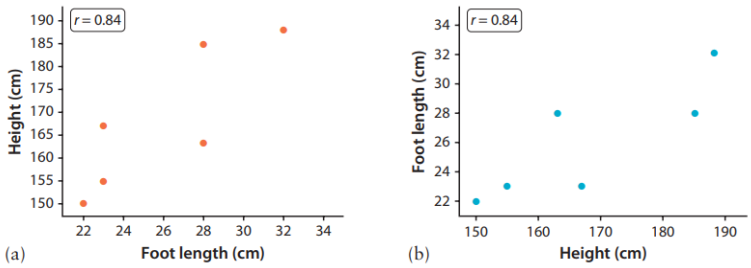
2.4 Calculating the Correlation (Part 2): Properties of the Correlation

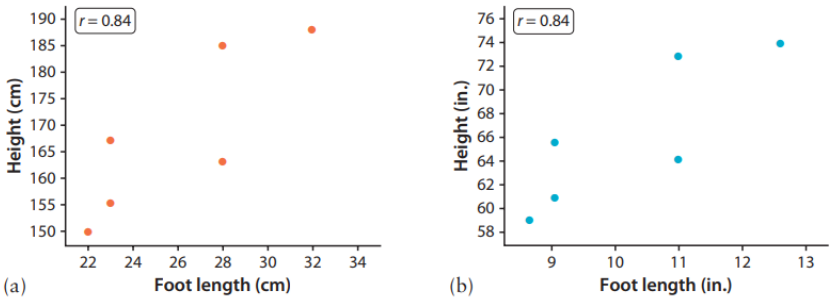
1. *Correlation makes no distinction between explanatory and response variables.* It makes no difference which variable you call x and which you call y in calculating the correlation. As you can see in the formula, reversing the roles of x and y would only change the order of the multiplication, not the product:

$$r = \frac{\sum\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)}{n-1} = \frac{\sum z_x z_y}{n-1}$$

Likewise, the scatterplots below show the same direction and strength, even though the variables are reversed in the second scatterplot.

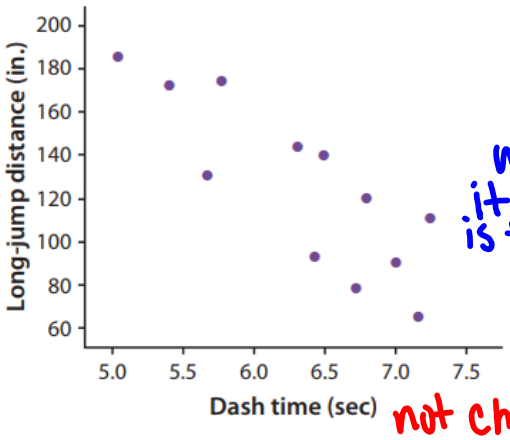


2. Because r uses the standardized values of the observations, *r does not change when we change the units of measurement of x, y, or both.* Measuring foot length and height in inches rather that centimeters does not change the correlation between foot length and height. The scatterplots below are of the same six students. The graph on the left uses centimeters for both measurements, and the graph on the right uses inches for both measurements. The strength and direction are identical; only the scales on the axes have changed.



3. *The correlation r has no units of measurement* because we are using standardized values in the calculation and standardized values have no units.

Example: The scatterplot shows the relationship between 40-yard-dash times and long-jump distances from Section 2.2.
The correlation is r = -0.838.



a.) What would happen to the correlation if long-jump distance was plotted on the horizontal axis and dash time was plotted on the vertical axis? Explain. The correlation would stay the same since it does not depend on which is the explanatory/response variable?

b.) What would happen to the correlation if long-jump distance was measured in feet instead of inches? Explain. The correlation would not change since it does not depend on different units.

c.) Sabrina claims that the correlation between long-jump distance and dash time is r = -0.838 ~~inches per second~~. Is this correct?

No!! Correlation does not have units