Math 3339

Homework 3 (Chapter 4)

Name:_____ PeopleSoft ID:_____

Instructions:

- Homework will NOT be accepted through email or in person. Homework must be submitted through CourseWare BEFORE the deadline.
- Print out this file use or software and complete the problems.
- Write in black ink or dark pencil or type your solutions in the space provided. You must show all work for full credit.
- Submit this assignment at http://www.casa.uh.edu under "Assignments" and choose **hw3**.
- Total possible points: **15**

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1. A fair coin is tossed until either a tail occurs or 5 heads in a row have occurred. Let X denote the number of tosses. Find the frequency function, mean and variance of X.

2. A biased coin has probability 0.8 of turning up heads. You win $x if a head comes up and you lose $y if a tail comes up. If your expected winnings is $0, what is the relationship between x and y?

3. Six people are randomly selected in succession, with replacement, from a class containing 25 men and 20 women.
   a. What is the probability of obtaining the sequence (1,0,0,0,1,1) where “1” indicates a man was chosen and “0” indicates a woman was chosen?
   b. Write down all the other outcomes of this sequential sampling experiment that lead to 3 men and 3 women being chosen. What are their probabilities?
   c. What is the probability that 3 or more men are chosen in the sampling experiment?

4. Use R's "pbinom()" function to verify Chebyshev's inequality for k=2 and k=3 when X follows *Binomial*(30, 0.2).

5. Henry and Jim are waiting for a raft. The number of rafts floating by over intervals of time is a Poisson process with a rate of λ=0.6 rafts per day. They agree in advance to let the first raft go and take the second one that comes along. What is the probability that they will have to wait more than a week? Hint: If they have to wait more than a week, the number of rafts in a period of 7 days would be λ*7.

6. Fire ant colonies occur according to a spatial Poisson process with a rate of 2.5 colonies per acre.
   a. What is the probability that a 10 acre plot of land will have 10 or fewer fire ant colonies?
   b. What are the mean and variance of the number of colonies on a 10 acre plot?

7. Of all customers purchasing automatic garage door openers, 75% purchase chain-driven model. Let X = the number among the next 15 purchasers who select the chain-driven model.
   a. What is the frequency function (pmf) of X?
   b. Compute $P(X > 10)$.
   c. Compute $P(6 \leq X \leq 10)$.
   d. Compute μ and σ^2.
   e. If the store currently has in stock 10 chain-driven models and 8 shaft-driven models, what is the probability that at least 7 out of the 15 customers select a chain-driven model from this stock?