Sri Lanka Institute of Information Technology

Year 02 – Semester II – 2022

Probability and Statistics – IT2110

Practice Problems (Total Probability Law)

1. A company found that 85% of the engineers selected for its trainee program completed the course. Of those 60% became productive engineers, compared with only 10% of those trainees who did not complete the trainee program. If a new engineer enters the same program what is the probability that this person will also become an efficient engineer? If an engineer is deemed to be productive what is the probability that this engineer completed the trainee program?

2. In an electronic factor machines M1, M2, and M3 manufacture 25%, 35% and 40% of the total output respectively. Of their outputs 5%, 4% and 2% are defectives. A product is chosen at random and found to be defective. What is the probability that the defective product came from,

    i. Machine M1?
    ii. Machine M2?
    iii. Machine M3?

3. In a railway reservation office two clerks are engaged in checking reservation forms. On an average the first clerk (A1) checks 55% of the forms while the second clerk (A2) checks the remaining. While A1 has an error rate of 0.03, that of A2 is 0.02. A reservation form is selected at random from the total number of forms checked during a day and is discovered to have an error. Find the probability that it was checked by A1 and A2 separately.

4. Data compiled by the Department of Justice on the number of people arrested for serious crimes (murder, forcible rape, robbery, and so on) in 1988 revealed that 89% were male and 11% were female. Of the males, 30% were under 18, whereas 27% of the females arrested were under 18.

    i. What is the probability that a person arrested for a serious crime in 1988 was under 18?

ii. If a person arrested for a serious crime in 1988 was known to be under 18, what is the probability that the person is female?

5. A municipal bond service has three rating categories (A, B, and C). Suppose that in the past year, of the municipal bonds issued throughout the United States, 70% were rated A, 20% were rated B, and 10% were rated C. Of the municipal bonds rated A, 50% were issued by cities, 40% by suburbs, and 10% by rural areas. Of the municipal bonds rated B, 60% were issued by cities, 20% by suburbs, and 20% by rural areas. Of the municipal bonds rated C, 90% were issued by cities, 5% by suburbs, and 5% by rural areas.

    i. If a new municipal bond is to be issued by a city, what is the probability that it will receive an A rating?
    ii. What proportion of municipal bonds are issued by cities?

6. A sample of 500 respondents in a large metropolitan area was selected to study consumer behavior. Among all the questions asked, one was “Do you enjoy shopping for clothing?”. Out of 240 males, 136 answered yes. Out of 260 females, 224 answered yes. Construct a contingency table to evaluate the probabilities. What is the probability that a respondent chosen at random,

    i. Enjoys shopping for clothing.
    ii. Is a female, if person identified is enjoying shopping?
    iii. Is a female or enjoys shopping for clothing?
    iv. Is a male or a female?