Do voters make judgments about political candidates based on his/her facial appearance? Can you correctly predict the outcome of an election, more often than not, simply by choosing the candidate whose face is judged to be more competent-looking? Researchers investigated this question in a study published in *Science* (Todorov, Mandisodka, Goren, and Hall, 2005). Participants were shown pictures of two candidates and asked who has the more competent-looking face. Researchers then predicted the winner to be the candidate whose face was judged to look more competent by most of the participants. For the 32 U.S. Senate races in 2004, this method predicted the winner correctly in 23 of them.

a) Identify the observational units (cases) and variable in this study. Also classify the variable as categorical (also binary?) or quantitative.

b) In what proportion of these Senate races did the “competent face” method predict the winner correctly?

c) Describe (in words) the null model to be investigated with this study.

d) Describe how you could (in principle) use a coin to produce a simulation analysis of whether these data provide strong evidence that the “competent face” method would correctly predict the election winner more than half the time. Include enough detail that someone else could implement the full analysis and draw a reasonable conclusion.

e) Use the One-Proportion Inference applet (see link under “Applets” from our course web page) to conduct a simulation (using 10,000 repetitions), addressing the question of whether the researchers’ results provide strong evidence in support of the researchers’ conjecture that the “competent face” method would correctly predict the election winner more than half the time. Submit a print-out of the applet output (you can use the “print screen” key), and indicate where the observed research result falls in that distribution. Also report the approximate p-value from this simulation analysis.

f) Calculate the exact p-value using the appropriate probability distribution. Indicate the name of this distribution and the parameter values. Use the applet or Minitab to perform the probability calculation, and submit a graph that displays the probability distribution and calculation. Is this exact p-value close to the approximate one from your simulation analysis?

g) Interpret this p-value: probability of what, assuming what?

h) Write a paragraph, as if to the researchers, describing what your simulation analysis reveals about whether the data provide strong evidence in support of their conjecture.
These researchers also predicted the outcomes of 279 races for the U.S. House of Representatives in 2004. The “competent face” method correctly predicted the winner in 189 of those races.

i) In what proportion of these House of Representatives races did the “competent face” method predict the winner correctly? Is this a larger or smaller proportion than with the Senate races?

j) Use the One-Proportion Inference applet to conduct a simulation analysis of these data. Again submit a print-out of the distribution, and indicate where the observed research result falls in that distribution. Also report the approximate p-value, and summarize your conclusion, again as if to the researchers.

k) In which situation (Senate races or House races) did you find stronger evidence that the “competent face” method would correctly predict the election winner more than half the time? Explain why this situation produced stronger evidence.