MATH 210 - Test #3 - 4/24/03

All hypothesis tests must include the *null and alternative hypotheses*, the *test statistic* and the *P-value*. All hypothesis tests and confidence intervals must include a *fully written conclusion* in the context of the study. Points in [brackets] sum to 100.

1. You wish to estimate the mean amount M.C. students spent for textbooks this semester. Assume that the standard deviation for *all* M.C. students is $35. You survey an SRS of 40 students and compute a mean of $250.

   a. Construct a 90% confidence interval for the mean amount spent by all M.C. students. [15]

   b. Suppose you still wish to use 90% confidence but reduce the margin of error to $5. How many students would need to be surveyed? [5]

   c. Suppose the data you collected was strongly skewed to the right. Would this affect the validity of your answer to (a)? Explain. [5]

2. A restaurant wishes to determine which customers have higher bills — those paying by VISA or those using American Express (AmEx). The manager believes AmEx customers have higher bills. 370 credit transactions are recorded during one week. The results are summarized as follows:

	Number	Mean	Std Dev
VISA	250	$27	$7
AmEx	120	$29	$8

a. We will consider this week's customers to be a random sample of all the restaurant's customers. Conduct the appropriate hypothesis test to determine if the mean amount spent by all AmEx customers is *different* than the mean spent by all VISA customers. (Use a significance level of .05.)

[15]

b. Construct a 95% confidence interval for the *difference* between the mean amount spent by AmEx customers and VISA customers.

[10]

3. You wish to determine whether people's heart rates increase while dining at Chartwell's. On a given evening you pick 10 people at random as they walk into the cafeteria, all of whom agree to be in your experiment. You record each subject's heart rate both as they walk into the cafeteria and also when they leave. The results are as follows:

Subject	Rate Before	Rate After
1	60	65
2	62	63
3	58	63
4	70	75
5	65	64
6	68	66
7	69	74
8	70	70
9	74	76
10	66	71

a. Using α=.05, conduct the appropriate hypothesis test to determine if there was a statistically significant increase in people's heart rates. (The appropriate standard deviation from the sample is 2.84.)

[15]

b. Do you feel confident in concluding that eating Chartwell's food *causes* an increase in people's heart rates? Explain.

[5]

4. You are the manager for the "Brown for Mayor" campaign. It is one week before the election and you believe Brown is leading. If polling data shows that 60% of likely voters favor Brown you will stop spending campaign funds and save the money for the next campaign. In a survey of 1000 likely voters, 630 say that they plan to vote for Brown.

a. Does this survey provide convincing evidence (at the .05 level) that at least 60% of likely voters favor Brown?

[15]

b. Explain why, in this context, it might be better to use a lower significance level, say .01.

[5]

5. Miscellaneous

a. Suppose that you were conducting a randomized-comparative experiment to determine if taking a daily dose of aspirin reduces the chance of having a heart attack. Which of the following would be considered a *Type II Error*? (**circle one**)

[3]

- The subjects were told whether they were receiving the aspirin or the placebo.
- You conclude that aspirin is effective in reducing heart attacks when in fact it is not.
- All the high-risk subjects were placed in the control group.
- You did not conclude that aspirin is effective in reducing heart attacks even though it actually is.

b. In constructing a confidence interval, the margin of error can be reduced by making the sample size _____ or the confidence level _____ .

[3]

c. In estimating the mean of a population, you use a *z* statistic when the standard deviation for the _____ is known. Otherwise, you use the standard deviation from the _____ and analyze the result using a ____ statistic. This will result in a margin of error that is generally _____ than when using the *z* statistic.

[4]