Name _____ Date _____

LESSON 1.6

Challenge

For use with the lesson "Precision and Significant Digits"

While *precision* is the level of detail that an instrument can measure, *accuracy* describes how close a measurement is to the actual or accepted value. Various factors can affect the accuracy of a measurement. For example, a measurement tool that is not calibrated properly is not likely to produce accurate measurements. Human errors, such as misreading the markings on a ruler, also play a role in determining the accuracy of measurements.

EXAMPLE 1 Compare Precision and Accuracy

The actual mass of a crystal is 1.8 kg. Three geologists use a scale to measure the crystal's mass. Their measurements are 1.7 kg, 1.92 kg, and 2 kg. Which measurement is most accurate? Which is most precise?

Solution

Among the three measurements, 1.7 kg is closest to the actual mass of 1.8 kg.

Among the three measurements, 1.92 kg uses the smallest units (hundredths of a kilogram).

So, 1.7 kg is the most accurate measurement and 1.92 kg is the most precise.

1. Three science students are asked to measure the volume of air in a balloon whose volume is exactly 30.4 cubic inches.

Student	Measurement
Austin	29.95 $in.^3$
Hiroshi	31.1 $in.^3$
Calli	30.5 $in.^3$

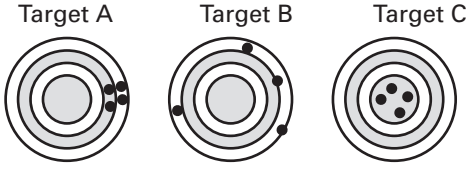
a. Which student made the most precise measurement?

b. Which student made the most accurate measurement?

c. Which student made the least accurate measurement?

2. According to the United States Mint, a nickel has a mass of 5 grams. Tara finds the mass of a nickel and reports a mass of 5.42 grams. Pablo finds the mass to be 4.9 grams. Whose measurement is more precise? Whose measurement is more accurate?

3. Scientists and engineers sometimes define *precision* as follows. *Precision* is the degree to which repeated measurements show the same results. Thus, the closer repeated measurements are to each other, the more precise the measurement tool is. You can use a target to help you understand this definition of precision. The center circle of the target represents the accepted or true value of a measurement.



a. Which target shows measurements that are *not* accurate and *not* very precise?

b. Which target shows measurements that are *not* accurate, but very precise?

c. Which target shows measurements that are both accurate and very precise?