Categorical Data Analysis: HW 3

1. Assume multinomial sampling in a 2×2 table with observed cell counts $n_{11}, n_{12}, n_{21}, n_{22}$. Show that the asymptotic variance of the sample log-odds, $\log(n_{11}n_{22}/n_{12}n_{21})$ is given by $(1/n_{11} + 1/n_{12} + 1/n_{21} + 1/n_{22})^{1/2}$.

2. There is a rumor that females are better at math. Let's see what your friends think. Randomly sample 6 of your male friends and 6 of your female friends and ask them who they think is in general better at math, females or males.

   (a) What sampling design is this?

   (b) Find and interpret (just say in words what it means) a 95% confidence interval for the difference of proportions, relative risk and odds ratio.

   (c) Use Fisher's exact test to obtain an exact P-value for testing the claim that females are better in math. (If you want, you can compute the null table probabilities for each possible table using the dhyper() function in R, that computes hypergeometric probabilities)