

Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

1. Every term I receive evaluations from my students and included in my summary is a  $z$ -score. One question on the evaluation from Spring of 2007 term was “How available was the instructor during office hours?” with a corresponding  $z$ -score of -1.1. Explain what this means.
  
2. Determine if the following are correct descriptions of the Central Limit Theorem for sample distributions of  $z$  procedures.
  - (a) Since we are working with  $z$  procedures we can assume we have a population with mean  $\mu$  and a finite standard deviation  $\sigma$ . Let  $n$  be the sample size of our SRS. The Central Limit Theorem says that when  $n$  is large the sample is approximately normal.
  
  - (b) Since we are working with  $z$  procedures we can assume we have a population with mean  $\mu$  and a finite standard deviation  $\sigma$ . Let  $n$  be the sample size of our SRS. The Central Limit Theorem says as you take larger and larger samples from a population, the histogram of the sample values looks more and more Normal.

3. A 95% confidence interval was calculated (using one-sample  $t$ -procedures) for the mean angle of deformity (of the big toe) among people who have HAV. The confidence interval is:  $24.74 \pm 2.042 \frac{6.34}{\sqrt{37}}$  or (22.63, 26.89).

Determine if the following are correct responses to the question, “What does it mean that we are 95% confident that the average angle of deformity among people who have HAV is between 22.63 and 26.98.” If not correct, explain why.

- (a) [2] If I plan to choose a random person with HAV, the angle of deformity of that observation has a 95% chance of falling between 22.63 and 26.98.

- (b) [2] The mean angle of deformity of people with HAV is caught between 22.63 and 26.98 about 95% of the time.

4. A study is investigating if job satisfaction of assembly workers differ when their work is machine paced rather than self-paced. All subjects work in both settings, in random order. This is a matched pairs design. After two weeks in each work setting, the workers take a test of job satisfaction. The response variable is the difference in satisfaction scores, self-paced minus machine-paced.

A significance test was run using this data with the null hypothesis that there was no difference in job satisfaction and the alternative hypothesis that there was a difference. The  $P$ -value calculated was .2302. Explain what the  $P$ -value is in the context of this problem.

5. A researcher looking for evidence of extrasensory perception (ESP) tests 500 subjects. Four of these subjects do significantly better ( $P < 0.01$ ) than random guessing. Is it proper to conclude that these four people have ESP? Explain your answer.
6. A professor asked her sophomore students. "How many drinks do you typically have per session? (A drink is defined as one 12 oz beer, one 4 oz glass of wine, or one 1 oz shot of liquor.)" Some of the students didn't drink.

The table below gives the responses of the female and male students who did drink. (pg 490) It is likely that some of the students exaggerated a bit. The sample is all students in one large sophomore -level class. The class is popular, so we are tentatively willing to regard its members as an SRS of sophomore students at this college.

Female students	2.5	9	1	3.5	2.5	3	1	3	3	3	3
	5	3.5	5	1	2	1	7	3	7	4	4
	3	6	5	3	8	6	6	3	.25		
Male students:	7	7.5	8	15	3	4	1	5	11	4.5	6
	16	4	8	5.25	9	7	7	3	5	6.5	1
	6	8	8	4.5	10.5	8	6				

- (a) Make a stem plot for the data on the female students.
- (b) Make a box plot for the data on the male students.
- (c) What procedures would you use to find the mean drinking behavior claimed by sophomore women at this college?
- (d) What is the mean drinking behavior claimed by sophomore women at this college?
- (e) What procedures would you use to find out if the sophomore men claim to drink more than the sophomore women?
- (f) Do sophomore men claim to drink more than sophomore women at this college?
7. The National AIDS Behavior Surveys interviewed a sample of adults in the cities where AIDS is most common (pg 511). This sample included 803 heterosexuals in high-risk cities who have multiple partners. These people risk infection with AIDS virus. Yet 304 of the respondents said they never use condoms.
- (a) What procedures can you use?
- (b) Is this strong evidence that more than one-third of the population never uses condoms?
- (c) Find a 95% confidence interval for the percentage of people who do not use condoms.

8. A pollster reports that he is 99% confidence that 58% of voters favor a certain candidate in the upcoming presidential election with a margin of error of 6%.
- What was the sample size?
  - What should the sample size be so that the 99% confidence interval for the proportion of voters favoring this candidate has a margin of error of 2%?
  - If the pollster reports that based on a sample of size 3,000, he predicts that the candidate will win 58% of the vote with a margin of error of 2.096%, what confidence does he have in the prediction?
9. [2] In a discussion of the education level of the American workforce, someone says, “The average young person can’t even balance a checkbook.”. The National Assessment of Educational Progress says that a score of 275 or higher on its quantitative test reflects the skill needed to balance a checkbook. The NAEP random sample of 840 young men had a mean score of  $\bar{x} = 272$ , a bit below the checkbook-balancing level. Assume NAEP scores have a Normal distribution with  $\sigma = 60$ .
- To test the claim, what procedure can you use?
  - Give a 95% confidence interval for the average quantitative score of young men.
  - Is there good evidence to suggest that the average young man can’t balance his checkbook?
10. IQ’s are normally distributed with population mean 100 and known standard deviation 10.
- Draw the density curve for IQ scores.
  - We plan to choose a random person. What is the probability s/he will have an IQ between 98 and 102?
  - If I ask 20,000 people what their IQ score is, *about* how many should I expect to report scores between 98 and 102?
  - What IQ score is in the 90th percentile?
  - We plan to choose a random sample of 100 people. Find the probability that that sample mean is between 98 and 102. *Hint: draw the density curve you will be working with*

11. The article “Objective Measurement of the Stretchability of Mozzarella Cheese” (J. of Texture Studies, 1992: 185-194) reported on an experiment to investigate how the behavior of mozzarella cheese varied with temperature. Consider the following data where elongation records the % stretched at the failure of the cheese. (Note: The researchers were Italian and used *real* mozzarella cheese, not the poor cousin widely available in the United States.)

temperature ( $^{\circ}$ C)	59	63	68	72	74	78	83
elongation(%)	118	182	247	208	197	135	132

- (a) [2] What will you set to be the explanatory variable?
- (b) [5] Construct a scatter plot of the above information. Be sure to clearly mark and label your axes.
- (c) [5] Find the least-squares regression line and plot it on the above graph.
- (d) [3] Use the regression line to predict the ability to stretch when the temperature is freezing ( $0^{\circ}$  C).
- (e) [5] Do you believe your prediction in the above problem?