

- 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 probably $1/2,000,000$ 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 $\mathbb{E}((X)(X - 1)(X - 2))$.