Shri Swami Vivekanand Shikshan Sanstha's

**Raje Ramrao Mahavidyalaya, Jath**

**Department of Statistics**

**B.Sc- I Sem- I**

**Paper-II**

**Elementary probability theory**

**Question Bank**

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# Multiple choice Questions

1) If A and B are two events, the probability of occurrence of both A and B is given by…….
   A) P(A∪B) B) P(A ∩ B) C) P(A) + P(B) D) P(A) - P(B)
2) A ticket is drawn from 25 tickets numbered 1 to 25. Define an event as : the number drawn is odd number. The number of elements in this event is……….
   A) 11 B) 12 C) 13 D) 25
3) If A and B are events such that P(A) = 0.6, P(B) = 0.5 and P(A ∩ B) = 0.3 then $P(\bar{A} \cap B)$ is …….
   A) 0.4 B) 0.8 C) 0.2 D) 0.3
4) If P(A) = 0.7, P(B) = 0.8, then most appropriate lower and upper possible values of P(A ∩ B) are ……
   A) (0.1, 0.2) B) (0.5, 0.7) C) (0, 0.7) D) (0, 0.8)
5) Which of the following is the power set corresponding to sample space Ω ={1,2} ?
   A) {{},Ω} B) {{1},{2}} C) {{1},{2},{1,2}} D) {{},{1},{2},{1,2}}
6) If A and B are any two events, then $P(A \cup B)$ is equal to……….
   A) P(A) + P(B) B) P(A) + P(B) - P(A ∩ B)
   C) P(A) + P(B) - $P(A \cup B)$ D) P(A) + P(B) + P(A ∩ B)
7) If A and B are two events defined on the sample space Ω of a random experiment, then occurrence of A but not B is given by
   A) $\bar{A} \cap B$ B) $A \cup \bar{B}$ C) $A \cup B$ D) $A \cap \bar{B}$
8) An event consisting of these elements which are not in A is called………
   A) Simple event B) Compound event
   C) Complementary event D) Primary event
9) If a sample space Ω has n elements then its power set will have……..
   A) n/2 elements B) $2^n$ elements C) n elements D) 2n elements
10) An event containing only one element is called………
   A) Sure Event B) Impossible Event
   C) Compound Event D) Elementary Event
11) The probability of getting 5 Sundays in the month of May is…….
   **A)** $\frac{2}{7}$ **B)** $\frac{3}{7}$ **C)** $\frac{1}{7}$ **D)** 6/7

12) A and B are two events, then probability of at least one of them will occur is given by……

A) Multiplication law of probability B) addition law of probability

C) Conditional probability D) none of these

13) Power set of a sample space having 3 sample points contains…... Subsets of the sample space.

A) 3 B) 6 C) 8 D) 10

14) A ticket is drawn from 25 tickets numbered 1 to 25. Define event as : the number drawn is a prime number. Then number of elements in this event is ………..

A) 9 B) 10 C) 11 D) { 1,2,3… 23}

15) In a group of 10 men, 6 are graduates. A group of 3 men are selected at random. The probability group consist of all graduates is…….

A)1/6 B) 0.1 C) 0.2 D) none of these

16) If the letters of the word SUN are arranged at random, the probability that the letter U gets the middle position is……

A) 2/3 B) 1/6 C) 1/3 D) 5/6

17) If a coin tossed 3 times the sample space has ….. points.

A) 2 B) 3 C) 8 D) 16

18) If A and B are any two events then the probability that at least one of them will occur is denoted by………

A) P(A) or P(B) B) P(A) + P(B) C) P(A∪ B) D) $P(\bar{A}) \cup P(\bar{B})$

19) If A and B are any two events then the following statement is true.

A)P(A∩B) ≤ P(A) B) P(A∩B) ≤ P(B)
C) $P(A \cup B) \leq P(A) + P(B)$ D) All of these

20) The probability of getting the sum greater than 9 in a throw of a pair of fair dice is………
A) 1/36 B) 2/9 C) 1/6 D) 5/9

21) The probability of getting 5 Sundays in a month of February of a leap year is…….

A) 2/7 B) 1/7 C) 5/29 D) 5/

22) The sample space corresponding to the experiment “Three seeds are planted and total number of seeds germinated are recorded after a week” is ………

A) {0, 3} B) {0, 1, 2, 3} C) {1, 2, 3} D) [0, 3]

23) Which of the following pairs is a pair of mutually exclusive events in drawing a single card from a pack of 52 cards?

B)a heart and a queen B) an even number and a spade
C) a club and a red card D) an ace and an odd number

24) The probability of drawing one white ball randomly from a bag containing 6 red, 8 black, 10 yellow and 1 green ball is…………

A) 1/25 B) 0 C) 1 D) 14/25

25) If A and B are two events such that $A < B$, then…….

A) P(A) = P(B) B)$P(A) \geq P(B)$ C) $P(A) \leq P(B)$ D) None of these

26) If $A^c$ is the complementary event of A, then $P(A^{C)}$ is……….

A) 1 B) 0 C) P(A) D) 1- P(A)

27) A set is called doubleton, if its cardinality is ……..

A) 2 B) $\geq 2$ C) $\leq 2$ D) $\infty$

28) A box has 4 red and 4 blue balls. Five balls are selected at random, then probability of getting at least 1 blue ball is given by…..

A) 1 B) 1/2 C) 0 D) None of these

29) I: A and B are mutually exclusive

II: $P(A \cap B) = 0$

III : A and B are independent events. Then
A) I⇒II B) I⇒III C) III⇒I D) All of the above

30) Let A and B be two events such that P(A) = 0.2 and P(B) = 0.8. Which of the following statement is always true?
A) $P(A \cup B) = 1$ B) $P(A \cap B) = 0.16$ C) $P(A \cap B) \leq 0.2$ D) None of the

31) If P(A) = 1/3, P(B) = 3/4, $P(A \cup B) = 11/12$ then P(B|A) =………..
A)1/6 B) 4/9 C) 1/ 2 D) none of these

32) Let A and B be two events defined on Ω and P(B) > 0
then P(A/B)=P(A)/P(B)

A) $B < A$ B) $A \cap B = \phi$ C) $A < B$ D) none of these

33) If $B < A$ then $P(B|A)$ is ……
A) 0 B) 1 C)P(A)/P(B) D)P(B)/P(A)

34) For any event A, $P(\Omega/A)$ is……..

A) One B) Zero C) P(A) D) P(1/A)

35) If P(A) = 1/3, P(B) = 1/ 4, P(A|B) = 1/6 then P(B|A)
A)1/4 B) 1/8 C)3/4 D) none of these

36) If an event B has occurred and it is known that P(B) =1 then P(A|B) is equal to. . .

A)One B) Zero C) P(B) D) P(A)

37) If A and B are mutually exclusive events then P(A|B) = ……….

A) P(A) B) P(B) C) One D) Zero

38) If P(A) = 0.3, P(B) = 0.4 and A and B are mutually exclusive events then $P(A^c/B^c)$ =……..

A) 0.3 B) 0.4 C) 0.12 D) 0.5

39) For an event A, P(A/A) is………

A)One B) Zero C) P(A) D) Not determined

40) If $A < B$ then $P(A|B)$ is
A) 0 B) 1 C)P(A)/P(B) D)P(B)/P(A)

41) Let A and B be two events such that P(A) = 0.4, P(B) = k and P(AUB) = 0.6. If A and B are exclusive events then the value of k is…………

A) 0.3 B) 0.6 C) 0 D) 0.2

42) If A and B are exclusive events and P(A) = 0.3, P(B) = 0.4 then P(A∩B) =……….

A) 0.3 B) 0.4 C) 0.7 D) 0

43) A card is drawn from a pack of cards. If it is a picture card, the probability that it is a king is…..

A) 1/3 B) 1/4 C) 1/12 D) None of these

44) If A is an event defined on the sample space Ω and P(A) > 0 then following statement is false.

A) $P(B/A) \geq 0$ B) $P(\Omega / A) = 1$

C) $P(B \cup C/A) = P(B/A) + P(C/A)$ D) None of these

45) For an event A, $P(A/\bar{A})$ is………

A) P(A) B) $P(\bar{A})$ C) 0 D) 1

46) If $A < B$ then $P(B|A)$ is ………

A) 0 B) P(A) C) P(B) D) 1

47) If A and B are exclusive events and P(A) = 0.3, P(B) = 0.4 then $P(\bar{B}) =$

A) 0.7 B) 0.5 C) 0.6 D) 0

48) If A and B are exclusive events and P(A) = 0.2, P(B) = 0.5 then $P(\overline{A \cup B})$ =……..

A) 0.2 B) 0.3 C) 0.4 D) 0.7

49) If P(A) = 0.5, P(B) = 0.6 and P(B/A) = 0.9 then $P(A \cap B)$ =……….

A) 0.3 B) 0.4 C) 0.45 D) 0.54

50) The probability that A card drawn from a pack of cards is a red card given that it is a king is ………

A) 1/4 B) 1/2 C) 1/13 D) 1/12

# Long Answers Questions

1) Define i) An event ii) Sample Space iii) Power set of a sample space
iv) mutually exclusive events v) compliment of an event

2) With usual notation show that
i) P(A∪B) = P(A)+ P(B) – P(A∩B)
ii) P($A^C \cap B$) = P(B) – P(A∩B)

3) Define probability measure and prove that P(∅)=0 and P($A^C$) = 1- P(A)

4) For two events show that
P(A∩B) ≤ P(A) ≤ P(A∪B) ≤ [P(A)+ P(B)]

5) Given P(A) = 3/4 P(B) = 5/8 then show that
i) P(A∪B) ≥ 3/4 ii) 5/8 ≥ P(A∩B)
iii) 3/8 ≤ P($A \cap B$) ≤ 5/8 iv) 1/8 ≤ P($A \cap B^C$) ≤ 3/8

6) Give an axiomatic definition of probability. Show that conditional probability satisfies the axioms of probability.

7) State and prove Baye's theorem.

8) State and prove multiplication law of probability.

9) State partition of sample space and Baye's theorem. A man is equally likely to choose one of the three routes $C_1$ , $C_2$ and $C_3$ from his house to railway station. The probability of missing the train by the routes $C_1$ , $C_2$ and $C_3$ are 2/5, 3/10, 1/10. He sets out on a day and misses the train. What is probability that the route $C_2$ was selected?

10) A fair coin tossed twice and the events are defined as fallows
A: Head on the first toss
B: Head on the Second toss
C: Same face on the both tosses
Discuss the pair wise and mutual independence of events A, B and C.

# Short Answers Questions

1) Define i) a-priori definition of probability
   ii) Axiomatic definition of probability.
2) Write a power set in an experiment of tossing a coin.
3) Explain through a concept of a partition of sample space by events.
4) If A and B are independent events with P(A) =1/2 and P(B) = 1/4 then obtain P(A∪B) and P(A/B).
5) If A and B are independent events then show that $A^C$ and $B^C$ are also independent events.
6) If A, B and C are mutually independent events then show that A∪B and C are also independent events.
7) If A and B are exclusive events then show that
   i) P (A/B) = 0 ii)P(A/$B^c$) = $\frac{P(A)}{1-P(B)}$
8) Define i) mutually exclusive events ii) Independent events. Give an illustration of each.
9) If B⊂A, prove that P ($A \cap B^C$) = P (A) - P (B). Hence deduce that P (B) ≤ P (A).
10) Define i) Union of two events ii) intersection of two events
    iii) Impossible event iv) Certain event v) Complementary event
11) An urn contains 6 blue, 5 white, and 7 red balls. A person draws 4 balls from the box what is probability that among the balls drawn
    i) two are red and two are blue ii) two are blue and two are white
12) If a fair coin and a die are tossed together
    Find i)sample space ii) P(head on a coin and an even number) iii) P (number > 4)
13) If A and B are independent events then show that A and $B^C$ are also independent events.
14) If Ω= ($\omega_1, \omega_2, \omega_3, \omega_4$), A= ($\omega_1, \omega_2$), B = ($\omega_2, \omega_3$), and C = ($\omega_1, \omega_3$) then discuss about pair wise independence and mutual independence of three events A, B and C
15) If A and B are exclusive events then show that
    i) P (B/A) = 0 ii) P (A/ A∪B) = $\frac{P(A)}{P(A)+P(B)}$
16) If A and B are any two events then prove that P ($A^c$/B) = 1- P (A/B)
17) If P(A) =1/4 , P(A/B) = 1/3, P(B/A) = 1/2 then find P(A/$B^c$)
18) If A and B are independent and P(A) = 1/4 and P(B) = 1/3
    Find i) P(A∪B) ii) P($A^C \cap B^C$)
19) Let P be the probability function on sample space Ω= ($\omega_1, \omega_2, \omega_3$).
    Find P ($\omega_1$), P ($\omega_2$) if P ($\omega_1$) = 2 P ($\omega_2$) and P ($\omega_3$) = 1/3.
20) If A and B are independent events then show that $A^C$ and B are also independent events.