CHAPTER-13
PROBABILITY
03 MARKS TYPE QUESTIONS

Q. NO	**QUESTION**	**MARK**
1.	In a bilateral cricket series between India and South Africa, the probability that India wins the first match is 0.6. If India wins any match, then the probability that it wins the next match is 0.4, otherwise the probability is 0.3. Also, it is given that there is no tie in any match.  Based on the above information answer the following questions: (i) What is the probability that India won the second match, if India has already loose the first match? (ii) What is the probability that India losing the third match, if India has already loose the first two matches? (iii) Find the probability that India is loosing the first two matches.	3
2.	A factory has three machines A, B and C to manufacture bolts. Machine A manufacture 30%, machine B manufacture 20% and machine C manufacture 50% of the bolts respectively. Out of their respective outputs 5%, 2% and 4% are defective. A bolt is drawn at random from total production and it is found to be defective.  Based on the above information, answer the following questions: What is the probability that defective bolt drawn is manufactured by machine A?	3
3.	A coin is biased so that the head is three times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails. Hence find the mean of the number of tails.	3
4.	A bag contains $(2n+1)$ coins. It is known that $(n-1)$ of these coins have a head on both sides, whereas the rest of the coins are fair. A coin is picked up at random from the bag and is tossed. If the probability that the toss results in a head is $\frac{31}{42}$, determine the value of n. 	3
5.	The probability that Abraham hits the target is $\frac{1}{3}$ and the probability that Bhavesh hits it, is $\frac{2}{5}$. If both try to hit the target independently, find the probability that target is hit.	3

		
6.	An electric shop has two types of LED bulbs of equal quantity. The probability of an LED bulb lasting more than 6 months given that it is of type 1 is 0.7 and is given that it is of type 2 is 0.4. Then find the probability that on LED bulb chosen uniformly at random lasts more than 6 months. 	3
7.	A die marked 1,2,3 in red and 4,5,6 in green is tossed. Let A be the event "numbers even" and B be the event" numbers are marked red". Find whether the event A and B are independent or not.	3
8.	Suppose that 5 men out of 100 and 25 women out of 1000 are good orators assuming that there are equal nos. of men and women, find the probability of choosing a good orator.	3
9.	Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin 3 times and notes the number of heads. If she gets 1, 2,3 or 4 she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1, 2, 3 or 4 with the die?	3

ANSWERS:

<table>
<tr><th>Q. NO</th><th>ANSWER</th><th>MARKS</th></tr>
<tr><td>1.</td><td>(i)It is given that if India loose any match, then the probability that it wins the next match is 0.3.
Required probability= 0.3
(ii) It is given that if India loose any match, then the probability that it wins the next match is 0.3.
Required probability= 1-0.3=0.7
(iii)Required probability= P(India loosing first match).P(India loosing second match when India has already lost first match) = 0.4×0.7 = 0.28</td><td>3</td></tr>
<tr><td>2.</td><td>Let E_1, E_2, E_3 be the events of drawing a bolt produced by machine A,B and C.
Then $P(E_1) = \frac{3}{10}, \quad P(E_2) = \frac{1}{5}, \quad P(E_3) = \frac{1}{2}$
Let, E be the event of drawing a defective bolt.
Probability that defective bolt drawn is manufactured by machine A =
$$P(E_1|E) = \frac{P(E|E_1) \times P(E_1)}{P(E_1)P\left(\frac{E}{E_1}\right) + P(E_2)P\left(\frac{E}{E_2}\right) + P(E_3)P\left(\frac{E}{E_3}\right)} = \frac{\frac{1}{20} \times \frac{3}{10}}{\frac{3}{10} \times \frac{1}{20} + \frac{1}{5} \times \frac{1}{50} + \frac{1}{2} \times \frac{1}{25}}$$
$$= \frac{5}{13}$$</td><td>3</td></tr>
<tr><td>3.</td><td>$$P(Head) = \frac{3}{4}, P(Tail) = \frac{1}{4}$$
Let, X = Number of tails.
Probability distribution is given by
<table><tr><td>X</td><td>0</td><td>1</td><td>2</td></tr><tr><td>P(X)</td><td>$\frac{9}{16}$</td><td>$\frac{6}{16}$</td><td>$\frac{1}{16}$</td></tr></table>Mean = ∑ X.P(X) = $\frac{6}{16} + \frac{2}{16} = \frac{1}{2}$</td><td>3</td></tr>
<tr><td>4.</td><td>No of coins with head on both sides $= (n-1)$
No of fair coins $= (n+2)$
Let $E_1 =$ picking a coin with head on both sides and $E_2 =$Picking a fair coin.
$A =$Getting a head on tossing the coin
Now by total probability theorem
$$P(A) = P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P\left(\frac{A}{E_2}\right)$$
$$= \frac{n-1}{2n+1} \times 1 + \frac{(n+2)}{2n+1} \times \frac{1}{2} = \frac{3n}{2(2n+1)}$$
ATQ
$$\frac{3n}{2(2n+1)} = \frac{31}{42} \Rightarrow n = 31$$</td><td></td></tr>
<tr><td>5.</td><td>$P(A) = P(\text{A hits target}) = \frac{1}{3}$
$P(B) = P(\text{B hits target}) = \frac{2}{5}$
Now, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$= \frac{1}{3} + \frac{2}{5} - \frac{1}{3} \times \frac{1}{5} = \frac{3}{5}$</td><td></td></tr>
<tr><td>6.</td><td>$P(\text{LED of type 1}) = \frac{1}{2} = 0.5$</td><td></td></tr>
</table>

	$P(\text{LED of type 2}) = \frac{1}{2} = 0.5$ Also note that $P\left(\frac{\text{LED lasting more than 6 months}}{\text{LED of type 1}}\right) = P\left(\frac{A}{T_1}\right) = 0.7$ $P\left(\frac{\text{LED lasting more than 6 months}}{\text{LED of type 2}}\right) = P\left(\frac{A}{T_2}\right) = 0.4$ $P(H) = P(T_1)P\left(\frac{H}{T_1}\right) + P(T_2)P\left(\frac{H}{T_2}\right)$ $= 0.5 \times 0.7 + 0.5 \times 0.4$ $= 0.35 + 0.22$ $= 0.55$	
7.	$A = \{2,4,6\}$ $\quad B = \{1,2,3\}$ $P(A) = \frac{3}{6} = \frac{1}{2}$ $\quad P(B) = \frac{1}{2}$ $P(A) \times P(B) = \frac{1}{4}$ $n(A \cap B) = \{2\}$ $\quad P(A \cap B) = \frac{1}{6}$ $\therefore P(A \cap B) \neq P(A) \times P(B)$. $\therefore$. Given two events are not independent	1 1 1
8.	Let, A = good orator E_1 =no. of men good orator $E_2 =$ no. of women good orator $\therefore \mathrm{P}(\mathrm{E}_1) = \mathrm{P}(\mathrm{E}_2) = \frac{1}{2}$, $\mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E}_1}\right) = \frac{5}{100}$, $\quad \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E}_2}\right) = \frac{25}{1000}$ $\therefore P\left(\frac{E_1}{A}\right) = \frac{P(E_1) \times P\left(\frac{A}{E1}\right)}{P(E_1) \times P\left(\frac{A}{E1}\right) + P(E_2) \times P\left(\frac{A}{E_2}\right)} = \frac{2}{3}$	1 1 1
9.	Let $\quad \mathrm{E}_1$: the die shows 1, 2, 3 or 4 E_2 : the die shows 5 or 6 and $\quad$ A: the girl obtained exactly one head $\mathrm{P}(\mathrm{E}_1) = \frac{4}{6} = \frac{2}{3}$ $\quad$ and $\quad \mathrm{P}(\mathrm{E}_2) = \frac{2}{6} = \frac{1}{3}$ $\mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E}_1}\right) = \frac{1}{2}$ $\quad \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E}_2}\right) = \frac{3}{8}$ From Baye's theorem $\therefore \mathrm{P}\left(\frac{\mathrm{E}_1}{\mathrm{A}}\right) = \frac{\mathrm{P}(\mathrm{E}_1) \times \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E1}}\right)}{\mathrm{P}(\mathrm{E}_1) \times \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E1}}\right) + \mathrm{P}(\mathrm{E}_2) \times \mathrm{P}\left(\frac{\mathrm{A}}{\mathrm{E}_2}\right)} = \frac{8}{11}$	1 1 1