Homework 3

S520, Spring 2019

Due at the beginning of class, Tuesday January 29th. Please upload your file to Canvas no later than 1pm on the due date. Late submission will be accepted (but penalized) before the solutions are posted.

Trosset question numbers refer to the hardcover textbook. Show all work.

1. Consider an unfair six-sided die. Let X be a discrete random variable representing the result of a roll of the die. The probability mass function of X is

$$f(x) = \begin{cases} 0.1 & x = 1 \\ 0.1 & x = 2 \\ 0.3 & x = 3 \\ 0.3 & x = 4 \\ 0.1 & x = 5 \\ 0.1 & x = 6 \\ 0 & \text{otherwise.} \end{cases}$$

   (a) Find $F(x)$, the cumulative distribution function of X, for all $x \in (-\infty, \infty)$. (3 points)

   (b) Find the expected value and the variance of X. (6 points)

   (c) Suppose I roll the die ten times (all independently.) Let Y be the sum of the ten die rolls. What are the expected value and the variance of Y? (3 points)

2. (9 points) A large bowl contains 50 chips (2 Red, 12 Green, 12 Blue, 12 Yellow, and 12 White). For each of the following situations, identify the distribution of Y and the parameters:

   (a) Y is the number of blue chips you get if you randomly select 5 chips from the bowl without replacement.

   (b) Y is the number of red chips you get if you randomly select 15 chips from the bowl with replacement.

   (c) Keep selecting the chips with replacement. Y is the number of chips selected before getting the first red one.

3. Trosset exercise 4.5.4 (6 points)

4. Trosset exercise 4.5.10 (3 points)

5. Trosset exercise 4.5.13 (6 points)

6. Trosset exercise 4.5.14 (9 points)