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)

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 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

First motion definitions:

$$\text{Distance, } d \equiv x_2 - x_1$$

$$\text{Average speed, } < v > \equiv \frac{x_2 - x_1}{t_2 - t_1}$$

- 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)

$$\text{Example, } < v > = \frac{x_2 - x_1}{t_2 - t_1} = \frac{8.0\ \text{m} - 0.0\ \text{m}}{4.0\ \text{s} - 0.0\ \text{s}} = 2.0\ \frac{\text{m}}{\text{s}}$$

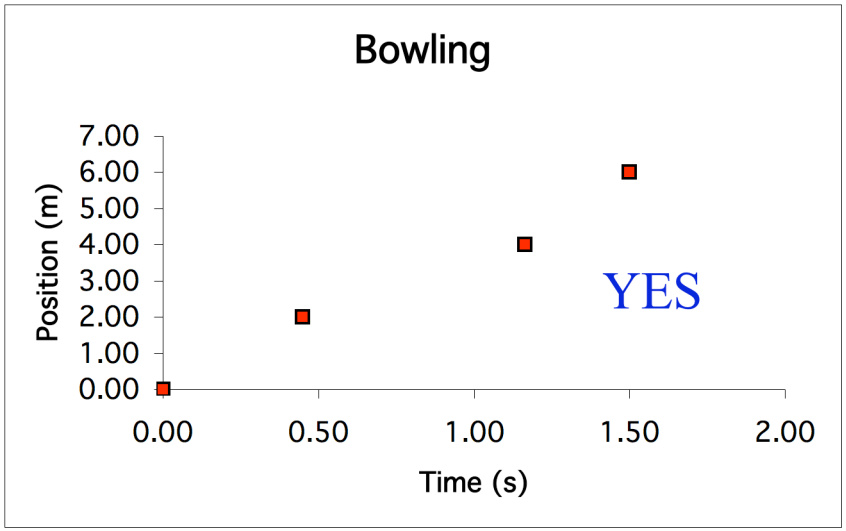
Unit 1.7

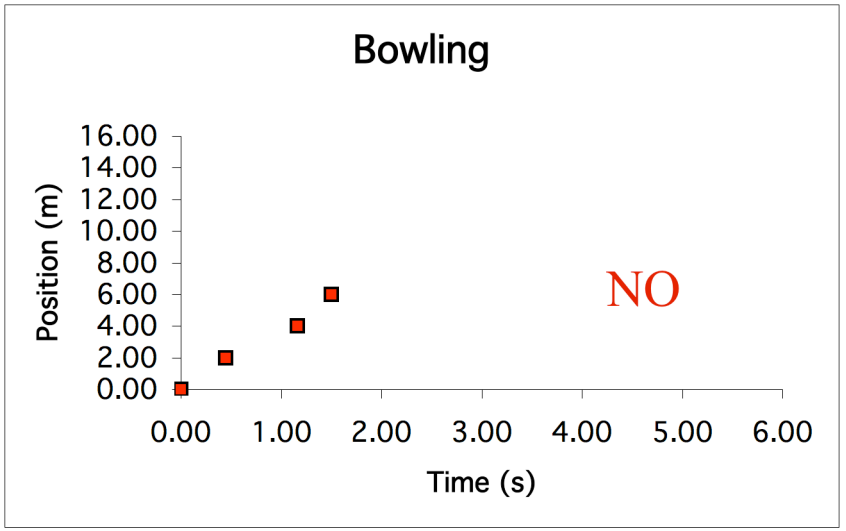
Here, we will learn to graph our data:

- by hand
- by computer (spreadsheet)

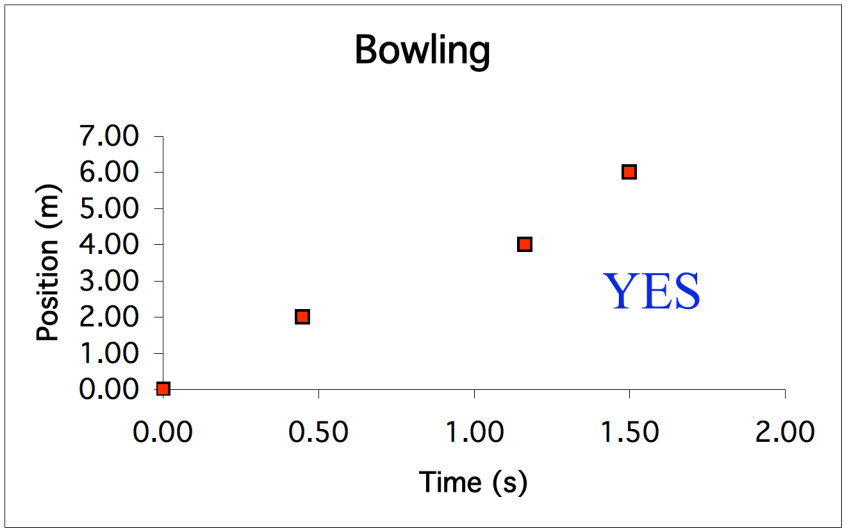
Guidelines:

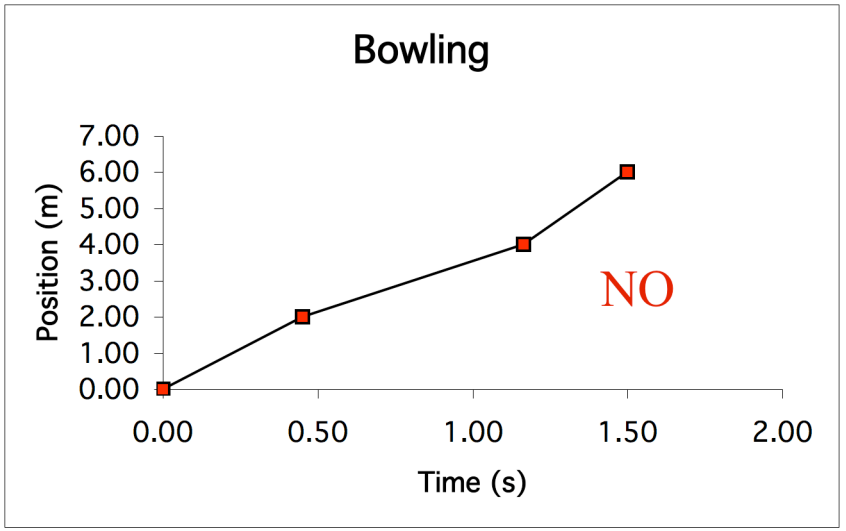
- title the graph, label the axes, and include units
- use the full axes





- 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**

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