

First Exam

Write all answers in your blue book and show all work there. Return your exam and printout(s) in your blue book.

14 pts.

- 1) a) Candidate Z collects opinions over the telephone at relatively low cost and can afford a sample of 500.
- b) Candidate Y selects a sample systematically from the Census based Criss Cross Directory and through repeated efforts gets an eighty percent response rate. Only a sample of 50 is affordable.
- c) Candidate X selects city blocks randomly from the city map and sends interviewers to those blocks to interview whoever they find. A sample of 500 is affordable.

Compare the strengths and weaknesses of the three approaches.

20 pts.

- 2) A population has 2 values {3,5} and we take samples of 2 with replacement.
 - a) Show the sampling distribution for the sample mean.
 - b) Find the variance of the sampling distribution and the expected value of the sample mean.
 - c) Find population mean and the population variance.
 - d) Do your findings show the sample mean to be an unbiased estimator? Why?
 - e) Confirm your result in part b with the infinite population form for the variance of the mean. Why does the infinite form apply in this instance?

20 pts.

- 3) The X corporation regularly collects samples of its output and expects that 15 percent of that output will fail inspection. It can tolerate a sampling error of 2 percent ($\bar{p} - p = .02$), if the confidence level is .90.
 - a) How large a sample do they need if the proportion is presumed to be no larger than .2?
 - b) Suppose that they have a sample size that you recommend in part a and that the sample proportion is .16. Find the 90 percent confidence interval for p.
 - c) Use the part b results to test the hypothesis that $p = .15$. Show all steps to the test.

23 pts

- 4) **Computer Problem.** a) Open the "Orders" file in the Chapter 9 (hypothesis tests) folder of the 2216 files using SPSS.
- b) Do these data provide convincing evidence that units average less than 40? Let $\alpha = .1$ and show all steps to your test on your printout. (Don't print the data or anything else that wastes paper.)
- c) Do you need to assume that the population is normally distributed for your part b results? Why?
- d) Use SPSS to generate one kind of descriptive data that to see if the sample seems to be normally distributed. Print it and write your interpretation on the printout.

23 pts.

- 5) Mr X thinks that 1 carat diamonds have a mean price of \$7000. He takes a sample of 100 diamonds and finds the mean to be \$6500 and the standard deviation to be \$1000.
- a) If he tests at a one percent level of significance, will he reject his hypothesis? Show all steps.
- b) If the real μ is \$6300, what is the probability that he will get a sample mean that leads him to accept his hypothesis? What name do we have for probabilities like this?
- c) If the real mean is 7000 and the population is normally distributed, what is the probability that a randomly chosen 1 carat diamond will have a value of \$7100 or more?

I have neither given nor received unfair aid on this test nor am I aware of anyone else who has. _____