Stat 410: Midterm 1

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Read carefully the following instructions:

- Write your name & student ID on the exam book and sign it.
- You may not use any books, notes, or calculators.
- Solve all problems. Answer all problems after carefully reading them. Start every problem on a new page.
- Show all your work and explain everything you write.
- Exam time: 75 minutes
- Good luck!

Problems: (Each problem = 10 points. Maximum total points = 50)

1. (a) How many different numbers can be obtained by arranging the digits contained in the number 5,751,542,269 ?

   (b) How many of these numbers have the digit 9 followed by the three 5's?

2. An American citizenship test is given in a class with 10 Mexican nationals, 8 Saudi nationals, and 3 French nationals. What is the probability that the first three to finish the test are all Mexican?

3. A box contains 7 fair dice and 3 unfair dice. For the unfair dice, the probability that 6 comes out is 1/4. Suppose a die is randomly selected and tossed 5 times.

   (a) Compute the probability that the first toss was a 6.

   (b) Compute the probability that the dice is unfair given that all 5 times it landed on 6.

4. There are 5 boxes. Each of them contains 4 red balls, 3 green balls, and i blue balls ($i = 1, \ldots, 5$). (The first box contains 4 red balls, 3 green balls, and one blue ball. The second box contains 4 red balls, 3 green balls, and two blue balls, etc.). Carly randomly selects a box and then removes two balls from that box (without replacement).

   (a) What is the probability that the two balls are one red and one blue?

   (b) Assume that the two chosen balls are one red and one blue. What is the probability that the i-th box has been selected, for each $i = 1, \ldots, 5$?

5. Bernie and Ted choose 3 rocks each from a box containing 7 red and 7 blue rocks.

   (a) Find the probability that Bernie gets 1 red and 2 blue rocks.

   (b) Find the probability that Bernie gets 1 red and 2 blue rocks given that Ted got 2 red and 1 blue rocks.

   (c) Find the probability that Bernie gets 1 red and 2 blue rocks given that Ted did not get 2 red and 1 blue rocks. (Hint: use the law of total probability).