## APPM 3570: Homework Set 8

Note: To help out the LAs, please draw a grading table at the top of the first page of your homework. The table should have five rows and two columns, just like the ones drawn on your graded homework.



- 1. Chapter 4 in Ross: Problem 65 ; Theoretical Exercise 35
- 2. Chapter 5 in Ross: Problems 4,6,13,20; Theoretical Exercises: 5,8
- 3. Test retaking. Each time a student takes an exam, their score is a independent sample from a uniform distribution on [0, 100].

(a) If a student is allowed to take the exam twice, and average their two resulting scores, what will be their expected score? What if they are allowed to take the exam one hundred times and average their resulting scores?

(b) An alternate policy allows a student to retake the exam once, but if they do, they must accept their second score as their final score. If a student only decides to retake the exam if their initial score is less than 50, what will their expected final score be?

(c) A very generous instructor allows their students to retake their exam as many times as they wish and then accept their most recent score. Describe a strategy that would ensure a student would get at least a 90 on the exam. What is the student's expected score in this case? Also, what is the average number of times the student must take the exam to get at least a 90?

4. **Normal distributions.** Annual snowfall at Eldora Mountain Resort is approximated by a normal distribution with mean 300 inches and standard deviation 100 inches.

(a) The resort roughly breaks even in terms of profits if snowfall in a year is between 200 and 400 inches. What is the probability the resort breaks even this year?

(b) The resort loses money if snowfall is less than 200 inches, but makes double profits if snowfall is greater than 400 inches. What is the probability the resort loses money in a given year? What is the probability the resort makes double profits in a given year?

(c) The resort will need to shut down if it has a losing money year **unless** that year is preceded by a double profits year. Considering events over 2020, 2021, and 2022, what is the probability the resort will have to shut down sometime during those three years? (Assume a low snowfall year in 2020 results in a shut down.)