CHAPTER-13

PROBABILITY

02 MARKS TYPE QUESTIONS

<table>
<tr><th>Q. NO</th><th>QUESTION</th><th>MARK</th></tr>
<tr><td>1.</td><td>In pre-board examination of class XII, commerce stream with Economics and Mathematics of a particular school, 50% of the students failed in Economics, 35% failed in Mathematics and 25% failed in both Economics and Mathematics. A student is selected at random from the class.
Based on the above information, answer the following questions:
(i) What is the probability that the selected student has failed in Economics, if it is known that he has failed in Mathematics?
(ii) What is the probability that the selected student has failed in Mathematics, if it is known that he has failed in Economics?</td><td>2</td></tr>
<tr><td>2.</td><td>Box I contains 1 white, 3 black and 2 red balls. Box II contains 2 white, 1 black and 3 red balls. Box III contains3 white, 2 black and 1 red balls. One box is chosen at random and two balls are drawn with replacement.
If E_1, E_2 and E_3 be the events that the balls drawn from box I, box II and box III respectively and E be the event that balls drawn are one white and one red, then what is the probability of occurrence of event E given that the balls drawn are from box I?</td><td>2</td></tr>
<tr><td>3.</td><td>A shopkeeper sells three types of flower seeds A1, A2, A3. They are sold is 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. Calculate the probability that a randomly chosen seed will germinate?
  </td><td>2</td></tr>
<tr><td>4.</td><td>Let a dice has property that the probability of a face with n dots showing up is proportional to n, then find the probability of face showing five dots?</td><td>2</td></tr>
<tr><td>5.</td><td>The probability distribution of a random variable X is given below:
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>P(X)</td><td>k</td><td>k/2</td><td>k/4</td><td>k/8</td></tr>
</table>
Find the value of k.</td><td>2</td></tr>
<tr><td>6.</td><td>A box contains 12 black and 24 white balls. Two balls are drawn from the box one after the other without replacement. What is the probability that both drawn balls are black?
  </td><td>2</td></tr>
<tr><td>7.</td><td>Two cards are drawn successively, without replacement from a pack of 52 well shuffled cards. What is the probability that first card is king, and the second card drawn is an ace?</td><td>2</td></tr>
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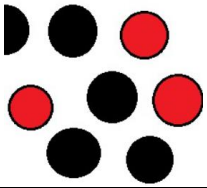
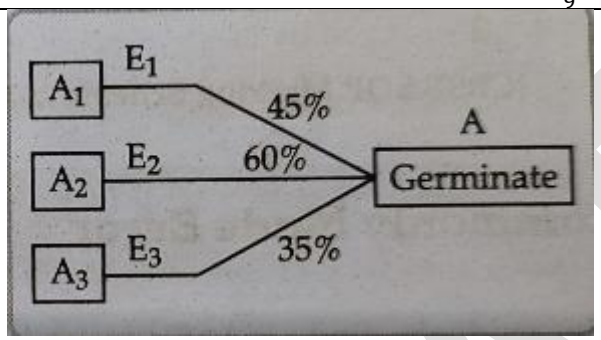
8.	Bag one contains 3 red and 4 black balls second another Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from second Bag. 	2
9.	A group consists of an equal number of girls and boys. Out of this group 20% of boys and 30% of the girls are unemployed. If a person is selected at random from this group, then find the probability of the selected person being employed. 	2
10.	Abraham speaks truth in 80% cases and Bhavesh speaks truth in 90% cases. In What percentage of cases are they likely to agree with each other in stating the same fact? 	2
11.	If P(A) =0.4, P(B)=0.8 and P(B/A) = 0.6 then find P(A ∪ B).	2
12.	Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively if both are trying to solve the problem independently then find the probability of that (i) The problem is solved (ii) Exactly one of them solves the problem	2
13.	A speaks truth in 80% cases and B speaks truth in 90% cases. In what percentage of cases are they likely to agree with each other in stating the same fact?	2
14.	Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that (i) the youngest is a girl? (ii) at least one is a girl?	2
15.	An unbiased coin is tossed 4 times. Find the probability of getting at least one head.	2

ANSWERS:

Q. NO	ANSWER	MARKS
1.	Let,E and M denote the events that student has failed in Economics and Mathematics respectively. $P(E) = \frac{50}{100}$ $P(M) = \frac{35}{100}$ $P(E \cap M) = \frac{25}{100}$ (i) $P(E\|M) = \frac{P(E \cap M)}{P(M)} = \frac{5}{7}$ (ii) $P(M \mid E) = \frac{P(M \cap E)}{P(E)} = \frac{1}{2}$	2
2.	$P(E_1) = P(E_2) = P(E_3) = \frac{1}{3}$ Probability of drawing red and white ball if box I is selected = $P(E\|E_1) = P(red) \times P(white) + P(white) \times P(red) = \frac{1}{9}$	2
3.	 $P(E_1) = \frac{4}{10}$ $P(E_2) = \frac{4}{10}$ $P(E_3) = \frac{2}{10}$ $P\left(\frac{A}{E_1}\right) = \frac{45}{100}$ $P\left(\frac{A}{E_2}\right) = \frac{60}{100}$ $P\left(\frac{A}{E_3}\right) = \frac{35}{100}$ $P(A) = P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P\left(\frac{A}{E_2}\right) + P(E_3)P\left(\frac{A}{E_3}\right) = \frac{49}{100}$	2
4.	Let P(n)=Proportional to n where n=1,2,3,4,5,6 ⇒ P(n)=nk P(1)+P(2)+P(3)+P(4)+P(5)+P(6)=1 ⇒k+2k+3k+4k+5k+6k=1 $\Rightarrow k = \frac{1}{21}$ P(5)=5k=$\frac{5}{21}$	2
5.	We know, $\sum p_i = 1$ Or, $k + \frac{k}{2} + \frac{k}{4} + \frac{k}{8} = 1$ Or, $k = \frac{8}{15}$	2
6.	Let E and F denote respectively the events that first and second ball drawn are black. We have to find $P(EF)$. Now $P(E) = \frac{12}{36}$ and $P(F\|E) = \frac{11}{35}$ By multiplication rule of probability, we have $P(E \cap F) = P(E)\,P\left(\frac{F}{E}\right)$ $= \frac{12}{36} \times \frac{11}{35}$	

	$= \frac{11}{105}$	
7.	Let K denote the event that the card drawn is king and A be the event that the card drawn is an ace. Clearly, we have to find P (KA) Now $P(K) = \frac{4}{52}$ and $P(A\|K) = \frac{4}{51}$ By multiplication rule of probability, we have $P(KA) = P(K)\, P\left(\frac{A}{K}\right)$ $= \frac{4}{52} \times \frac{4}{51}$ $= \frac{4}{663}$	
8.	Let E_1 be the event of choosing the first bag I, E_2 the event of choosing the second bag and A be the event of drawing a red ball. Then $P(E_1) = P(E_2) = \frac{1}{2}$ Note that $P\left(\frac{A}{E_1}\right) = \frac{3}{7}$ and $P\left(\frac{A}{E_2}\right) = \frac{5}{11}$ Now the required probability is $P\left(\frac{E_2}{A}\right)$. By using Bayes' theorem, we have By using Bayes' theorem, we have $P\left(\frac{E_2}{A}\right) = \frac{P(E_2)P(\frac{A}{E_2})}{P(E_1)P\left(\frac{A}{E_1}\right) + P(E_2)P(\frac{A}{E_2})}$ $= \frac{\frac{1}{2} \times \frac{5}{11}}{\frac{1}{2} \times \frac{3}{7} + \frac{1}{2} \times \frac{5}{11}}$ $= \frac{35}{58}$	
9.	$P(\text{girls}) = \frac{1}{2}$ $P(\text{boys}) = \frac{1}{2}$ $P\left(\frac{\text{unemployed}}{\text{boys}}\right) = \frac{20}{100} = \frac{2}{10}$ $P\left(\frac{\text{unemployed}}{\text{girls}}\right) = \frac{30}{100} = \frac{3}{10}$ $P(\text{unemployed}) = P(\text{boys})P\left(\frac{\text{unemployed}}{\text{boys}}\right) + P(\text{girls})\, P\left(\frac{\text{unemployed}}{\text{girls}}\right)$ $= \frac{1}{2} \times \frac{2}{10} + \frac{1}{2} \times \frac{3}{10} = \frac{5}{20} = \frac{1}{4}$ Therefore $P(employed) = 1 - \frac{1}{4} = \frac{3}{4}$	

10.	$P(A) = \frac{80}{100} = \frac{4}{5}, P(B) = \frac{90}{100} = \frac{9}{10}$ P(agree)= P(both speaking truth or both speaking lie) $= P(AB \text{ or } \bar{A}\bar{B})$ $= \frac{4}{5} \times \frac{9}{10} + \frac{1}{5} \times \frac{1}{10}$ $= \frac{37}{50} = \frac{74}{100} = 74\%$	
11.	P(B/A) = $\frac{P(A \cap B)}{P(A)}$ P (A ∩ B) = $0.6 \times 0.4 = 0.24$ ∴ P(A ∪ B) = P(A) + P(B) – P (A∩B) = 0.4 + 0.8 − 0.24 = 1.2 – 0.24 = 0.96	1 1
12.	(i) P $(\bar{A})$P(B) + P(A) P $(\bar{B})$ + P(A). P(B) $= \frac{1}{2} \text{ x } \frac{1}{3} + \frac{1}{2} \text{ x } \frac{2}{3} + \frac{1}{2} \text{ x } \frac{1}{3}$ $= \frac{2}{3}$ (ii) P $(\bar{A})$ P(B) + P(A). P$(\bar{B})$ $= \frac{1}{2} \text{ x } \frac{1}{3} + \frac{1}{2} \text{ x } \frac{2}{3}$ $= \frac{1}{2}$	1 1
13.	Given $P(A) = \frac{80}{100} = \frac{4}{5}$ and $P(B) = \frac{90}{100} = \frac{9}{10}$ P(Agree) = P(both speaking truth or both telling lie) = P(AB or $\bar{A}\bar{B}$) = P(A). P(B) or P $(\bar{A})$ P$(\bar{B})$ $= \frac{4}{5} \times \frac{9}{10} + \frac{1}{5} \times \frac{1}{10}$ $= \frac{37}{50} = \frac{74}{100} = 74$ %.	1 1
14.	Sample space S = {BB, BG, GB,GG} (i) Let A and B be two events such that A = Both are girls ={GG} B = The youngest is a girl = {BG, GG} P$(\frac{A}{B}) = \frac{P(A \cap B)}{P(B)} = \frac{\frac{1}{4}}{\frac{2}{4}} = \frac{1}{2}$ (ii) Let C be the event such that C = at least one is a girl ={BG, GB, GG} Now , P$(\frac{A}{C}) = \frac{P(A \cap C}{P(C)} = \frac{\frac{1}{4}}{\frac{3}{4}} = \frac{1}{3}$	 1 1
15.	When an unbiased coin is tossed once, then	

	$P(H) = P(T) = \frac{1}{2}$	1
	Probability of getting at least one head $= 1 - P(\text{ no head})$ $= 1 - P(\text{all tails})$ $= 1 - \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ $= 1 - \frac{1}{16} = \frac{15}{16}$	1