

## Accuracy, Precision & Error

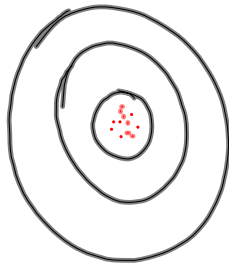
it is impossible for scientists to make perfect measurements

Scientists use accuracy, precision & error to identify these imperfections

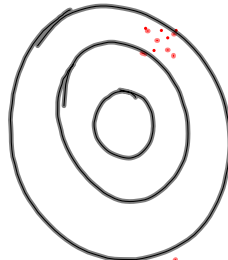
accuracy - how close your measurement is to the accepted value

% Error - numerical representation of accuracy

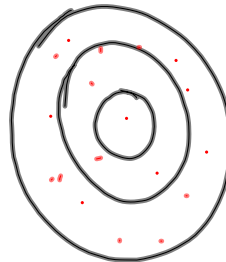
precision - how close your measurements are to each other



accurate +  
precise



precise, but  
not accurate



neither accurate  
nor precise

$$\% \text{ error} = \left| \frac{\text{accepted} - \text{experimental}}{\text{accepted}} \right| \times 100\%$$

$$\% \text{ error} = \left| \frac{2.1 \text{ m} - 1.8 \text{ m}}{2.1 \text{ m}} \right| \times 100\%$$

2.1

$$\% \text{ error} = \frac{2.1 - \frac{1.8}{1.9} \cdot 1.75}{2.1} \times 100\%$$

$$\% \text{ error} = \frac{23.7 \text{ cm} - 25 \text{ cm}}{23.7} \times 100\%$$

$$\% \text{ error} = \left| \frac{\text{accepted} - \text{experimental}}{\text{accepted}} \right| \times 100\%$$

"book"

$$\begin{aligned} \% \text{ error} &= \left| \frac{10 - 7}{10} \right| \times 100\% \\ &= \frac{3}{10} \times 100\% = \boxed{30\% \text{ error}} \end{aligned}$$

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$$\text{exp} = 25 \text{ cm}$$

$$\text{acc} = 23.7 \text{ cm}$$

$$\% \text{ error} = \left| \frac{23.7 \text{ cm} - 25 \text{ cm}}{23.7 \text{ cm}} \right| \times 100\%$$

$$= \left| \frac{+1.3 \cancel{\text{cm}}}{23.7 \cancel{\text{cm}}} \right| \times 100\% = \boxed{5.5\% \text{ error}}$$

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