MATH 210 - Test #3 - 4/19/01

All hypothesis tests must include the *null and alternative hypotheses*, the *test statistic* and the *p-value*. All hypothesis tests and confidence intervals must included a *fully written conclusion* in the context of the study.

1. The mean time that our class is supposed to meet is 50 minutes. My department chair chooses an SRS of 20 sessions, observes the class duration and calculates a mean meeting time of 49 minutes with standard deviation of 1.5 minutes.

   a. Does this data provide evidence at the .05 level that the mean meeting time for all class meetings is *not equal to* 50 minutes?

[15]

   b. Before doing the analysis in (a), it would be best to make a histogram of the data. Explain *what two things you should look for* in the histogram and *why it is is important*.

[5]

2. The American Management Association conducted a poll of 1,627 large and mid-sized firms. They asked each company whether they monitor employees' work through electronic means. 1,269 companies responded "yes." (Source: abcnews.com, April 18, 2001)

   a. Assuming this is a representative sample of large and mid-sized companies in the U.S., construct a *95% confidence interval* for the percentage of such firms who monitor their employees electronically.

[15]

   b. Suppose you want to reduce the margin of error in this poll to only 1%. Still using 95% confidence, how many companies must be surveyed?

[5]

3. 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 26 people shopping in such stores located in New York city and 30 people in such stores in Los Angeles. The results are as follows. (Incomes are measured in 1000s of dollars.)

	Sample Size (n)	Mean Income ($\bar{x}$)	Standard Deviation (s)
New York	26	93	9
Los Angeles	30	99	14

a. You wish to estimate how much greater the customers' mean income is for Los Angeles compared to New York. Construct a *98% confidence interval* for this difference.

[15]

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

[15]

4. You wish to determine if running a moderate distance (say 1 mile) causes immediate swelling of the ankles amongst men in the age group 18 to 22. You have solicited volunteers by posting flyers in the PERC and 50 male M.C. students have volunteered to take part in your experiment. You have your 50 subjects, the college track and a sunny August afternoon to work with. Describe the experiment and statistical analysis you would use to determine if running causes swelling to occur. **Include the follow issues in your discussion.**

[15]

- How are the 50 subjects used in the experiment?
- What data is collected from each subject?
- What values are computed from the collected data?
- What are the null and alternative hypotheses?
- What is the form of the t-score you will compute?

5. Miscellaneous

a. You wish to estimate the mean time that M.C. students sleep on Friday nights. You choose an SRS of 50 students and compute a mean of $\bar{x}$=5.8 hours with standard deviation of s=0.4 hours. Suppose someone misinterpreted your results and assumed that 0.4 represented the standard deviation for the entire student body. Explain how this misinterpretation would lead to an incorrect confidence interval; in particular, would the interval obtained be too broad or too narrow? **Justify your answer!**

[5]

b. In assessing cause-and-effect questions, which is a "more powerful" experimental design — *matched pairs* or *randomized comparative*? Explain your choice and be sure to make clear what "more powerful" means in this context.

[5]

c. When conducting a hypothesis test, to reduce the chance of making a *Type I error* you should use a: (circle *one*)

[2]

- < high confidence level.
- < low significance level.
- < large sample.
- < robust procedure.

d. In a hypothesis test the *null hypothesis* can be thought of as: (circle *all* that are correct)

[3]

- < a default assumption.
- < the statement you are trying to "prove."
- < a statement of "no difference" or "no effect."
- < the outcome which requires action to be taken.