COSC 030, Fall 2014: Problem Set $\#7$

Assigned: Thursday, 10/23.
Due: Tuesday, 11/4. **Lectures Covered:** Weeks 9 and 10 (Chapters 7.1, 7.2, 7.4).
Academic Integrity: You must work alone on the problem set and not consult outside sources (with the exception of the professor and teaching assistants). See the syllabus for details on the academic integrity policy for problem sets.

Problems

Note #1: When asked to provide a probability you can express the probability as a fraction (e.g., you can say, $9/115$ instead of 0.07826086956).

Note #2: For all problems you must **show your work** to get full credit.

1. Consider a game where I roll two dice and you win if their sum is greater than 9.

   - What is the probability that you win?
   - Assume on one of the two die I scratch out some of the dots on the side showing 6 so that it reads 3. Now what is the probability that you win?

2. Consider a game where I roll six dice and you win if no more than four of the dice roll a one. What is the probability that you win?

3. Assume I weight a die so that: (1) the probability of rolling a 1 is the same as the probabiltiy of rolling a 6; (2) the probability of rolling a $2, 3, 4$ or 5 are all the same; (3) you are three times more likely to roll a 1 than a 5. Consider a game where you win if you roll a value less than 3. What is the probability that you win?

4. I generate a string of 5 bits by flipping a coin 5 times (heads = 0 and tails = 1). Given that the first two flips are heads, what is the probability that I end up with a string containing at least three 0's in a row? (To receive full credit you must use conditional probability in calculating your answer.)

5. Consider a gambling game where I roll two dice. If both dice roll the same value, you win $10. Otherwise, you lose $1. What is your expected winnings for this game?

6. Describe how to adjust the payouts and/or loss amounts for the game from the previous problem such that the game becomes "fair" (i.e., over time your average winnings should converge to $0).