

# LATEX ASSIGNMENT

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## CLASS 10

### PROBABILITY

1. Two dice are thrown simultaneously. The probability that the sum of two numbers appearing on the top of the dice is less than 12, is
  - (a)  $\frac{1}{36}$
  - (b)  $\frac{35}{36}$
  - (c) 0
  - (d) 1
2. A jar contains 18 marbles. Some are red and others are yellow. If a marble is drawn at random from the jar, the probability that it is red is  $\frac{2}{3}$ . Find the number of yellow marbles in the jar.
3. A die is thrown twice. What is the probability that
  - (i) 5 will come up at least once, and
  - (ii) 5 will not come up either time ?
4. Let  $A$  and  $B$  be two events such that  $P(A) = \frac{5}{8}$ ,  $P(B) = \frac{1}{2}$  and  $P(A/B) = \frac{3}{4}$ . Find the value of  $P(B/A)$ .
5. Two balls are drawn at random from a bag containing 2 red balls and 3 blue balls, without replacement. Let the variable  $X$  denotes the number of red balls. Find the probability distribution of  $X$ .
6. A card from a pack of 52 playing cards is lost. From the remaining cards, 2 cards are drawn at random without replacement, and are found to be both aces. Find the probability that lost card being an ace.
7. Probabilities of  $A$  and  $B$  solving a specific problem are  $\frac{2}{3}$  and  $\frac{3}{5}$ , respectively. If both of them try independently to solve the problem, then find the probability that the problem is solved.

8. A pair of dice is thrown. It is given that the sum of numbers appearing on both dice is an even number. Find the probability that the number appearing on at least one die is 3.
9. In Fig. 1, At the start of a cricket match, a coin is tossed and the team winning the toss has the opportunity to choose to bat or bowl. Such a coin is unbiased with equal probabilities of getting head and tail.



Figure 1: Tossing a coin

Based on the above information, answer the following questions :

- (a) If such a coin is tossed 2 times, then find the probability distribution of number of tails.
- (b) Find the probability of getting at least one head in three tosses of such a coin.
10. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of spade cards.
11. A pair of dice is thrown and the sum of the numbers appearing on the dice is observed to be 7. Find the probability that the number 5 has appeared on atleast one die.
12. In Fig. 2, A shopkeeper sells three types of flower seeds  $A_1$ ,  $A_2$ ,  $A_3$ . They are sold in the form of a mixture, where the proportions of these seeds are 4 : 4 : 2, respectively. The germination rates of the three types of seeds are 45%, 60% and 35% respectively.



Figure 2: Three Types of Flower Seeds

Based on the above information:

- (a) Calculate the probability that a randomly chosen seed will germinate;
  - (b) Calculate the probability that the seed is of type A2, given that a randomly chosen seed germinates.
13. Three friends  $A$ ,  $B$  and  $C$  got their photograph clicked. Find the probability that  $B$  is standing at the central position, given that  $A$  is standing at the left corner.
14. In Fig. 3 A coin is tossed twice. The following table shows the probability distribution of number of tails :

$X$	0	1	2
$P(X)$	$K$	$6K$	$9K$

Figure 3: Probability Distribution of number of tails

- (a) Find the value of  $K$ .
  - (b) Is the coin tossed biased or unbiased ? Justify your answer.
15. In Fig. 4 In a game of Archery, each ring of the Archery target is valued. The centre most ring is worth 10 points and rest of the rings are allotted points 9 to 1 in sequential order moving outwards.
- Archer  $A$  is likely to earn 10 points with a probability of 08 and Archer  $B$  is likely the earn 10 points with a probability of 09.

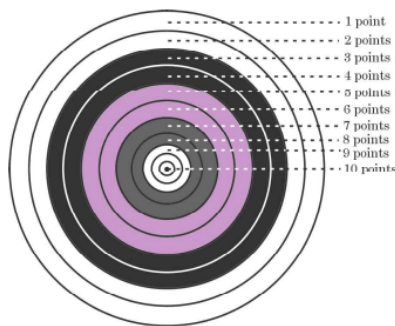


Figure 4: Ring of the Archery Target

Based on the above information, answer the following questions : If both of them hit the Archery target, then find the probability that

- (a) exactly one of them earns 10 points.
  - (b) both of them earn 10 points.
16. (a) Events  $A$  and  $B$  are such that  $P(A) = \frac{1}{2}$ ,  $P(B) = \frac{7}{12}$  and  $P(\overline{A} \cup \overline{B}) = \frac{1}{4}$  Find whether the events  $A$  and  $B$  are independent or not.
  - (b) A box  $B_1$  contains 1 white ball and 3 red balls. Another box  $B_2$  contains 2 white balls and 3 red balls. If one ball is drawn at random from each of the boxes  $B_1$  and  $B_2$  then find the probability that the two balls drawn are of the same colour.
  17. There are two boxes, namely box-I and box-II. Box-I contains 3 red and 6 black balls. Box-II contains 5 red and 5 black balls. One of the two boxes, is selected at random and a ball is drawn at random. The ball drawn is found to be red. Find the probability that this red ball comes out from box-II.
  18. In a toss of three different coins, find the probability of coming up of three heads, if it is known that at least one head comes up.
  19. Two rotten apples are mixed with 8 fresh apples. Find the probability distribution of number of rotten apples, if two apples are drawn at random, one-by-one without replacement.
  20. A laboratory blood test is 98% effective in detecting a certain disease when it is in fact, present. However, the test also yields a false positive result for 04% of the healthy person tested. From a large population, it is given that 0.2% of the population actually has the disease. Based on the above, answer the following questions :
    - (a) One person, from the population, is taken at random and given the test. Find the probability of his getting a positive test result.

- (b) What is the probability that the person actually has the disease, given that his test result is positive ?
21. Two cards are drawn from a well-shuffled pack of playing cards one-by-one with replacement. The probability that the first card is a king and the second card is a queen is
- (a)  $\frac{1}{13} + \frac{1}{13}$   
 (b)  $\frac{1}{13} \times \frac{4}{51}$   
 (c)  $\frac{4}{52} \times \frac{3}{51}$   
 (d)  $\frac{1}{13} \times \frac{1}{13}$
22. In Fig. 5 If  $X$  is a random variable with probability distribution as given below :

<b>X</b>	<b>0</b>	<b>1</b>	<b>2</b>
<b>P(X)</b>	<b>k</b>	<b>4k</b>	<b>k</b>

Figure 5: Probability Distribution

- The value of  $k$  and the mean of the distribution respectively are
- (a)  $\frac{1}{7}, 1$   
 (b)  $\frac{1}{6}, 2$   
 (c)  $\frac{1}{6}, 1$   
 (d)  $\frac{1}{6}$
23. For two events  $A$  and  $B$  if  $P(A) = \frac{4}{10}$ ,  $P(B) = \frac{8}{10}$  and  $P(B | A) = \frac{6}{10}$ , then find  $P(A \cup B)$ .
24. Bag I contains 4 red and 3 black balls. Bag II contains 3 red and 5 black balls. One of the two bags is selected at random and a ball is drawn from the bag, which is found to be red. Find the probability that the ball is drawn from Bag II.
25. Two cards are drawn successively without replacement from a well-shuffled pack of 52 cards. Find the probability distribution of the number of aces and hence find its mean.

26. The probability of solving a specific question independently by  $A$  and  $B$  are  $\frac{1}{3}$  and  $\frac{1}{5}$  respectively. If both try to solve the question independently, the probability that the question is solved is
- $\frac{7}{15}$
  - $\frac{8}{15}$
  - $\frac{2}{15}$
  - $\frac{14}{15}$
27. A card is picked at random from a pack of 52 playing cards. Given that the picked up card is a queen, the probability of it being a queen of spades is ?
28. A bag contains 19 tickets, numbered 1 to 19. A ticket is drawn at random and then another ticket is drawn without replacing the first one in the bag. Find the probability distribution of the number of even numbers on the ticket.
29. Find the probability distribution of the number of successes in two tosses of a die, when a success is defined as “number greater than 5”.
30. The random variable  $X$  has a probability function  $P(x)$  as defined below, where  $k$  is some number :

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

Find :

- The value of  $k$
  - $P(X < 2)$ ,  $P(X \leq 2)$ ,  $P(X \geq 2)$
31. Consider the following hypothesis :

$$H_0 : \mu = 35 \quad (2)$$

$$H_1 : \mu \neq 35 \quad (3)$$

A sample of 81 items is taken whose mean is 375 and the standard deviation is 5. Test the hypothesis at 5% level of significance.

[Given : Critical value of  $Z$  for a two-tailed test at 5% level of significance is 1.96]

32. In Fig. 6 Fit a straight line trend by the method of least squares and find the trend value for the year 2008 for the following data :

Year	Production (in lakh tonnes)
2001	30
2002	35
2003	36
2004	32
2005	37
2006	40
2007	36

Figure 6: Years and Production