Unit 1.6

We will continue:

- collecting data by hand
- developing our spreadsheet skills (tables, graphs)

+ start looking at how objects move

→ develop precise language to describe motion
  (Unit 5: start looking at what causes objects to change motion)
Unit 1.6

General motion of an object can be quite complicated.

Ex: tossing a hammer → 3D translational motion (horiz. & vert.)

→ rotational motion

We will start simply and add complexity as we go along

⇒ 1D horizontal motion of a ball

⇒ Remove/greatly reduce outside influences and interactions

Experimental design question: Why are we using a bowling ball?
Unit 1.6 (continued)

Again:  We are not measuring speed.

We are measuring:  
  – positions
  – time interval

We are calculating:
  – distance
  – speed
Distance, $\Delta x = x_2 - x_1$

Average speed, $\langle v \rangle = \frac{\Delta x}{\Delta t} = \frac{x_2 - x_1}{t_2 - t_1}$

- $x_1 =$ position of object at instant of time $t_1$
- $x_2 =$ position of object at instant of time $t_2$

(This is not quite the same as speed = distance/time, which is not correct)

Example, $\langle v \rangle = \frac{x_2 - x_1}{t_2 - t_1} = \frac{8.0 \ m - 0.0 \ m}{4.0 \ s - 0.0 \ s} = 2.0 \ \frac{m}{s}$
Unit 1.7
Here, we will learn to graph our data:
- by hand
- by computer (spreadsheet)

Guidelines:
- title the graph, label the axes, and include units
- use the full axes
- use scale increments of multiples of 1, 2, or 5
- do not connect the data points with lines

Appendix A walks you through how to make a graph using Excel.
- select/highlight time and position data before using Chart Wizard
Unit 1.8

Our data:

- position, \( x \), increases as time, \( t \), increases
- increases linearly
- passes through \((0,0)\) ⇒ proportional

\[
\text{Slope, } m \equiv \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}} = \frac{x_2 - x_1}{t_2 - t_1}
\]
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