Statistics 1211 Midterm 6/12/2015

1. A certain licensing exam consists of 3 parts. Consider a randomly selected individual who has taken the exam, and define events by A_1 = passing score on part #1, A_2 = passing score on part #2 , A_3 = passing score on part #3. Suppose that

$$P(A_1) = .55, \quad P(A_2) = .65, \quad P(A_3) = .70, \quad P(A_1 \cup A_2) = .80 ,$$

$$P(A_1 \cap A_3) = .32, \quad P(A_2 \cap A_3) = .52, \quad P(A_1 \cup A_2 \cup A_3) = .88$$

(4) a. Based on the given probabilities, why are A_2 and A_3 not independent events?

(4) b. What is the probability that the individual passes none of the three parts?

(4) c. What is the probability that the individual passes both part #1 and part #2?

(4) d. Given that the individual did NOT pass part 1, what now is the probability that he/she passed both of the other two parts (a conditional probability)? W`

2. Blue Cab operates 15% of the taxis in a certain city and Green Cab operates the other 85%. After a nighttime hit and run accident involving a taxi, an eyewitness said the vehicle was blue. Suppose, though, that under night vision conditions, only 80% of individuals can correctly identify the color of the vehicle i.e., if the cab is blue, 80% chance the witness says it was blue and 20% chance the witness says it was green, if the cab is green then 80% chance witness says it was green and 20% the witness says it was blue. What is the probability that the taxi at fault was blue given the witness said that it was blue? (This is a conditional probability.) [10]

3. A mail-order computer business has four telephone lines. Let X denote the number of lines in use at a specified time. Suppose the pmf of X is as given in the accompanying table.

x	0	1	2	3	4
$p(x)$	.30	.20	.15	.20	.15

Calculate the probability of each of the following events

(4) a. {at most two lines are in use}
(4) b. {at least two lines are in use}
(4) c. {between one and three lines, inclusive, are in use}

(4) d. Calculate the expectation of X.

4. Miscellaneous probability distribution questions:

a. Suppose that 10% of all people who buy a certain type of computer purchase an extended warranty. If 25 buyers of such a computer are randomly selected, what are the mean value and standard deviation of the number who also purchase an extended warranty? *Hint: Let S (for success) = purchase an extended warranty.* [3]

b. Return to the scenario of (a). What is the probability that **more than** 5 of the 25 purchase an extended warranty? [3]

c. Visits to a certain web site during a certain period occur according to a Poisson distribution with parameter 5. What is the probability that the actual number of visits in this period is **smaller than** the mean number of visits? [3]

d. If Z is a **standard** normal random variable, what is the median of the distribution of Z, and what is P(Z = 0)? [4]

5.

The weekly demand X for propane gas (thousands of gallons) from a particular facility is a continuous random variable with pdf

$$f(x) = \begin{cases} 2\left(1-\dfrac{1}{x^2}\right) & 1 \le x \le 2 \\ 0 & \textit{otherwise} \end{cases}$$

a. Obtain the cumulative distribution function of X. [5]

b. Calculate the expected demand. [5]

c. Calculate the variance of demand. [5]