Name: _____

Group _____

- You are driving down an interstate when you suddenly realize you have missed your exit because you were busy listening to an exciting chapter of a Harry Potter book on CD. According to the CD case, the chapter lasts for 14 minutes. Assume you are driving 60 miles per hour (in other words, 1 mile per minute). You could have passed your exit anytime over the past 14 minutes. you want to know about the probabilities for where it was exactly (how far back in miles) as your turn around the head back to find it.
- a) Why is this a Continuous Uniform distribution situation?
- b) What does X represent in this scenario?
- c) What are the parameters?
- e) What is the density?
- e) Graph the density.

f) What is the CDF?

g) Graph the CDF

h) Find the probability that the exit was passed within a mile of the half-way point.

i) Find the probability that the exit was passed in the first minute of the chapter.

j) You are pretty sure that you were paying attention to the road until the last 4 minutes of the chapter when Voldemort tried to attack Harry, so within that 4-minute interval, what is the probability that you missed the exit within the last 30 seconds?

k) What is the expected value?

I) What is the standard deviation?

m) How many total miles do you expect to have to drive out of your way to get back to the missed exit (two times the miles past the exit)?

n) Find the standard deviation in the total miles out of your way that had to drive.

o) If you get reimbursed by your company 43 cents a mile for your trip plus the \$3.20 you spent on a grande moche at Starbucks (conveniently located at the turn-around spot) to wake yourself up as you get turned around, how much is the expected amount of money this detour will cost the company.

p) What is the standard deviation in tis amount of money that you get reimbursed in part (m)?

2) On the average, a category 4 (on the Stafford/Simpson scale) or stronger hurricane strikes the United States once every 6 years. A hurricane of this strength has winds of at least 131 miles per hour and can cause extreme damage. An insurance agency is considering whether it might want to stop insuring oceanfront homes and wants to assess the risk involved. The president of the company wants to know how long (in years) before the next hurricane that is category 4 or stronger hits the US. (Note: When I was in Florida, I was hit by a hurricane this strong and there was a huge problem with insurance companies wanting to drop coverage.)

a) Why is this an example of the Exponential distribution?

- b) What does X represent in this story? What values can X take?
- c) What is the parameter for this distribution?
- d) What is the density?
- e) Graph the density.

f) What is the CDF?

g) Graph the CDF.

h) What is the probability that there will be a hurricane that is category 4 or stronger within the next 5 years?

i) What is the probability that there will not be any hurricane that is category 4 or stronger, during the next 3 years?

j) What is the probability that there will be a hurricane that is category 4 or stronger, during the period that is between 5 to 10 years from now?

k) Given that there are no hurricanes that are category 4 or stronger during the next 3 years, what is the probability that there will not be any during the next 10 years? Do this problem two different ways

I) How long a waiting time do we need, if we want to be 75% sure that there is a hurricane that is category 4 or stronger during the waiting time?

m) What is the expected length of time (in years) between now and when the next hurricane that is category 4 or stronger will hit the US?

n) What is the standard deviation for the length of time?

3) The network latency per request from your computer to a server is Uniform between 30 ms and 150 ms.

a) What is the probability that a particular request is 60 ms or less?

b) If your computer makes 320 requests to the server, how many are expected to have a latency that is 60 ms or less?

4) A bird lands at a location that is Uniformly distributed along an electrical wire of length 150 feet. The wire is stretched tightly between two poles. What is the probability that the bird is 20 feet or less from one or the other of the poles.

5) A wall in a room is 108 inches tall and 132 inches wide. There is a painting on the wall that is 18 inches by 24 inches. If a tennis ball is accidentally flung at the wall, and the location where it lands is Uniformly distributed on the wall, what is the probability that the tennis ball hits the painting?

6) Suppose that a particular long jumper assumes that each of his jumps are Uniformly distributed between 6.5 and 7.2 meters. He is happy whenever he jumps 7 meters or more. If he makes 10 such jumps, what is the probability that he is happy with exactly 4 of his jumps? (Hint: What is the distribution?

7) Suppose that the length X of a randomly selected passenger's trip in a cab is Uniformly distributed between 5 and 30 miles. The charge induced fro such a trip, in dollars, is Y = 2.50X + 3.00.

a) How much should a randomly selected customer expect to pay?

b) What is the standard deviation of the amount that a randomly selected customers pays?

8) It is your birthday and you are waiting for someone to write a "Happy Birthday" message on your Facebook wall. Your waiting time is approximately Exponential with average waiting time of 10 minutes between such postings; assume that the times of the postings are independent.

a) What is the probability that the next posting takes 15 minutes or longer to appear?

b) What is the standard deviation of the time in between consecutive Happy Birthday messages?

c) Suppose that the most recent posting was done at 1:40 PM, and it is now 1:45 PM (i.e., no postings have been made during the last five minutes). What is the expected time for the next message to appear?

9) The time between consecutive uses of a vending machine is Exponential with average 15 minutes.

a) Given that the machine has not been used in the previous 5 minutes, what is the probability that the machine will not be used during the next 10 minutes?

b) What is the distribution of the number of purchases to be made within the next hour? Include the parameters and the reason for your choice.

c) How many purchases are expected within the next hour?

d) Suppose that a person pays 75 cents for each beverage in the vending machine. The supplier pays 40 cents per beverage in the machine, and thus makes a profit of 35 cents per beverage. What is the expected profit made during a given 8 hour period?