Learning Goal: For a linear relationship, use the least squares regression line to summarize the overall pattern.

Learning Objective: Interpret the rate of change (slope) and initial value (y-intercept) for regression lines.

Introduction:

The y-intercept of the regression line is the predicted initial value of y when x is 0.

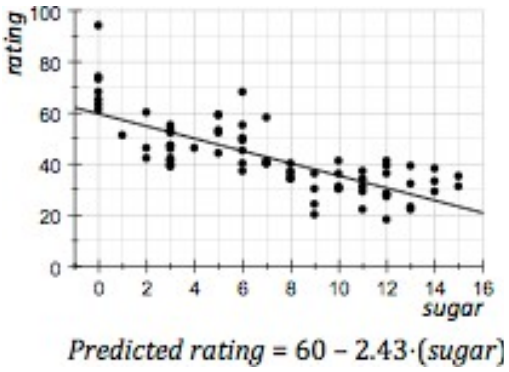
The slope is the predicted change in y divided by the change in x. It can be interpreted as the rate that our predictions for y change for each 1 unit increase in x.

Example:
Here are the Consumer Report ratings for 77 breakfast cereals. Sugar is measured in grams per serving. The Consumer Report rating is on a scale of 0 to 100, with 100 being the best score.

The equation of the regression line is *Predicted rating = 60 – 2.43(sugar).*

Let's interpret the meaning of the initial value in this context. The initial value (y-intercept) is 60. This is the prediction when x=0.

X is sugar (grams per serving) → (0, 60) ← Y is predicted CR rating



This tells us that if a cereal has 0 grams of sugar per serving, the predicted Consumer Report rating is 60.

Now let's interpret the meaning of the rate of change (slope). The slope is –2.43.

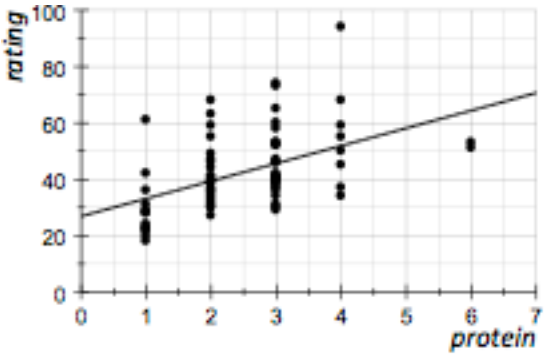
Think of this number as a rate (a ratio) $\frac{-2.43}{1}$ → Change in Y: CR rating predictions / Change in X: grams of sugar in a serving

This rate tells us that when sugar amount increases from x to x+1, the predicted Consumer Report rating drops 2.43 points. In other words, our predictions for Consumer Reports ratings decrease 2.43 points for each additional gram of sugar in a serving of cereal.

Practice:

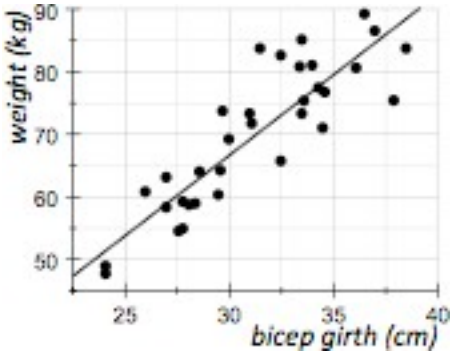
1) Here are the Consumer Report ratings for 77 breakfast cereals. Protein is measured in grams per serving. The Consumer Report rating is on a scale of 0 to 100, with 100 being the best score.

   Interpret the y-intercept and the slope for the regression line using the context for the data. In other words, your interpretations should refer to protein and ratings.



2) The regression line shown in the scatterplot has the equation: *Weight = -13.45 + 2.67 (bicepgirth)*

   Interpret the y-intercept and the slope for the regression line using the context for the data.



3) For the 130 adults in this sample, heart rate is measured in beats per minute. Body temperature is measured in degrees Fahrenheit. StatCrunch gives the following linear regression results:

   Dependent Variable: Temperature
   Independent Variable: HeartRate
   Temperature = 96.306754 + 0.026334549 HeartRate
   Sample size: 130
   R (correlation coefficient) = 0.2536564

   Interpret the y-intercept and the slope for the regression line using the context for the data.