How Does Your Tree Measure Up?

Grades 3-5th

by Debbie Corson

Overview

In order to prepare students to accurate measure and record trees in a penny plot, the classroom teacher will first lead a guided practice with students with one tree on the school grounds. When students have mastered the key concepts they will be ready to submit a Student Tree Observation Form to the Missouri Forestkeepers Network. Student confidence in process and assessment will be increased as they will have prior knowledge and practice. The practice tree may also be used for further extension lessons, such as being tree pals with another school.

Preparation

- The whole class briefly discusses measuring and estimating — comparing and contrasting. They also review terms such as circumference, diameter, horizontal, and vertical. The teacher explains the tasks of each group and distributes hand-outs. Students work in cooperative learning groups, each with a different task. Group #1 Tree Height, Group #2 Tree Circumference & Diameter, Group #3 Crown Circumference, and Group #4 Leaf Estimation. Each student should complete a K-W-L Graphic Organizer before the lesson.

OBJECTIVES

- Students use prior knowledge from Lesson #1 and their tree species guides to compare and contrast leaf pictures with the leaves on the chosen tree.
- Students practice tree diameter measurement using a Biltmore Stick.
- Students estimate the tree height by using Handout #2.
- Students measure the circumference and diameter of the trunk using Handout #3.
- Students estimate the number of leaves on the tree using Handout #4.
- Students rate the crown health, foliage, limbs and trunk using the Forestkeepers Field Manual, pages 12 to 17.

BACKGROUND

Complete Lesson #1 — Leaf Recognition first. The tree to be studied should be selected ahead of time by teacher and/or students. Students will work in cooperative learning groups.

MATERIALS

- Forestkeeper Field Manual for each group:
  Handout #1 — *Tree Height*
  Handout #2 — *Trunk Diameter*
  Handout #3 — *Crown Circumference*
  Handout #4 — *Leaf Estimation*
- Five 5 Biltmore Stickers and yardsticks
- Plastic lids (8 to 10) to use as markers, a clipboard and pencil for each group, a ruler, string and a measuring tape.

Note: *Depending on the class skill level, teachers may choose to eliminate one or more handouts.*

Procedure

1. Whole class reviews leaf recognition materials — poster and the Forestkeepers Field Manual about rating the health of crown, trunk, limbs and foliage — pp. 12-17.
2. Students will review materials pertinent to their group before going outside to meet their tree.
3. Group #1 works with teacher to practice measuring the height of a student using the information in Handout #1.
4. Group #2 assembles Biltmore Sticks and reads information in Handout #2.
5. Group #3 & Group #4 read their handouts and determine the tree species from a leaf.
6. Class goes outside to work on measurements.

Final Activities

1. Ask students to share their observations within each group. Have them decide on the measurement for the final report. Ask students to decide if they measured or estimated.
2. Have the recorder write the data on the class data sheet and the reporter tell the class the results.
3. As a class, look back at the Forestkeepers Field Manual and determine the Student Tree Observation data.

Extensions

- Repeat the lesson with another tree and switching groups
- Send each student home with a Student Tree Observation form and give each a Biltmore Stick sticker for home use. Ask them to choose a tree at home to measure.

RESOURCES

- **The Missouri Department of Conservation's Discover Nature Schools Program and Resources**
  www.mdc.mo.gov
- **Discovery Trunks Loan Program** available through the Missouri Department of Conservation. A Discovery Trunk is a collection of materials that may be checked out by innovative teachers and youth leaders. These trunks are a great way to compliment thematic units or as an intriguing way to cross disciplines. There is not fee for using the trunks and each may be checked out for two weeks. Check out **www.mdc.mo.gov** keyword *Discovery Trunks* for more information.
- **Just for Teachers: Forests**
  http://mdc4.mdc.mo.gov/Documents/184.pdf
- **50 Common Missouri Trees** available from the Missouri Department of Conservation and includes a simple dichotomous key to identify trees
- **Tree Measurement**
  An Educator's Reference Desk Lesson Plan, *Jeanette Vratil*, Lowell Elementary, KS, 1994

Assessment

- Each student should fill out a new K-W-L Graphic Organizer and then compare to the original.

GLE'S

THIRD GRADE - MATH

- **MA 1 3.2** Represent a mental strategy used to compute a given multiplication problem up to 9 x 9, estimate and justify sums and differences of whole numbers
- **MA4 1.10** Using all operations, represent a mathematical situation as an expression or number sentence.
- **MA 2 3.1** Identify, justify and use the appropriate unit of measure
- **MA 2 1.6** Use a referent for measures to make comparisons and estimates

THIRD GRADE - SCIENCE

- **Strand 7, 1.B.c** Measure length to the nearest centimeter, mass using grams, temperature using degrees Celsius, volume using liters
  1.B.d Compare amounts/ measurements
  1.C.a Use quantitative and qualitative data as support for reasonable explanations
- **Strand 8, 3.A.b** Work with a group to solve a problem, giving due credit to the ideas and contributions of each group member (Assess Locally)

FOURTH GRADE - MATH

- **MA 1 3.2** Represent a mental strategy used to compute a given multiplication problem (up to 2-digit by 2-digit multiple of), apply and describe the strategy used to compute a given multiplication of 2-digit by 2-digit numbers and related division facts , estimate and justify products of whole numbers
- **MA1 1.6** Demonstrate fluency with basic number relationships (12 X 12) of multiplication and related division facts, select and use benchmarks to estimate measurements (linear, capacity, weight)
- **MA2 3.1** Identify and justify the unit of linear measure including perimeter and (customary metric)
  MA 3 1.2 Collect data using observations, surveys and experiments
  MA3 3.5 Given a set of data, propose and justify conclusions that are based on the data.

FOURTH GRADE - SCIENCE

- **Strand 7, 1.B.c** Measure length to the nearest centimeter, mass using grams, temperature using degrees Celsius, volume using liters
  1.B.d Compare amounts/ measurements
  Strand 8, 3.A.b Work with a group to solve a problem, giving due credit to the ideas and contributions of each group member (Assess Locally).

FIFTH GRADE - MATH

- **MA1 3.2** Estimate and justify products, and quotients of whole numbers and sums differences of decimals and fractions
  MA2 3.1 Identify and justify the unit of measure for area (customary and metric)
  MA3 1.2 Evaluate data-collection methods, describe methods to collect, organize and represent categorical and numerical data.

FIFTH GRADE - SCIENCE

- **Strand 7, 1.B.d** Measure length to the nearest centimeter, mass to the nearest gram, volume to the nearest milliliter, temperature to the nearest degree Celsius, force/ weight to the nearest Newton
  1.B.e Compare amounts/ measurements
  1.B.f Judge whether measurements and computation of quantities are reasonable
  3.A.b Work with a group to solve a problem, giving due credit to the ideas and contributions of each group member (Assess Locally)

MULTIPLE INTELLIGENCES: Logical Mathematical – Intrapersonal – Naturalist

Name: .....

SUPPLIES: *Measuring tape*

1. **Measurer #1** should hold a 12 inch ruler straight out in front of them in a vertical position. Walk away from the tree until the tree and the ruler appear to be the same height as the tree.
2. Close one eye and adjust your position. Stay there!
3. **Measurer #2** should measure the distance between the tree and Measurer #1. Estimate the measurement by taking step that are about one foot long. This measurement is the approximate height of the tree. Measurer #2 report to the recorder.
4. Mark the tree height on the diagram below.
5. Switch measurers and complete steps 1 to 4 again, but this time, use exact measurement using a measuring tape. Compare the tree height of the two measurers.

Cooperative Learning Group #1

.....
READER

.....
RECORDER

.....
MEASURER #1
(estimated measurement)

.....
MEASURER #2
(exact measurement)

.....
REPORTER

.....
HEIGHT #1
(estimated measurement)

.....
HEIGHT #1
(exact measurement)

Name: .....

SUPPLIES: *String, ruler, Biltmore Stick, Forestkeepers Field Manual*

Trying to measure around the trunk of a tree could be really difficult if you had to use a ruler, but you can use a string first to go around the tree and then use the ruler to measure the string. **This measurement is the circumference**.

1. Measure from the ground to 4 ½ feet high on the trunk.
2. Measurers should wrap a string around the tree at this height.
3. Then measure the length of the string with a ruler and round to the nearest inch. Write the number beside the circle below.
4. Now use your Biltmore Stick to find the diameter of the trunk. The reader should read aloud page #5 in your Forest Keepers Field Manual.
5. The recorder should write this number on the line going through the circle below.

Cooperative Learning Group #2

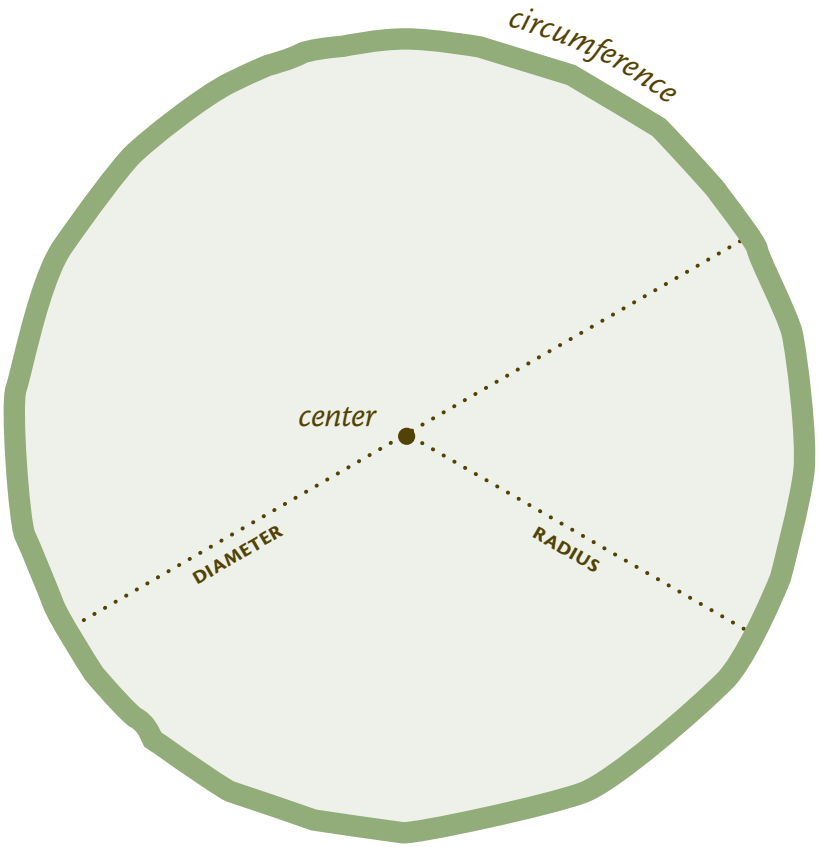
READER .....

RECORDER .....

MEASURER #1 .....

MEASURER #2 .....

REPORTER .....



Name: .....

SUPPLIES: *Measuring Tape or Ruler, stakes*

The Crown

1. Four members of the group should start at the tree trunk – back to the trunk and walk directly away from the tree until you get to the edge of the branches when you look straight up. Put markers on the ground beneath the tip of the branch.
2. Repeat step #1 between the first markers and place new markers until you have at least 8 markers around the tree. The markers show the tree's Drip Line.
3. Measure along the ground from marker to marker. Write each distance on the chart below.
4. The recorder should add each number and record the sum in box #1 below.
5. Then walk around the diameter and count the steps.
6. The recorder should write that number in box #2 below.

Cooperative Learning Group #3

READER .....

RECORDER .....

MEASURER #1 .....

MEASURER #2 .....

REPORTER .....

a-b .....

b-c .....

c-d .....

d-e .....

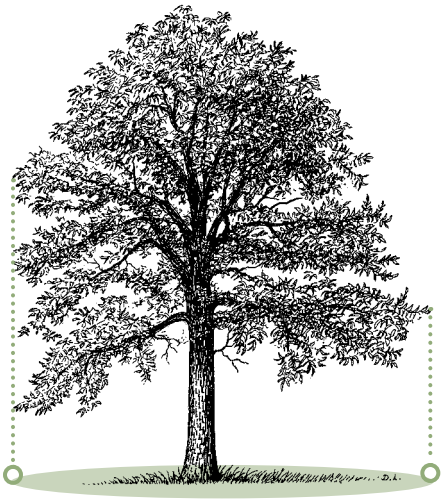
e-f .....

f-g .....

g-h .....

h-a .....

+



set markers at dripline

1. TOTAL RULER MEASUREMENT

2. WALKING MEASUREMENT

Name: .....

1. Counters should each find a small twig on the tree that looks "average" and count as accurately as possible the number of leaves on the twig. Don't remove the twig. Recorder marks below in box a.
2. Count the number of twigs on an average branch and record below in box b.
3. Count the number of branches on the tree, and record below in box c.
4. Recorder should use a calculator to do the math below. Calculate the number of leaves on the tree; then find the average of each person's total abc.

Cooperative Learning Group #4

READER

RECORDER/MATHEMATICIAN

COUNTER #1

COUNTER #2

REPORTER

Counter #1

a. LEAVES ON A TWIG

b. TWIGS ON A BRANCH

c. BRANCHES ON THE TREE

a. × b. (*total leaves on a branch*) × c. (*branches on the tree*)

TOTAL NUMBER OF LEAVES ON THE TREE

Counter #2

a. LEAVES ON A TWIG

b. TWIGS ON A BRANCH

c. BRANCHES ON THE TREE

a. × b. (*total leaves on a branch*) × c. (*branches on the tree*)

TOTAL NUMBER OF LEAVES ON THE TREE

Name: .....

What I know...

K

What I want to know...

W

What I learned...

L