

What is the temperature at noon during the season of the year you like least? _____

Metric True and False Quiz

Try these 10 metric T&F statements.

- | | | |
|--|---|---|
| 1. A centimeter is one-hundredth of a meter. | T | F |
| 2. A kilometer is shorter than a mile. | T | F |
| 3. A liter is larger than a quart. | T | F |
| 4. A meter is longer than a yard. | T | F |
| 5. There are five hundred milliliters in a liter. | T | F |
| 6. Metric conversion is voluntary in America. | T | F |
| 7. Photographic film is measured in meters. | T | F |
| 8. Zero degrees Celsius is the same as 100 degrees Fahrenheit. | T | F |
| 9. The symbol kg is the same as kilogram. | T | F |
| 10. The approximate thickness of a dime is 1 mm. | T | F |



Answers:
1. T
2. F
3. F
4. F
5. F
6. F
7. F
8. F
9. F
10. F

Metric Expressions

Test your knowledge of metric terms. Replace the customary measures in the ten familiar expressions below with the appropriate metric measures and see what they would sound like in metric. Remember, the metric terms will not equal the customary terms.

1. The Texan pulled a rabbit out of a ten liter (gallon) hat.
2. There was a crooked man and he walked a crooked _____ (mile).
3. A _____ (pound) of flesh.
4. Give him a _____ (inch), and he will take a _____ (mile).
5. I wouldn't touch a skunk with a ten _____ (foot) pole.
6. I won't budge a (inch) _____.
7. One hundred _____ (yard) dash.
8. I'd walk a _____ (mile) for a Camel.
9. A _____ (ounce) of prevention is worth a _____ (pound) of cure.
10. This is a _____ (mile) -stone in my life.

- Answers:**
1. liter
 2. kilometer
 3. kilogram
 4. centimeter, kilometer
 5. meter
 6. centimeter
 7. meter
 8. kilometer
 9. gram, kilogram
 10. kilometer

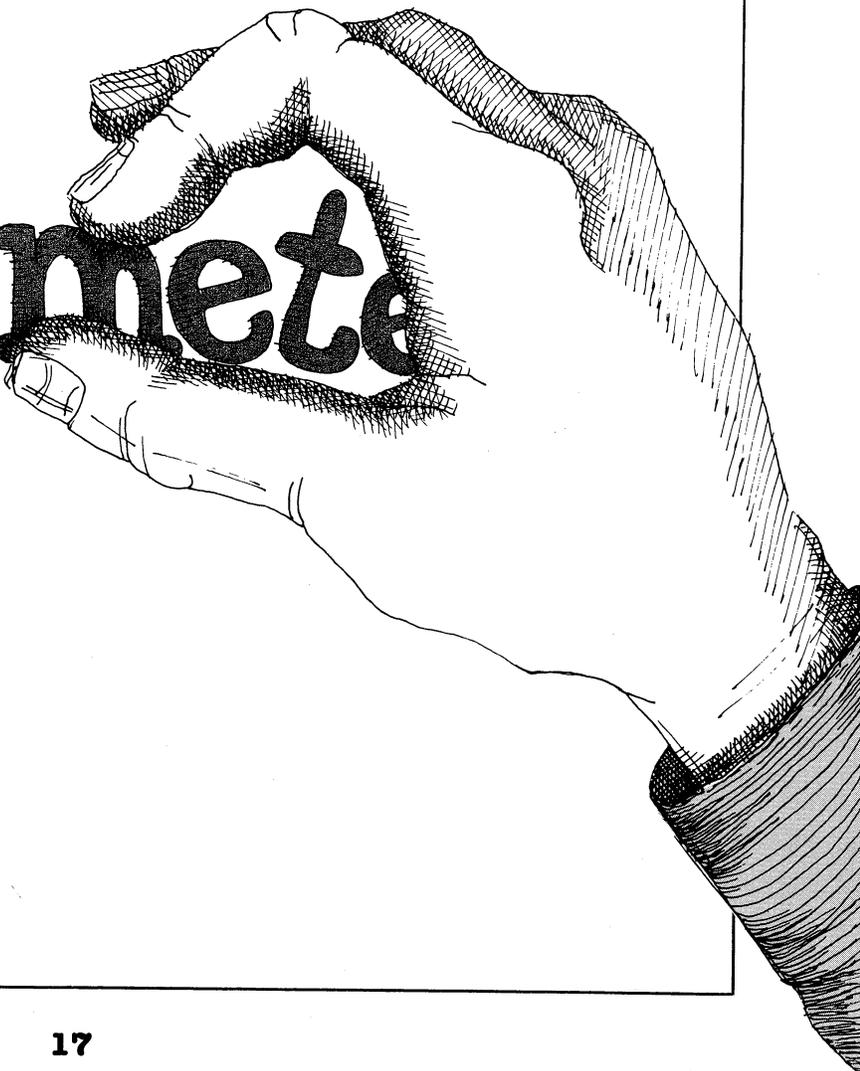
The Great Metric Unscramble

See if you can unscramble these 10 words to make the correct metric units of measurement.

1. magr
2. sleiuCs
3. ermte
4. teril
5. olmagrki

6. olterilki
7. icermteed
8. niermtetce

9. olermteki
10. lilterilim



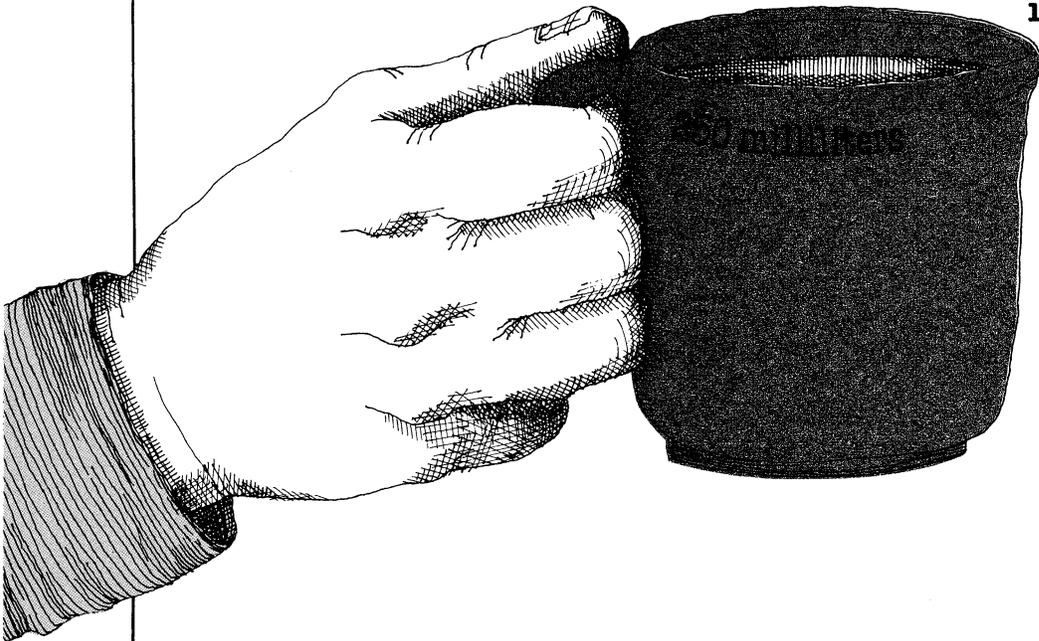
millimete

- Answers:**
1. gram
 2. Celsius
 3. meter
 4. liter
 5. kilogram
 6. kiloliter
 7. decimeter
 8. centimeter
 9. kilometer
 10. milliliter

Metric: The Choice is Yours

For each of the following 10 questions, choose the answer you think is correct and put a check in the space provided.

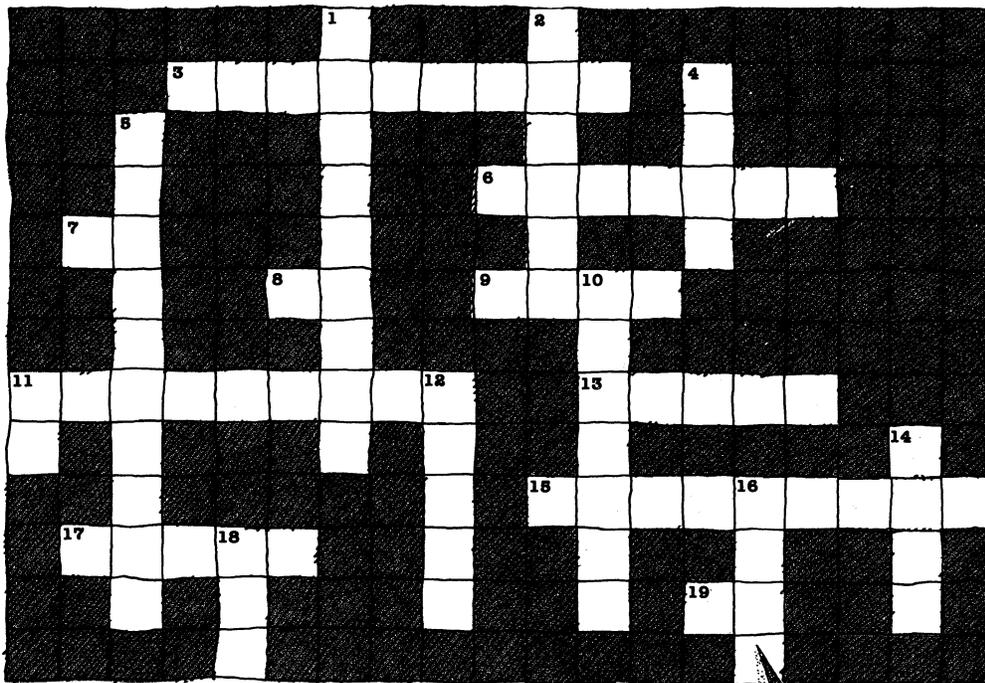
1. A gram weighs about the same as:
(a) ___ an apple
(b) ___ a dime
(c) ___ a pineapple
2. A meter is about the height of:
(a) ___ a door
(b) ___ a kitchen counter
(c) ___ the seat of a chair
3. Water freezes and boils at:
(a) ___ 32°C and 212°C
(b) ___ 100°C and 200°C
(c) ___ 0°C and 100°C
4. A coffee cup holds about:
(a) ___ 2 milliliters (mL)
(b) ___ 20 mL
(c) ___ 250 mL
5. A newborn baby weighs about:
(a) ___ 3 kilograms (kg)
(b) ___ 30 kg
(c) ___ 300 kg
6. The height of a tall man is about:
(a) ___ 20 centimeters (cm)
(b) ___ 200 cm
(c) ___ 2000 cm
7. Normal body temperature is:
(a) ___ 25°C (degrees Celsius)
(b) ___ 37°C
(c) ___ 45°C
8. A liter of milk is:
(a) ___ larger than a quart
(b) ___ smaller than a quart
(c) ___ the same size as a quart
9. A liter of water weighs
(a) ___ 1000 grams (g)
(b) ___ 10 g
(c) ___ 100 g
10. The thickness of a dime is about
(a) ___ 0.1 millimeters (mm)
(b) ___ 1 mm
(c) ___ 5 mm



Answers:
1. d
2. b
3. a
4. b
5. a
6. b
7. b
8. c
9. a
10. a

Metric Crossword Puzzle

Test your metric knowledge with this crossword puzzle. Try ten clues across and ten clues down.

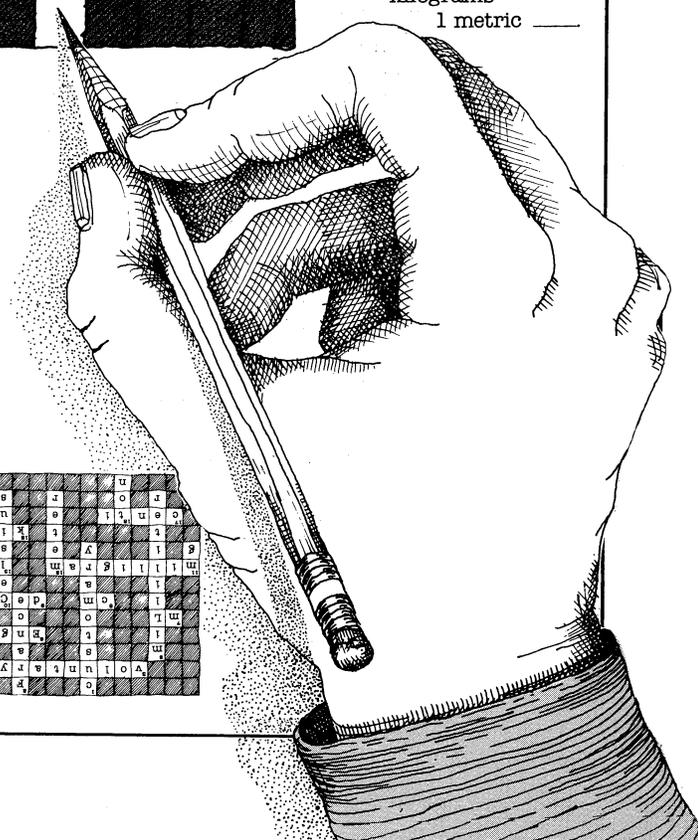
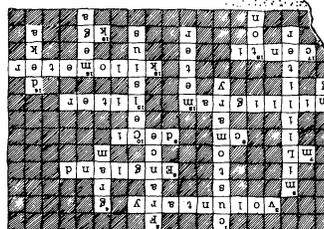


Down

1. The word used to describe the inch pound system.
2. The nation where the metric system was developed.
4. A small unit that measures mass (or weight).
5. One-thousandth of a liter.
10. degree _____
11. The symbol for 1/1000 of a gram.
12. The base unit of length.
14. The prefix meaning 10.
16. The prefix meaning one million.
18. One thousand kilograms = 1 metric _____

Across:

3. The legislation for the U.S. Metric Board calls for a _____ conversion.
6. The nation in which the inch pound system was developed.
7. The symbol for milliliter.
8. The symbol for centimeter.
9. The prefix for one-tenth.
11. One-thousandth of a gram.
13. A unit of volume.
15. One thousand meters.
17. The prefix for one-hundredth.
19. The symbol for kilogram.



Test Your Metric Knowledge

Test your metric knowledge: Circle the correct answer to each of these ten multiple choice questions.

1. What metric measure would you use to measure the length of a pencil?

- gram
- Celsius
- liter
- centimeter

2. When weighing a moose in metric, which measure would you use?

- kilogram
- meter
- Celsius
- liter

3. If the temperature outside is 35 degrees Celsius, what will you most likely be doing?

- cross-country skiing
- ice skating
- swimming
- hiking

4. Which is the shortest distance?

- 23 liters
- 24 meters
- 25 centimeters
- 26 millimeters

5. If you were buying tomato juice that had been packaged in a metric sized can, what metric measure would be used?

- kilometers
- liters
- Celsius
- tons

6. What is the metric measure used for snow skis?

- millimeters
- centimeters
- liters
- grams

7. At birth, which one of these babies might weigh 3 kilograms?

- moose
- elephant
- flea
- human

8. Which of these is about the same size as a liter?

- gallon
- quart
- ounce
- inch

9. About how much does a paper clip weigh?

- 1 kilogram
- 1 liter
- 1 gram
- 1 meter

10. Which one of these measures is about the width of an average doorway?

- meter
- kilometer
- gram
- Celsius



- Answers:
1. centimeter
 2. kilogram
 3. swimming
 4. 26 millimeters
 5. liters
 6. centimeters
 7. human
 8. quart
 9. gram
 10. meter

Additional Information

For additional information and publications, contact any of the following organizations:

American National Metric Council
5410 Grosvenor Lane
Bethesda, Maryland 20814

Metric Education Program
United States Department of Education
400 6th Street, Southwest
Washington, D.C. 20202

National Council of Teachers of Mathematics
1906 Association Drive
Reston, Virginia
22091

United States Metric Association
Sugarloaf Star Route
Boulder, Colorado
80302

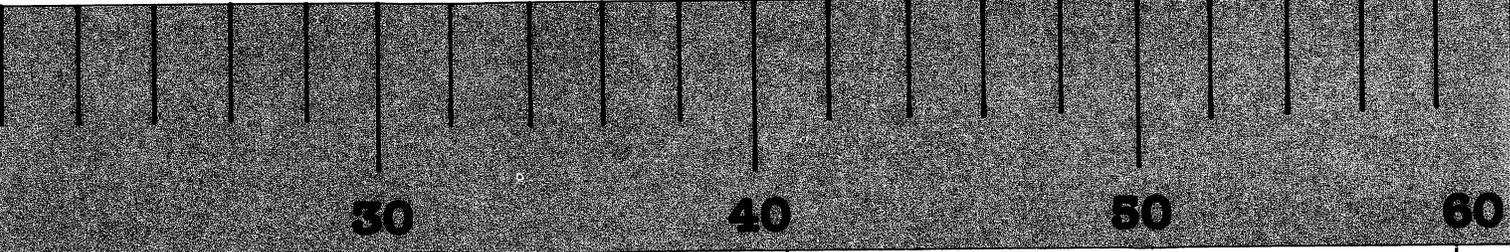
USMB Publications

USMB—an introduction
Metrics in the Kitchen
All About Metric
U.S. Metric Board Annual Reports
Metric Speakers Directory;
Antitrust: A Handbook for Metric Planning and
Conversion
Conversion Factors
All You Will Need to Know About Metric

There has been some confusion about the role of the U.S. Metric Board and the national policy on metric conversion. Congress established the Board to plan and coordinate voluntary metric conversion activity in this country. It is not, however, the role of the Board to promote metric usage.

Metric conversion in this country is voluntary. When Congress passed the Metric Conversion Act in 1975 it did not make conversion mandatory; nor did it establish a target date or deadline for conversion. The Board has no compulsory power. It is a public service agency responsible for conducting public information and education programs and appropriate research, coordination and planning activities.

Please contact us if you have any questions about the role of the Board or the national policy on metric conversion.



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