Introductory Statistics
Dr. Crutcher

HW # 8 (1, 4, 5, 6, 8, 9, 13, & 24)

1. Discuss the errors that can be made in hypothesis testing.
   a. What is a Type I error? Why might it occur?
   b. What is a Type II error? How does it happen?

4. Suppose that scores on the Scholastic Achievement Test (SAT) form a normal distribution with $\mu = 500$ and $\sigma = 100$. A high school counselor has developed a special course designed to boost SAT scores. A random sample of $n = 16$ students is selected to take the course and then the SAT. The sample had an average score of $\overline{X} = 554$. Does the course have an effect on SAT scores?
   a. What are the dependent and independent variables for this experiment?
   b. Perform the hypothesis test using the ~~four~~ five steps outlined in the chapter. Use $\alpha = .05$.
   c. If $\alpha = .01$ were used instead, what z-score values would be associated with the critical region?
   d. For part c, what decision should be made regarding H_0? Compare to part b, and explain the difference.

5. Explain the structure of the z-score formula as it is used for hypothesis testing.
   a. What does $\overline{X} - \mu$ tell us in a hypothesis-testing situation?
   b. What does the standard error indicate?

6. IQ scores for the general population form a normal distribution with $\mu = 100$ and $\sigma = 15$. However, there are data that indicate that children's intelligence can be affected if their mothers have German measles during pregnancy. Using hospital records, a researcher obtained a sample of $n = 20$ school children whose mothers all had German measles during their pregnancies. The average IQ for this sample was $\overline{X} = 97.3$. Do these data indicate that German measles have a significant effect on IQ? Test with $\alpha = .05$.

8. On a perceptual task, subjects must sort cards with shapes (star, cross, triangle, or square) into separate piles. Normative data reveal a normal distribution with an average completion time of $\mu = 92$ seconds and $\sigma = 11$. A sample of $n = 5$ subjects with frontal lobe damage is tested on the task. For these subjects, the average time to complete the task is $\overline{X} = 115$ seconds. Do these people differ significantly from the norm? Use the .01 level of significance for two tails.

9. For the past two years, the vending machine in the psychology department has charged 70¢ for a soft drink. During this time, company records indicate that an average of $\mu = 185$ cans of soft drinks were sold each week. The distribution of sales is approximately normal with $\sigma = 23$. Recently, the company increased the price to 80¢ a can. The weekly sales for the first 8 weeks after the price increase are as follows: 148, 135, 142, 181, 164, 159, 192, 173. Do these data indicate that there was a significant change in sales after the price increase? Test at the .05 level of significance for two tails.

13. A psychologist develops a new inventory to measure depression. Using a very large standardization group of "normal" individuals, the mean score on this test is $\mu = 55$ with $\sigma = 12$, and the scores are normally distributed. To determine if the test is sensitive in detecting those individuals that are severely depressed, a random sample of patients who are described as depressed by a therapist is selected and given the test. Presumably, the higher the score on the inventory is, the more depressed the patient is. The data are as follows: 59, 60, 60, 67, 65, 90, 89, 73, 74, 81, 71, 71, 83, 83, 88, 83, 84, 86, 85, 78, 79. Do patients score significantly differently on the test? Test with the .01 level of significance for two tails.

24. A psychologist is examining the effect of chronic alcohol abuse on memory. In this experiment, a standardized memory test is used. Scores on this test for the general population form a normal distribution with $\mu = 50$ and $\sigma = 6$. A sample of $n = 22$ alcohol abusers has an average score of $\overline{X} = 47$. Is there evidence for memory impairment among alcoholics? Use $\alpha = .01$ for a one-tailed test.