

probability:CBSE

2 Marks Questions

- If $P(\text{not } A) = 0.7$, $P(B) = 0.7$ and $P(B/A) = 0.5$, then find $P(A/B)$.
- A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event 'number is even' and B be the event 'number is marked red'. Find whether the events A and B are independent or not.

Or A die, whose faces are marked 1, 2, 3 in red and 4, 5, 6 in green, is tossed. Let A be the event "number obtained is even" and B be the event "number obtained is red". Find if A and B are independent events.

- A black and a red die are rolled together. Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4.
- Evaluate $P(A \cup B)$, if $2P(A) = P(B) = \frac{5}{13}$ and $P(A/B) = \frac{2}{5}$.
- Prove that if E and F are independent events, then the events E and F' are also independent.

4 Marks Questions

- A and B throw a pair of dice alternately. A wins the game, if he gets a total of 7 and B wins the game, if he gets a total of 10. If A starts the game, then find the probability that B wins.

- A and B throw a pair of dice alternately, till one of them gets a total of 10 and wins the game. Find their respective probabilities of winning, if A starts first.
- Probabilities of solving a specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve problem independently, then find the probability that
 - problem is solved.
 - exactly one of them solves the problem.
- A couple has 2 children. Find the probability that both are boys, if it is known that
 - one of them is a boy.
 - the older child is a boy.
- Assume that each born child is equally likely to be a boy or a girl. If a family has two children, then what is the conditional probability that both are girls? Given that
 - the youngest is a girl?
 - atleast one is a girl?
- A speaks truth in 75% of the cases, while B in 90% of the cases. In what percent of cases are they likely to contradict each other in stating the same fact? Do you think that statement of B is true?
- P speaks truth in 70% of the cases and Q in 80% of the cases. In what percent of cases are they likely to agree in stating the same fact? Do you think, when they agree, means both are speaking truth?
- A speaks truth in 60% of the cases, while B in 90% of the cases. In what percent of cases are they likely to contradict each other in stating the same fact? In the cases of contradiction do you think, the statement of B will carry more weight as he speaks truth in more number of cases than A ?

6 Marks Questions

14. If A and B are two independent events such that $P(\bar{A} \cap B) = \frac{2}{15}$ and

$$P(A \cap \bar{B}) = \frac{1}{6}, \text{ then find } P(A) \text{ and } P(B).$$

15. Consider the experiment of tossing a coin. If the coin shows head, toss it again, but if it shows tail, then throw a die. Find the conditional probability of the event that 'the die shows a number greater than 4', given that 'there is atleast one tail'.

2 Marks Questions

1. Find the probability distribution of X , the number of heads in a simultaneous toss of two coins.
2. The random variable X has a probability distribution $P(X)$ of the following form, where ' k ' is some number.

$$P(X = x) = \begin{cases} k, & \text{if } x = 0 \\ 2k, & \text{if } x = 1 \\ 3k, & \text{if } x = 2 \\ 0, & \text{otherwise} \end{cases}$$

Determine the value of ' k '.

4 Marks Questions

3. Suppose a girl throws a die. If she gets 1 or 2, she tosses a coin three times and notes the number of tails. If she gets 3, 4, 5 or 6, she tosses a coin once and notes whether a 'head' or 'tail' is obtained. If she obtained exactly one 'tail', what is the probability that she threw 3, 4, 5 or 6 with the die?

4. Two numbers are selected at random (without replacement) from the first five positive integers. Let X denotes the larger of the two numbers obtained. Find the mean and variance of X .

5. Two groups are competing for the positions of the Board of Directors of a corporation. The probabilities that the first and second groups will win are 0.6 and 0.4 respectively. Further, if the first group wins, the probability of introducing a new product is 0.7 and the corresponding probability is 0.3 if the second group wins. Find the probability that the new product introduced way by the second group.

6. The random variable X can take only the values 0, 1, 2, 3. Given that $P(X = 0) = P(X = 1) = p$ and $P(X = 2) = P(X = 3)$ such that $\sum p_i x_i^2 = 2\sum p_i x_i$, find the value of p .

7. There are 4 cards numbered 1, 3, 5 and 7, one number on one card. Two cards are drawn at random without replacement. Let X denote the sum of the numbers on the two drawn cards. Find the mean and variance of X .

8. Three persons A , B and C apply for a job of Manager in a private company. Chances of their selection (A , B and C) are in the ratio 1 : 2 : 4. The probabilities that A , B and C can introduce changes to improve profits of the company are 0.8, 0.5 and 0.3, respectively. If the change does not take place, find the probability that it is due to the appointment of C .

9. A bag X contains 4 white balls and 2 black balls, while another bag Y contains 3 white balls and 3 black balls. Two balls are drawn (without replacement) at random from one of the bags and were found to be one white and one black. Find the probability that the balls were drawn from bag Y .

10. In a game, a man wins ₹ 5 for getting a number greater than 4 and loses ₹ 1 otherwise, when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a number greater than 4. Find the expected value of the amount he wins/loses

11. A bag contains 4 balls. Two balls are drawn at random (without replacement) and are found to be white. What is the probability that all the balls in the bag are white?

12. Let X denote the number of colleges where you will apply after your results and $P(X = x)$ denotes your probability of getting admission in x number of colleges. It is given that

$$P(X = x) = \begin{cases} kx & , \text{ if } x = 0 \text{ or } 1 \\ 2kx & , \text{ if } x = 2 \\ k(5 - x) & , \text{ if } x = 3 \text{ or } 4 \\ 0 & , \text{ if } x > 4 \end{cases}$$

where k is a positive constant. Find the value of k . Also, find the probability that you will get admission in (i) exactly one college (ii) at most 2 colleges (iii) at least 2 colleges:

13. A bag A contains 4 black and 6 red balls and bag B contains 7 black and 3 red balls. A die is thrown. If 1 or 2 appears on it, then bag A is chosen, otherwise bag B . If two balls are drawn at random (without replacement) from the selected bag, find the probability of one of them being red and another black.

14. Three machines E_1 , E_2 and E_3 in a certain factory producing electric bulbs, produce 50%, 25% and 25% respectively, of the total daily output of electric bulbs. It is known that 4% of the bulbs produced by each of machines E_1 and E_2 are defective and that 5% of those produced by machine E_3 are defective. If one bulb is picked up at random from a day's production, calculate the probability that it is defective.

- 15.** Two numbers are selected at random (without replacement) from positive integers 2, 3, 4, 5, 6 and 7. Let X denote the larger of the two numbers obtained. Find the mean and variance of the probability distribution of X .
- 16.** From a lot of 15 bulbs which include 5 defectives, a sample of 2 bulbs is drawn at random (without replacement). Find the probability distribution of the number of defective bulbs.
- 17.** Three cards are drawn at random (without replacement) from a well-shuffled pack of 52 playing cards. Find the probability distribution of number of red cards. Hence, find the mean of the distribution.
- 18.** A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded. What is the probability distribution of the random variable X ? Find the mean of X .
- 19.** A bag contains 3 red and 7 black balls. Two balls are selected at random one by one without replacement. If the second selected ball happens to be red, what is the probability that the first selected ball is also red?
- 20.** An urn contains 4 white and 6 red balls. Four balls are drawn at random (without replacement) from the urn. Find the probability distribution of the number of white balls.
- 21.** Two cards are drawn simultaneously (without replacement) from a well-shuffled deck of 52 cards. Find the mean and variance of number of red cards.
- 22.** Find the mean number of heads in three tosses of a coin.

- 23.** A random variable X has following probability distributions:

X	0	1	2	3	4	5	6	7
$P(X)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Find (i) k (ii) $P(X < 3)$ (iii) $P(X > 6)$
(iv) $P(0 < X < 3)$.

- 24.** Find the probability distribution of number of doublets in three tosses of a pair of dice.
- 25.** Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Find the probability distribution of number of aces.
- 26.** Two cards are drawn simultaneously (without replacement) from a well-shuffled pack of 52 cards. Find the probability distribution of number of aces. Also, find the mean of distribution.
- 27.** There are two bags, bag I and bag II. Bag I contains 4 white and 3 red balls while another bag II contains 3 white and 7 red balls. One ball is drawn at random from one of the bags and it is found to be white. Find the probability that it was drawn from bag I.

6 Marks Questions

- 28.** There are three coins. One is two-headed coin, another is biased coin that comes up heads 75% of the time and the third is an unbiased coin. One of three coins is chosen at random and tossed. If it shows heads, what is the probability that it is the two-headed coin?
- 29.** A bag contains 5 red and 4 black balls, a second bag contains 3 red and 6 black balls. One of the two bags is selected at random and two balls are drawn at random (without replacement) both of which are found to be red. Find the probability that the balls are drawn from the second bag.

30. A manufacturer has three machine operators A , B and C . The first operator A produces 1% of defective items, whereas the other two operators B and C produces 5% and 7% defective items respectively. A is on the job for 50% of the time, B on the job 30% of the time and C on the job for 20% of the time. All the items are put into one stockpile and then one items is chosen at random from this and is found to be defective. What is the probability that it was produced by A ?
31. Two cards are drawn simultaneously (or successively without replacement) from a well-shuffled pack of 52 cards. Find the mean and variance of the number of kings.
32. Three numbers are selected at random (without replacement) from first six positive integers. Let X denotes the largest of the three numbers obtained. Find the probability distribution of X . Also, find the mean and variance of the distribution.
33. Bag A contains 3 red and 5 black balls, while bag B contains 4 red and 4 black balls. Two balls are transferred at random from bag A to bag B and then a ball is drawn from bag B at random. If the ball drawn from bag B is found to be red, find the probability that two red balls were transferred from A to B .
34. In a factory which manufactures bolts, machines A , B and C manufacture respectively 30%, 50% and 20% of the bolts. Of their outputs, 3%, 4% and 1% respectively are defective bolts. A bolt is drawn at random from the product and is found to be defective. Find the probability that this is not manufactured by machine B .
35. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{5}$ be the probability that he knows the answer and $\frac{2}{5}$ be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability $\frac{1}{3}$, what is the probability that the student knows the answer given that he answered it correctly?
36. A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and two balls are drawn at random without replacement from the bag and are found to be both red. Find the probability that the balls are drawn from the first bag.
37. Two numbers are selected at random (without replacement) from the first six positive integers. Let X denotes the larger of the two numbers obtained. Find the probability distribution of the random variable X and hence, find the mean of the distribution.
38. There are three coins. One is a two headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the times and third is also a biased coin that comes up tails 40% of the times. One of the three coins is chosen at random and tossed and it shows head. What is the probability that it was the two headed coin?
39. In a game, a man wins rupees five for a six and loses rupee one for any other number, when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the amount he wins/loses.
40. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probabilities of an accident for them are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver or a car driver?

41. A man is known to speak the truth 3 out of 5 times. He throws a die and reports that it is '1'. Find the probability that it is actually 1.
42. A card from a pack of 52 playing cards is lost. From the remaining cards of the pack three cards are drawn at random (without replacement) and are found to be all spades. Find the probability of the lost card being a spade.
43. Assume that the chances of a patient having a heart attack is 40%. Assuming that a meditation and yoga course reduces the risk of heart attack by 30% and prescription of certain drug reduces its chance by 25%. At a time, a patient can choose anyone of the two options with equal probabilities. It is given that after going through one of the two options, the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga. Interpret the result and state which of the above stated methods, is more beneficial for the patient?
44. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers, the probability of their meeting an accident respectively are 0.01, 0.03 and 0.15. One of the insured persons meets with an accident. What is the probability that he is a car driver?
45. Bag I contains 3 red and 4 black balls and bag II contains 4 red and 5 black balls. Two balls are transferred at random from bag I to bag II and then a ball is drawn from bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred balls were both black.
46. Among the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholars attain A
- A grade in their annual exams. At the end of year, one student is chosen at random from the college and he has A grade, what is the probability that the student is a hosteler?
47. Suppose a girl throws a die. If she gets 5 or 6, then she tosses a coin 3 times and note the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and note whether a head or tail is obtained. If she obtained exactly one head, then what is the probability that she throw 1, 2, 3 or 4 with the die?
48. A girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin two times and notes the number of heads obtained. If she obtained exactly two heads, what is the probability that she threw 1, 2, 3 or 4 with the die?
49. Suppose 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male? Assume that there are equal number of males and females.
50. Bag I contains 3 red and 4 black balls and bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag II.
51. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.
52. A factory has two machines A and B. Past record shows that machine A produced 60% of items of output and machine B produced 40% of items. Further, 2% of items, produced by machine A and 1% produced by machine B were defective. All the items are put into a stockpile and then one item is chosen at random from this and this is found to be defective. What is the probability that it was produced by machine B?

- 53.** There are three identical boxes I, II and III, each containing two coins. In box I, both coins are gold coins, in box II, both are silver coins and in box III, there is one gold and one silver coin. A person chooses a box at random and take out a coin. If the coin is of gold, then what is the probability that the other coin in box is also of gold?
- 54.** There are three coins. One is a two tailed coin (having tail on both faces), another is a biased coin that comes up heads 60% of the times and third is an unbiased coin. One of the three coins is chosen at random and tossed and it shows tail. What is the probability that it is a two tailed coin?
- 55.** In a class, 5% of boys and 10% of girls have an IQ of more than 150. In the class, 60% are boys and rest are girls. If a student is selected at random and found to have an IQ of more than 150, then find the probability that the student is a boy.
- 56.** In a bolt factory, machines *A*, *B* and *C* manufacture 25%, 35% and 40% of total production, respectively. Out of their total output, 5%, 4% and 2% are defective bolts. A bolt is drawn at random and is found to be defective. What is the probability that it is manufactured by machine *B*?
- 57.** A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn at random and are found to both of clubs. Find the probability of the lost card being of clubs.
- 58.** From a lot of 10 bulbs, which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of number of defective bulbs?