A recent study (Ackerman, Griskevicius, and Li, 2011) examined expressions of commitment between two partners in a committed romantic relationship. One aspect of the study involved 47 heterosexual couples who were asked about which person was the first to say “I love you.” For 7 of those couples, the two people disagreed about the answer to this question. But both people agreed for the other 40 couples, so those 40 responses were included in the analysis.

a) Identify the observational units and variable in this study.

The null and alternative hypotheses for testing whether one person or the other (male or female) is more likely to say “I love you” first can be expressed with symbols as $H_0: \pi = .5$ vs. $H_a: \pi \neq .5$.

b) Describe (in words) what the symbol $\pi$ stands for in these hypotheses.

c) Use the One-Proportion Inference applet to simulate 1000 repetitions for these 40 couples, assuming that the null hypothesis is true. Submit a screen capture of the applet results.

It turned out that for 28 of the 40 couples in the sample (after the 7 couples who could not agree were excluded), the man said “I love you” before the woman did.

d) Use the applet simulation results to approximate the two-sided p-value from these data. Also report which values are being counted to determine this approximate p-value.

e) Write a sentence interpret this p-value. (Hint: The probability of …)

f) Use the applet to determine the exact binomial (two-sided) p-value. Also indicate how you would calculate this exact p-value by hand if you had to.

g) Based on the exact binomial p-value, would you conclude that .5 is a plausible value of the parameter, using .10 as the criterion for rejection/plausibility? How about using .05 as the criterion? How about using .01 as the criterion? Explain (briefly) how you decide.

h) Determine a 95% confidence interval of plausible for the parameter by conducting a series of two-sided tests. Determine the endpoints of the confidence interval to 3 decimal places of accuracy. Also write a sentence or two describing how you determined this interval.

i) Interpret the interval that you obtained in h): You’re 95% confident of what?
j) Repeat h) for a 90% confidence interval. Comment on how this interval compares to the 95% confidence interval.

k) Summarize what your analyses reveal about the research question of whether one sex tends to be the first to say “I love you.”