HOMEWORK ASSIGNMENT 2. CONDITIONAL PROBABILITY AND BAYES RULE

(1) Read sections on Conditional Probability, Theorem of Total Probability and Bayes Rule.

(2) Solve practice problems for Homework 2.

(3) Solve Homework Assignment 2 and submit your answers.

1. (10 marks) Trivedi, Sec 1.11 (page 44), #4

A certain firm has plants A, B, and C producing respectively 35%, 15%, and 50% of the total output. The probabilities of a nondefective product are, respectively, 0.75, 0.95, and 0.85. A customer receives a defective product. What is the probability that it came from plant C?

2. (20 marks) Two computers are connected to a password-protected wireless network. When the password is temporarily removed, a virus can attack the first computer with probability 0.5, the second computer with probability 0.7, and it can attack both computers with probability 0.4.

   a) The first computer appears infected with a virus. What is the probability that the second computer was also attacked?
   b) The first computer was not attacked at all. What is the probability that the second computer was attacked?

3. (10 marks) There are two coins in a box. One coin is fair, the other has heads on both sides. You reach one coin at random, toss it, and it lands up heads. What is the probability that it is a two-headed coin?

4. (20 marks) A company has been running a television advertisement for one of its new products. A survey was conducted. Based on its results, it was concluded that an individual buys the product with probability 56%, if he/she saw the advertisement, and buys with probability 8%, if he/she did not see it. Twenty-five percent of people saw the advertisement.

   a) What is the probability that a randomly selected individual will buy the new product?
   b) What is the probability that at least one of randomly selected five individuals will buy the new product?

5. (10 marks) A problem on a multiple-choice quiz is answered correctly with probability 0.9 if a student is prepared. An unprepared student guesses between 4 possible answers, so the probability of choosing the right answer is 1/4. Seventy-five percent of students prepare for the quiz. If Mr. X gives a correct answer to this problem, what is the chance that he did not prepare for the quiz?
6. **(10 marks)** Two students, X and Y, forgot to sign their exam papers. Professor knows that they can write a good exam with probabilities 0.8 and 0.4, respectively. After grading, he notices that one unsigned exam is good and the other is bad. Given this information, and assuming that students worked independently of each other, what is the probability that the good exam belongs to student X?

7. **(20 marks)** A manufacturer of scientific workstations produces its new model at sites A, B, and C; 20% at A, 35% at B, and the remaining 45% at C. The probability of shipping a defective model is 0.01 if shipped from site A, 0.06 if from site B, and 0.03 if from site C.

   a) What is the probability that a randomly selected customer receives a defective model?

   b) If you receive a defective workstation, what is the probability that it was manufactured at site B?

8. **(10 marks)** All athletes at the Olympic games are tested for performance-enhancing steroid drug use. The imperfect test gives positive results (indicating drug use) for 90% of all steroid-users but also (and incorrectly) for 2% of those who do not use steroids. Suppose that 5% of all registered athletes use steroids. If an athlete is tested negative, what is the probability that he/she uses steroids?