STAT 305 D Homework 1

Due January 24, 2012 at 12:40 PM in class

EXTRA CREDIT: complete the survey at http://www.surveymonkey.com/s/M7WK3PG before you hand in this assignment.

1. Vardeman and Jobe Chapter 1 Section 2 Exercise 1 (page 13):

   Describe a situation in your field where an observational study might be used to answer a question of real importance. Describe another situation where an experiment might be used.

2. Vardeman and Jobe Chapter 1 Section 2 Exercise 2 (page 13):

   Describe two different contexts in your field where, respectively, qualitative and quantitative data might arise.

3. Vardeman and Jobe Chapter 1 Section 2 Exercise 6 (page 14):

   Explain why it is safer to infer causality from an experiment than from an observational study.

4. Vardeman and Jobe Chapter 1 Section 3 Exercise 1 (page 19):

   Why might it be argued that in terms of producing useful measurements, one must deal first with the issue of validity, then the issue of precision, and only then the issue of accuracy?

5. Vardeman and Jobe Chapter 1 Section 3 Exercise 2 (page 19): Often, in order to evaluate a physical quantity (for example, the mean yield of a batch chemical process run according to some standard plant operating procedures), a large number of measurements of the quantity are made and then averaged. (The alternative is just to use an individual measurement in place of an average.) Explain which of the three aspects of measurement quality - validity, precision, and accuracy - this averaging of many measurements can be expected to improve and which it cannot.

6. A group of chemists and chemical engineers tested their newly-designed Type I Diabetes medication on rats. The goal was to figure out if the medicine would improve the conditions of Type I Diabetes-afflicted rats in general (future work will be on humans). 18 rats with Type I diabetes were randomly selected for the study. Half of these 18 rats were randomly selected to be given the medicine, and the others were not given any medicine. For each rat, the investigators recorded the improvement of of the rat's physical fitness over the duration of the experiment (measured

according to initial and final stress tests). The weight of each rat on the first day of the study was passively recorded. The investigators made sure that the distribution of food, room temperature, opportunity for exercise, etc., was the same for each rat for the duration of the study.

a. What is the population of interest for this study? What is the sample?

b. Is this study an experiment or an observational study? Why?

c. Identify and classify all the variables in this study.

d. Identify the treatment groups, if any, and state how many there are.

7. Weekly feedback. You get full credit as long as you write something.

    1. Is there any aspect of the subject matter that you currently struggle with? If so, what specifically do you find difficult or confusing? The more detailed you are, the better I can help you.

    2. Do you have any questions or concerns about the material, class logistics, or anything else? If so, fire away.