Worksheet 17 (§8.8-§8.9)
Confidence Intervals for Proportions and Differences of Proportions

This worksheet is a continuation of Discussion Sheet 17. Please complete that Discussion Sheet before continuing. The material is in §8.8 and §8.9 of the textbook. Please read these if you have not already done so.

\[(1 - \alpha)100\% \text{ Confidence Interval for the Difference of Proportions, } p_1 - p_2\]

\[
\left( \hat{p}_1 - \hat{p}_2 \right) - t_{\frac{\alpha}{2}, \nu} \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}} < p_1 - p_2 < \left( \hat{p}_1 - \hat{p}_2 \right) + t_{\frac{\alpha}{2}, \nu} \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}
\]

where \( \hat{p}_1 \) is the sample proportion used to estimate the population proportion, \( p_1 \), and where \( \hat{q}_1 = 1 - \hat{p}_1 \); similarly \( \hat{p}_2 \) is the sample proportion used to estimate the population proportion, \( p_2 \), and where \( \hat{q}_2 = 1 - \hat{p}_2 \). \( \nu = n_1 + n_2 - 2 \), the degrees of freedom.

Note 1: The confidence interval is approximate since we must use \( \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}} \) to estimate \( \sigma_{p_1 - p_2} \).

Note 2: We are assuming that the samples are sufficiently large that the approximation that is mentioned in Note 1 is valid. "Sufficiently large" usually can be taken as a sample sizes such that \( n_1 \hat{p}_1 \geq 4, n_1 \hat{q}_1 \geq 4, n_2 \hat{p}_2 \geq 4 \) and \( n_2 \hat{q}_2 \geq 4 \).

2. Suppose that a random sample of 200 OU students show that 164 of them think that their team will win the NCAA basketball championship while a random sample of 400 Texas students show that 238 of them think that their team will win the championship. Make a 95% confidence interval estimate of the difference in proportions of OU and Texas students who think their team will win.

Suggested Homework: 8.44, 8.45, 8.46, 8.48, 8.51, 8.52, 8.53

Homework Solutions to be Posted: 8.46, 8.48, 8.52