

Lab: Measurement

Integrated Science: Physics & Engineering Design

Name _____ Period _____

Lab Partner(s): _____

Essential Question:

How do you use scientific tools to make accurate measurements?

In everyday life we use tools to make our work easier. For example, it is difficult to pound a nail without a hammer, to wrap a gift without tape, or to open clear plastic packages without scissors. In science, it is important to be able to correctly choose and use laboratory equipment to make measurements. During the “Measurement Games” you and a partner will practice choosing the correct tool to make measurements accurately. The group with the best averages overall wins the “Measurement Games!”

Materials (per group)

- Small paper cup
- Pebbles
- Water
- Masking tape
- Graduated cylinder
- Electronic scale
- Meter stick
- Beaker
- Measuring tape
- Data Collector
- GeoBox

A. Stop and think

1. Are you familiar with the tools necessary to make measurements of length, mass, and volume? Look at the list of materials above and write down a tool used for measuring each property.

| Property | Tool used |
|----------|-----------|
| Length | |
| Mass | |
| Volume | |

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2. Do you understand what metric units coincide with length, mass, and volume? Discuss this with your partner and write an appropriate unit that corresponds to each property.

| Property | Unit used |
|----------|-----------|
| Length | |
| Mass | |
| Volume | |

3. Read about the events listed below in Part 2 and predict the outcome of each event for yourself before you actually perform the task.

| Event | Prediction |
|---------------|------------|
| Straw Javelin | |
| Paper Cup | |
| Pebble grab | |
| Side Step | |
| Hoppity Hop | |

B. Doing the activity

A. Perform the “Measurement Games” event, collect, and record data.

1. **Straw Javelin:** During this event, you will be throwing a straw as far as you can, like it is a javelin. Your front foot may not cross the start line, and you must throw the straw like a javelin with only one hand. Measure the distance of your throw in meters and centimeters.

2. **Paper Cup Challenge:** How much water can you move from a GeoBox to a beaker in 10 seconds using just one paper cup? Use a graduated cylinder to measure the volume of water you successfully transferred. Be careful so you don't spill any water!

3. **Pebble Grab:** Who can grab the greatest mass of pebbles? Use ONLY ONE HAND to grab as many pebbles as you can out of a container. Transfer them to an electronic balance to measure the mass. Be sure the balance is measuring in the correct units before you begin!

4. **Side Step:** How far is your leg span? From a starting point step as far as you can to the side. Your partner will measure the length of your step in meters and centimeters.

5. **Hoppity Hop:** Who can hop 10 meters the fastest on one foot? Measure and mark 10 meters on the floor with the masking tape. Use the Data Collector in stopwatch mode to time how long it takes your partner to hop 10 meters on one foot.

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B. Results

1. Record your results below. Any result with missing or incorrect units will be automatically disqualified from the Measurement Games!

2. After you have recorded your results there will be a class discussion to see who the winners are in each event. Decide within your group who has the best score for each event. Use that score for the class data set. Record the data in the data table your teacher has drawn on the board. Determine the best overall score for the group winner. Record the individual winner's results for each event in the data table below.

| Olympic event | My results | Winner's results |
|---------------------|------------|------------------|
| Straw Javelin | | |
| Paper Cup Challenge | | |
| Pebble Grab | | |
| Side Step | | |
| Hoppity Hop | | |

C. Thinking about what you observed

1. Calculate the difference between the winner's results and your results for each event. (Don't forget units!)

| Event | Difference |
|---------------------|------------|
| Straw Javelin | |
| Paper Cup Challenge | |
| Pebble Grab | |
| Side Step | |
| Hoppity Hop | |

2. In which event were you closest to the winner?

3. In which event were you the farthest away from the winner?

4. How close were you to your predictions?

