8/28/18 Kengo Kato

STSCI 5080 Homework 1

- Due is 9/6 (Th) in class.
- Write your name and NetID at the top of the first page, along with the assignment number.
- Use only the one side of the paper. Attach your pages with a staple at the top left corner.
- There are five problems. Each problem is worth 10 points.

Problems

1. Two six-sided dice are thrown sequentially, and the face values that come up are recorded.
   (a) List the sample space. (Hint). One example of outcomes is $(1, 2)$.
   (b) List the elements that make up the following event: A =the sum of two values is 6.
   (c) Suppose that all the outcomes occur equally likely. What is the probability of event A?
2. Suppose that we know that $P(A) = 1/4, P(B) = 3/8$, and $P(A \cap B) = P(A)P(B)$ holds. Then compute the value of $P(B \cap A^c)$.
3. In a certain city, three newspapers X, Y and Z are published. Suppose that 60 percent of the families in the city subscribe to newspaper X, 40 percent of the families subscribe to newspaper Y and 30 percent to newspaper Z. Suppose also that 20 percent subscribe to both X and Y, 10 percent to both X and Z, 20 percent to both Y and Z, and 5 percent subscribe to X, Y and Z. What percentage of families in the city subscribe to at least one of the three newspapers?

   (Hint). You may use the following identity:

   $$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C).$$

4. Prove the following formula:

   $$P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2 \mid A_1)P(A_3 \mid A_1 \cap A_2),$$

   where we assume all of the conditioning events have positive probabilities.
5. Three cards are drawn from an ordinary 52-card deck without replacement (drawn cards are not placed back in the deck). What is the probability that none of the three cards is a heart?

   (Hint). Use the result of Problem 4.