

- The homework requirements given on the course web page were revised last week to **add the requirement of a cover page** in a certain format, to help ensure that the grader grades all of your work. Please read this and follow it.
- The practice problems are from the NINTH edition of the course text “A first course in probability”.

Problems for practice (not to be handed in): **Chapter 4:** Problems 4.45, 4.47, 4.50, 4.53, 4.58, 4.61, 4.72, 4.74, 4.82

**Problems to be handed in.**

- (1) A manufacturer makes a certain electronic part. The probability that a given part is malfunctioning is  $1/500$ . The manufacturer can do a test on a group of parts. The group will pass the test if all of the parts in the group are functioning and will fail the test if one or more parts in the group is malfunctioning. Suppose we test a group of 200 parts.
  - (a) Assuming the assumptions of the problem are correct, what is the type of random variable and appropriate parameters that exactly represents the number of malfunctioning parts in a group?
  - (b) What random variable (and with what parameters) can be used to give a good estimate to the random variable in the previous part?
  - (c) Give a decimal estimate for the probability that the group fails the test.
  - (d) If the group fails the test, estimate the conditional probability that there is exactly one part in the group that is malfunctioning.
- (2) A salesperson makes calls to potential customers. The probability that a given call results in a sale is  $2/7$ . Suppose the salesman stops for the day after making 6 sales.
  - (a) What random variable (and with what parameters) represents the total number of calls made by the salesman?
  - (b) What is the probability that the number of calls made is more than 20? (You may express this as a sum.)
  - (c) What is the expected number of calls?
  - (d) What is the variance of the number of calls?
- (3) Consider a gambling game in which a player selects 5 different numbers between 1 and 10, and then 5 random numbers are selected (without replacement) between 1 and 10. The payoffs are as follows: If the player matches all 5 of the selected numbers he wins \$400, if the player matches 4 numbers he wins \$20 and if he matches 0 of the selected numbers he wins \$200. If it costs \$5 to play and  $X$  is the amount won minus the cost of playing, find the expected value of  $X$ . (The random variable  $X$  is called the *payoff* of the game so you are computing the expected payoff of the game.)
- (4) A group of 6 players numbered 1 to 6 play a sequence of games. In each game there is one winner, and  $p_i$  is the probability that player  $i$  wins a given game. If the players play exactly 6 games, what is the expected number of players who win no games. (Your answer will be a sum involving the quantities  $p_1, p_2, p_3, p_4, p_5, p_6$ .)
- (5) You are going hunting for pearls. If you select a clam at random and open it, the probability that it contains a pearl is about 1 in 12000.
  - (a) Estimate the number of clams that must be opened so that the expected number of pearls found is 1.

---

<sup>1</sup>Version: 10/24/13

2

- (b) Estimate the number of clams that must be opened so that the probability of finding a pearl is at least  $1/2$ .
- (c) Estimate the number of clams that must be opened so that the probability of finding a pearl is at least  $.9$