STAT/MA 41600
In-Class Problem Set #37: November 13, 2015

1. Suppose that the time that a customer waits at a receiving center in the Union is Exponentially distributed, with an average wait of 2.5 minutes. Also, suppose that the students' waiting times are independent. Suppose that we survey 500 students, and we add up their waiting times. Let X denote the total waiting time of the 500 students.

1a. What kind of distribution does X have? What are the parameters of X?

1b. Write an integral expression for the probability that the total waiting time is less than 20 hours, i.e., less than 1200 minutes. In other words, write an integral for $P(X \leq 1200)$. You do not need to evaluate the integral.

1c. Approximate the probability in **1b**.

2. Consider 5000 stones whose weights are Normally distributed, each weight having expected value 70 grams, and standard deviation of 8 grams. A stone is considered "big" if it weighs 80 grams or more. (Assume that the weights are independent.) Let X denote the number of big stones found in the collection.

2a. What kind of distribution does X have? What are the parameters of X?

2b. Write a sum for the probability that there are 500 or fewer "big" stones in the collection. You do not need to evaluate the sum.

2c. Approximate the probability in **2b**.

3. Let X, Y be independent Poisson random variables, with $\mathbb{E}(X) = 5000$ and $\mathbb{E}(Y) = 4900$.

3a. Find a double sum for the probability that X is strictly less than Y. I.e., find a double sum for $P(X < Y)$. You do not need to evaluate the double sum.

3b. Approximate the probability in **3a**.

4. Consider 300 Continuous Uniform random variables, each of which has constant density on the interval $(0, 10)$. Assume that these random variables are independent. Find the probability that their sum is greater than 1600.