STAT/MA 41600

In-Class Problem Set #18: September 30, 2015

1a. Suppose X and Y are independent Poisson random variables, each with expected value 2. Define $Z = X + Y$. Find $P(Z \leq 3)$.

1b. Consider a Poisson random variable X with parameter $\lambda = 5.3$, and its probability mass function, $p_X(x)$. Where does $p_X(x)$ have its peak value?

2a. If X is a Poisson random variable with expected value 2.2, find the conditional probability that $X > 4$, given that $X > 2$.

2b. If X is a Poisson random variable with expected value 2.2, find the conditional probability that $X \leq 1$, given that $X \leq 3$.

3a. Suppose that, during a given week, 5,000,000 people play a lottery game. If their chances to win the lottery are independent, and if each person has probability 1/2,000,000 of winning the lottery, write an *exact expression* for the probability that there are exactly 4 winners of the lottery that week. (This actual probability corresponds to a particular value of the probability mass function of a Binomial random variable.)

3b. Briefly explain how you can *approximate* the value in part (3a) using a Poisson random variable. Then give an approximate value for the probability that there are exactly 4 winners.

4. Suppose that X is a Poisson random variable with $\mathbb{E}(X) = \lambda$. Find $\mathbb{E}((X)(X-1)(X-2))$.