

# Lesson 2: Uncertainty → The margin of error of a measurement.

When you use a measurement tool, it is difficult to measure something EXACTLY. For example, you cannot measure the EXACT length of a pencil with a ruler. You might get close, depending on the precision of your ruler, but are you EXACTLY correct? Every measurement has uncertainty built into it.

Uncertainty is defined as half of the precision of your measuring device. This means that you CANNOT determine uncertainty before you determine precision. In other words:

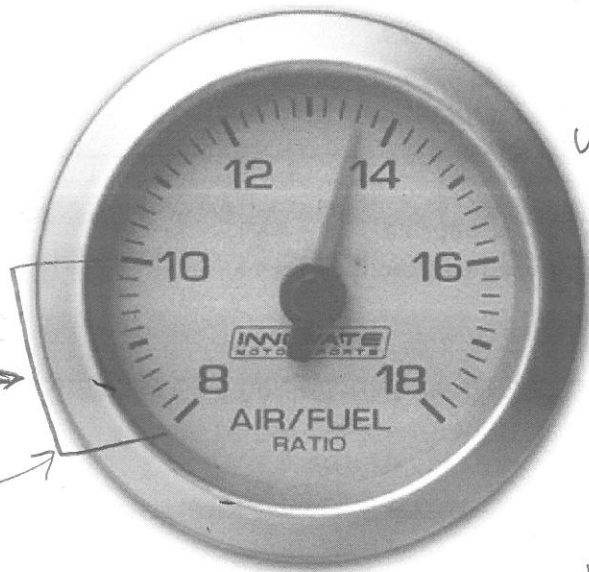
$$* \text{uncertainty} = \frac{\text{precision}}{2}$$

$$\text{Precision} = \frac{\text{measurement}}{\# \text{ of ticks}}$$

## Example 1

Determine the precision and uncertainty of each of the following measurement tools.

a) an airplane gauge:



measurement:  
 $10 - 8 = \underline{\underline{2 \text{ psi}}}$  →  
 10 "ticks" →

$$\text{Uncertainty} = \frac{\text{Precision}}{2}$$

① First: Find the Precision of the gauge =  $\frac{\text{measurement}}{\# \text{ of ticks}}$

$$\text{Precision} = \frac{2 \text{ psi}}{10 \text{ "ticks"}} = \underline{\underline{0.2 \text{ psi}}}$$

② Uncertainty is half of the precision.

$$\text{Uncertainty} = \frac{\text{Precision}}{2} \Rightarrow \frac{0.2}{2}$$

$$\text{Uncertainty} = \underline{\underline{0.1 \text{ psi}}}$$