HW1: Chimpanzee problem-solving? (assigned on Tues Jan 6; due on Mon Jan 12)

You may work with in a group of as many as three students on this assignment, handing in one report with all names, provided that you all contribute to the work. Word-processed reports are preferred to hand-written ones. Integrate computer output into your report as appropriate.

In a 1978 study published in *Science*, Premack and Woodruff asked "To what extent does the chimpanzee comprehend the elements of a problem situation and potential solutions?" An adult chimpanzee (Sarah) was shown 30-second videotapes of a human actor struggling with one of several problems (for example, not able to reach bananas hanging from the ceiling, a record player not playing). Then Sarah was shown two photographs, one that depicted a solution to the problem (like stepping onto a box, plugging in the record player) and one that did not. She was then instructed to pick one of the photos and place it under the television monitor. (Sarah had been raised in captivity since age one and had extensive prior exposure to photographs and television.) The order in which the scenes were presented to Sarah was randomized, as was the left/right position of the photos presented to her. Sarah was shown eight different scenarios. For each scenario, researchers recorded whether or not Sarah selected the correct (solution) photo or not. It turned out that Sarah identified the correct photo for 7 of the 8 scenarios.

a) Identify the observational units for this study.

b) Identify the variable for this study. Also classify it as categorical (also binary?) or quantitative.

c) Describe (in words) the null model/hypothesis 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 Sarah has the ability to select the correct solution/photo more often than not. Include enough detail that someone else could implement the full analysis and draw a reasonable conclusion.

e) Use the One-Proportion Inference applet to conduct a simulation (using at least 1000 repetitions), addressing the question of whether the observed data provide strong evidence in support of the conjecture that Sarah has the ability to select the correct solution/photo more often than not. Submit a print-out of the applet output, and indicate where the observed result falls in that distribution.

e) Report the approximate p-value from this simulation analysis. Also write a sentence or two describing what this approximate p-value means.

f) Write a paragraph, as if to students not in our class, describing what your simulation analysis reveals about whether the observed data provide strong evidence in support of the conjecture that Sarah has the ability to select the correct solution/photo more often than not. Be sure to explain the reasoning process behind your conclusion.
g) Now suppose that Sarah had selected the correct solution/photo for only 5 of the 8 scenarios. Suppose that someone were to say: “5 out of 8 is more than half, so Sarah must have the ability to select the correct solution/photo more often than not.” How would you respond? Refer to the results of the simulation analysis above in your response.

h) Now suppose that the study had consisted of 16 scenarios, and that Sarah had selected the correct solution/photo for 14 of them. How does the proportion correct compare to that in the actual study? How do the p-value and strength of evidence compare to that in the actual study? Refer to the results of a simulation analysis, including a screen capture, in your response.