Stat 151.003 (Kozdron) Fall 2006
Practice Problems for Midterm #2

The following questions should constitute a *portion* of your review for Midterm #2. You are responsible for all of the material covered in lecture and in the appropriate sections of the textbook through class on Friday, November 10, 2006. This Midterm will be comprehensive, with an emphasis on the material covered since the first midterm.

The following questions illustrate the basic computations that are necessary for constructing confidence intervals and designing hypothesis tests.

- page 357 #1, #2, #3, #4, #5, #8, #9, #10
- page 359 #12, #13, #14, #15, #16, #17, #21,#22
- Section 8-2, page 374 #13

The remaining 5 problems (which begin on the next page) may be *viewed* as a "sample midterm." As such, they have been designed to be answered in their entirety in 50 minutes. (Use the number of points as a guide to budgeting your time. There are 50 possible points.) However, it must be noted that a 50 minute exam CANNOT test ALL of the required material, but rather a selection of the professor's choosing. Therefore, do not expect the actual midterm to be a replica of this sample which contains a selection of required material. Do expect that the actual midterm will be at approximately this level of difficulty, and will test a selection of the required material.

1. (*12 points*) A city builds a new public parking garage in the central business district hoping to lure more shoppers downtown. They plan to pay for the structure through parking fees. During a two-month period (44 weekdays), daily fees collected averaged $\overline{X} = \$126$ with a standard deviation of $S = \$15$. It is believed that daily parking fees are approximately normally distributed.

(a) Write a 95% confidence interval for the mean daily income this parking garage will generate.

(b) Explain in context what this confidence interval means.

(c) The consultant who advised the city on this project predicted that parking revenues would average \$130 per day. Based on your confidence interval, do you think the consultant could have been correct? Explain.

2. (*12 points*) The intelligence quotient (IQ) score, as measured by the Stanford–Binet IQ test, is exactly normally distributed in a certain population of children. The mean IQ score is 100, and the standard deviation is 16 points.

(a) What percentage of children in the population have IQ scores between 80 and 120?

(b) Suppose that five children are chosen at random from the population. What is the probability that the average IQ score for these five children is between 80 and 120?

(c) Suppose that five children are chosen at random from the population. What is the probability that one of them will have an IQ score of 80 or less and four will have IQ scores higher than 80?

3. (*10 points*) Two rival airlines provide domestic service from a certain Prairie city. Flight delays for Airline A are believed to be approximately normally distributed with mean 30 minutes and standard deviation 10 minutes, while flight delays for Airline W are believed to be approximately normally distributed with mean 20 minutes and standard deviation 15 minutes. A local businessperson must fly 20 times during the next year, and will choose one of the two airlines for all travel. Assume that the delays for the two airlines are independent. Which airline would you recommend that the businessperson select? Give some justification for your answer.

(continued)

4. (*8 points*) The level of nitrogen oxide (NOX) in the exhaust of a particular car is approximately normally distributed with mean 0.9 grams per kilometre and standard deviation 0.15 grams per kilometre. A company has 125 cars of this model in its fleet.

(a) What is the approximate distribution of the mean NOX emission level $\overline{X}$ for the company's cars?

(b) What is the level L such that the probability that $\overline{X}$ is greater than L is only 0.01?

5. (*8 points*) Many industrial air pollutants adversely affect plants. In a study of the effect of sulfur dioxide in the air on a particular type of garden vegetable, a researcher exposed 40 spinach plants to a given concentration of sulfur dioxide under controlled greenhouse conditions. After exposure, it was noted if there was severe leaf damage or not. The observed counts are as follows:

	Severe leaf damage	Not severe or no leaf damage	**Total**
Spinach	28	12	**40**

State a null hypothesis and an alternative hypothesis that describe the researcher's conjecture that sulfur dioxide has no effect on these spinach plants. Be sure to clearly define your variable of interest.