**Homework 09.**

In this assignment, you will analyze the effect that powdered root of Carpolobia lutea has on the mating behavior of male rabbits.

**Assigned: 24 October 2017**

**Due: 5:00PM PST, 31 October 2017**

**Instructions: There are ten multiple choice questions. To receive credit, EMAIL your solution by the deadline to** [**tony\_statman@yahoo.com**](mailto:tony_statman@yahoo.com) **according to the following instructions:**

* The SUBJECT LINE must be “**GSBA545 HW09 for [Last name, First name] –** “ and then the ten letters corresponding to your answers; so, for example, if your name were John Doe, and you believed the answers were CABEDABCCD, then the subject line of the email must be “**GSBA545 HW09** for **Doe, John - BADBADBADD**”
  + The first seven characters (**GSBA545**) do not have a space between “GSBA” and “545”
  + The ten characters of your answer should have **no spaces in between**
  + If you submit less than 10 letters, it is assumed that the first letter corresponds to your answer to the first question, etc.
* The FIRST LINE of the body of the email should be your last name, your first name, and your student ID
* The SECOND LINE of the body of the email should be five letters, corresponding to the answers to the five questions (make sure your answer consists of five characters)

**For example, a typical email might be**

From: John Doe <john.doe@usc.edu>

To: tony\_statman <tony\_statman@yahoo.com>

Subject: GSBA545 HW09 for Doe, John - BADBADBADD

DOE, JOHN 123456789  
BADBADBADD

While love potions exist in fantasy literature (e.g., *amortentia* in “Harry Potter”), developing love potions in the real world is difficult. Some claim that love potions may exist “in ten years” (see <http://www.independent.co.uk/life-style/love-sex/love-potions-exist-ten-years-scientist-anders-sandberg-oxford-a7683771.html> ), but no one has found a formula to make humans fall in love.

Creating love is difficult. Creating sexual desire is not.

Root of Carpolobia lutea is used by the Eket tribe in Nigeria as an aphrodisiac. In 2015, a study was done to determine the effect of the MECLR (methanol extract of C lutea) on the mating habits of rabbits (see <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4665025/> ). Twenty male rabbits were randomly assigned to one of four groups:

* Control: no MECLR or sildenafil citrate
* 40 mg/kg body weight of MECLR
* 80 mg/kg body weight of MECLR
* 0.5 mg/kg body weight of sildenafil citrate

The next day, each male was paired with a female rabbit, and the number of times the male tried to mount the female (“mounting frequency”) was recorded. The results are as follows:

* Control rabbits: 2, 3, 3, 3, 3
* 40 mg/kg MECLR: 4, 5, 5, 5, 6
* 80 mg/kg MECLR: 6, 6, 7, 8, 8
* 0.5 mg/kg sildenafil: 8, 9, 11, 11, 11

1. What is the regression line for predicting “mounting frequency” from “dosage of MECLR” (given the assumption that mounting frequency is linearly related to amount of MECLR)? Choose the best answer.
2. Predicted MF = 8.842 – 0.0376(dose)
3. Predicted MF = 6.077 + 0.0041(dose)
4. Predicted MF = 4.933 + 0.9305(dose)
5. Predicted MF = 3.000 + 0.0500(dose)
6. Predicted MF = 2.833 + 0.0525(dose)
7. When predicting “mounting frequency” when dosage of MECLR is known, what is the typical error of prediction? Choose the best answer.

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| 1. 2.933 | 1. 0.006 | 1. 0.931 | 1. 0.725 | 1. 1.907 |

1. Is the relationship between “mounting frequency” and “dosage of MECLR” statistically significant?
2. No, T = 0.21
3. Yes, T = 6.85
4. Yes, T = 9.16
5. Yes, T = 9.57
6. Yes, T = 83.9
7. A researcher wants to estimate average mounting frequency when no MECLR is given. One scientist suggests using the data for just the five rabbits in the control group, since those rabbits by definition received no MECLR. Another scientist suggests using the intercept from the regression line, since that uses more data. What is the best estimate for a 95% confidence interval for the average mounting frequency of rabbits when no MECLR is present?
8. 1.558 to 4.042
9. 2.072 to 3.594
10. 2.194 to 3.473
11. 2.245 to 3.355
12. 2.311 to 3.689
13. Suppose a large number of mice will be given 60 mg/kg of MECLR. Assume that rate of “mounting frequency” for any given dosage is normally distributed (even though the actual number of mounts will of course be an integer). Based on these assumptions, what percentage of mice would be expected to have mounting frequency values of 9.5 or higher?

A. None, T = 7.90

B. Very few, T = 4.64

C. Few, T = 2.32

D. Some, T = 1.16

E. Very few, T = 3.81

1. Suppose a researcher claims that MECLR is identical to sildenafil citrate (since both are “aphrodisiacs”). Given this assumption, what is the one-sided p-value for the slope of the regression that predicts “mounting frequency” from “amount of either aphrodisiac”?

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| --- | --- | --- | --- | --- |
| 1. 0.004 | 1. 0.020 | 1. 0.21 | 1. 0.42 | 1. 0.84 |

1. The average mounting frequency for 0.5 mg/kg sildenafil citrate was 10.0. Based on the regression equation that uses “dosage of MECLR” to predict “mounting frequency”, what dosage of MECLR would be required so that one could be 95% confident that the average MF at that dosage exceeds 10.0? (A separate experiment showed that mice can tolerate doses as high as 300 mg/kg or more, so you don’t need to worry about extrapolation error here.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. 134 mg/kg | 1. 162 mg/kg | 1. 153 mg/kg | 1. 156 mg/kg | 1. 149 mg/kg |

1. A key assumption of regression is that the relationship is linear. If one is not willing to assume that the relationship between mounting frequency and amount of MECLR is linear, is there still a significant relationship between amount of MECLR and mounting frequency?
2. Yes, because F = 6.5 and p = 0.012
3. Yes, because F = 39 and p < 0.0001
4. Yes, because F = 51 and p < 0.0001
5. Yes, because F = 84 and p < 0.0001
6. If one is not willing to make the assumption that the relationship is linear, then statistical inference can not be done here.

<https://stats.stackexchange.com/questions/115304/interpreting-output-from-anova-when-using-lm-as-input>

1. What is the most reasonable conclusion to draw from these data?
2. Based on the data from 0, 40, and 80 mg/kg of MECLR, we conclude that MECLR caused an increase in mounting frequency for rabbits, since the slope is statistically significantly positive.
3. Based on using all the data, we conclude that there is no evidence that MECLR has an effect on mounting frequency, since the slope is not statistically significant.
4. Based on using only the data where an aphrodisiac was given (i.e., ignoring control group rabbits, since they were given no aphrodisiacs), we conclude that aphrodisiacs decrease mounting frequency, since the slope is statistically significantly negative.
5. There is statistically significant evidence that MECLR is different from control, but it is impossible to tell from the data whether MECLR increases or decreases mounting frequency.
6. Based on the data from 0, 40, and 80 mg/kg of MECLR, we conclude that there is a statistically significantly positive slope with MECLR dosage, but we can not conclude causality because the results for MECLR are confounded with the results from sildenafil citrate.
7. If a researcher concludes that MECLR has an effect on mating behavior of rabbits, and it is later proven that MECLR has no effect on rabbits, what error did the researcher make?
8. The researcher made a Type I error but not a Type II error
9. The researcher made a Type II error but not a Type I error
10. The researcher made both a Type I error and a Type II error
11. The researcher did not make an error, based on the data available at the time
12. The researcher’s original error was Type I, but became a Type II error when the new information became available