MA2110 Probability
Assignment 1

August 4, 2017

1. Studies on adults over age 40 indicate that a man is broke with a probability of 0.3 . It also indicates that the chances of a man being a divorcee is 0.4 . A man is a divorcee and isn't broke at the same time with a probability of 0.2 .

   (a) What is the probability that a man is a divorcee and is broke?

   (b) What is the probability that a man is broke given that he is a divorcee?

2. Winter is here, Jon Snow is too afraid of white walkers and needs help from Queen Dany. Queen Dany giving dragonstone to Jon Snow and Jon bending the knee are independent events. The sum of probabilities of Jon getting dragonstone given that he doesn't bend the knee and Jon bending the knee given that he doesn't get the dragonstone is 0.7. Also the probability of Jon neither getting dragonstone nor bending the knee is 0.42 . What is the probability that Jon bends the knee?

3. Joey Tribbiani goes to a restaurant. The probability that he orders pizza is 0.4 , pasta is 0.3 and Lasagna is 0.2. The probability that he orders exactly two out of these three is 0.15. Also, the probability that he orders three items, given that he has ordered atleast two items is 0.25 and probability that he has ordered both pizza and pasta is 0.1.

   (a) What is the probability that he eats all three items?

   (b) What is the probability that he eats pasta given that he has eaten pizza?

4. Dr. House is a brilliant doctor and he likes to have a clean record. He has n patients over the last year. What is the probability that in the past year, after every treatment his number of successful treatments were more than the number of failures that he had untill that patient.

5. Spock chooses 3 unique vertices A,B and C of a regular polygon with n (≥ 3) sides . What is the probability that $\angle$ ABC is greater than $\frac{\pi}{4}$.

6. Flash is stuck inside a rectangular land with boundary of length a and breadth b, ($a > b$). What is the probability that he is closer to any one of the longer sides (of length a) than to any one of the shorter sides(of length b).

7. Louis Litt works at a law firm and his boss is very strict. He has to send n clients their respective files. But he is lazy and realises that he won't be fired if he sends the correct file to atleast one client. He sends the files randomly to each client. What is the probability that he won't be fired.

8. Sheldon likes to be perfect. He picked two numbers in range $[1, n]$. Let the probability that the sum of those two numbers is a perfect square be p_n . Find $lim_{n\to\infty}\ \sqrt{n}p_n$.

9. Monica has OCD and she doesn't like odd numbers. She has to write a number n as a sum of all elements in an ordered set of whole numbers of cardinality p. What is the probability that she has exactly k odd numbers in that set?

10. Lily is waiting for Marshall to come from Minnesota to tell him a good news. She gets worried about the rain and asks a weather analyst. He confirms that there is a 80% chance that there will be delay if it rains, but only 30% times when it doesn't. Weather forecast also confirms that there is a 40% chance that it will rain. What is the probability that Lily meets Marshall on time.

11. Harvey Specter is an expert poker player. Harvey and his friend Mike decide to play a game of poker to settle who is better. Mike knows from his experience that Harvey has one ace card and that he bluffs only 1 out of 4 times if he has "four of a kind" and 3 out of 4 times if he doesn't. 2 out of 5 cards on the table are aces. What is the probability that Harvey will bluff in his next move given that cards were dealt from a deck of 52 cards ?

12. Chandler and Joey love playing foosball and statistically , probability that Chandler scores a goal is p. They also keep count of the number of rounds they have played. However, Joey is stubborn and wants to play until he scores. What is the probability that Joey wins his first round at an even numbered match.

13. Bran meets Sansa after a long time and decide to play a game whose winner will be made Lord of Winterfell. It was a simple game of aiming a rock throw at a tree. The game finishes when anyone of them hits the tree. The probability of Sansa hitting the tree is α and Bran hitting the tree is β. What is the probability that Sansa wins if :

    (a) Sansa goes first

    (b) Bran goes first

14. Robin went on a road trip to Vegas with her friends. Later one night , she meets a guy Barney Stinson who claims that in that casino there are two sorts of machines. One of them pays out 10% of the time and the other pays out 20% of the time. The two of them are coloured red and blue. The only problem is Barney is too drunk and can't remember which colour corresponds to which machine and is kicked out by security. Robin finds a red and a blue machine and tosses a coin to choose which machine to go first. As her smart friend , help her update the estimated chances of winning if :

    (a) First machine pays out.

    (b) First machine doesn't pay out.