



## **Chapter One: Measurement**

- **1.1 Measurements**
- **1.2 Time and Distance**
- **1.3 Converting Measurements**



## Section 1.1 Learning Goals

- **Define measurement.**
- **Compare English and SI measurements.**
- **Become familiar with metric prefixes.**
- **Distinguish between accuracy, precision, and resolution.**

## 1.1 Measurements

- A measurement is a determination of the amount of something.
- A measurement has two parts:
  - a number value and
  - a unit





## 1.1 Two common systems


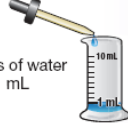


- **The English System is used for everyday measurements in the United States.**
- **Miles, yards, feet, inches, pounds, pints, quarts, gallons, cups, and teaspoons are all English system units.**
- **In 1960, the Metric System was revised and simplified, and a new name was adopted—International System of Units.**



## 1.1 International System of Measurement (SI)

- The acronym **SI** comes from the French name **Le Système International d'Unités**.
- **SI units** form a base-10 or decimal system.
- In the metric system, there are:
  - 10 millimeters in a centimeter,
  - 100 centimeters in a meter, and
  - 1,000 meters in a kilometer.

# Common SI Units

Measurement	Unit	Value
<b>LENGTH</b>		
width of pinky finger = 1 cm 	<b>meter (m)</b> kilometer (km) decimeter (dm) centimeter (cm) millimeter (mm) micrometer ( $\mu\text{m}$ ) nanometer (nm)	1 km = 1,000 m 1 dm = 0.1 m 1 cm = 0.01 m 1 mm = 0.001 m 1 $\mu\text{m}$ = 0.000001 m 1 nm = 0.000000001 m
<b>VOLUME</b>		
10 drops of water = 1 mL 	<b>cubic meter (m<sup>3</sup>)</b> cubic centimeter (cm <sup>3</sup> ) liter (L) milliliter (mL)	1 cm <sup>3</sup> = 0.000001 m <sup>3</sup> 1 L = 0.001 m <sup>3</sup> 1 mL = 0.001 L
<b>WEIGHT</b>		
1 large paper clip = 1 gram 	<b>kilogram (kg)</b> gram (g) milligram (mg)	1 g = 0.001 kg 1 mg = 0.000001 kg
<b>TEMPERATURE</b>		
21° C = room temperature 	Kelvin (K) Celsius (°C)	0°C = 273 K 100°C = 373 K

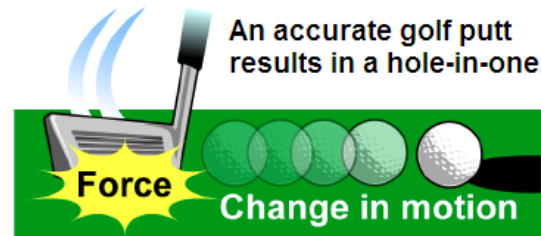
# Bytes and SI Prefixes

<b>BYTE</b> One unit of computer storage	 8 bits	 1 character - anything you type on a keyboard
<b>KILOBYTE</b> 1000 bytes	 1/2 page of text	 One Apollo on-board computer (1960) = 74 KB of memory
<b>MEGABYTE</b> One million bytes	 One minute of music	 500 pages of text
<b>GIGABYTE</b> One billion bytes	 18 hours of mp3 music	 12 hours of flash video
<b>TERABYTE</b> One trillion bytes	 Library of Congress has about 10 TB of print collections	 Superstore data warehouse has about 9000 TB of data
<b>PETABYTE</b> One quadrillion bytes	 Internet search engine processes 20 PB per day	 All emails sent in the world in 2002 = 440 PB



## 1.1 Accuracy, Precision and Resolution

- **Accuracy** is how close a measurement is to the accepted, true value.
- **Precision** describes how close together repeated measurements or events are to one another.



Why is precision important in golf?



## 1.1 Resolution



Low resolution



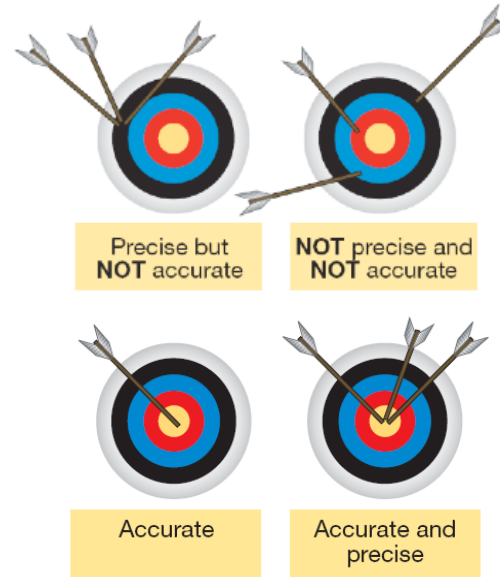
High resolution

- **Resolution** refers to the smallest interval that can be measured.
- You can think of resolution as the “sharpness” of a measurement.



## 1.1 Measurement analogy

- Using the bow and arrow analogy explain how it is possible to be precise but inaccurate with a stopwatch, ruler or other tool.



# Accuracy, Precision, and Resolution



Accurate



Accurate and precise



Precise but **NOT** accurate

**NOT** precise and **NOT** accurate



Low resolution



High resolution