**HOMEWORK 3**

*Scatterplots, Correlation, and Simple Linear Regression*

Reading: This assignment focuses on content from your textbook, *STAT2: Modeling with Regression and ANOVA*, Chapter 1 Section 1. Read this section of your textbook.

Notes:

* For questions requiring you to use JMP, you must provide a copy of your output at the end of your assignment or embedded within your assignment. No credit will be given if you do not include your output, even if your answer is correct.
* Recall that you can download JMP to your personal computer for free. See the JMP information posted on Canvas. Problems due to not getting JMP working or output printing will not allow you to submit your assignment late. Please plan to work ahead and email your instructor questions if needed.
* The answers to the odd-numbered questions are at the end of the book. You are required to use your own words in answering all homework questions. You cannot copy information from the book or other sources.
* Round all numbers to 2 decimal places unless otherwise specified.
* For all questions requiring calculations, show your work in order to receive credit.
* For all questions asking for interpretations, they should be completed in the context of the data.

Complete the following Exercises from your textbook, *STAT2: Building Models for a World of Data*. This assignment focuses on content from Chapter 1 Section 1. The Exercises are shown after the Chapter Summary in the textbook on Page 56.

1. 39a and b – Caterpillar CO2 assimilation and food intake. (.jmp file posted on Canvas)
   1. Include a copy of your JMP output and interpret the scatterplot. Do not forget to discuss form, direction, strength, and presence/absence of outliers.

The form of the data is linear, positive, and strong (r= **√**0.985354=0.9926). There are no extreme outliers.

Chart, scatter chart

Description automatically generated

* 1. Least squares regression equation (round values to 3 decimal places):

Ŷ = b­0+b1x

Predicted cassim = 0.004 + 0.064(Intake)

 Ŷ = predicted cassim, x = intake (grams)

1. More Caterpillar CO2 assimilation and food intake questions not in your book.
   1. Interpret the estimated slope. Note that Intake is the amount of wet food intake in grams per day.

When x increases by 1 gram wet food intake per day, the predicted value of cassim will increase by 0.064 grams.

* 1. What is the predicted cassim for a caterpillar with an intake of 5 grams per day?

Ŷ = b­0+b1x

Predicted cassim = 0.004 + 0.064(Intake)

Predicted cassim = 0.004 + 0.064(5)

Predicted cassim = 0.324 grams

* 1. Compute the residual for the last observation in the dataset.

Actual cassim = 0.123132372 grams,

Predicted cassim = 0.004 + 0.064(2.3514) = 0.1544896 grams

Residual = y- Ŷ

Residual = 0.123 – 0.154 = -0.031 grams

Interpret the value of the residual:

The residual for the grams of cassim was negative, so this point value was over predicted by 0.031 grams.

* 1. What is the value of the estimated y-intercept? Keep 3 decimal places. Is it appropriate to interpret the y-intercept in this context? If yes, interpret it. If not, explain why not.

Estimated y-int = 0.004. Yes, this is appropriate to interpret the y-intercept in this context. In this context, you can predict as low as 0 grams of cassim given the intake.

* 1. When the amount of wet food intake increases by 2 grams per day, by how much do we predict CO2 assimilation to increase? Describe or show how you computed this value.

Predicted cassim = 0.004 + 0.064(Intake)

Slope = 0.064

Increased by 2 = 0.064(2) = 0.128

Predicted cassim will increase by 0.128 grams

* 1. What is the value of the correlation? Interpret the correlation.

r = √0.985354 = 0.9926

The linear relationship between cassim and intake is strong and positive.

* 1. What is the value of the coefficient of determination (i.e., R2)? Keep 3 decimal places in your answer. Interpret the value of R2.

R­­2 = 0.985 or 98.5%.

98.5% of the variability in cassim (grams) can be explained using a linear model with intake (grams).

* 1. Intake was measured in grams per day. If we changed the data to be measured in milligrams per day, would the value of the correlation change?

No. The value of correlation does not change because although the values may change, they are proportional to the cassim measured in grams. Since correlation would be a relationship between cassim (grams) vs intake (grams), converting to milligrams or other measurements is still cassim vs intake. Again, the values of the points may change, but the relationship of the explanatory (grams intake) and response variable (grams cassim) is the same, thus, their correlation stays the same.