Math 351 - Spring 2025: Homework 3

Due: Monday, March 3, 2025

Instructions: Be sure to give explanations to your answers. I'm interested not only in whether you get the correct answer but also how you obtained it and your thought process along the way. Don't just write down a number even if the answer seems obvious.

1. A standard deck of 52 cards is shuffled and dealt out to thirteen people so that each person has four cards. What is the probability that each player has exactly one diamond (i.e. has exactly one card whose suit is a diamond)?

2. Two cards are randomly chosen without replacement from a standard deck of 52 cards. Let B denote the event that both cards are clubs. Let Ac denote the event that the ace of clubs is chosen. Let C denote the event that at least one club is chosen. Find $P(B|Ac)$ and $P(B|C)$.

3. Urn A has $N-1$ red balls and 1 green ball. Urn B has 1 red ball and $N-1$ green balls. An urn is picked at random and a ball is chosen from it. If the ball is red, what is the probability that it came from urn A?

4. A coin is flipped until heads appears ten times. (a) What is the probability that the tenth heads appears on the 20th flip?

   (b) If instead the coin is flipped until heads appear N times, what is the probability that the N^{th} heads appears on flip number $2N$?

5. A fair die is rolled. If the outcome is i (where $i \in \{1,2,3,4,5,6\}$), then a ball is drawn from an urn that has i red balls and 1 blue ball. Suppose that a blue ball was drawn. For each $i = 1,2,3,4,5,6$, determine the probability that the outcome of the roll of the die was i.