Class 12– CBSE– Math– Chapter–Probability

Max Marks – 20 Time: 40 minutes

S.No.	Questions/Problems	Marks
1.	If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{2}{3}, then$ $P(A\|B)$ is: (a) $\frac{1}{4}$ (b) $\frac{1}{2}$ - answer (c) $\frac{1}{3}$ (d) $\frac{2}{3}$	1
2.	Assertion (A): If A and B are independent events, then P(A∩B)=P(A)·P(B). Reason (R): For independent events, P(A|B)=P(A). (a) Both A and R are true, and R is the correct explanation of A. answer (b) Both A and R are true, but R is not the correct explanation of A. (c) A is true, but R is false. (d) A is false, but R is true.	1
3. Solution :	A bag contains 4 red and 6 black balls. Two balls are drawn randomly without replacement. Find the probability that both balls are red. Total balls = 10(4 red, 6 black) $P(both\ red) = \frac{\binom{4}{2}}{\binom{10}{2}} = \frac{6}{45} = \frac{2}{15}.$	2
4. Solution :	Given P(A)=0.6, P(B)=0.4, and P(A∪B) =0.8. Verify whether A and B are independent events. P(A∩B) =P(A)+P(B)−P(A∪B) =0.6+0.4−0.8=0.2. If independent, P(A∩B) =P(A)·P(B)=0.6×0.4=0.24. Since 0.2≠0.24, A and B are not independent.	2
5. Solution :	A pair of dice is thrown. Find the probability that the sum of numbers on the dice is 9, given that at least one die shows 5. Let S: sum is 9, E: at least one die shows 5. Total outcomes: 6×6=36.	3

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<td>E:(1,5),(2,5),(3,5),(4,5),(5,5),(6,5),(5,1),(5,2),(5,3),(5,4),(5,6) → 11
outcomes.
S∩E: (4,5),(5,4),(5,5) → 3 outcomes.
P(S|E)=$\frac{3}{11}$</td>
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Solution</td>
<td>A box contains 10 bulbs, of which 3 are defective. Two bulbs are drawn at random. Let X be the number of defective bulbs drawn. Find the probability distribution of X and calculate E(X).
X can be 0, 1, or 2.

$P(X=0)=\frac{\binom{7}{2}}{\binom{10}{2}}=\frac{21}{45}=\frac{7}{15}$
$P(X=1)=\frac{\binom{3}{1}\binom{7}{1}}{\binom{10}{2}}=\frac{21}{45}=\frac{7}{15}$
$P(X=2)=\frac{\binom{3}{2}}{\binom{10}{2}}=\frac{3}{45}=\frac{1}{15}$

Probability distribution:
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>P(X)</td><td>$\frac{7}{15}$</td><td>$\frac{7}{15}$</td><td>$\frac{1}{15}$</td></tr>
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$E(X)=0\cdot\frac{7}{15}+1\cdot\frac{7}{15}+2\cdot\frac{1}{15}=\frac{9}{15}=\frac{3}{5}$</td>
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Solution</td>
<td>An urn contains 5 white and 3 black balls. Two balls are drawn without replacement. What is the probability that the second ball is black, given that the first ball is white? Also, find the probability that both balls are white.
Let W_1: first ball white, B_2: second ball black.

$P(B_2|W_1)=\frac{p(B_2\cap W_1)}{p(W_1)}$
$P(W_1)=\frac{5}{8}$
$p(B_2\cap W_1)=\frac{5}{8}\times\frac{3}{7}=\frac{15}{56}$
$P(B_2|W_1)=\frac{15/56}{5/8}=\frac{15}{56}\times\frac{8}{5}=\frac{3}{7}$
$P(both\ white)=\frac{5}{8}\times\frac{4}{7}=\frac{20}{56}=\frac{5}{14}$
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<td>8.</td>
<td>A card from a pack of 52 cards is lost. From the remaining cards, two cards are drawn and found to be diamonds. Find the probability that the lost card was a diamond.</td>
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solution	(Hint: Use Bayes' theorem) Let D: lost card is diamond, $\overline{D}$: lost card is not diamond. $P(D) = \frac{13}{52} = \frac{1}{4}, P(\overline{D}) = \frac{3}{4}$. Let E: two cards drawn are diamonds. • If D occurs, 12 diamonds left. $P(E\|D) = \frac{\binom{12}{2}}{\binom{51}{2}} = \frac{66}{1257}$ • If $\overline{D}$ occurs, 13 diamonds left. $P(E\|\overline{D}) = \frac{\binom{13}{2}}{\binom{51}{2}} = \frac{78}{1275}$ By Bayes' theorem: $P(D\|E) = \frac{P(E\|D)P(D)}{P(E\|D)P(D)+P(E\|\overline{D})P(\overline{D})} = \frac{\frac{66}{1275}\times\frac{1}{4}}{\frac{66}{1275}\times\frac{1}{4}+\frac{78}{1275}\times\frac{3}{4}} =$ $\frac{66}{66+234} = \frac{66}{300} = \frac{11}{50}$	