

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ SCORE: \_\_\_\_/100

**MATH5500: STATISTICAL METHODS  
FOR ANALYZING DATA**

**SAS PROJECT – FALL 2021**

**Directions:** Please complete each problem in SAS. For each problem, you will be required to:

- Submit your SAS code.
- Submit the results screen for your code.
- Answer any questions posed to you.

1. The article “Daily Weigh-Ins Can Help You Keep Off Lost Pounds, Experts Say,” (*Associated Press*, October 17, 2005) describes an experiment in which 291 people who had lost at least 10% of their body weight in a medical weight-loss program were assigned at random to one of three groups for follow-up. One group met monthly in person, one group met monthly in an online chat room, and one group received a monthly newsletter by mail. After 18 months, participants in each group were classified according to whether or not they had regained more than 5 pounds, according to the table below.
- a. What is the expected number of participants who met in-person and regained 5 pounds or less?
  - b. The researchers wanted to determine whether the type of follow-up group is associated with the amount of weight regained. Write the appropriate null and alternative hypotheses.
  - c. What are the degrees of freedom for the test?
  - d. If using  $\alpha = 0.01$ , what is the critical value of the test, according to the  $\chi^2$  table?
  - e. Report the test statistic and  $P$ -value for the test. What conclusion can you draw?

	Regained 5 lbs or Less	Regained More than 5 lbs
In-Person	52	45
Online	44	53
Newsletter	27	70

2. The article “Genetic Tweak Turns Promiscuous Animals into Loyal Mates” (*Los Angeles Times*, June 17, 2004) summarizes a research study that appeared in the June 2004 issue of *Nature*. In this study, 11 male meadow voles that had a single gene introduced into a specific part of the brain were compared to 20 male meadow voles that did not undergo the genetic manipulation. All of the voles were paired with a receptive female partner for 24-hours. At the end of the 24-hour period, the male was placed in a situation where he could either choose the partner from the previous 24-hours or a different female. The percentage of the time that the male spent with his previous partner during a 3-hour time period was recorded and the data is presented below.
- a. Using  $\alpha = 0.05$ , is there evidence to suggest that the population variances for the genetically modified group versus the unmodified group are equal? Report the test statistic and the  $P$ -value?

- b. Based on the results of Part a, which will be more appropriate for comparing the mean percentage of the 3-hour period spent with the first female partner, the pooled estimate of variance or the Satterthwaite estimate of the degrees of freedom? Explain.
- c. Using  $\alpha = 0.05$ , do the genetically modified voles spend a different percentage of a 3-hour period with the first female partner when compared to the unmodified voles? Report the appropriate test statistic and  $P$ -value.

**Genetically Altered:** 59, 62, 73, 80, 84, 85, 89, 92, 92, 93, 100

**Not Genetically Altered:** 2, 5, 13, 28, 34, 40, 48, 50, 51, 54, 60, 67, 70, 76, 81, 84, 85, 92, 97, 99

3. Northern flying squirrels eat lichen and fungi, which makes for a relatively low-quality diet. The authors of the paper “Nutritional Value and Diet Preference of Arboreal Lichens and Hypogeous Fungi for Small Mammals in the Rocky Mountains” (*Canadian Journal of Zoology* [2008]: 851-862) measured nitrogen intake ( $x$ , in grams) and nitrogen retention ( $y$ , in grams) in six flying squirrels that were fed the fungus *Rhizopogon*. Data from a graph in the paper is presented below.
  - a. Determine the equation of the linear regression model for this data.
  - b. What is the standard error of the slope?
  - c. Is there a significant linear relationship in nitrogen retention vs. nitrogen intake for all Northern flying squirrels? Use  $\alpha = 0.05$ . Report the test statistic and  $P$ -value.

Nitrogen Intake (grams)	Nitrogen Retention (grams)
0.03	-0.04
0.1	0.00
0.07	0.01
0.06	0.01
0.07	0.04
0.25	0.11

4. The effect of caffeine levels on performing a simple finger tapping task was investigated in a double-blind study. Thirty male college students were trained in finger tapping and randomly assigned to receive three different doses of caffeine (0, 100, or 200 mg) with 10 students per dose group. Two hours following the caffeine treatment, students were asked to finger tap and the number of taps per minute were counted. The data is presented below.
  - a. Present the ANOVA table for the data.
  - b. Using  $\alpha = 0.10$ , is there evidence to suggest that the mean number of finger taps per minute is the same across all treatment groups? Report the test statistic and  $P$ -value.

0 mg	100 mg	200 mg
242	248	246
245	246	248

244	245	250
248	247	252
247	248	248
248	250	250
242	247	246
244	246	248
246	243	245
242	244	250

5. Three different washing solutions are being compared to study their effectiveness in slowing bacteria growth in five-gallon milk containers. The analysis is done in a laboratory, and only three trials can be run on any day. Because days could represent a potential source of variability, the experimenter decides to use a randomized block design. Observations are taken for four days, and the data are shown below.
- Present the ANOVA table for the data.
  - Using  $\alpha = 0.05$ , determine whether the different types of washing solutions are equally effective in slowing bacterial growth in the five-gallon milk containers. Report the test statistic and  $P$ -value.

	<b>Solution</b>		
<b>Days</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>1</b>	13	16	5
<b>2</b>	22	24	4
<b>3</b>	18	17	1
<b>4</b>	39	44	22