Assignment #3

Due on Wednesday October 1, 2008

Read Chapter 2 in the class notes, *Introduction to Statistical Inference,* in the course webpage at `http://pages.pomona.edu/~ajr04747`

Read Sections 4.2 on *Probability Models,* and Section 4.3 on *Random Variables* in Moore, McCabe and Craig.

Do the following problems

1. Use randomization to test the null hypothesis that "there is no difference between calcium supplementation and a placebo" for the experimental data provided in the MS Excel file `CalciumBloodPressureData.xls`, which may be downloaded from `http://pages.pomona.edu/~ajr04747`.

   Describe the procedure that you followed in R to do the simulations and how you estimated the p–value.

2. (Spam Topics[1]) A majority of e-mail messages are now "spam." The distribution of topics, according to an article by Robyn Greenspan found on the internet at `http://www.clickz.com/showPage.html?page=3295851`, is given in the following table.

Topic	Adult	Financial	Health	Leisure	Products	Scams
Probability	0.145	0.162	0.073	0.078	0.210	0.142

   Choose a spam e-mail message at random.

   (a) What is the probability that the selected e-mail does not deal with any of the topics listed in the table?

   (b) What is the probability that the randomly chosen spam e-mail offers adult content or is a scam?

3. (PINs[2]) Personal identification numbers (PINs) for automatic teller machines usually consist of four digits. Suppose you notice that most of your pins have the digit 1 in them. You wonder if the issuers of PINs use lots of ones to make

[1] Adapted from Exercise 4.26 in Moore, McCabe abd Graig, *Introduction to the Practice of Statistics,* Sixth Edition, p. 256

[2] Adapted from Exercise 4.33 in Moore, McCabe abd Graig, *Introduction to the Practice of Statistics,* Sixth Edition, p. 257

the numbers easier to remember. Assume that the choice of digits for a 4–digit PIN is done randomly, so that all digits have the same likelihood of being chosen.

(a) How many possible PINs are there?

(b) What is the probability that a PIN assigned at random has at least one 1 in it?

4. (Nonstandard dice[3]) Assume you have two balanced, six–sided dice. One is a standard die, with faces having 1, 2, 3, 4, 5, and 6 spots. The other die has three faces with no spots and three faces with 6 spots.

   (a) Describe the sample space for the experiment consisting of tossing the two dice simultaneously.

   (b) Let X denote the sum of the spots on the up–faces of the two dice after they are rolled. Give the probability distribution of X.

5. (Foreign–born residents of California[4]) The Census Bureau reports that 27% of California residents are foreign–born. Suppose that you choose three Californians at random so that each has probability $p = 0.27$ of being foreign born, and the choice of each individual is independent from that of any other in the group.

   (a) List the elements of the sample space using the letter F to denote foreign–born and D to denote domestic birth.

   (b) Define a random variable, W, to be the number of foreign–born people in the group of three that are chosen. What are the possible values of W?

   (c) Give the probability distribution of W

[3] Adapted from Exercise 4.57 in Moore, McCabe abd Graig, *Introduction to the Practice of Statistics,* Sixth Edition, p. 268

[4] Adapted from Exercise 4.59 in Moore, McCabe abd Graig, *Introduction to the Practice of Statistics,* Sixth Edition, pp. 268, 269