EXAM 2

Stat 201

June 30, 2005

Name _____

1. For a population of 17-year-old boys, the mean sub-scapular skinfold thickness (in millimeters) is 9.7 and the standard deviation is 6.0. For a simple random sample of size 40 drawn from this population what is the probability that the sample mean will be between 7 and 10.5? (10 pts)

2. In a certain area of a large city it is hypothesized that 40 percent of the houses are in a dilapidated condition. A random sample of 75 houses from this section and 90 houses from another section yielded a difference, $\hat{p}_1 - \hat{p}_2$ of .09. If there is no difference between the two areas in the proportion of dilapidated houses, what is the probability of observing a difference this large or larger? (That is greater than or equal to .09) (10 pts)

3. Twenty-four experimental animals with vitamin D deficiency were divided equally into two groups. Group 1 received treatment consisting of a diet that provided vitamin D. The second group was not treated. At the end of the experimental period, serum calcium determinations were made with the following results:

   Treated group: $\overline{x} = 11.1$ mg/100 ml, $s = 1.5$

   Untreated group: $\overline{x} = 7.8$ mg/100 ml, $s = 2.0$

   Assuming normally distributed populations with equal variance find 95% and 99% confidence intervals for the difference between the population means. Use the 95% interval to draw a conclusion as to whether or not there actually is a difference in the *population* means. (Clearly, the sample means are different.) (12 pts)

4. In a study of myocardial transit times, appearance transit times were obtained on a sample of 30 patients with coronary artery disease. The sample variance was found to be 1.03. Construct 90% confidence intervals for σ^2 and for σ. State any assumptions you made in order to do this. (12 pts)

5. Measurements of gastric secretion of hydrochloric acid (milliequivalents per hour) in 16 normal subjects and 10 subjects with duodenal ulcer yielded the following results:

   Normal subjects: $6.3, 2.0, 2.3, 0.5, 1.9, 3.2, 4.1, 4.0, 6.2, 6.1, 3.5, 1.3, 1.7, 4.5, 6.3, 6.2$

   Ulcer subjects: $13.7, 20.6, 15.9, 28.4, 29.4, 18.4, 21.1, 3.0, 26.2, 13.0$

   Construct a 95% confidence interval for the ratio of the two population variances. State any assumptions needed in your procedure. (10 pts)

6. Following a week-long hospital supervisory training program, 16 assistant hospital administrators made a mean score of 74 on a test administered as a part of the evaluation of the training program. The sample standard deviation was a 12. Can it be concluded that the population mean is greater than 70?

   (a) State any assumptions you would need to make in order to answer the question. (6 pts)

   (b) Find the Alternative and Null hypothesis. (6 pts)

   (c) Calculate the test statistic (6 pts)

7. A colleague approaches you with a problem. They are doing a hypotheses test against a Null Hypotheses of

   $H_o : \mu_1 - \mu_2 \leq 0$ (where μ_1 is the mean of population 1 and μ_2 is the mean of population 2) and have calculated a test statistic of 2.6537. They do not know population variances but are assuming both populations are normal and that the variances are equal. The sample sizes are 9 and 16 respectively. If your colleague wishes a significance level of $\alpha = .05$ find the appropriate rejection region. Will you be able to reject the Null? Find the p-value. (15 pts)

8. In an experiment to assess the effects on rats of exposure to cigarette smoke, 11 animals were exposed and 11 control animals were not exposed to smoke from unfiltered cigarettes. At the end of the experiment, measurements were made of the frequency of the ciliary beat (beats/min at 20°C) in each animal. The variance for the exposed group was 3400 and 1200 for the unexposed group. Do these data indicate that in the populations represented the variances are different?

   Assume that the populations are approximately normally distributed. The hypotheses are:

   $H_o : \sigma_1^2 \neq \sigma_2^2$ (or $\dfrac{\sigma_1^2}{\sigma_2^2} \neq 1$)

   $H_A : \sigma_1^2 = \sigma_2^2$ (or $\dfrac{\sigma_1^2}{\sigma_2^2} = 1$)

   Let $\alpha = .05$, calculate the test statistic and decision criteria. Draw a conclusion (if possible). (13 pts)