

STAT/MA 41600
In-Class Problem Set #41: November 29, 2017

1a. Suppose that the expected time until the next message appears on your GroupMe app is 26 seconds. Find an upper bound on the probability that no messages appear during the next 40 seconds.

1b. Now suppose that you know that the expected time until the next GroupMe message is 26 seconds, and the standard deviation of this time is 4 seconds. Find a bound on the probability that the waiting time is between 20 and 32 seconds.

2. Every day, a shop owner puts a random number of candies into a jar on the counter, and he offers a reward to whoever guesses the correct number of candies in the jar. It is rumored that the number of candies has expected value 545 and standard deviation 10. Suppose that these rumors about the distribution are true.

Bob decides that he is going to guess that there are between 515 and 575 candies in the jar. Can you give a bound on the probability that the true number of candies is somewhere in this range $[515, 575]$?

3 (review). Suppose that Bob eats candies until finding the first cherry flavor candy, and then he stops afterwards. Also suppose that Daniel eats jelly beans until he finds the first licorice flavor jelly bean, and then he stops afterwards. Let X denote the number of candies eaten by Bob, and let Y denote the number of jelly beans eaten by Daniel. Suppose that $\mathbb{E}(X) = 3$ and $\mathbb{E}(Y) = 5$, and suppose that X and Y are independent. Find the probability that X is less than or equal to Y .

4 (review). Suppose that X is the waiting time, in minutes, until Bob's aunt arrives. Also suppose that Y is the waiting time, in minutes, until Daniel's uncle arrives. If X and Y have joint probability density function $f_{X,Y}(x,y) = 120e^{-10x-12y}$, find the probability that X is less than or equal to Y .