NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES

Marks: 100	ASSIGNMENT-2	Dead Line: 02-10-24

Subject: Probability and Statistics   **Sections: ALL**
Instructors: Mr. Hazber Samson, Miss Rijah Khan   Date: 26-09-2024

Q1. A study of the post treatment behavior of a large number of drug abusers suggests that the likelihood of conviction within a two-year period after treatment may depend upon the offender's education. The proportions of the total number of cases falling in four education–conviction categories are shown in the following table:

Education	Status within 2 Years after Treatment		
	Convicted	Not Convicted	*Total*
10 years or more	.10	.30	.40
9 years or less	.27	.33	.60
Total	.37	.63	1.00

Suppose that a single offender is selected from the treatment program. Define the events:
A: The offender has 10 or more years of education.
B: The offender is convicted within two years after completion of treatment.
Find the following

a $P(A)$.
b $P(B)$.
c $P(A \cap B)$.
d $P(A \cup B)$.
e $P(\overline{A})$.
f $P(\overline{A \cup B})$.
g $P(\overline{A \cap B})$.
h $P(A|B)$.
i $P(B|A)$.

Q2. (a) Find the total number of different arrangements of the 8 letters in the word TOMORROW.
(b) Find the total number of different arrangements of the 8 letters in the word TOMORROW that have an R at the beginning and an R at the end, and in which the three Os are not all together.
(c) Four letters are selected at random from the 8 letters of the word TOMORROW. Find the probability that the selection contains at least one O and at least one R.

Q3. There are 90 applicants for a job with the news department of a television station. Some of them are college graduates and some are not; some of them have at least three years' experience and some have not, with the exact breakdown being

	College graduates	Not college graduates
At least three years' experience	18	9
Less than three years' experience	36	27

If the order in which the applicants are interviewed by the station manager is random, G is the event that the first applicant interviewed is a college graduate, and T is the event that the first applicant interviewed has at least three years' experience, determine each of the following probabilities directly from the entries and the row and column totals of the table:

(a) $P(G)$;   **(b)** $P(T')$;   **(c)** $P(G \cap T)$;

(d) $P(G' \cap T')$;   **(e)** $P(T|G)$;   **(f)** $P(G'|T')$.

Q4. A bag contains two red, three green and four black balls, three balls are drawn at random. Find the probability that

(a) Three balls have different color
(b) Two balls have the same color and third is different
(c) All three balls have the same color

Q5. For Events A and B, $P(A) = 0.7$, $P(B \cup A) = 0.9$, $P(A \cap B) = 0.3$ Find

(a) $P(A \cap B^c)$
(b) $P(B \cap A^c)$
(c) $P(A^c \cap B^c)$
(d) $P(A^c \cup B)$
(e) $P(A^c \cup B^c)$

Q6. Three missiles are fired at a target. The probabilities of hitting the target are 0.4, 0.5 and 0.6 respectively. If the missiles are fired independently, what is the probability that
(a) all the missiles hit the target
(b) at least one missile hits the target
(c) at most one missile hits the target
(d) exactly one missile hits the target
(e) exactly two missiles hit the target

Q7. If a person visits his dentist, suppose that the probability that he will have his teeth cleaned is 0.44, the probability that he will have a cavity filled is 0.24, the probability that he will have a tooth extracted is 0.21, the probability that he will have his teeth cleaned and a cavity filled is 0.08, the probability that he will have his teeth cleaned and a tooth extracted is 0.11, the probability that he will have a cavity filled and a tooth extracted is 0.07, and the probability that he will have his teeth cleaned, a cavity filled, and a tooth extracted is 0.03. What is the probability that a person visiting his dentist will have at least one of these things done to him?

Q8. For married couples living in a certain suburb, the probability that the husband will vote on a bond referendum is 0.21, the probability that the wife will vote on the referendum is 0.28, and the probability that both the husband and the wife will vote is 0.15. What is the probability that
(a) at least one member of a married couple will vote?
(b) a wife will vote, given that her husband will vote?
(c) a husband will vote, given that his wife will not vote?

Q9. On each day that Alexa goes to work, the probabilities that she travels by bus, by train or by car are 0.4, 0.35 and 0.25 respectively. When she travels by bus, the probability that she arrives late is 0.55. When she travels by train, the probability that she arrives late is 0.7. When she travels by car, the probability that she arrives late is x.
On a randomly chosen day when Alexa goes to work, the probability that she does not arrive late is 0.48.
(a) Find the value of x.
(b) Find the probability that Alexa travels to work by train given that she arrives late.

Q10. Suppose that the four inspectors at a film factory are supposed to stamp the expiration date on each package of film at the end of the assembly line. John, who stamps 20% of the packages, fails to stamp the expiration date once in every 200 packages; Tom, who stamps 60% of the packages, fails to stamp the expiration date once in every 100 packages; Jeff, who stamps 15% of the packages, fails to stamp the expiration date once in every 90 packages; and Pat, who stamps 5% of the packages, fails to stamp the expiration date once in every 200 packages. If a customer complains that her package of film does not show the expiration date, what is the probability that it was inspected by John?