SLIIT UNI
THE KNOWLEDGE UNIVERSITY

# IT2120 - Probability and Statistics

**Department of Information Technology, Faculty of Computing**

## Year 2 semester 1 (2025)

## Tutorial 03

1. 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 $P(A \mid C)$?

   (b) What is $P(B \mid C)$?

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

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

3. 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.

4. 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) $\Pr(A \cap B)$

5. 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?

6. 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 $\Pr(A \cup B)$.

7. 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?

8. Show that for any events $A$ and $B$,

$$\Pr(A \cap B) \geq \Pr(A) + \Pr(B) - 1.$$

9. 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?

10. 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?

11. 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.

12. 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.

13. 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.

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

15. 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.

16. 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.

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

    (b) 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?

17. 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.

    (a) What proportion of municipal bonds are issued by cities?

    (b) If a new municipal bond is to be issued by a city, what is the probability that it will receive an A rating?

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

    (a) Enjoy shopping for clothing?

    (b) female enjoys shopping for clothing if person identified is enjoying shopping?

    (c) is a female or enjoys shopping for clothing?