1. (10 pts) Use the data of problem 3 of HW5, treat party identification as an ordinal categorical variable with scores 1, 2, 3 and assign score 1 to black and 2 to white. Do the following:

(a) Use Proc Freq to find CMH1 and CHM2, interpret the results.

(b) Use Proc Corr to find the Pearson correlation coefficient and hence calculate CMH1 by hand. Hint: You can use statement Freq in Proc Corr to represent the number of observations in each cell.

(c) Run ANOVA to get the F-Statistic and compare CMH2 to \((I - 1)F\). Since now \(I = 2\), CMH2 and the F-Statistic should be almost the same. Are they close? Why they are different? Hint: You can also use statement Freq in Proc GLM to represent the number of observations in each cell.

2. (10 pts) Problem 3.13 (a & c) of 2nd ed. CDA or Problem 3.18 of 3rd ed. CDA + the following

(a) Find the exact conditional distribution of the Pearson \(\chi^2\) test statistic under independence and given margins, then conduct the exact Pearson \(\chi^2\) test. (Note: You can use the formula on slide 176 to calculate the Pearson \(\chi^2\) test statistic).

(b) Find the exact 95\% CI and asymptotic 95\% CI for the underlying odds-ratio \(\theta\).

(c) Find the unconditional P-value for testing independence using the software in the website http://www4.stat.ncsu.edu/~boos/exact/. Note: Since the study is retrospective, you need to take it into account when entering data.

For dis-advantage of a mid p-value, please review your homework 2.

3. (10 pts) Problem 3.30 of 2nd ed. CDA. The problem is re-phrased in the following:

For testing \(H_0 : \pi_1 = \pi_2\) using independent binomial data \(y_1\) and \(y_2\) with \(n_1\) and \(n_2\) trials, the score statistic is:

\[
Z = \frac{\hat{\pi}_1 - \hat{\pi}_2}{\sqrt{\hat{\pi}(1-\hat{\pi})(1/n_1 + 1/n_2)}}
\]
where $\hat{\pi}_i = y_i/n_i$ and $\hat{\pi} = (y_1 + y_2)/(n_1 + n_2)$ is the pooled estimate of the common $\pi$ under $H_0$. Show that

$$Z^2 = X^2$$

where $X^2$ is the Pearson $\chi^2$ statistic for testing independence.

4. (10 pts) Problem 4.1 of 2nd ed. CDA or 3rd ed. CDA.

5. (10 pts) Problem 4.3 of 2nd ed. CDA or Problem 4.2 of 3rd ed. CDA.