

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:

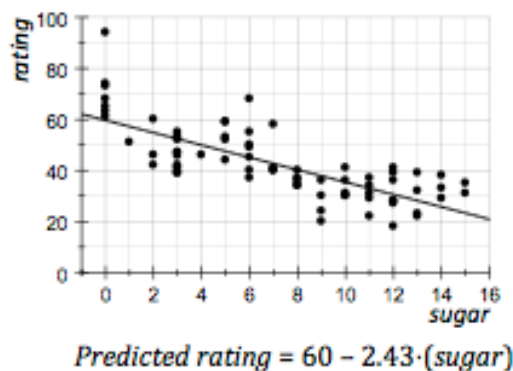
Here are the Consumer Report ratings for 77 breakfast cereals. Sugar is measured in grams per serving. The Consumer Report rating is on a scale of 0 to 100, with 100 being the best score.

The equation of the regression line is $\text{Predicted rating} = 60 - 2.43(\text{sugar})$.

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) \rightarrow (0, 60) \leftarrow 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) $\frac{-2.43}{1}$

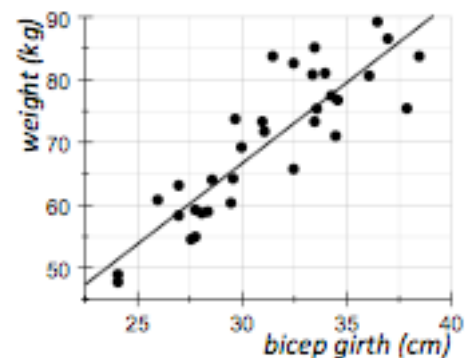
\rightarrow Change in Y: CR rating predictions
 \rightarrow Change in X: grams of sugar in a serving

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) The regression line shown in the scatterplot has the equation: $Weight = -13.45 + 2.67(bicep\ girth)$

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



- 2) 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.

