

Fun with Rainfall Measurements



Related Subject: Climate and Weather

Group Size: 10-15

Length of Activity: 30-45 minutes

Objective

Demonstrate how rain is measured using a rain gauge.

Overview

Through a hands-on experiment, the participants will examine a rain gauge, understand the measurements on a rain gauge and practice reading measurements of water using a rain gauge.

Preparation

Indoor and outdoor activity

Secure the CoCoRaHS rain gauge (standard 4 inch plastic gauge) to a pole or post in an open area within the proximity of the teaching area.

Paper and pencil for each pair of participants

Materials and Supplies

- CoCoRaHS Rain gauge secured on a pole or post, placed in an open area
- Several small water balloons filled with water
- Scale to weigh water balloons
- Ruler showing inches or download one from http://www.vendian.org/mncharity/dir3/paper_rulers/UnstableURL/ruler_foot.pdf
- 100 pennies and a paper dollar

Activity

- Divide the group into pairs of participants.
- Escort the pairs outside to an area where the rain gauge is secured to a pole.

Fun With Rainfall Measurements Activity 6

- Ask the participants to line up in pairs
 - Take turns throwing the water balloons at the rain gauge
 - Each pair will record the amount of water which goes into the rain gauge with each balloon toss.
- After all the participants take several turns, bring the rain gauge inside for discussion.

Discussion:

- Record the measurements on a poster board or blackboard for everyone to see.
- Who recorded the greatest amount of water in the rain gauge? Compare the measurements of all participants.
- How heavy do you think the water balloons are?
 - Weigh an average water balloon.
- Examine the rain gauge as a group and discuss the measurements:
 - What kind of measurement is this?
 - Why does the rain gauge show such a tall inch?
 - Explain hundredths by using the dollar bill and the 100 pennies. The measurement is divided into hundredths.
- Hand out rulers showing inches or download one from http://www.vendian.org/mncharity/dir3/paper_rulers/UnstableURL/ruler_foot.pdf and have participants find a one inch measurement, two inch measurement, etc.
- Explain: An inch of rain is just what it sounds like - one inch of water. It is one inch long, one inch wide and one inch tall.
- Ask: How much rain would you have if you have one inch of rain (depth) over an area of 12 inches long by 12 inches wide? ($12 \times 12 \times 1 = 144$) How about a square mile?
- How much do you think that would weigh?
- One inch of rain over one square mile equals to 17.4 million gallons (66 million liters) of water. The weight of one inch of water over one square mile equals over 145 million pounds (66 million kg). 145 million pounds of water is almost 73,000 tons or the weight of 241 locomotives.
- Did you know that one inch of rainfall produces 4.7 gallons of water per square yard or 22,650 gallons of water per acre? Now that's a lot of rain!

Rain Gauge Activity/Discussion



Fun With Rainfall Measurements Activity 6

- The CoCoRaHS (standard 4 inch plastic) rain gauge is designed to hold a total of 11 inches. That is A LOT of rain! (One inch in the inner tube, and 10 additional inches of 'overflow' can be collected in the outer tube.)
 - Show the rain gauge and explain that rain gauges are usually designed with the collecting part at the top, funneling down to an inner tube inside the gauge. This way, we can easily record measurements in 1/100 inch increments.
 - To show this, take the funnel and inner tube out of the gauge. Next, fill the OUTER tube with water up to approximately 1 inch (hold a ruler next to the gauge to determine 1 inch, or estimate...). Explain to the students that it just rained...about an inch. Ask the students if this is exactly one inch? How do they know? The increments are so small, it could be more, it could be less...
 - Next, pour this water directly into the INNER tube, filling it to the top. Notice the increments on the inner tube. One inch is labeled at the top, with 1/100th markings up the side. Was it exactly 1 inch? You may find out that is .98 or it may have passed the 1 inch line.
 - This is why the inner tube is used... This allows us to accurately measure smaller, more common amounts of rain. If we had to measure directly, we could never measure rainfalls like 0.05 inches.
 - To show this, take .05 from the INNER tube and pour it back into the OUTER tube. Can you accurately measure .05 this way?
 - Now try different amounts in the INNER tube and practice reading the measurements (from the bottom of the meniscus).
 - How would you measure a rain event over one inch?
 - After recording the first inch from the inner tube, pour it out. Next, pour the remaining rain from the OUTER tube into the INNER tube and add it to your previous amount that was just recorded.

Sources: www.madsci.org ; www.cocorahs.org

National Science Education Standards:

NSES K-4:

Science as Inquiry (4ASI)

Abilities necessary to do scientific inquiry (4ASI 1)

Understandings about scientific inquiry (4ASI 2)

Earth and Space Science (4DESS)

Changes in earth and sky (4DESS 3)

NSES 5-8:

Science as Inquiry (8ASI)

Abilities necessary to do scientific inquiry (8ASI 1)

Understandings about scientific inquiry (8ASI 2)

Earth and Space Science (8DESS)

Structure of the earth system (8DESS 1)

NSES 9-12:

Science as Inquiry (12ASI)

Abilities necessary to do scientific inquiry (12ASI 1)

Understandings about scientific inquiry (12ASI 2)

Earth and Space Science (12DESS)

Energy in the earth system (12DESS 1)