

22. HOW BIG IS THAT CACTUS?

Overview: Cacti come in various shapes and sizes. In this activity, students will measure cactus in different ways.

Objective: Students will use different techniques and standard units of measure to determine the height of a cactus.

Time needed: 1 hour

Group Size: 3-4

Age appropriateness: 3rd Grade and up

Site: any large cactus

Background: Plants are measured to plan planting patterns so plant have enough space to grow well. Other Garden management decisions may be made concerning plant size such as placement.

Measurement method #1

Use the ratio comparison method by measuring a student's height, student's shadow, and the cactus's shadow and solving the following proportion problem.

$$\frac{\text{Cactus's Height}}{\text{Cactus's Shadow}} = \frac{\text{Student's Height}}{\text{Student's Shadow}}$$

For example, if the student is 4 feet tall, their shadow is 3 feet tall, and the cactus shadow is 9 feet long, the equation would be set up like this.

$$\frac{n}{9} = \frac{4}{3} \quad \text{Cross multiply} \quad 3n=36$$

Divide both sides by 3 and the answer, 12 is the Cactus's Height.

Measurement method #2

To use the proportional method of estimating a cactus's height, have one student stand at the base of the cactus. Have another student hold a ruler at arm's length and walk backward, keeping arm stiff, until the top and bottom of the ruler line up with the top and bottom of the cactus. Note where the top of the partner's head (the one standing by the cactus) appears on the ruler (for example, at 2" or 5cm). Divide the length of the ruler (12" or 30 cm) by this figure. For example, 12" ÷ by 2" = 6" or 30 cm ÷ by 5 cm = 6 cm. Measure the partner's actual height and multiply it by the previous result. For example, if the student's height was 55" or 1.4 m, then the height of the tree would be 55" x 6 = 330" (27.5') or 1.4 m x 6 = 8.4 m.

Measurement method #3

To measure height, it has been recorded that some groups of Indians would walk away from an object until they could sight the top of the object while holding their ankles and viewing through their legs. When the top was just visible through the crotch, they turned around and paced the distance back to the object. The distance they paced was equal to the height of the object. This is based on the assumption that the angle formed by this sighting is equal to 45°.

Measurement method #4

Several sources such as AIMS Our Wonderful World, give details for making a clinometer and provide accompanying charts for determining height using a clinometer.

Materials:

Provided at the Garden
Measuring tools
Provided by the classroom teacher
Paper and pencil
Calculators

Preparation: The cactus to be measured may be preselected by the teacher.

Pre Activity: Practice the measuring techniques on plants at school.

Procedure:

1. Remind students that when moving around cactus to use caution as they can cause injury.
2. Remind students of the measuring procedures they practiced at school.
3. Have students estimate the height of the plant before measuring.
4. Allow students to use any method and any unit of measure. (Either may be assigned by the teacher.)
5. After computations have been made, hold a class discussion and compare results. What might explain any differences?

Modifications: For small children, have them compare the height of a child to a plant and guesstimate the plants height.

Extensions:

1. Have students determine the circumference of a cactus.
2. Students can also use these same methods to compute the height of trees in the Garden.

Reference List:

Project Learning Tree
Our Wonderful World, AIMS activity "Trees as a Crop"

Time of Year: any

****This activity was adapted from "How Big is a Tree?", Project Learning Tree.**
