Sri Lanka Institute of Information Technology

Year 02 – Semester II – 2022

Probability and Statistics – IT2110

Tutorial 03

1. Suppose you are taking a multiple choice test with 'c' choices for each question. In answering a question on this test, the probability that you know the answer is P. If you don't know the answer, you choose one at random. What is the probability that you knew the answer to the question, given that you answered it correctly?

2. Two dice are rolled. Let *A* - sum of two dice equals 3, *B* - sum of two dice equals 7 and *C* - at least one of the dice shows a 1.

   (a) What is $P(A|C)$?

   (b) What is $P(B|C)$?

   (c) Are *A* and *C* independent? What about *B* and *C*?

3. A multiple choice exam has 4 choices for each question. A student has studied enough so that the probability they will know the answer to a question is 0.5. The probability that they will be able to eliminate one choice is 0.25. Otherwise all 4 choices seem equally possible.

   If they know the answer, they will get the question right. If not, they have to guess from the 3 or 4 choices. As the teacher, you want the test to measure what the student knows.

   If the student answers a question correctly, what is the probability that they knew the answer?

4. Suppose that $P(A) = 0.4$, $P(B) = 0.3$ and $P((A \cup B)^c) = 0.42$. Are *A* and *B* independent?

5. An airport security has two checkpoints. Let A be the event that the first checkpoint is busy, and B be the event that the second checkpoint is busy. Assume that $Pr(A) = 0.2$, $Pr(B) = 0.4$ and $Pr(A \cap B) = 0.08$. Find the probability that neither of the two checkpoints is busy.

6. A consumer testing service rates a given DVD player as either very good or good. Let A denote the event that the rating is very good and B the event that the rating is good. You are given: $Pr(A) = 0.22$, $Pr(B) = 0.35$.

   Find,

   a) $Pr(A^c)$

   b) $Pr(A \cup B)$

   c) $Pr(A \cap B)$

7. An entrance exam consists of two subjects: Mathematics and English. The probability that a student fails the mathematics test is 0.20. The probability of failing English is 0.15 and the probability of failing both subjects is 0.03. What is the probability that the student will fail at least one of these subjects?

8. Let A be the event of "drawing a king" from a deck of cards and B the event of "drawing a diamond". Are A and B mutually exclusive? Find $Pr(A \cup B)$.

9. An urn contains 4 red balls, 8 yellow balls, and 6 green balls. A ball is selected at random from the urn. What is the probability that the ball chosen is either red or green?

10. Show that for any events A and B, $Pr(A \cap B) \geq Pr(A) + Pr(B) - 1$.

11. An urn contains 2 red balls, 4 blue balls, and 5 white balls.

    a) What is the probability of drawing a red ball (Event R) at random?
    b) What is the probability of the event "not R" that is, that a ball drawn at random is not red?
    c) What is the probability of the event that a ball drawn at random is either red or blue?

12. In the experiment of rolling of fair pair of dice, let E denotes the event of rolling a sum that is an even number and P the event of rolling a sum that is a prime number. Find the probability of rolling a sum that is even or prime?

13. Let S be a sample space and A and B be two events such that $Pr(A) = 0.8$ and $Pr(B) = 0.9$. Determine whether A and B are mutually exclusive or not.

14. A survey of a group's viewing habits over the last year revealed the following information.

    (i) 28% watched gymnastics
    (ii) 29% watched baseball
    (iii) 19% watched soccer

(iv) 14% watched gymnastics and baseball

(v) 12% watched baseball and soccer

(vi) 10% watched gymnastics and soccer

(vii) 8% watched all three sports.

Find the probability of the group that watched none of the three sports during the last year.

15. The probability that a visit to a primary care physician's (PCP) office results in neither lab work nor referral to a specialist is 35%. Of those coming to a PCP's office, 30% are referred to specialists and 40% require lab work. Determine the probability that a visit to a PCP's office results in both lab work and referral to a specialist.

16. You are given $Pr(A \cup B) = 0.7$ and $Pr(A \cup B^c) = 0.9$. Determine $Pr(A)$.

17. Among a large group of patients recovering from shoulder injuries, it is found that 22% visit both a physical therapist and a chiropractor, whereas 12% visit neither of these. The probability that a patient visits a chiropractor exceeds by 14% than the probability that a patient visits a physical therapist.

Determine the probability that a randomly chosen member of this group visits a physical therapist.