MAT 221 - Sec. 003
Fall 2006
Exam 3
December 4, 2006

Name ________________________________

**Directions**: Students must complete all test questions. The use of notes and/or textbooks is NOT allowed. Students are allowed the use of a graphing calculator, their formula sheet, and the table of standard normal scores. All work, other than direct calculations done on a calculator, MUST be shown. A correct answer with no work shown will receive NO credit.
1. A selective college would like to have an entering class of 1200 students. Because not all students who are offered admission accept, the college admits more than 1200 students. Past experience shows that about 70% of the students admitted will accept. The college decides to admit 1500 students.
   a) Assuming that students make their decisions independently, what is the distribution of the number $X$ of students who accept?
   b) What are the mean and standard deviation of the number $X$ of students who accept?
   c) Use the normal approximation to find the probability that at least 1000 students accept. You do NOT need to use the continuity correction.
   d) The college does not want more than 1200 students. What is the probability that more than 1200 will accept?
2. "Durable press" cotton fabrics are treated to improve their recovery from wrinkles after washing. Unfortunately, the treatment also reduces the strength of the fabric. The breaking strength of untreated fabric is normally distributed with mean 58 pounds and standard deviation 2.3 pounds. The same type of fabric after treatment has normally distributed breaking strength with mean 30 pounds and standard deviation 1.6 pounds. A clothing manufacturer tests 5 specimens of each fabric. All 10 strength measurements are independent.

a) What is the probability that the mean breaking strength of the 5 untreated specimens exceeds 50 pounds?

b) Let X be the mean breaking strength of the 5 untreated specimens and Y be the mean breaking strength of the 5 treated specimens. Assume that X and Y are independent. What are the mean and standard deviation of X-Y? (Hint: use formulas from Ch 4.)

c) What is the distribution of X-Y?

d) What is the probability that the mean breaking strength of the 5 untreated specimens is at least 25 pounds greater than the mean strength of the 5 treated specimens? (Hint: use parts (b) and (c).)
3. In a study of 200 women who are 19 to 30 years of age, randomly selected from the United States population, the average number of calories consumed per day is 1800. Assume that the standard deviation for the average number of calories consumed by women aged 19 to 30 in the United States is 31.

a) What is the standard deviation of the sample mean?
b) Find a 95% confidence interval for the mean calorie consumption per day for women in this age range.
4. The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures the motivation, attitude toward school, and study habits of students. Scores range from 0 to 200. The mean score for U.S. college students is about 115, and the standard deviation is about 30. A teacher who suspects that older students have better attitudes toward school gives the SSHA to 25 students who are at least 30 years of age. Their mean score is 132.2. Assume that $\sigma = 30$ for the population of older students. Let $\mu$ be actual average score for all older students.

a) Suppose $H_0$: $\mu = 115$. What is $H_a$?

b) Find the test statistic and P-value.

c) Are the data statistically significant at level $\alpha = 0.05$?

d) What conclusion should you make?