Stat 401 A XM   Homework 2
On-Campus Due Date: Wednesday, September 10
Off-Campus Due Date: Wednesday, September 17

1. Find the approximate distance ("as the crow flies") from your place of birth to Ames, Iowa. (See http://www.indo.com/distance/ to get an approximate distance.) Write down this distance in miles. Consider the distribution of such distances obtained by collecting this information from all Stat401AXM students. Which would be larger, the mean or the median distance? Why?

2. The authors of a scientific article wrote, "Thirty-six rats weighing 150 ± 10 g were injected...". 150 g is almost certainly the average weight of the 36 rats. The 10 g figure could be interpreted in many different ways.

   (a) If the author wished to directly convey information about the variation among the weights of the thirty-six rats, should the 10 g be the standard deviation or the standard error of the mean?

   (b) Suppose 10 g was the standard error of the mean. What must the standard deviation of the 36 weights have been?

   (c) Suppose 150 ± 10 g was actually a 95% confidence interval for the mean weight of a population of rats. What must the standard deviation of the 36 weights have been?

3. A cheese company suspects that a milk supplier is watering down milk to increase profits. The freezing point of natural milk follows a normal distribution with mean $\mu = -0.545$ degrees Celsius. Added water raises the freezing temperature toward 0 degrees C. The freezing temperature of 15 lots of the suppliers milk is measured. The average of the 15 measurements is $\bar{Y} = -0.538$ degrees C. The standard deviation of the 15 measurements is $s = 0.008$. Is this good evidence that the supplier is adding water to the milk?

   (a) Write down the null and alternative hypotheses.

   (b) Compute a test statistic.

   (c) Determine the p-value.

   (d) Provide a conclusion.

4. A plant physiologist grew 13 individually potted soybean seedlings of the type called Wells II. She raised the plants in a greenhouse under identical environmental conditions. She measured the total stem length (cm) for each plant after 16 days of growth. The data are provided below.

   20.2 22.0 19.7 22.9 22.1 21.5 23.3 22.0 20.9 20.0 21.9 19.4 21.5

   Suppose we regard the 13 plants as being like a random sample from some population of soybean plants (e.g., Wells II soybean seedlings after 16 days of growth under the same environmental conditions). Download, examine, and run *soybean.sas* from the Stat course web site. Use the output to help you complete the following parts.

   (a) Provide an estimate for the population mean.

   (b) Provide an estimate for the population standard deviation.

   (c) Determine the standard error for the estimate computed in part (a).

   (d) Find a 95% confidence interval for the mean of stem length of Wells II soybean seedlings after 16 days of growth under the environmental conditions used in this study.

5. Download, study, and run the SAS program *steers.sas* available on the course web site. The data comes from a study designed to compare the effectiveness of two diets for increasing the weight of beef steers. Nine pairs of animals were chosen from a herd. The members of each pair were matched as closely as possible with respect to hereditary factors and randomly allocated to diets such that one member of each pair received Diet 1 and the other Diet 2. The data are the weight gains (lbs) of the animals over a 140-day test period.

   (a) Estimate the mean difference in weight gain (Diet 1 - Diet 2).

   (b) Provide a 95% confidence interval for the estimate computed in part (a).

   (c) A representative from a company that makes the feed for Diet 1 claims that Diet 1 is superior to Diet 2 and that the difference estimated in part (a) is large enough to warrant charging those who raise steers a higher price for the feed used in Diet 1 compared to the feed used in Diet 2. On the basis of the confidence interval that you computed in part (b), write a response to the company representative explaining whether you agree or disagree with his claim.