Final Exam–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. EACH PROBLEM SHOULD BE ANSWERED ON A SEPARATE PAGE. Use the back side of a page if necessary.

1. Consider the data -3, 2, 2, -4, -1, 1 .

a. (14 pts.) Determine the sample mean, median and sample standard deviation.

b. (6 pts.) How do the sample mean, median and sample standard deviation change if we add 5 to every number in the above data?

2. Lisa wonders about typical July weather in Springfield. Studying old July weather reports, Lisa classifies days in three ways: **sunny** vs. **cloudy; hot** vs. **cold; humid** vs. **dry.** Lisa finds that in July

— it is **sunny** with probability 0.6
— **cloudy** days are **humid** with probability 0.7
— it is **cold** with probability 0.4
— it is **hot** and **humid** with probability 0.2
— it is **cold** and **humid** with probability 0.3
— **sunny** skies and **hot** weather are independent.

What does Lisa conclude for

a. the probability that it is **cloudy**
b. the probability that it is **cloudy** and **humid**
c. the probability that a **dry** day is **humid**
d. the probability that it is **sunny** or **hot** or **both**
e. the probability that on a **hot** day it is **humid** ?

3. Suppose the number X of raisins in a muffin from Jim's Bakery has a probability distribution

n	0	1	2	3	4	5 or more
$P[X = n]$	0.1	0.2	0.3	0.3	0.1	0

a. What is the probability that a muffin has fewer than 3 raisins?
b. Find the mean of X.
c. Find the standard deviation of X.
d. Buying 250 muffins from Jim's, how many raisins does one expect to get in total?

4. An advertisement seeking volunteers for a clinical research has 4 respondents below age 40 and 7 above age 40. The researcher selects 5 persons at random for testing a new treatment.

a. (7 pts.) How many different selections are possible?
b. (8 pts.) What is the probability that exactly 3 of the selected persons are below 40?
c. (5 pts.) What is the probability that 3 or more of the selected persons are below 40?

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

5. Suppose 40% of the students at the University have a part-time job.
a. (8 pts.) In a random sample of 15 students, what is the probability that at least 4 have a part-time job?
b. For a random sample of 150 students, let X denote the number with a part-time job.
i.(3 pts.) What is the exact distribution of X?
ii.(9 pts.) Approximate $P(X < 72)$.

6. Let $\overline{X}$ denote the sample mean for a random sample of size 50 from a normal population with mean 10 and standard deviation 2.
a. (8 pts.) What is the distribution of $\overline{X}$? Is this distribution exact or approximate?
b. (6 pts.) Find $P(\overline{X} > 10.1)$.
c. (6 pts.) Find the number b so that $P(\overline{X} < b) = .7939$.

7. A factory produces new VCR's. In a set of 600 VCR's produced by the factory, 24 are found to be defective.
a. (16 pts.) Determine a 95% confidence interval for the proportion of defective VCR's produced by the factory.
b. (4 pts.) Suppose the factory claims that the probability of a VCR it produces being defective is .015. Would you believe the factory based on the confidence interval found in part a? Explain your response.

8. The SunBrite Battery Company claims its new type of battery lasts longer. The old type has an average usage life of 8 hours. In a sample of 15 new-type batteries, the average usage life is 8.5 hours with standard deviation 0.75 hours.
a. (4 pts.) State the Null and Alternative Hypotheses.
b. (6 pts.) State the test statistic and rejection region for a test with a 5% significance level.
c. (5 pts.) Determine if the claim of longer life is substantiated at the 5% significance level.
d. (5 pts.) Which of the following best approximates the P-value: .10, .05, .025, .01, .005 ?

9. From a certain obese population, ten persons are randomly selected for weight reduction program A, and ten are randomly selected for program B. After one year, the sample statistics for weight loss in pounds for the two programs are

	A	B
mean	25	30
stand. dev.	25	15

a. (15 pts.) Construct a 90% confidence interval for $\mu_A - \mu_B$, the expected difference in weight loss under the two programs.
b. (5 pts.) State any assumption or computation you make to justify your procedure.

10. A poll of 350 voters on a proposed law gives the following data.

	Favor	Indifferent	Oppose	Total
Male	93	72	21	186
Female	55	79	30	164
Total	148	151	51	350

Test the claim that the proposed law appeals differently to men and women, at $\alpha = .05$.