

1. At a certain college, 40% of the students live in a residence hall (on-campus), and the other 60% of the students live off-campus. Suppose that students who live in the residence hall arrive to class on-time with probability 0.85, and students who live off-campus arrive to class on-time with probability 0.70.

If a random student is interviewed, and it is found that the student arrived on-time, what is the probability that the student lives in a residence hall?

2. Suppose that a drawer contains 8 marbles: 2 are red, 2 are blue, 2 are green, and 2 are yellow. The marbles are rolling around in a drawer, so that all possibilities are equally likely when they are drawn. Alice chooses 2 marbles without replacement, and then Bob chooses 2 marbles. Let  $A$  denote the event that Alice's 2 marbles have a matching color. Let  $B$  denote the event that Bob's 2 marbles have a matching color.

2a. Find  $P(A | B)$ , i.e., given that Bob's marbles have a matching color, find the probability that Alice's marbles had a matching color.

2b. Find  $P(A^c | B)$ , i.e., given that Bob's marbles have a matching color, find the probability that Alice's marbles did not have a matching color.

3. Suppose that a box contains 10 balls. At the start, 3 are white and 7 are blue. On round 1, a ball is selected from the box, and a layer of blue paint is applied to it; so, if it was blue, it stays blue; if it was white, it becomes blue. Then the ball is replaced in the box.

At the very start of round 2 (i.e., *before any painting in round 2 is performed*), suppose that the ball chosen from the box is already blue.

3a. What is the probability that this blue ball was originally blue (before round 1)?

3b. What is the probability that this blue ball was originally white (before round 1)?

4. In round 1 of a game, Alice and Bob roll a die simultaneously. Alice's die is 6-sided. Bob's die is 4-sided. If Bob's first roll is smaller-than-or-equal to Alice's, then Bob quits the game. If, on the other hand, Alice's first roll is (strictly) smaller than Bob's, then Alice quits the game. The player who remains alive in the game rolls her/his die a second time. What is the probability that this second roll shows a value of "3"?

5. Suppose we put five different dice into a hat. The dice have the following number of sides: 4, 6, 8, 12, 20. When we choose a die from the hat, each of the five dice are equally likely to appear. Suppose that a "7" appears. (Obviously it was neither the 4-sided nor the 6-sided die that was chosen.)

5a. What is the probability that the 8-sided die was chosen?

5b. What is the probability that the 12-sided die was chosen?

5c. What is the probability that the 20-sided die was chosen?

6. This is a classical one: Suppose that there are two coins in a hat. One of the coins is painted white on both sides. The other coin is painted white on one side, and blue on the other side. Juanita reaches into the hat and pulls out a coin. The side facing upward is white. What is the probability that the side facing downward is white too?