

CE 311S: Exam 1
Tuesday, October 13
12:30 – 1:45 PM

Name _____

Instructions:

- **SHOW ALL WORK** unless instructed otherwise. No shown work means no partial credit!
- If you require additional space, you may use the back of each sheet and/or staple additional pages to the end of the exam.
- If you need to make any additional assumptions, state them clearly.
- You may use one regular-sized sheet of notes; please turn in the notes with your exam. No additional resources are permitted.
- The number of points associated with each part of each problem is indicated.

Problem	Points	Possible
1		20
2		30
3		30
4		20
TOTAL		100

Problem 1. (20 points). It's finally here! This weekend is the *Round Rock City Limits* music festival, a low-budget event mostly featuring one-hit wonders and other "artists" whose music has not stood the test of time. As a starving student with questionable taste, you couldn't be more excited. You have made a list of all eleven shows you want to see on Day One. Unfortunately some of these are scheduled at the same time, so you need to choose one show at each time slot. Here is the list you have created:

12:00–1:30	Rick Astley, Rebecca Black, Right Said Fred
2:00–3:30	The Baha Men, Los Del Rio
4:00–5:30	Ja Rule, Nickelback, Soulja Boy
7:00–8:30	Ke\$ha
9:00–10:30	Fergie, Pitbull

- (a) (5) How many different schedules can you create?
- (b) (5) How many schedules can you create where you see Rick Astley?
- (c) (5) If you pick your schedule completely at random, what is the probability that you see Rick Astley?
- (d) (5) If you pick your schedule completely at random, what is the probability that you see both Rick Astley and Pitbull?

Problem 2. (30 points). After the first three shows of the festival, you are starving and want to grab some food. There are three food trucks on site: Franklin BBQ, Torchy's Tacos, and the Ham Palace (featuring the cheapest and sketchiest ham dishes in town). You think carefully about where to go, because you are a huge Ke\$ha fan and would be devastated if you are late to her show. Based on your extensive experience attending this festival, you know that the probability of long lines at Franklin's, Torchy's, and the Ham Palace are 0.9, 0.8, and 0.1, respectively. You also know that the probability that you fall ill after eating at these food trucks is 0.1, 0.2, and 0.8, respectively. (Assume that these probabilities are independent of the probabilities of long lines.) If the lines are long, or if you fall ill, you will be unable to make the start of Ke\$ha's show.

- (a) (5) If you eat at the Ham Palace, what is the probability you make the start of Ke\$ha's show?
- (b) (5) Which food truck should you attend to maximize the probability you can make the start of Ke\$ha's show?
- (c) (20) You are so pumped up from the Soulja Boy show that you do not trust your ability to calculate probabilities, so in the end you choose one of the three food trucks randomly. If you end up falling ill, what was the probability that you chose to eat at the Ham Palace?

Problem 3. (30 points).

- (a) (10) After ordering at the Ham Palace, you have to wait five minutes for your food. You notice that no other customer arrives while you wait for your food. As a frequent visitor to the Ham Palace, you realize that the probability of this happening was exactly 10%. Assuming this is true, what is the mean and standard deviation of the number of customers at the Ham Palace in the next hour?
- (b) (10) Unfortunately, you fall ill and have to miss the rest of Day One. Thinking about tomorrow, it turns out that 4 out of the 20 shows on Day Two are good, and the rest are terrible. If you pick 5 shows completely at random, what is the probability that you see more good shows than terrible ones?
- (c) (10) After Day Two is over, you and your friends are trying to decide where to go out. Your friends are very picky, so there is only a 10% chance they will agree with any given place you suggest. Let N be the number of places you have to suggest before you name one that is agreeable to your friends (so, if the first place you name is acceptable, $N = 1$, etc.). What are the mean and standard deviation of N ?

Problem 4. (20 points). Finally, you and your friends agree on a place to go. When you arrive, at the bar you happen to see Taylor, whom you are madly in love with and have been trying to talk to all semester. Unfortunately all six seats at the bar are currently occupied. You decide to wait until one of the seats next to Taylor is free. Over the next hour, the other five people at the bar get up one by one, in a random order. Let A be the number of people who get up before I can sit next to Taylor. Assuming that Taylor is in the third seat from the left, answer the following questions.

- (a) (10) What is the PMF for A ?
- (b) (5) What is $E[A]$?
- (c) (5) What is the standard deviation of A ?