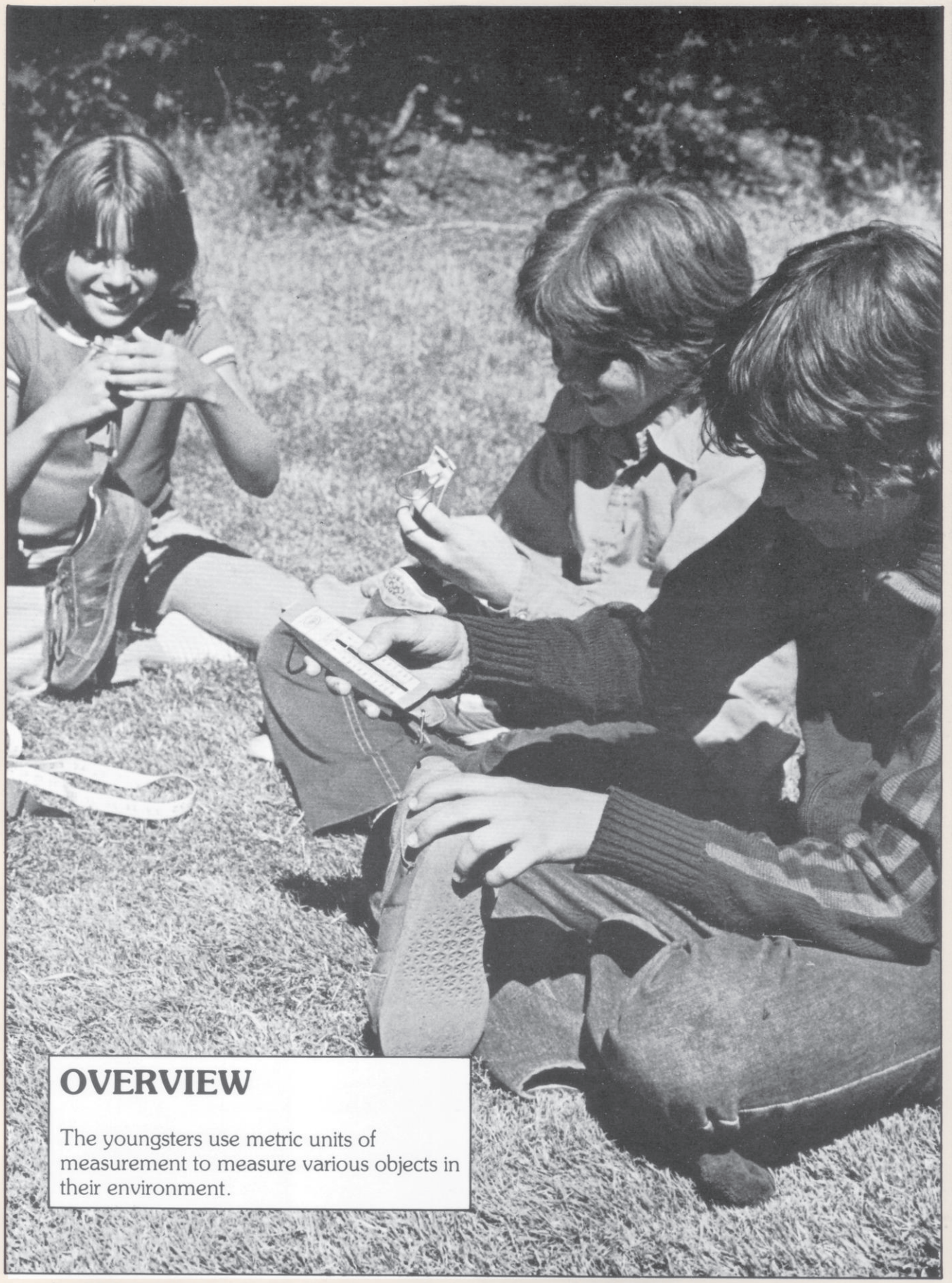
METRIC CAPERS

BIO KEY

Game
Measuring
Estimating



OVERVIEW

The youngsters use metric units of measurement to measure various objects in their environment.

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BACKGROUND

Have you ever heard the old saying: "Give 'em a centimeter and they'll take a kilometer"? You haven't? Well, give your youngsters meters, liters, grams, and degrees Celsius, and they will take home the metric system. The metric system is the household system of measure in most countries outside the United States. Although the transition is far from complete, the U.S. is switching to the metric system.

Measurements in all OBIS activities are metric, so you might want to take your group on a metric caper before embarking on other investigations. In this activity, the youngsters develop their "metric senses" by measuring and estimating in metric units the mass, length, volume, and temperature of familiar objects. The basic system is illustrated here.

MASS (amount of material)
Basic unit is the gram (g)
1000 milligrams (mg) = 1 gram
1000 grams = 1 kilogram (kg)
1000 kilograms = 1 metric ton

LENGTH
Basic unit is the meter (m)
10 millimeters (mm) = 1 centimeter (cm)
100 centimeters (or 1000 millimeters) = 1 meter
1000 meters = 1 kilometer (km)

VOLUME
Basic unit is the liter (l)
1000 milliliters (ml) = 1 liter

TEMPERATURE
Basic unit is the degree Celsius (°C)
0°C = ice
22°C = room temperature
37°C = normal body temperature
100°C = boiling water

CHALLENGE: LEARN THE METRIC SYSTEM BY MEASURING FAMILIAR OBJECTS IN YOUR ENVIRONMENT.

MATERIALS

The materials listed under each Caper Card are enough for two teams. At least two teams are needed to work on one Caper Card.

FOR CAPER CARD A

Measuring Mass:
2 kilogram scales*, 0-10 kilograms (Fishermen's scales are fine.)
2 gram scales*, 0-2000 grams
4 onion bags or mesh bags* to hold objects
2 plastic bags* strong enough to hold one liter of soil

Measuring Length:
2 meter tapes*†
2 rulers*, 15-30 cm, preferrably clear plastic

FOR CAPER CARD B

Measuring Volume:
2 liter-containers*†
2 250-ml measuring cups*
2 plastic bags*
2 buckets of water
1 8-10 liter bucket*† (optional)

Measuring Temperature:
2 Celsius thermometers*
2 rulers*, 15-30 cm

ODDS 'N' ENDS
flagging* (See "Preparation.")
1 "Metric Tools" Equipment Card*
1 sheet of Practice and Caper Cards* (See "Preparation.")
pencils*

*Available from Delta Education.
†See the "Metric Tools" Equipment Card.

PREPARATION

Group Size. Team size should be two to six youngsters. If you only have enough youngsters for two teams, both must work with the *same* Caper Card.

Time. Plan on forty to sixty minutes for the activity.

Materials. Before you gather the materials, decide whether your group will work with Caper Card A, Caper Card B, or both cards.

Site. The site should be large enough for the teams to be separated from each other by at least five meters. Select a working area for each team that contains the objects on the Caper Cards, e.g. rocks, soil, leaves.

Flagging. Cut brightly colored cloth into flags of 4 cm x 30 cm. Each team using Caper Card A will need seven flags, and each team using Caper Card B will need six flags.

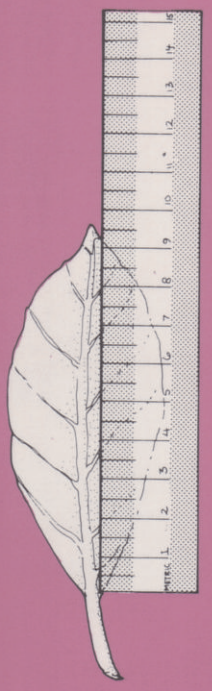
Caper Cards and Practice Cards. Make one copy of a Caper Card for *each team* and one copy of the corresponding Practice Card for each team member. You should always have two teams working on any one Caper Card set of measurements.

ACTION

1. Introducing the tools. Show the youngsters how to make metric measurements with the tools they will be using. Use the following demonstrations.

- **For Length:** Measure the length of one of the youngsters' arms.
- **For Mass:** Place your shoe in a mesh bag, hook the bag to the gram scale, and measure the mass of your shoe.
- **For Volume:** Follow the procedure on the Equipment Card to measure the volume of your fist.
- **For Temperature:** Measure the temperature of the water you used for the volume measurement.

2. Practice measurements. Divide your group into teams of two to six kids each. Distribute the appropriate Practice Cards and measuring tools. Allow ten to fifteen minutes for the youngsters to complete the Practice Cards.



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3. Outlining Metric Caper procedures. Go over the following procedures.

- Each team works in its own area and selects the items described on its Caper Card to measure.
- The teams use the flags to clearly mark each item they select.
- The teams use the tools to measure the items and then record the measurements on their Caper Cards. Suggest that the team members take turns measuring and recording.

4. Describing the switch. Explain that pairs of teams (each of which worked on the same Caper Card) will switch areas after making their measurements and then, without any measuring tools, estimate the mass, length, temperature, or volume of the other team's items.

5. Measuring the caper items. Distribute a Caper Card, pencil, and flagging (seven flags for A teams, six for B teams) to each team. Direct each team to its measurement area, and let the teams begin.

6. "Guestimating" metric measurements. When two A or two B teams have recorded all their measurements, call them over and collect their measuring tools. Caution them to keep their Caper Cards secret from the other team. Direct the teams to switch areas and to "guestimate" the metric measurements of the other team's items. Ask the teams to fill in the "Guestimates" blanks at the bottom of their Caper Cards. Go!

COMPARING "GUESTIMATES"

Give the teams a few minutes to compare their "guestimates" with the actual measurements. Ask these questions:

1. Which measurements were the most difficult to estimate? Why?

2. How did you go about estimating the measurements for the different items? Did you use personal measuring units such as hand span, arm length, or walking stride? Which ones?

AFTER THE CAPER

1. Make a metric collage. Find objects that are exactly 100 grams, 1 kilogram, 1 liter in volume, 1 meter, etc., and make a collage out of them.

2. How tall are you in centimeters?

3. How fast can you run? Use a watch and meter tape to find out how many meters you can run in ten seconds.

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Metric Capers

METRIC TOOLS

Equipment Card

LITER CUP

MATERIALS FOR ONE CUP:

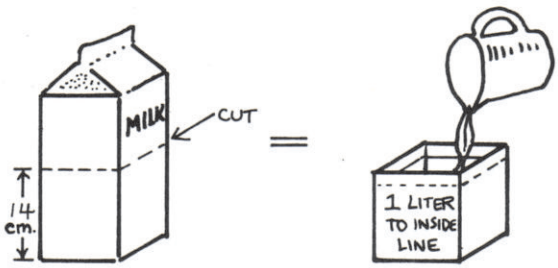
1 half-gallon milk carton
1 15-30 cm ruler*
1 pair of scissors*
1 250-ml measuring cup*
1 waterproof marking pen*

*Available from Delta Education.

MAKING THE LITER (1000 ml) CUP:

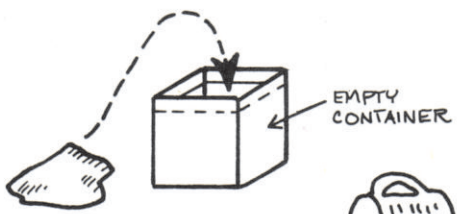
1. Cut off the top of the milk carton about 14 cm from the bottom.

2. Use the 250-ml measuring cup to add exactly one liter (1000 ml) of water to the carton. Mark the one-liter level with the marking pen.

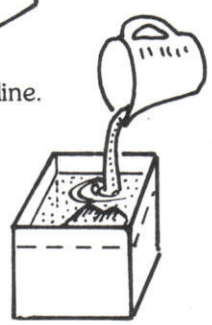


MEASURING VOLUME WITH YOUR LITER CUP:

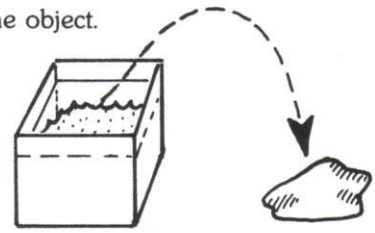
1. Place the object (must fit below one-liter level) you wish to measure in the container.



2. Add water to the one-liter line.



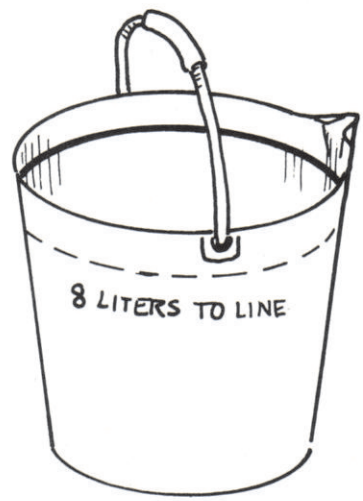
3. Remove the object.



4. Measure the water with your 250-ml measuring cup. (Example: Volume of water = 330 ml.)

5. Subtract the volume of water from 1000 ml to obtain the volume of the object. (Example: 1000 ml − 330 ml = 670 ml.)

Optional, for larger objects: Get a standard-sized bucket and use your liter cup to calibrate the bucket in liters. Use this bucket in the same way for measuring the volume of larger objects.



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Metric Capers

METRIC TOOLS

Equipment Card

METER TAPE

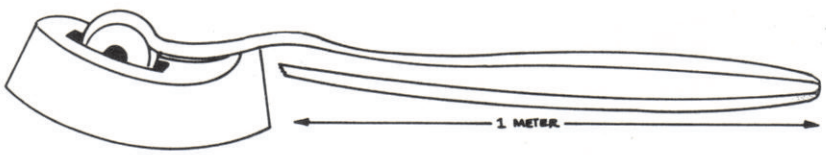
MATERIALS FOR ONE METER TAPE:

1 fine-tip permanent marking pen*
1 roll of masking tape
1 meter stick*

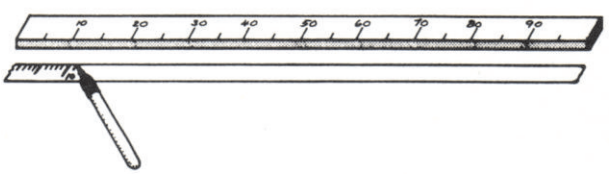
*Available from Delta Education.

MAKING YOUR METER TAPE:

1. Unroll two meters of tape and double it over, sticky sides together.



2. Use your meter stick to calibrate your tape with your marking pen.



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Metric Capers
Practice Card A: Mass and Length

My shoe length is _____centimeters (cm).

My shoe has a mass of _____grams (g).

My eyes are _____cm apart.

My coat has a mass of _____g.

My longest stride is _____meters (m).

A fist-sized rock has a mass of _____g.

Metric Capers
Practice Card B: Volume and Temperature

The temperature of the air is _____degrees Celsius (°C).

The volume of my fist is _____milliliters (ml).

The temperature of my armpit is _____°C.

The volume of water that I can cup in my hand is _____ml.

Metric Capers
Caper Card A: Mass and Length

The distance between two trees or bushes is _____meters (m).

The length of one branch is _____centimeters (cm).

The length of a leaf is _____cm.

The mass of a rock is _____grams (g).

The mass of a bag of soil is _____g.

The mass of a bag of rocks is _____g.

"Guestimates"

Distance between two trees or bushes _____m

Length of one branch _____cm

Length of a leaf _____cm

Mass of a rock _____g

Mass of a bag of soil _____g

Mass of a bag of rocks _____g

Metric Capers
Caper Card B: Volume and Temperature

The temperature of the soil 5 cm beneath the surface is _____degrees Celsius (°C).

The temperature inside a bush or hedge is _____°C.

The temperature of the ground in a cool, shaded place is _____°C.

The volume of a rock is _____milliliters (ml).

The volume of three rocks is _____ml.

The volume of a bag of soil is _____ml.

"Guestimates":

Temperature of soil 5 cm beneath surface _____°C

Temperature inside a bush or hedge _____°C

Temperature of cool, shaded ground _____°C

Volume of a rock _____ml

Volume of three rocks _____ml

Volume of a bag of soil _____ml

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