Math 3339 Name:

HW #4

Please recall the following commands in R to compute probabilities associated with binomial, negative binomial and Poisson distributions.

`dbinom(x, size, prob)`: $P(X = x)$ for $X \sim B(size, prob)$
`pbinom(q, size, prob)`: $P(X \leq q)$ for $X \sim B(size, prob)$
`dnbinom(x, size, prob)`: $P(X = x)$ for $X \sim NB(size, prob)$
`pnbinom(q, size, prob)`: $P(X \leq q)$ for $X \sim NB(size, prob)$
`dpois(x, lambda)`: $P(X = x)$ for $X \sim Poisson(\lambda)$
`ppois(q, lambda)`: $P(X \leq q)$ for $X \sim Poisson(\lambda)$

Note that the negative binomial rv in R counts the number of failures that occur before getting the desired success, as I explained in the lectures.

(1) The probability of producing a high-quality color print is 0.10. How many prints do you have to produce so that the probability of producing at least one quality print is larger than 0.90?

(2) The university football team has 11 games on its schedule. Assume that the probability of winning each game is 0.40 and that there are no ties. Assuming independence, what is the probability that this year's team will have a winning season, that is, that the team will win at least six games?

(3) If a student answers questions on a true-false test randomly (i.e., assume that $p = 0.5$) and independently, determine the probability that:

(a) the first correct answer is in response to question 4;

(b) at most four questions (that is, four or fewer) must be answered to get the first correct answer.

(4) Suppose that there are 100 defective items in a lot of 2000 items. If a sample of size 10 is taken at random and without replacement, what is the probability that there are two or fewer defectives in the sample?

(5) A stockbroker has a 60 percent probability of success in picking stocks that appreciate. Assume independence. You are investing in 20 securities that he suggested. Calculate the probability that

(a) 9, 10 or 11 stocks will appreciate;

(b) that fewer than 14 stocks will appreciate;

(c) calculate the mean and standard deviation of the number of the stocks that will appreciate.

(6) On average, 2.5 telephone calls per minute are received at the UH's switchboard. Assuming that the number of incoming calls per minute follows a Poisson distribution, compute the probability that at any given minute there will be more than 2 calls.

(7) Suppose that in one year the number of industrial accidents X follows a Poisson distribution with mean 3.0. If each accident leads to an insurance claim of \$5,000, how much money would an insurance company need to keep in reserve to be 95 % certain that the claims are covered?

(8) A delivery company found that the number of complaints was six per years on average. Assuming that the number of complaints follows a Poisson distribution, calculate the probability of having no complaints in

(a) all of next year;

(b) the next quarter.