

MTH 372

Hw 10

Due Thursday, 12/2/2021.

Read Chapters 20, 21, 22, 28. of *Huber*.

p.134 #20.4 Suppose I roll a fair six-sided die over and over until I get a 5. Let T be the number of rolls that I make. What is $E[T]$?

#20.8 Let B_i be a Bernoulli process with parameter 0.2.

(a) Find $P(\min\{i : B_i = 1\} = 4)$. (In words: What is the probability that the first 1 occurs on the fourth trial?)

(b) Find $P(\min\{i : B_i = 0\} = 4)$. (In words: What is the probability that the first 0 occurs on the fourth trial?)

p.142 #21.2 For a Poisson process with a rate of 3.2 occurrences per hour, what is the expected time to the first occurrence?

#21.4 Suppose T_1, T_2, \dots are an iid sequence of $\text{Exp}(2)$ random variables. Let $N = \max\{n : T_1 + \dots + T_n \leq 4.1\}$. What is $P(N = 8)$?

#21.6 Requests for information at Honnold library during finals week arrive according to a Poisson process at rate 4.2 per hour.

(a) What is the expected number of requests seen during a six hour shift?

(b) What is the chance that the third request arrives before the end of the first hour?

(c) What is the covariance between the time of the third request and the time of the fourth request? (Hint: Define T_k to be the time of the k^{th} request. Then $T_4 = T_3 + (T_4 - T_3)$, and $T_3, T_4 - T_3$ are independent random variables.)

(d) Each request (independently) has a 5% chance of being unsolvable. What is the chance that at least one unsolvable request comes in during a six hour shift?

p.146 #22.2 Say N_1, \dots, N_{10} are Poisson random variables with mean 0.5. What is the chance that their sum is greater than 1?

p.178 #28.1 (modified) A small plastic bucket contains tiles with the letters MISSISSIPPI.

(a) Four of these tiles are drawn out of the bucket at random without replacement. Let X be the number of drawn tiles that are either M or I. Write out the values of the pmf $p_X(x)$.

(b) Four of these tiles are drawn out of the bucket at random **with** replacement. Let Y be the number of drawn tiles that are either M or I. Write out the values of the pmf $p_Y(y)$.

#28.2 A jar contains five blue and ten green marbles. Seven marbles are drawn from the jar, what is the chance that exactly 3 are blue?