

Sociology 592 - Research Statistics I
Sample Exam 2
November 11, 1994

1. (10 points each, 30 points total, up to 10 points extra credit). You have been asked to serve as a statistical consultant for several proposed projects. For three of the following, your employers want you to tell them:

- (i) Which of the cases we have studied their problem falls under (e.g. one sample tests, case I, σ known; nonparametric tests, case II, tests of association). Briefly explain why.
- (ii) the null and alternative hypotheses
- (iii) whether a Z, T, chi-square, or F test is appropriate; where applicable, also tell what the degrees of freedom for the test are. You DO NOT have to give the formula for the test statistic, nor do you need to specify the acceptance region.

If values for population parameters are not specified (e.g. σ) assume they are unknown; and if two or more unknown σ 's are involved, assume they are equal. [NOTE: You must do three of the following, and you'll receive 5 points extra credit for each additional problem you get right.]

a. The Republican party claims that it is equally popular with men and women. Others, however, feel that there is a "gender gap", with the party having less support among women than among men. Random samples of 100 men and 100 women will be asked whether or not they support the Republican party.

b. It is known that business executives have an average score of 87 on a test of leadership ability. The military now wants to know how its officers compare with the business population. A random sample of 186 military officers will therefore be given this same test.

c. Bill Clinton is worried after Tuesday's election results. He needs to find out whether support for his re-election varies across the country. He wants to poll 50 Easterners, 50 Westerners, 50 Northerners, and 50 Southerners. Using a scale that ranges from 1 to 100, respondents will be asked how much they support the Clinton presidency.

d. A software company advertises that 90 percent of the calls to its technical support lines are answered in 5 minutes or less. Disgruntled customers claim this figure is far too high. To resolve the controversy, the company agrees to let an independent auditor record how long it takes for a random sample of 500 calls to get answered.

e. Last Resort Savings and Loan wants to know whether the racial characteristics of an ad and the race of a viewer are in any way related to the perceived effectiveness of the ad. It has therefore developed three new commercials. In one commercial, all the speakers are black, in another commercial half the speakers are black and half are white, and in the third commercial all the speakers are white. Each commercial will be shown to 10 whites and 10 blacks (i.e. 60 people altogether). Respondents will be asked to rate the effectiveness of the ads on a scale ranging from 0 to 100.

2. (5 points each, 20 points total). For each of the following, indicate whether the statement is true or false. If you think the statement is false, indicate how the statement could be corrected.

NOTE: These are all pretty easy, but you could waste a great deal of time on some of them or make stupid mistakes if you don't happen to see what the easiest way to approach each problem is.

a. A researcher wants to know whether husbands and their wives significantly differ in how much they read. Eighteen husbands and their wives are asked how many books they have read in the past year. The researcher gets a T value of 2.08. If she is using the .05 level of significance, she should reject the null hypothesis.

b. Twelve (12) randomly selected patients have received a drug, while another 12 randomly selected patients have not. A researcher's null and alternative hypotheses are

$$\begin{aligned} H_0: & \mu_1 - \mu_2 = 0 \\ H_A: & \mu_1 - \mu_2 > 0 \end{aligned}$$

The computed value of the test statistic is -2.50. If $\alpha = .05$, you should reject the null hypothesis.

c. A professor believes that men are more likely to get an A in her class than women are. A chi-square statistic will tell her whether or not her hypothesis seems to be supported.

d. A researcher has collected data from 60 respondents on their race (white or nonwhite), gender (male or female), and political conservatism (measured on a scale ranging from 1 to 30). She computes

$$F_{JK-1, N-JK} = \frac{SS \text{ Cells}/(JK - 1)}{SS \text{ Error}/(N - JK)} = 3$$

If she is using the .05 level of significance, she should conclude that men and women differ in how politically conservative they are.

3. (25 points) A researcher selected a sample of 25 homes, and careful logs were kept of how many hours per week the TV set was on. The mean number of hours per week turned out to be 44, with a sample standard deviation of 10. Use both confidence intervals and our 5 step procedure to test the hypothesis that families watch an average of 40 hours of TV a week. Use the .05 level of significance.

4. (25 points) A politician wants to know whether his crime bill is equally popular with members of all political parties. Interviews are conducted with 100 democrats, 100 Republicans, and 50 independents. Forty percent of the Democrats, sixty percent of the Republicans, and half of the independents say they support the bill, while the rest say they oppose it. Use our five step procedure and the .01 level of significance to test whether party affiliation is related to support for the bill.