

CE 311S: Exam 1
Thursday, February 27
2:00 – 3:15 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		15
2		30
3		25
4		15
5		15
TOTAL		100

Problem 1. (15 points). This summer you take an internship position at the National Security Agency. Due to a routine mixup, you are accidentally granted access to an enormous trove of secret documents including personal information, classified government programs, and Colonel Sanders' original recipe of 11 herbs and spices. Not knowing what else to do, you randomly post 6 of these documents to your Facebook page. It turns out that each document contains personal information on a different number of citizens, as shown below:

34 64 70 58 30 80

- (a) (5) What is the mean number of citizens spied on by each document?
- (b) (5) What is the median?
- (c) (5) What is the variance?

Problem 2. (30 points). After posting these documents to Facebook, you start getting calls from reporters day and night (independent of each other), at an average rate of 2 per hour, each requesting an interview. You talk to them, hoping to find an agreeable reporter who will write an open-minded article, but unfortunately only 10% of reporters are agreeable, and you reject any interview requests from disagreeable reporters. When you finally get an interview, you are asked 20 questions. Unfortunately you are so nervous that for any question asked, there is a 90% probability that you babble incoherently and fail to answer the actual question.

To answer these questions, you may need to make additional reasonable assumptions. **You must state any such assumptions** in addition to answering the following questions:

- (a) (10) How many calls from reporters do you expect to get in the next day? What is the standard deviation?
- (b) (10) What is the probability that you have to reject more than one interview before talking to an agreeable reporter?
- (c) (10) During an interview, what is the probability that you successfully answer all 20 questions? What is the average number of questions you will answer successfully?

Problem 3. (30 points). Unsurprisingly a warrant is issued for your arrest and you are forced to flee the country. You hop on an international flight and begin traveling the world, hoping to find a country which will let you enter. The only three countries you think will let you enter are China, Germany, and Russia. To the best of your knowledge, the probability you will end up in these three countries are 0.5, 0.3, and 0.2, respectively. If you enter China, the probability you will eventually be caught and is 0.2; in Germany 0.3; and in Russia 0.1.

- (a) (10) What is the probability you will be caught in Russia?
- (b) (10) What is the probability you will be caught?
- (c) (10) If you are caught, what is the probability you were caught in Russia?

Problem 4. (15 points). Before fleeing the country, you find one more folder of 40 documents. Of these, 3 are highly classified (illegal military operations), 17 are merely secret (diplomatic cables), and 20 are completely mundane (your grandmother's recipes for biscuits). You randomly choose 3 of these documents to release.

- (a) (5) What is the probability that all of the documents you release are mundane?
- (b) (5) What is the probability that none of the documents you release are mundane?
- (c) (5) What is the expected number of mundane documents released?

Problem 5. (15 points). You are finally down to the last 3 highly classified documents concerning illegal military operations (call them A, B, and C). You randomly choose document A, and give it to a friend for safekeeping. After doing so, Julian Assange (Wikileaks founder, international fugitive, and maniac on the dance floor) calls you and tells you that two of the three documents are so secret that you will be killed if they are released. For a hefty fee, he offers to look at the two documents you have left (B and C), and point out one of the documents which will get you killed (if they will both get you killed, he picks one of them randomly). You agree, and he tells you that releasing document B will get you killed.

- (a) (7) What is the probability you are killed if you continue with your original plan of releasing document A?
- (b) (8) What is the probability you are killed if you release document C instead?