VPM's B.N BANDODKAR COLLEGE OF SCIENCE
DEPARTMENT OF STATISTICS

F.Y.B.Sc(Paper II : STATISTICAL METHODS)

Semester I Question Bank

UNIT I : Probability

1. Mr X uses one of a bus, a train or a taxi to go to his office everyday. The chances of his using vehicles are 50%, 40% and 10% respectively. The probability that he gets late if he uses a bus is 0.2. The similar probability for a train and taxi is 0.1 and 0.05 respectively. What is the probability that on a randomly chosen day, Mr. X would report late at the office? (0.145)

2. The contents of 3 urns I, II and III are as follows:
Urn I : 1white, 2black , 3red balls.
Urn II: 2white,1black ,1red balls.
Urn III: 4white , 5black, 3red balls.
One urn is chosen at random and 2 balls are drawn from it.
a) find the probability that one of them is red and the other is white.(0.1828)
b) if the 2 balls selected are white and red , what is the probability that urn II was selected? (0.30387)

3. A can hit a target 3 times in 5 shots, B can hit the target times in 5 shots and C can hit the target 3 times in 4 shots. If A, B and C try once to hit the target simultaneously, find the probability that a) target is hit b) 2 shots hit the target.
(0.94; 0.45)

4. A bag contains 5 silver and 4 copper coins. Another bag contains 6 silver and 5 copper coins. A fair dice is thrown, if it shows perfect square number then 1st bag is selected otherwise 2nd bag is selected then a coin is drawn from the bag. What is the probability that it is a silver coin? (0.5488)

5. If the letters of the word 'RHEUMATIC' be arranged at random what is the probability that there will be exactly 3 letters between H and M? (5/36)

6. If a set of four books is arranged in shelf. What is the probability that they will be in a correct order.

7. Two dice one red and the other yellow are thrown. Let A be the event that sum of the points on the faces is even and B be the event that exactly one of them is an ace. Describe a) the complete sample space b) events A, B , $\bar{B}$, A∩B , A∩$\bar{B}$.
Also find their probabilities. (1/2 ; 5/18; 13/18; 1/9; 2/3; 7/18)

8. If P(A) = 0.3 , P(B) = 0.4, show that $0.4 \leq P(AUB) \leq 0.7$.

9. If P(A) = 0.18, P(B)= 0.17, P(A ∩ B) = 0.09, P(B ∩ C) =0.05, P(A ∩ C) =0.06, P(A∩B∩C)= 0.02. find a) P(only A happens) b) P(only B happens) c) P(only A and B happen) d) P(only B and C happens). (0.05;0.05;0.07;0.03)

10. Probability that a student will pass in Mathematics is 0.8 ; that he will pass in Statistics , given that he has passed in Mathematics is 0.6; that he will pass in English, given that he has passed in Mathematics and Statistics is 0.5. What is the probability that he will pass in all three subject? (0.24)

11. A box contains 3 bad and 7 good bulbs. Two of them are taken out. One of them is tested and found to be good. What is the probability that other one is also good? (1/6)

12. If A and B are independent events such that P(A)= 0.6, P(B)=0.7, P(A∩B)=0.5 then find a) P(A U B) b) P($\bar{A} \cap B$) c) P($\bar{A} \cup \bar{B}$) d) P(A/B) e)P(B/A).
(0.8; 0.2; 0.5; 0.7143; 0.333)

13. In a company, out of 500 employees, 120 are below 45 years of age and 300 employees are female. Out of 120 employees who are below 45 years of age, 20 are females. If an employee selected at random from the company is female, find the probability that she is below 45 years of age. (1/15)

14. If P(A) = 0.3 , P(B) = 0.2, P(C)= 0.15 find P(A U B U C) if a) they are mutually exclusive b) they are mutually independent. (0.65 ; 0.524)

15. If A, B are two events with P(A) = 0.3 and P(B) = 0.4 find the probabilities that a) atleast one of them will occur b) exactly one of them will occur c) none of them will occur d) both will occur
when (i) A and B are independent (ii) A and B are mutually exclusive events.
(0.7;0.7;0.3;0;0.58;0.46;0.42;0.12)

16. If the events A, B, C and D form a partition of the sample space S and the probabilities of A and C are equal, the event B is twice as likely as A and the event D is twice as likely as B find P(A U B U C). (1/2)

17. The odds against shooting a target with gun A are 1:3 and in favour of shooting with gun B are 5:1. If both the guns are fired together what is the probability that the target will be at all shot?

18. A and B throw two dice, the first to get the sum 9 wins. A starts. Find the chance of their winning. (A:9/17, B: 8/17)

19. A committee of 4 persons is to be appointed from 3 Mathematicians, 4 Physicists, 2 Statisticians and 1 Chemist. Find the probability that in the committee :
a) there will be one from each category,
b) atleast one will be physicist,
c) There will be chemist. (4/35; 39/42; 2/5)

20. Probability that A will pass is 1/3, that B will pass is 2/5, that C will pass is 1/5. What is the probability that all will pass? What is the probability that atleast two will fail? (2/75 , 17/75)

21. Probability that machine A will be working years hence is ¼ while another machine B will be working after the same period is 1/3, Assuming independence, find the probabilities that after 5 years,
a) atleast one of them will be working.
b) exactly one of them will be working
c) neither will be working
d) both machines will be working. (1/12;1/2;5/12;1/2)

22. Three boxes contain balls some of which are red. The proportions of red balls in box A1, box A2, box A3 are 1/3, 1/2 and ¾. A box is selected at random and a ball is drawn from it. If the ball is drawn is found to be red, What is the probability that box A2 is selected?

23. Four persons are selected at random from a group containing 3 men, 2 women and 4 children. Find the probability that exactly two of them will be children. (10/21)

24. Screws are manufactured by 2 machines A and B. A produces 70% of total manufacture and B produces total 30%. It is found that 4% of product from machine A and 1 % from machine B are defective. Find the probability that randomly chosen screw :
a) manufactured by A is defective,
b) screw is defective,
c) is given defective manufactured by A.

25. Twelve balls are distributed at random in four boxes. Find the probability that the first box will contain 3 balls.

26. What is the probability that a positive integer selected at random from the set of positive integers not exceeding 100 is divisible by (i) 5, (ii)5 or 3 (iii)5 and 3 ?

27. What is the probability that in a random arrangement of alphabets of word ``REGULATIONS"(i)All vowels are together.(ii)No two vowels are together?

28. From a pack of well shuffled 52 cards four cards are selected without replacing the selected card. Jack, queen, king or ace cards are treated as honor card.
a)What is the probability that are there are i) all honor cards ii) More honor cards ?
b)What will be these probabilities if cards are drawn with replacement?

29. Cards are to be prepared bearing a four digit number formed by choosing digits among 1,4,5,6 8 . Find the probability that a randomly chosen cards among them bear (i) An even number (ii) A number divisible by 4 (iii)A number has all four digits same.

30. A sample of 50 people surveyed for their blood group. If 22 people have 'A ' blood group , 5 have 'B ' blood group, 21 have 'O ' blood group and 2 have 'AB ' blood group. Find the probability that a randomly chosen person has(i)Either 'A 'or 'B' blood group (ii)Neither 'A 'nor 'B' blood group.

31. A roulette wheel has 40 spaces numbered from 1 to 40.Find the probability of getting (i)number greater than 25(ii)An odd number(iii)A prime number.

32. A, B, C forms a partition. If the event A is twice as likely as B, and event C is thrice as likely as A .Find their respective probabilities.

33. What is the probability that in a random arrangement of alphabets of word ``CHILDREN"(i)All vowels are together.(ii)No two vowels are together?

34. A committee of 5 is to be formed from among a coordinator, chairperson ,five research guides and three research students. What is the probability that committee (i)Do not have coordinator and chairperson.(ii)All research guides(iii) None of the students

35. 9 people are randomly seated at a round table. What is the probability that a particular couple sit next to each other?

36. In a box there are 10 bulbs out of which 4 are not working .An electrician selects 3 bulbs from that box at random what is the probability that at least one of the bulb is working?

37. S= { 1,2, … ,50} A denote number divisible by 5,B denotes number up to 30 ,C is number greater than 25 and D is number less than or equal to 4.
Answer the following (i)Which events are exhaustive?(ii)Which events are mutually exclusive?
(iii)Give a pair of events which is mutually exclusive but not exhaustive.
(iv)Give a pair of events which is not mutually exclusive but exhaustive.
(v)Give a pair of events which is neither mutually exclusive nor exhaustive.

38. A pair of fair dice is thrown . What is the probability that the sum of the numbers on faces of the dice is (i) 6 ,7 or 8.(ii)divisible by 5.(iii)a prime number?

39. What is the probability that there are 53 Thursdays and 53 Fridays in a leap year?

40. A sequence of 10 bits is randomly generated. What is the probability that (i)atleast one of these bits is 0 ?(ii)a sequence has equal number of 0 and 1.

41. The odds against an event A are 3:5 ,the odds in favor of an event B are 7:5,What are the probabilities of the events?

42. In a group of 12 persons what is the probability that (i) each of them have different birthday(ii) each of them have birthday in different calendar month?

For more sums refer Statistical Methods (Manan Prakashan, R.J Shah, Vipul Publication)

OBJECTIVES

State whether the following statements are true or false. If true justify the statement. If false correct it.

1. If two events A and B are mutually exclusive then they are independent as well.

2. Complementary events are mutually exclusive and the converse is true and well

3. The probability of addition of two events is always equal to addition of their individual probabilities.

4. $P(A \cap B) > P(A)$

5. $P(\bar{A} \cap \bar{B}) = P(A \cup B)$

6. $P(\bar{A} \cup \bar{B}) = 1 - P(\overline{A \cup B})$

7. The number of ways the letters of the word "METHOD" can be arranged is 120.

8. If P(A/B) = P(A) then A depends on B.

9. Addition theorem on probability uses the concept of conditional probability.

10. P(A)=0.4 and P(B)= 0.6 then P(AUB) = 1 if A and B are independent.

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