STAT 341 - Worksheet
2/15/2019

Your Name (scribe): _____

Partner Name(s): _____

State without proof the distribution of each quantity.

a. The probability of seeing someone with red hair on a light rail train is θ .
   i. What is the distribution of seeing someone with red hair on one train ride?

   ii. What is the distribution of number of train rides until you see the first person with red hair?

   iii. What is the distribution of number of red-haired people you encounter after 30 train rides?

   iv. Given you know that in the previous 30 train rides, you saw 10 red-haired people, what is the distribution of number of encounters with red-haired folks in the first train ride you take this week?

   v. Given you know that for the previous 30 train rides, there were 10 encounters with red-haired folks, what is the distribution of number of red-head folks you'll see in your first 5 train rides next month?

b. Text messages arrive to your phone according to a Poisson process with rate λ per hour.
   i. What is the distribution of number of texts to arrive over a time interval of 20 minutes?

   ii. What is the distribution of number of texts to arrive over a time interval of 4 hours?

   iii. What is the distribution of wait times between arrivals?

   iv. What is the distribution of wait time until the first two texts have arrived?

   v. Is a Poisson process model really suitable for this situation? Consider the temporal dynamics of the text messages you receive.

c. Let $Z_1, Z_2, \ldots, Z_n$ be an iid random sample of size n from the $N(0,1)$.

i. What is the distribution of $\bar{Z}$?

ii. What is the distribution of $X \equiv a Z_1 + b$?

iii. What is the distribution of $\bar{X}$?

iv. What is the distribution of Z_1^2 ?

v. What is the distribution of $\sum_{i=1}^{n} Z_i^2$?

vi. What is the distribution of $Z_1 / \left[\left(Z_2^2 + Z_3^2 \right) / 2 \right]$?

vii. What is the distribution of $\left[\left(Z_1^2 + Z_2^2 + Z_3^2 \right) / 3 \right] / \left[\left(Z_4^2 + Z_5^2 \right) / 2 \right]$?