Spring 2009

Statistics 131A

Homework 2

Due : April 17

1. *(Problem 2.1)* : A box contains 3 marbles, 1 red, 1 green and 1 blue. Consider and experiment that consists of taking 1 marble from the box, then replacing it in the box and drawing a second marble from the box. Describe the sample space. Repeat when the second marble is drawn without first replacing the first marble.

2. *(Problem 2.5)* : A system is composed of 5 components, each of which is either working or failed. Consider an experiment that consists of observing the status of each component, and let the outcome of the experiment be given by the vector $(x_1, x_2, x_3, x_4, x_5)$, where x_i is equal to 1 if component i is working and is equal to 0 if component i is failed.

   (a) How many outcomes are there in the sample space of this experiment ?

   (b) Suppose that the system will work if components 1 and 2 are both working, or if components 3 and 4 are both working, or if components 1,3 and 5 are all working. Let W be the event that the system will work. Specify all the outcomes in W.

3. *(Problem 2.14)* : The following data were given in a study of a group of 1000 subscribers to a certain magazine: In reference to a job, marital status, and education, there are 312 professionals, 470 married persons, 525 college graduates, 42 professional college graduates, 147 married college graduates, 86 married professionals, and 25 married professional college graduates. Show that the numbers reported in the study must be incorrect.

4. *(Problem 2.15)* : If it is assumed that all $\binom{52}{5}$ poker hands are equally likely, what is the probability of being dealt

   (a) a flush ? (A hand is said to be a flush if all 5 cards are of the same suit.)

   (b) one pair ? (This occurs when the cards have denominations a, a, b, c, d, where a, b, c and d are all distinct.)

   (c) two pairs ? (This occurs when the cards have denominations a, a, b, b, c, where a, b and c are all distinct.)

   (d) three of a kind ? (This occurs when the cards have denominations a, a, a, b, c, where a, b and c are all distinct.)

   (e) four of a kind ?

5. *(Problem 2.30)* : The chess club of two schools consist of, respectively, 8 and 9 players. Four members from each club are randomly chosen to participate in a contest between

the two schools. The chosen players from one team are then randomly paired with those from the other team, and each pairing plays a game of chess. Suppose that Rebecca and her sister Elise are on the chess clubs at different schools. What is the probability that

(a) Rebecca and Elise will be paired ?

(b) Rebecca and Elise will be chosen to represent their schools but will not play each other ?

(c) exactly one of Rebecca and Elise will be chosen to represent the school ?

6. *(Problem 2.37)* : An instructor gives her class a set of 10 problems with the information that the final exam will consist of a random selection of 5 of them. If a student has figured out how to do 7 of the problems, what is the probability that he or she will answer correctly

(a) all 5 problems ?

(b) at least 4 of the problems ?