

1. A random sample of 200 voters reveals that 115 favor the Democratic candidate while 85 favor the Republican. Test the hypothesis that both candidates have equal levels of support, using both a chi-square test (nonparametric tests, Case I) and a test of the binomial parameter  $p$  (single sample tests, Case II). Use  $\alpha = .05$ . Are your results consistent? Why or why not?

2. A researcher believes that there is no relationship between religion and party affiliation; that is, a Catholic is just as likely to be a Republican or Democrat as a NonCatholic is. She collects the following data:

Party/Religion	Catholic	NonCatholic	$\Sigma$
Republican	126	99	225
Democrat	71	162	233
$\Sigma$	197	261	458

Test the researcher's hypothesis, using  $\alpha = .01$ . Use both a chi-square test (Nonparametric tests, Case II) and a test of the difference between two proportions (2 sample tests, case V). Are the results consistent? Why or why not?

3. A researcher is interested in the relationship between type of high school attended (Catholic or Noncatholic), Socio-economic status (classified as High, Medium, or Low) and Academic achievement (attended college or did not attend college). She collects data from 200 adults.

a. She first tests whether type of school, socio-economic status, and academic achievement are independent of each other. She gets a Pearson chi-square value of 17.0. If she is using  $\alpha = .05$ , should she accept or reject the model of independence? Why?

b. She then tests whether academic achievement is independent of type of school attended and socio-economic status. She does NOT assume that type of school attended is independent of socio-economic status; that is, she tests the model of conditional independence. She gets a Pearson chi-square of 10.0. Using  $\alpha = .05$ , should she accept or reject the model of conditional independence? (HINT: The only trick to solving this problem is figuring out what the appropriate degrees of freedom are.)

4. Determine the following:

- a.  $P(F_{5,30} \geq ???) = .10$
- b.  $P(F_{4,25} \geq 2.76) = ???$
- c.  $P(F_{3,???} \geq 5.01) = .01$

5. A researcher believes that the gender of an author affects the evaluation of his or her work. An identical manuscript is printed three ways. On one, the author is listed as Patrick Smith, on another, the author is listed as Patricia Smith, and on the third the author is listed as P. Smith. Random samples of 3 subjects each are given one of the manuscripts, and asked to evaluate the author's work. Their evaluation scores are as follows:

<b>Patrick Smith:</b>	88, 92, 66
<b>Patricia Smith:</b>	75, 56, 88
<b>P. Smith:</b>	56, 63, 78

- (a) Compute the treatment effects
- (b) Test whether the treatment effects differ at the .05 level. Present the ANOVA table.

6.. A pollster wants to test whether voters, on average, like each of 3 candidates running for office equally well. Six voters are asked how much they like candidate A, six different voters are asked how much they like candidate B, and another 6 voters are asked how much they like candidate C. She finds that  $SS_{\text{Between}} = 3078.11$  and  $SS_{\text{Total}} = 3676.44$ . Test (using  $\alpha = .01$ ) whether the candidates are equally popular. Present the ANOVA table.

7. A manager wants to test whether the average quality of a paint job is the same for 5 types of surface to which it is applied. Random samples of 5 each are drawn for each of the 5 surfaces. If  $F = 3.22$  and  $\alpha = .025$ , what should the manager conclude?

8. Do the following AFTER you have worked the problems by hand:

A. Use the SPSS NPAR TEST chi-square routine to confirm your answer to the first part of problem 1. Note that there will be two variables (PARTY and FREQ) with two lines of data (one for each party). Remember to weight by FREQ before using the chi-square routine. In Stata, use the `chitest i` or `chitest` command (remember, you'll have to first install Nick Cox's `tab_chi` routines.)

B. Use SPSS to confirm that you have done the chi-square test for problem #2 correctly. (You can further impress me if you can figure out how to get SPSS to do 2 sample tests, case V — I don't know how myself.) There will be three variables (PARTY, RELIG, FREQ) and four lines of data (one for each of the possible party/relig combinations). Remember to weight by FREQ. You will use the SPSS Crosstab routine (remember to tell SPSS that you want the chi-square statistic and expected values). In Stata, use the `tab` or `tabi` command.

C. Use SPSS to confirm your answer to problem #5. You can use the routine of your choice, e.g. ONEWAY, ANOVA, MEANS. There will be two variables (SCORE, GENDER) and 9 cases. Remember to ask for descriptive statistics (or, if using ANOVA, the MCA table) so you can confirm that the treatment effects are correct. Do the same thing in Stata using the `oneway` command. [NOTE: Entering the data yourself is optional; if you prefer you can download the files hw06-8c.sav and/or hw06-8c.dta from the course web page.]