

In this activity, you will explore how different measuring tools provide information at different levels of accuracy based on how they are designed.

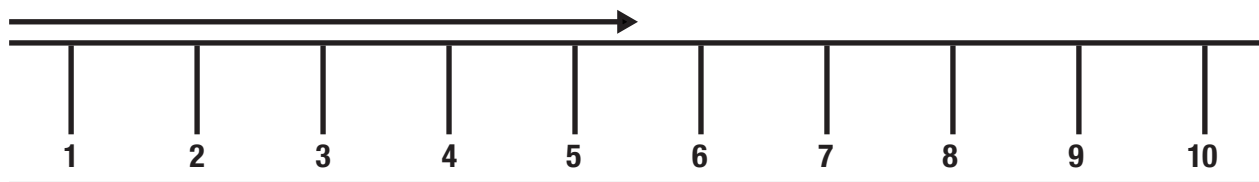
Significant figures allow an observer to evaluate the accuracy of a measurement. The more digits included in a measurement, the more accurate it is.

Materials:

- centimeter ruler
- millimeter ruler
- graduated cylinder
- beaker
- triple beam balance
- different objects

Procedure:

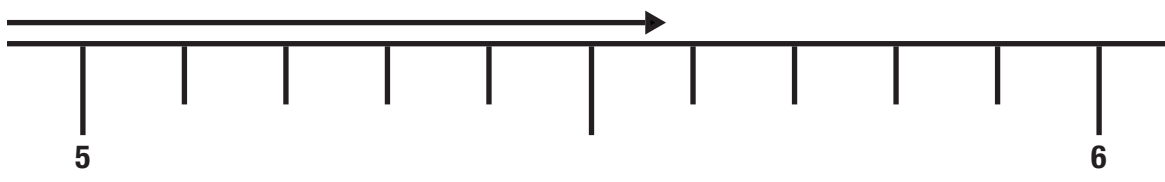
Measure the arrow below using a centimeter ruler.



By using this ruler, you **KNOW** that the arrow is at least 5 cm long. This is your **KNOWN** digit.

Then add **ONE** estimated digit to your measurement. The arrow looks to be roughly 5.5 cm long.

A more accurate ruler with millimeter markings would enable you to estimate more digits.



Using this ruler, you **KNOW** the arrow is at least 5.5 cm long. You now have two **KNOWN** digits. Then add an estimated digit, which would make your measurement around 5.55 cm.

When making a measurement, you can only add one unknown, or estimated, digit to the end. This allows an observer to understand the accuracy of your measurement.

Part II:

In this activity, you will be measuring different objects using a variety of tools and following the rules of significant digits.

Length Measurements:

Using both rulers provided, measure the length of each object. Be sure to add only ONE estimated digit to your known digits.

Item	Length (cm) Ruler A	Length (cm) Ruler B

1. Which ruler provides the most accurate measurements of length? Explain.

Volume Measurements:

Using the graduated cylinder and the beaker, measure the volume of the objects. Be sure to add only ONE estimated digit to your known digits.

Item	Volume (mL) Graduated Cylinder	Volume (mL) Beaker

2. Which tool provides the more accurate measurements of volume — the graduated cylinder or the beaker? Explain.

Mass Measurements:

Using the different beams on the triple beam balance, measure the mass of each object. Be sure to add only **ONE** estimated digit to your known digits.

Item	Mass (g) ONLY "Hundreds" Beam	Mass (g) "Hundreds" and "Tens" Beams	Mass (g) ALL Beams

3. Does increasing the number of beams affect your degree of confidence in the resulting measurement? Explain.

4. Was your estimated value close to the actual value on the other beams (i.e., the tens value when using only the hundreds, or the ones value when using the tens)?

5. More expensive high-tech lab equipment usually provides more accurate measurements. Do you see the need for such equipment in certain fields where accuracy is of great importance? Explain.
