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# Do You Measure Up?

Did you know that the temperature of the sun is 5506°C? Did you know how to convert that into Kelvin? Did you know the smallest cell in the human body is the granule cell in your cerebellum and is typically 4um-4.5um (microns- one thousandth of a millimeter)? Do you know how to convert that into meters? If you were a scientist in the United States, how would a scientist in China understand the data you gathered?

Scientists need to gather careful data when learning about the world around them and have a way to communicate with each other worldwide. Many people are not skilled at measuring data properly even though measurements are necessary for many everyday activities, not just in science! This year as we explore the world around us, we will need to use a variety of measurements to describe what we observe and share information. We will use this lab to help us figure out what tools to use for the type of measurement we need, as well as the different ways we can describe objects.

## The tools we use

You have probably worked with different tools before in science class, in math class, and at home. Review what you know about the tools we can use to measure different quantities. For each of the objects below write its name, what it measures, and one commonly used unit it can measure (ex. Rulers can measure in inches)

| | | | |
|---|---|---|---|
|  | |  | |
|  | |  | |

## Gathering Quantitative Data

Remember: Quantitative measurements deal with ***quantity***, these are measurements that have a number attached to them. For instance NC State wins the football game by 14 points, the room is 22°C, or he ate a dozen BoBerry biscuits.

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Directions: For this activity work with a partner (at your table) to **estimate** the measurements of the following objects. Then each of you **accurately** measure the object using the correct tool. Finally determine how accurate your original estimate was by subtracting your estimate from your measurement (negative answers mean you over-estimated, positive mean you under-estimated). Be sure to record your data!

***** To measure the volume of a marble we will use **water displacement**. To use this method, fill a graduated cylinder up to a nice rounded amount (50mL, 100mL) that you're sure will cover the marble. Then place the marble in the graduated cylinder with the water. Measure the volume in the graduated cylinder with the marble in the water and record the difference between the volume with the marble and the volume without it. *****

| **Object** | **What are you measuring? (length, mass, etc.)** | **Estimate (with UNIT)** | **Measurement (with UNIT)** | **Accuracy (How + or -)** |
|---|---|---|---|---|
| **Playing Card** | Length (cm) | | | |
| **Pen** | Mass (mg) | | | |
| **Marble** | Volume (mL) | | | |

## Gathering Qualitative Data

Remember: Qualitative observations describe the ***quality*** of something using adjectives. That chair is red, the bubble is shiny, and that surface is rough are all examples of qualitative data.

Directions: Make at least 2 qualitative observations for each of the 3 items you gathered quantitative data for.

| **Object** | **Observation 1** | **Observation 2** |
|---|---|---|
| **Playing Card** | | |
| **Pen** | | |
| **Marble** | | |

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## Analysis

1. Tommy wants to build a birdhouse for his grandmother. He needs to go to the store to buy lumber in order to get started. What kinds of quantitative observations would Tommy be making at the lumber store? What kinds of qualitative observations would Tommy be making at the lumber store?

2. Space shuttle launches don't always go according to plan. Many times, scientists and engineers will scrub (delay) a launch after noticing something's not right. Look back at your **accuracy** column in Part One and **infer** what might be happening at the NASA launch pad to cause these scrubs.

## Summary

1. In your own words, what is the difference between quantitative and qualitative observations?

2. Why do scientists and engineers need to make meaningful and accurate observations?