APPLIED MATHEMATICS SERIES

Thursday.

Deadline: Before Tomorrow.

Probability Theory.

1. Events A and B are independent such that $P(A \cup B) = 0.8$, $P(A) = 0.5$. Find:
   i.   P(B)
   ii. $P(A' \cap B)$
   iii. $P(A' \cup B)$

2. A and B are said to be independent events such that $P(A) = 0.4, P(A \cup B') = 0.9$. Find:
   i.   P(B)
   ii. $P(A \cap B)$
   iii. $P(A' \cap B')$
   iv. $P(A' \cup B')$

3. A and B are mutually exclusive events such that $P(A \cup B) = 0.8, P(A) = 0.4$. Find:
   i.   P(B)
   ii. $P(A \cap B')$
   iii. $P(A' \cap B)$
   iv. $P(A' \cap B')$
   v. $P(A' \cup B')$

4. A and B are mutually exclusive events such that $P(A \cup B) = 0.9, P(A \cup B') = 0.6$. Find:
   i.   P(B)
   ii. P(A)
   iii. $P(A' \cup B)$
   iv. $P(A' \cap B')$
   v. $P(A' \cup B')$

5. Given that A and B are exhaustive events such that $P(A) = 0.6$, find:
   i.   P(B)
   ii. $P(A \cup B)$
   iii. $P(A' \cup B')$

6. A, B and C are exhaustive events such that $P(A) = 0.1, 2P(B) = P(C)$. Find:
   i.   P(B)
   ii. P(C)
   iii. $P(A \cup B)$

7. Events A and B are such that $P(A) = 0.4, P(A \cup B) = 0.9, P(A \cap B) = 0.1$. Find:
   i.   P(B)
   ii. $P(A \cap B')$
   iii. $P(A \cup B')$
   iv. $P(A' \cap B')$
   v. $P(A' \cup B')$

8. Events A and B are such that $P(A' \cap B) = 0.3, P(A \cup B) = 0.8, P(A \cap B) = 0.2$. Find:

    i.   P(B)

    ii.   P(A)

    iii. $P(A' \cup B)$

    iv. $P(A' \cap B')$

    v. $P(A' \cup B')$

9. Events A and B are such that $P(A \cup B) = 0.8$, $P(A/B) = 0.2$ and $P(A' \cap B) = 0.4$. Find:

    i.   P(B)

    ii. $P(A \cap B)$

    iii.   P(A)

    iv. $P(A/B')$

    v. $P(A'/B')$

10. The probability that a regular scheduled flight departs on time is 0.83 and the probability that it arrives on time is 0.92. The probability that it departs on time and arrives on time is 0.78. Find the probability that the plane:

    i.   Arrives on time given that it departs on time.

    ii.   Departs on time given that it arrives on times.

11. In a group of 100 people, 40 own a cat, 25 own a dog and 15 own a cat and a dog. Find the probability that a person chosen at a random:

    i.   Owns a dog or a cat.

    ii.   Owns a dog or a cat but not both.

    iii.   Owns a dog given that he owns a cat.

    iv.   Doesn't own a cat, given that he owns a dog.

12. Three items are randomly picked from a bag containing 10 defective (D) and 30 non defective (N) items. Find the probability that $\frac{2}{3}$ of these items are defective if:

    i.   The items are picked with replacement.

    ii.   The items are picked without replacement.

13. Two baskets A and B contain similar balls. A contains 8 white and 5 red balls where as B contains 10 white and 6 red balls. A ball is randomly drawn from basket A and transferred to basket B, a ball is then randomly drawn from B, find the probability that it will be white.

14. Two bags A and B contain similar marbles. A contains 6 green and 8 blue marbles where as B contains 9 green and 7 blue marbles. A bag is picked at random unseen and from it one marble is picked and placed in the other bag. If a marble is finally picked from this second bag, find the probability that the marble selected is blue.

15. Two boxes P and Q contain similar balls. Box Q contains 6 red and 4 blue balls while box P contains 3 red and 5 blue balls. A box is randomly drawn and from it a ball is randomly drawn and put into the other. A ball is then drawn from this latter box. Find the probability that:

    i.   Both balls are red.

    ii.   The first ball drawn is blue.

    iii.   The first ball drawn is red given that the second ball drawn is blue.

16. Three bags A, B and C contain respectively 3 white and 2 red balls, 4 white and 4 red, 5 white and 2 red balls. A ball is drawn unseen from A and placed in B, a ball is then

drawn from B and placed in C. Find the probability that if a ball is now drawn from C, it will be red.

17. In a manufacturing plant, there are two different machines, A and B. 20% and 80% of the items are produced by A and B respectively. It has been established that 5% of the items produced by A and 8% of the items produced by B are defective. If one items is selected from the lot produced, determine the probability that:
    i. It is defective.
    ii. It is produced by A given that it is defective.

18. A certain device has probability $\frac{1}{3}$ of detecting an "AIDS" victim as having AIDS and probability of $\frac{1}{4}$ of detecting "non-AIDS" victim as having AIDS. The device is used on a population, 20% of which have AIDS. What is the probability that a person is detected as an AIDS victim by the device?

19. In a certain city, 30% of the people are conservatives, 50% are liberals and 20% are independent. Records indicate that in an election, 65% of the conservatives voted, 85% of the liberals voted and 50% of the independent voted. A person in the city is selected at random.
    i. Determine the probability that he voted.
    ii. Given that he didn't vote, determine the probability that he is a conversative.

20. In a certain university, 75% of the students are full time, 45% of the students are female, and 40% are male full-time students. Find the probability that:
    i. A student chosen at random from the university is a part time student.
    ii. A student chosen from the university is a female part time student.
    iii. A student chosen at random from the female students in the university is a part time student.

21. a) Three balls are drawn at a random one after the other without replacement from a bag containing 21 white, 9 blue, 40 red and 12 orange balls. Determine the probability that the first ball is blue, the second red or blue and the third is white.
    b) Tome is to travel from Lira to Kampala for an interview. The probabilities that he will be in time for the interview is when he travels by bus and taxi is 0.1 and 0.2 respectively. The probabilities that he will travel by bus and taxi are 0.6 and 0.4 respectively.
    i. Find the probability that he will be on time.
    ii. Given that he is not on time, what is the probability that he travelled by taxi?

22. a) A box contains 3 red, 3 green and 5 blue crayons. Two crayons are randomly picked from the box without replacement, find the probability that:
    i. the crayons are of the same colour.
    ii. At least one red crayon is selected.
        b) In an experiment, a box contains 2 green and 5 blue balls. A second box contains 5 green and 3 blue balls. One ball is drawn at random from the second box and placed in the first box. What is the probability that a ball now drawn from the first box is green?

commitment