Math 325 Section 01 **Exam 1**
Professor Carty **February 27, 2019**
50 points possible

Name: _____

1. No hats or dark sunglasses. All hats are to be removed.
2. All book bags are to be closed and placed in a way that makes them inaccessible. Do not reach into your bag for anything during the exam. If you need extra pencils, pull them out now.
3. Be sure to print your proper name clearly.
4. Use of the battery or solarpowered Texas Instruments BA35 model calculator, the BA II Plus, the BA II Plus Professional, the TI30Xa or TI30X II (IIS solar or IIB battery), or TI-30X MultiView (XS Solar or XB Battery) allowed.
5. Watches with recording, internet, communication or calculator capabilities (e.g., a smart watch or fitness band) are prohibited.
6. All electronic devices, including cell phones and other wearable devices, must be powered off and stored out of sight for the entirety of the exam.
7. If you have a question, raise your hand and I will come to you. Once you stand up, you are done with the exam. If you have to use the facilities, do so now. You will not be permitted to leave the room and return during the exam.
8. Every exam is worth a total of **50 points**. Including the cover sheet, each exam has 7 pages.
9. If you finish early, feel free to quietly and respectfully get up and hand in your exam.
10. When time is up, you will be instructed to put down your writing utensil, close the exam and remain seated. Anyone seen continuing to write after this announcement will have their exam marked and lose all points on the page they are writing on. I will come and collect the exams from you.
11. You have fifty minutes to complete the exam. Good luck.

1. (5 points) Of the travelers arriving at a small airport, 60% fly on major airlines, 30% fly on privately owned planes, and the remaining fly on commercially owned planes not belonging to a major airline. Of those traveling on major airlines, 50% are traveling for business reasons, whereas 60% of those arriving on private planes and 90% of those arriving on other commercially owned planes are traveling for business reasons. Suppose that we randomly select one person arriving at this airport. What is the probability that the person

   (a) is traveling for business?

   (b) arrived on a privately owned plane, given that the person is traveling for business reasons?

2. (6 points) A certain type of aluminum screen that is 2 feet wide has on the average one flaw in a 100-foot roll. Find the probability that a 50-foot roll has more than one flaw.

3. (5 points) Three brands of coffee, X, Y, and Z, are to be ranked according to taste by Patrick. Define the following events:

A**:** Brand X is preferred to Y

B**:** Brand X is ranked best.

C**:** Brand X is ranked second best.

D**:** Brand X is ranked third best.

If Patrick actually has no taste buds and randomly assigns ranks to the brands, is event A independent of events B, C, and D?

4. (8 points) A barrel contains six balls, which are numbered 1 to 6. Player A and Player B play a game. The winner of the game is the first person to choose the number 6 ball.

   (a) If the game is "in turn, each selects a ball from the barrel, then returns it to the barrel if they did not win", determine the *exact* probability that the player who goes first will win.

   (b) If the game is "in turn, each selects a ball from the barrel, and removes the ball if they did not win", determine the *exact* probability that the player who goes first will win.

5. (6 points) Let Y have a binomial distribution with mean of 4 and standard deviation of $4/\sqrt{5}$. Find $P(Y = 4)$.

6. (6 points) An insurance company issues a 1000$ policy for an event A. Historical records indicate that they need to payout on a claim about once for every fifty policy holders. For each policy, there is an administrative fee of 15$. Assuming $P(A) = 1/50$, if the company wants to profit 50$ per policy, how much should they charge for each policy?

7. (6 points) In an NBA championship series, the team which wins four games out of seven will be the winner. Suppose that team A has probability 0.55 of winning over the team B, and the teams A and B face each other in the championship games.

   (a) What is the probability that team A will win the series in six games?

   (b) What is the probability that team A will win the series?

8. (3 points) Let A, B, and C be three events for a given experiment. Express the following verbal statements in set notation.

   (a) "none of the three events occurs"

   (b) "two of more of the events occur"

9. (5 points) (a) State the DeMorgan's Laws.

   (b) Use set theory to prove that for any event's A and B, show that

$$P(A \cap B) \geq 1 - P(\overline{A}) - P(\overline{B}).$$