Math/Stat 414.1   Name: _____

Exam 1

Febrauary 18, 2011

Instructions: Please read!

1. Do all work on this exam packet. It is okay to leave your answer unsimplified, as in $0.56\frac{15!}{6!9!}$ or $14e - 20$. This means that no calculator is needed.

2. Show all work for full credit! Small mistakes in arithmetic wont reduce credit if you show work; but conversely, even a correct answer could get no credit without supporting work.

3. I will award partial credit where appropriate.

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1. Drawer A contains five pennies and three dimes, while drawer B contains three pennies and seven dimes. A drawer is selected in the following way. A die is rolled. If a 1 or 2 comes up, then drawer A is selected and a coin is drawn. If a 3,4,5 or 6 comes up, then drawer B is selected and a coin is drawn.

   (a) Find the probability of selecting a dime.
   (b) Suppose a dime is obtained. What is the probability that it came from drawer B?

2. A football coach has 49 players available for duty on a special kick-receiving team.

   (a) If eleven players must be chosen to play on this special team, how many different teams are possible?
   (b) If the 49 include 28 offensive and 21 defensive players, what is the probability that a randomly selected team has 6 offensive and 5 defensive players?

3. If random variable X has the moment generating function $M(t) = e^{2t+3t^2}$, find the variance of X using the moment generating function.

4. Find $E[z^X]$ where z is a real number and X is a geometric-distributed random variable. (Hint: Recall how we calculated the moment generating function for a geometric-distributed random variable.)

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5. A machine makes bolts at the rate of 1000 per hour. The probability of any given bolt is defective is 0.023 and is independent of whether any other bold is defective.

   (a) What is the exact distribution for the number of defects in an hour? What is the probability of 3 defects in an hour?

   (b) Is there a standard way to approximate the probability of 3 defects in an hour given the circumstances?

   (c) What is the mean number of defects in one hour? Is it different if you use the exact versus approximate distribution?

6. Let $E[X] = 2 \ Var[X] = 4$. Find

$$E\left[\left(\frac{X-2}{2}\right)^2\right]$$