Lesson 22: Simple Linear Regression

Homework

Instructions: You are encouraged to collaborate with other students on the homework, but it is important that you do your own work. Before working with someone else on the assignment, you should attempt each problem on your own.

1. Given the linear regression equation, $Y = 5.4 + 0.5X$, what is the Y-intercept?

2. Given the linear regression equation, $Y = 5.4 + 0.5X$, what is the slope?

3. Given the linear regression equation, $Y = 5.4 + 0.5X$, what is the predicted value of Y when $X = 16$?

Researchers studying healthy body composition recorded various measurements of 252 male subjects. Height, weight, age, and other measurements were collected on each subject. Open the data file BodyMeasurementsCorrected. For this exercise we will look at the height of the subjects compared with the weight. Researchers want to predict the weight of a man given his height. Use this information to answer questions 4 through 8.

4. If we consider the relationship between the height and weight of these men, which variable should go on the X-axis? The Y-axis? Justify your answer.

5. Create and attach a scatterplot of these two variables. Include the linear regression line on your plot.

6. Find the equation of the linear regression line used to predict the weight of a man given his height.

7. Interpret the slope and intercept of the regression line, if appropriate. If it is not appropriate to make an interpretation, explain why not.

8. Predict the weight of a man who is 76 inches tall in two ways: using the equation for the regression line and a calculator AND using the software.

A company in South Dakota manufactures hard hats used in the mining industry. They record measurements on all the hats they produce for quality control and planning purposes. The measurements they collect include hat size, circumference of the hat, and lengths of the major and minor axes. Meaning, the company wants to predict size of hat given the circumference. Open the data file JSE-Hats (Modified). Use this information to answer questions 9 through 12.

9. Create and attach a scatterplot of these two variables. Include the linear regression line on your plot.

10. Find the equation of the linear regression line used to predict the size of a hat given a circumference.

11. Interpret the slope and intercept of the regression line, if appropriate. If it is not appropriate to make an interpretation, explain why not.

12. Predict the size of a hat with a circumference of 24 inches in two ways: using the equation for the regression line and a calculator AND using the software.

Data were collected on estuarine, or saltwater, crocodiles. Researchers measured the head length and body length of 28 crocodiles and were interested to know if there is a linear relationship between crocodile head length and body length. Researchers want to predict body length based on head length. Open the data file EstuarineCrocodiles(Modified). Use this information to answer questions 13 through 19.

13. Create and attach a scatterplot of the head length compared with body length. Include the linear regression line on your plot.

14. Compute the sample correlation coefficient (r).

15. Describe the data displayed on the scatterplot. Does it appear linear or nonlinear? Does it have a positive or negative association, or neither? Does the association appear weak, moderate, or strong?

16. Compute the sample covariance (s_{xy}) of this data.

17. Find the equation of the linear regression line used to predict the body length of an estuarine crocodile given its head length.

18. Interpret the slope and intercept of the regression line, if appropriate. If it is not appropriate to make an interpretation, explain why not.

19. Predict the body length of an estuarine crocodile that has a head length of 55 cm in two ways: using the equation for the regression line and a calculator AND using the software.