	BCM SCHOOL BASANT AVENUE DUGRI ROAD LUDHIANA **ASSIGNMENT OF PROBABILTY** **ANSWER KEY**
1	**(A)$\frac{4}{7}$**
2	**(c) 1 – P(A’) P(B’)**
3	**(a) P(E|F)+P(E’|F)=1**
4	P(E) = $\frac{1}{6}$ $P\left(\bar{E}\right)=\frac{5}{6}$, P(F) = $\frac{1}{12}$ $P\left(\bar{F}\right)=\frac{11}{12}$ A wins if he gets a total of 7 in 1st, 3rd or 5th ... throws. Probability of A getting a total of 7 in the 1st throw = $\frac{1}{6}$ A will get the 3rd throw if he fails in the 1st throw and B fails in the 2nd throw. Probability of A getting a total of 7 in the 3rd throw = $P\left(\bar{E}\right)P\left(\bar{F}\right)P(E)=\frac{5}{6}\times\frac{11}{12}\times\frac{1}{6}$ Similarly, probability of getting a total of 7 in the 5th throw = $P\left(\bar{E}\right)P\left(\bar{F}\right)P(E)=\frac{5}{6}\times\frac{11}{12}\times\frac{1}{6}$ $P\left(\bar{E}\right)P\left(\bar{F}\right)P\left(\bar{E}\right)P\left(\bar{F}\right)P(E)=\frac{5}{6}\times\frac{11}{12}\times\frac{5}{6}\times\frac{11}{12}\times\frac{1}{6}$ and so on Probability of winning of A = $\frac{1}{6}+\left(\frac{5}{6}\times\frac{11}{12}\times\frac{1}{6}\right)+$ $\left(\frac{5}{6}\times\frac{11}{12}\times\frac{5}{6}\times\frac{11}{12}\times\frac{1}{6}\right)+\ldots=\frac{\frac{1}{6}}{1-\frac{5}{6}\times\frac{11}{12}}=\frac{12}{17}$ ∴ Probability of winning of B = 1 − Probability of winning of A = $1-\frac{12}{17}=\frac{5}{17}$

5	Here, probability of P speaking truth, $P(T) = 70\,\% \; = \frac{7}{10}$ $\therefore$ probability of P speaking lie, $P(L) = 1 - \frac{7}{10} = \frac{3}{10}$ Probability of Q speaking truth, $Q(T) = 80\,\% \; = \frac{4}{5}$ $\therefore$ probability of Q speaking lie, $Q(L) = 1 - \frac{4}{5} = \frac{1}{5}$ Probability of both P and Q agree in same fact $P(S) = P(T) \cap Q(T) + P(L) \cap Q(L)$ As, all these events are indepependent event, $\therefore P(S) = P(T)Q(T) + P(L)Q(L)$ $P(S) = \frac{7}{10} * \frac{4}{5} + \frac{3}{10} * \frac{1}{5} = \frac{28}{50} + \frac{3}{50} = \frac{31}{50}$ So, percentage of both of them agree on same fact $= \frac{31}{50} * 100 = 62\,\%$ Also, we can clearly see that when both of them agree, they also speak lie and probability of that is $\frac{3}{50}$.

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The probability distribution of X is

X	0	1	2	3	4
P(X)	0	k	$4k$	$2k$	k

The given distribution is a probability distribution.

$$\therefore \sum p_i = 1$$

$\Rightarrow 0 + k + 4k + 2k + k = 1$

$\Rightarrow 8k = 1$

$\Rightarrow k = 0.125$

(i) P (getting admission in exactly one college) = $P(X = 1) = k = 0.125$

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(ii) P (getting admission in at most 2 colleges) = $P(X \leq 2) = 0 + k + 4k = 5k = 0.625$

(iii) P (getting admission in atleast 2 colleges) = $P(X \geq 2) = 4k + 2k + k = 7k = 0.875$.

7	Bag X = 4 white, 2 black. Bag Y = 3 white, 3 black Let A be the event of selecting one white and one black ball. E_1 first bag selected E_2 second bag selected $P(E_1) = \frac{1}{2} P(E_2) = \frac{1}{2}$ $P\left(\frac{A}{E_1}\right) = \frac{4}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{4}{5} = \frac{16}{30}$ $P(AE_2) = \frac{3}{6} \times \frac{3}{5} + \frac{3}{6} \times \frac{3}{6} \times \frac{3}{5} = \frac{18}{30}$ $P(E_2/A) = \frac{P(E_2) P(A/E_2)}{P(E_1) P(A/E_1) + P(E_2) P(A/E_2)}$ $P(E_2/A) = \frac{\frac{1}{2} \times \frac{18}{30}}{\frac{1}{2} \times \frac{16}{30} + \frac{1}{2} \times \frac{18}{30}}$ $= \frac{18}{16 + 18}$ $= \frac{18}{34}$ $= \frac{9}{17}$

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The events are defined as follows:

E: Two ball drawn are white

A: There are 2 white balls in the bag

B: There are 3 white balls in the bag

C: There are 4 white balls in the bag

Then, P(A) = P(B) = P(C) = 1/3

$$P\left(\frac{E}{A}\right) = \frac{{}^{2}C_{2}}{{}^{4}C_{2}} = \frac{1}{6}$$

$$P\left(\frac{E}{B}\right) = \frac{{}^{3}C_{2}}{{}^{4}C_{2}} = \frac{3}{6} = \frac{1}{2}$$

$$P\left(\frac{E}{C}\right) = \frac{{}^{4}C_{2}}{{}^{4}C_{2}} = 1$$

$\therefore$ Required probability $= P\left(\frac{C}{E}\right)$

Apply Baye's theorem:

$$P\left(\frac{C}{E}\right) = \frac{P(C).P\left(\frac{E}{C}\right)}{P(A).P\left(\frac{E}{A}\right) + P(B).P\left(\frac{E}{B}\right) + P(C).P\left(\frac{E}{C}\right)}$$

$$= \frac{\frac{1}{3} \times 1}{\frac{1}{3} \times \frac{1}{6} + \frac{1}{3} \times \frac{1}{2} + \frac{1}{3} \times 1} = \frac{3}{5}$$

Thus, the required probability is 3/5.

9	E_1 : Loan at fixed rate E_2 : Loan at floating rate E_3 : Loan at variable rate A : A person defaults on loan $P(E_1) = \frac{10}{100}$; $P(E_2) = \frac{20}{100}$; $P(E_3) = \frac{70}{100}$ $P(A/E_1) = \frac{5}{100}$; $P(A/E_2) = \frac{3}{100}$; $P(A/E_3) = \frac{1}{100}$ (i) $P(A) = P(E_1)P(A/E_1) + P(E_2)P(A/E_2) + P(E_3)P(A/E_3))$ $= \frac{10}{100} \times \frac{5}{100} + \frac{20}{100} \times \frac{3}{100} + \frac{70}{100} \times \frac{1}{100}$ $= \frac{50+60+70}{10000}$ $\frac{180}{10000} = 0.018$ (ii) $P(E_3/A) = \frac{P(E_3)(P\ A/E_3)}{P(A)}$ $= \frac{\frac{70}{100} \times \frac{1}{100}}{\frac{180}{10000}} = \frac{70}{10000 \times \frac{180}{10000}} = \frac{7}{18}$