Midterm 3A–Stat 100–Spring 1997

You may use calculators, and ONE page of notes (writing allowed both sides). Each problem is worth 20 points. Different parts of a problem have equal weight unless otherwise indicated. Do not spend too much time on any one problem. Put a box around the final answer to a question.

1. It is claimed that more than 60% of students majoring in biology are female. In a random sample of 400 biology majors, 250 students were found to be female. We want to see whether this result provides strong evidence in favor of the claim.

a. Formulate the null and the alternative hypotheses.
b. Define the appropriate test statistic.
c. Give the form of the rejection region for level of significance α.
d. For the above survey-result, calculate the P-value, and determine all the levels α at which the null hypothesis would be retained.

2. Consider the following random sample of 5 observations from a certain population:

13, 12, 11, 9, 10

For this data, the sample mean is 10 and the sample standard deviation is 1.5 .

a. (10 points) Give a 95%-confidence interval for the population standard deviation σ.
b. (3 points) Give an assumption which justifies your computation of that confidence interval.
c. (4 points) From this sample, what is the best point estimate for the population standard deviation?
d. (3 points) Would a 98% confidence interval be contained in the interval you computed? Briefly explain.

3. A government administrator wants to know if there is any difference in the quality of training given to new air traffic controllers at 2 different training centers. The exam results for the trainees of the 2 locations are as follows:

	New York	Chicago
number of trainees	60	50
exam mean	78	75
exam standard deviation	6	12

Test the claim that the quality of training is different at the two centers at a 5% significance level. In your response,

a. Determine the null and alternative hypotheses.
b. Define the appropriate test statistic.
c. Determine the rejection region.
d. Determine the value of the test statistic.
e. Decide if the data support the claim that quality of training is different at the 2 sites.

**********THERE ARE MORE PROBLEMS ON THE BACK SIDE**********

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IN THE PROBLEMS BELOW:

If your answer involves a complicated formula, you need not take the time to evaluate it on your calculator; just write it out with the appropriate numbers inserted.

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4. Five randomly selected people are placed on a vegetarian diet for a month. The weight of the five patients is recorded at the beginning and the end of the month.

	1	2	3	4	5
Beginning	165	172	130	195	180
End	160	162	128	185	162

Find a 90% confidence interval for the mean amount of weight loss during the month for people on the vegetarian diet.
(If your answer involves a complicated formula, you need not take the time to evaluate it on your calculator; just write it out with the appropriate numbers inserted.

5. The KeepOn trucking firm wishes to decide which route between two depots is quicker. Five drivers are randomly selected to drive route A and five drivers are randomly selected to drive route B, and the following sample statistics are obtained for hours of driving time.

	Mean	Standard deviation
Route A	25	10.0
Route B	29	8.0

a. (15 points) Let μ_A be the mean travel time over route A and let μ_B be the mean travel time over route B. Compute a 95% confidence interval for $\mu_A - \mu_B$.
b. (5 points) Give assumptions and/or computations which justify your procedure for computing that confidence interval.