Statistics 302 Spring 2014 Larget Assignment #7 posted March 14, 2014

Due Friday, March 28

Textbook Exercises

11.56, 11.83, 11.85, 11.87, 11.95, 11.117, 11.121, 11.128

Computer Exercises

For each R problem, turn in answers to questions with the written portion of the homework. Send the R code for the problem to Katherine Goode. The answers to questions in the written part should be well written, clear, and organized. The R code should be commented and well formatted.

R problem 1 Use the data on page 280 from Exercise 4.136 to use R to compute a p-value from the exact probability distribution. Compare with the answer you get from 10,000 simulations of the randomization distribution using R. (Either write new code or reuse code from a previous assignment for the randomization test.)

R problem 2 Consider a hypothesis test $H_0 : \mu = 100$ versus $H_A : \mu > 100$ from data where the test statistic $\bar{X}$ is normally distributed with mean μ and standard deviation 5 (so the sample size is large enough for the standard error to be 5).

1. What would the p-value be if $\bar{X} = 108.7$?
2. What number c would $\bar{X}$ need to exceed for the p-value to be less than 0.05?
3. If the null hypothesis is true, what is the probability that the p-value, as calculated by an area under a normal curve, is less than 0.05?
4. If the true mean is 104, what is the probability that the p-value is less than 0.05?

R problem 3 A male fruit fly is equally likely to have genotype A or genotype B. If he has genotype A, then in a given cross, all offspring will have red eyes. If he has genotype B, each offspring is equally likely to have red or white eyes, independent of all others. Assume that there are five offspring, all with red eyes.

1. Given all five offspring have red eyes, what is the probability that the fly has genotype A?
2. Given all five offspring have red eyes, what is the probability that a sixth offspring will also have red eyes?

R problem 4 In a test to see if a person has ESP, the person identifies a correct shape 33 out of 125 trials. The test is designed so that the number of correct answers should be binomial with $p = 0.2$ if the null hypothesis of no ESP is true.

1. Use the R function `pbinom()` to compute a p-value for this hypothesis test.
2. Use R to find a p-value from a randomization distribution (using code from a previous homework or new code). Compare to the previous result.
3. Find the mean and standard deviation of the number of correct guesses assuming no ESP. Calculate a p-value by approximating the binomial probability with an area under a normal curve with the same mean and standard deviation. Compare the answer to the first result.