MATH 210 - Test #3 – 11/14/02

When conducting hypothesis tests clearly state the *null* and *alternative hypotheses* and *p-value* for the test. **Show all work and interpret your conclusion in the context of the study.**

1. You are a marketer of fine clothing and wish to study the household incomes of people who shop in high-end fashion stores. You randomly survey 51 people shopping in such stores located in New York City and 41 people in such stores in Los Angeles. The results computed from your study are as follows. (Incomes are measured in 1000s of dollars.)

[15]

	Sample Size	Mean Income	Standard Deviation
New York	51	95	10
Los Angeles	41	105	8

You wish to estimate how much greater the mean income is in Los Angeles compared to New York. Construct a *99% confidence interval* for this difference.

2. Does the above data provide evidence that the mean household income for the customers of the Los Angeles stores is greater than the mean for New York stores? Conduct a *formal hypothesis test* at the .01 level.

[15]

3. You wish to estimate the mean amount that M.C. students spend per semester on textbooks. You are told in advance that the standard deviation for *all* M.C. students is 25 dollars. You choose an SRS of 60 students and compute a mean of $500. Estimate the mean amount spent by all M.C. students using 95 percent confidence.

[15]

4. In problem #3, suppose you did not know the standard deviation for the entire student body. You instead compute the standard deviation from the 60 students surveyed. Suppose this also comes out to be $25.

[5]

   a. How would this affect the way you calculate your estimate?

   b. Would the resulting confidence interval be broader or narrower than what you determined in #3? **Explain!**

5. You wish to estimate the percent of adults in the U.S. who have a favorable view of President Bush. You randomly choose 500 people in a nationwide poll. 350 of those surveyed say they have a favorable view. Construct a *90% confidence interval* for the percent of U.S. adults that view Bush favorably.

[15]

6. You are the campaign manager for a political candidate. You wish to determine if watching a campaign video improves people's rating of your candidate. You choose a random sample of 10 registered votes and they agree to be in your experiment. First you have each person rate the candidate on a scale of 1 to 10 (10 indicates greatest approval). Immediately after showing the video you have them rate the candidate a second time. The results are below:

[20]

Person	Before	After
1	6	7
2	8	10
3	8	7
4	9	9
5	5	7
6	7	8
7	6	6
8	6	9
9	9	10
10	6	7

Conduct the appropriate hypothesis test to determine if this video is effective in increasing the rating of your candidate among registered voters. **Be sure to show all needed calculations.** Use α=.05. You will need to use the value s=1.155 to complete this problem. (Ignore the fact that this sample seems pretty small.)

7. Miscellaneous

a. You plan to set up a randomized-comparative experiment (RCE) to determine if taking a new drug reduces the risk of heart attack. In the context of this study describe what would constitute a "type I error."

[4]

b. In the context of question (a), would it be best to use a significance level of α=.10 or α=.01? **Justify your answer**.

[4]

c. Since a matched pairs experiment is more likely than an RCE to detect a causal relationship, matched pairs is said to be more: (circle *one*)

[3]

- confident
- powerful
- significant
- resistant

d. Matched pairs should never be used to assess a cause-and-affect question when the following is/are present: (circle *one*)

[3]

- outliers
- skewness
- confounding variables
- variation

e. When constructing a confidence interval, the margin of error will increase when: (circle *all* that are correct)

[4]

- the confidence level increases
- the sample size increases
- the true population standard deviation is known
- t^* is used, rather than z^*