

Third assignment
 Math 217 Probability and Statistics
 Prof. D. Joyce, Fall 2014

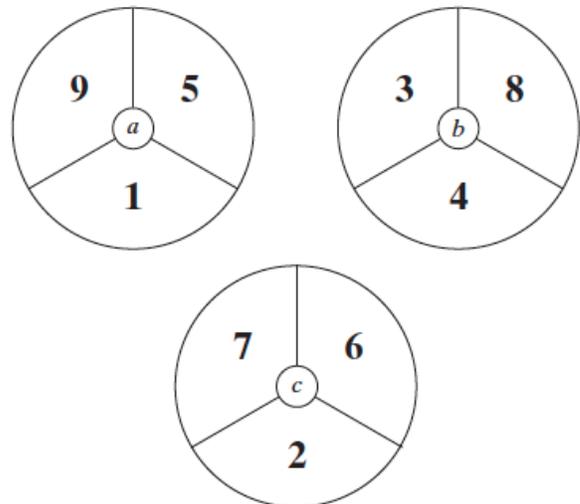
- (Exercise 40, page 51.) A town has 4 people who repair televisions. If 4 sets break down, what is the probability that exactly i of the repairers are called? Solve the problem for $i = 1, 2, 3, 4$. What assumptions are you making?
- What is the probability that at least 2 of the presidents of the United States died on the same day of the year? If you bet this has happened, would you win your bet?
- Explain why it is not possible to define a uniform discrete distribution function on a countably infinite sample space Ω . Hint: Assume $P(x) = a$ for all $x \in \Omega$, where a is some fixed number, $0 \leq a \leq 1$. Can P have all the properties of a probability function?
- A reader of Marilyn vos Savant's column wrote in with the following question:

My dad heard this story on the radio. At Duke University, two students had received A's in chemistry all semester. But on the night before the final exam, they were partying in another state and didn't get back to Duke until it was over. Their excuse to the professor was that they had a flat tire, and they asked if they could take a make-up test. The professor agreed, wrote out a test and sent the two to separate rooms to take it. The first question (on one side of the paper) was worth 5 points, and they answered it easily. Then they flipped the paper over and found the second question, worth 95

points: 'Which tire was it?' What was the probability that both students would say the same thing? My dad and I think it's 1 in 16. Is that right?"

- Assume that the test-takers' answers are independent and all four answers are equally likely. Is the answer $1/16$?
- The following question was asked of a class of students. "I was driving to school today, and one of my tires went flat. Which tire do you think it was?" The responses were as follows: right front, 58%, left front, 11%, right rear, 18%, left rear, 13%. Suppose that this distribution holds in the general population, and assume that the two test-takers are randomly chosen from the general population. What is the probability that they will give the same answer to the second question?

- (Exercise 56, page 51.) Two players play the following game: Player A chooses one of the three spinners a , b , or c in the figure, then player B chooses one of the remaining two spinners. Both players then spin their spinner and the one that lands on the higher number is declared the winner. Assuming that each spinner is equally likely to land on any of its three regions, would you rather be player A or player B ? Explain your answer!



- 6.** Consider the bet that all three dice will turn up sixes at least one in n rolls of three dice. Calculate $f(n)$, the probability of at least one triple-six when three dice are rolled n times. Determine the smallest value of n necessary for a favorable bet that a triple-six will occur when three dice are rolled n times. (DeMoivre would say it should be about $216 \log 2 = 149.7$ and so would answer 150. Do you agree with him?)
- 7.** Assume that E and F are two events with positive probabilities. Show that if $P(E|F) = P(E)$, then $P(F|E) = P(F)$.
- 8.** A coin is tossed three times. What is the probability that exactly two heads occur, given that
- the first outcome was a head?
 - the first outcome was a tail?
 - the first two outcomes were heads?
 - the first two outcomes were tails?
 - the first outcome was a head and the third outcome was a head?
- 9.** A die is rolled twice. What is the probability that the sum of the faces is greater than 7, given that
- the first outcome was a 4?
 - the first outcome was greater than 3?
 - the first outcome was a 1?
 - the first outcome was less than 5?
- 10.** A card is drawn at random from a deck of cards. What is the probability that
- it is a heart, given that it is red?
 - it is higher than a 10, given that it is a heart? (Interpret J, Q, K, A as 11, 12, 13, 14.)
 - it is a jack, given that it is red?
- 11.** From a deck of five cards numbered 2, 4, 6, 8, and 10, respectively, a card is drawn at random and replaced. This is done three times. What is the probability that the card numbered 2 was drawn exactly two times, given that the sum of the numbers on the three draws is 12?

Math 217 Home Page at <http://math.clarku.edu/~djoyce/ma217/>