Pre Calculus – 11.7 Review

1. A sports writer has already determined that there is a negative correlation between the batting average and the number of home runs for third basemen whose statistics are shown in the table.



a. Find the correlation coefficient.

b. Find the linear equation that best represents this data. Interpret the slope and the y-intercept in context of the problem.

c. Use the equation to predict the number of home runs for a third baseman with a batting average of 0.350. State whether this prediction is reasonable. Explain.

d. Graph and analyze the residual plot and determine whether the model is appropriate.

2. The table shows the number of absences of 7 students from a psychology class and their final grades.

 

a. Sketch a scatter plot of the data and identify the relationship.

b. Find the correlation coefficient.

c. Find the linear equation that best represents this data. Interpret the slope and the y-intercept in context of the problem.

d. Predict the grade of someone who has 12 absences.

e. Graph and analyze the residual plot and determine whether the model is appropriate.

3. Global warming is caused in part by the increase in the concentration of carbon dioxide in the atmosphere. The table shows the concentrations measured monthly over a period of two years

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Months | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Concentration of carbon dioxide in parts per million | 323.8 | 324.8 | 325.9 | 327.2 | 328.1 | 329.6 | 331.5 | 333.5 | 335.5 | 338.0 | 340.2 | 342.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Months | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Concentration of carbon dioxide in parts per million | 343.5 | 344.9 | 346.1 | 347.4 | 348.4 | 349.9 | 352.0 | 354.5 | 356.5 | 358.9 | 360.8 | 362.6 |

a. Make a scatter plot of the data

b. Run a linear and exponential regression. Find the correlation coefficient of each.

c. Make a residual plot using the exponential regression. What do you notice about the residual plot? Explain.

4. Anthropologists use a linear model that relates femur length to height. The model allows an anthropologist to

determine the height of an individual when only a partial skeleton (including the femur) is found. In this problem we find the model by analyzing the data on femur length and height for the eight males given in the table.

Femur length (cm) Height (cm)

50.1 178.5

48.3 173.6

45.2 164.8

44.7 163.7

44.5 168.3

42.7 165.0

39.5 155.4

38.0 155.8

a. Run a linear regression and find the correlation coefficient and find the equation of best fit.

b. An anthropologist finds a femur of length 58cm, how tall is the person?

c. If a person has a height of 145 cm, based on your equation how long would you expect their femur to be? In reality the person’s femur is 35.6 cm long. What is the residual?

5. To estimate ages of trees, forest rangers use a linear model that relates tree diameter to age. The model is useful because tree diameter is much easier to measure than tree age (which requires special tools for extracting a representative cross section of the tree and counting the rings). Use the data in the table below collected for a

certain variety of oaks to answer the following questions.

Diameter (in.) Age (years)

2.5 15

4.0 24

6.0 32

8.0 56

9.0 49

9.5 76

12.5 90

15.5 89

a. Run a linear regression and find the correlation coefficient and find the equation of best fit.

b. Use your equation to estimate the age of an oak tree whose diameter is 18 inches.

c. The tree in your grandparents back yard is 140 years old. What would you expect the diameter of the tree to be?

d. You think that an exponential model might work better. Run an exponential regression and find its equation and correlation coefficient.

e. Compare the residuals for both a linear regression and an exponential regression. Based on the residuals and the correlation coefficient which model should you use?