Let $n_1$ and $n_2$ be the number of red and black balls respectively, in box I. Let $n_3$ and $n_4$ be the number of red and black balls, respectively, in box II. [/esquestion]

Q. One of the two boxes, box I and box II, was selected at random and a ball was drawn randomly out of this box. The ball was found to be red. If the probability that this red ball was drawn from box II is $\frac{1}{3}$, then the correct option(s) with the possible values of $n_1, n_2, n_3$ and $n_4$ is (are) (A) $n_1 = 3, n_2 = 3, n_3 = 5, n_4 = 15$ (B) $n_1 = 3, n_2 = 6, n_3 = 10, n_4 = 50$ (C) $n_1 = 8, n_2 = 6, n_3 = 5, n_4 = 20$ (D) $n_1 = 6, n_2 = 12, n_3 = 5, n_4 = 20$

[JEE 2015, 4M, –0M]

Solution (a) Required probability $= \dfrac{\left(\frac{n_3}{n_3+n_4}\right)}{\frac{n_1}{n_1+n_2} + \frac{n_3}{n_3+n_4}} = \dfrac{1}{3}$ (now check option)

Q. All ball is drawn at random from box I and transferred to box II. If the probability of drawing a red ball from box I, after this transfer, is $\frac{1}{3}$, then the correct option(s) with the possible values of $n_1$ and $n_2$ is (are) (A) $n_1 = 4$ and $n_2 = 6$ (B) $n_1 = 2$ and $n_2 = 3$ (C) $n_1 = 10$ and $n_2 = 20$ (D) $n_1 = 3$ and $n_2 = 6$

[JEE 2015, 4M, –0M]

Solution (b) Required probability $= \frac{n_1}{n_1+n_2} \cdot \frac{n_1-1}{n_1+n_2-1} + \frac{n_2}{n_1+n_2} \cdot \frac{n_1}{n_1+n_2-1} = \frac{1}{3}$

(now check given option)

Q. A computer producing factory has only two plants $T_1$ and $T_2$ Plant $T_1$ produces 20% and plant $T_2$ produces 80% of the total computers Jproduced. 7% of computers produced in the factory turn out to be defective. It is known what

P ( computer turns out to be defective given that is produced in plant $T_1$ ) $=$

10P ( computer turns out to be defective given that it is produced in plant $T_2$ ) where P(E) denotes the probability of an event E. A computer produces in the factory is randomly eselected and it does not turn out to be defective. Then the probabality that it is produced plant $T_2$ is (A) $\frac{36}{73}$ (B) $\frac{47}{79}$ (C) $\frac{78}{93}$ (D) $\frac{75}{83}$

[JEE(Advanced)-2016]

Solution :- $P(T_1) = \frac{20}{100}$ $P(T_2) = \frac{80}{100}$

let $P\left(\frac{D}{T_2}\right) = x$ $P\left(\frac{D}{T_1}\right) = 10x$

$P(D) = \frac{7}{100}$ (given)

$P(T_1)P\left(\frac{D}{T_1}\right) + P(T_2)P\left(\frac{D}{T_2}\right) = \frac{7}{100}$

$\frac{20}{100} \times 10x + \frac{80}{100} \times x = \frac{7}{100}$ $\Rightarrow x = \frac{1}{40}$

$P\left(\frac{D}{T_2}\right) = \frac{1}{40}$ $\Rightarrow P\left(\frac{\bar{D}}{T_2}\right) = \frac{39}{40}$

$P\left(\frac{D}{T_1}\right) = \frac{10}{40}$ $\Rightarrow P\left(\frac{\bar{D}}{T_1}\right) = \frac{30}{40}$

$P\left(\frac{T_2}{\bar{D}}\right) = \dfrac{\frac{80}{100} \times \frac{39}{40}}{\frac{20}{100} \times \frac{30}{40} + \frac{80}{100} \times \frac{39}{40}}$

$= \frac{78}{93}$

Football teams $T_1$ and $T_2$ have to play two games against each other. It is assumed that the outcomes of the two games are independent. The probabilities of $T_1$ winning, drawing and losing a game against $T_2$ are $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$, respectively. Each team gets 3 points for a win, 1 point for a draw and 0 point for a loss in a game. Let $X$ and $Y$ denote the total points scored by teams $T_1$ and $T_2$, respectively, after two games

**[JEE(Advanced)-2016]**

Q. $P(X > Y)$ is- (A) $\frac{1}{4}$ (B) $\frac{5}{12}$ (C) $\frac{1}{2}$ (D) $\frac{7}{12}$

Solution:- $P(X > Y) = P(T_1 \text{ win})P(T_1 \text{ win}) + P(T_1 \text{ win})P(\text{match draw}) + P(\text{match draw})P(T_1 \text{ win})$

$= \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{6} + \frac{1}{2} \cdot \frac{1}{6} = \frac{1}{4} + \frac{2}{12} = \frac{1}{4} + \frac{1}{6} = \frac{10}{24} = \frac{5}{12}$

Q. $P(X = Y)$ is- (A) $\frac{11}{36}$ (B) $\frac{1}{3}$ (C) $\frac{13}{36}$ (D) $\frac{1}{2}$

Solution:- $P(X = Y) = P(\text{match draw})P(\text{match draw}) + P(T_1 \text{ win})P(T_1 \text{ loss}) + P(T_1 \text{ loss})P(T_1 \text{ win})$

$= \frac{1}{6} \cdot \frac{1}{6} + \frac{1}{2} \cdot \frac{1}{3} + \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{36} + \frac{2}{6} = \frac{13}{36}$

Q. Let X and Y be two events such that $P(X) = \frac{1}{3}$, $P(X|Y) = \frac{1}{2}$ and $P(Y|X) = \frac{2}{5}$. Then

**[JEE(Advanced)-2017]**

(A) $P(X'|Y) = \frac{1}{2}$ (B) $P(X \cap Y) = \frac{1}{5}$

(C) $P(X \cup Y) = \frac{2}{5}$ (D) $P(Y) = \frac{4}{15}$

Solution :- $p(x) = 1/3$ $\quad \dfrac{p(x \cap y)}{p(y)} = \dfrac{1}{2}$ $\quad \dfrac{p(y \cap x)}{p(x)} = \dfrac{2}{5}$

$p(x \cap y) = \dfrac{2}{15}$ $\quad p(y) = \dfrac{4}{15}$

$p(x \cup y) = p(x) + p(y) - p(x \cap y) = \dfrac{1}{3} + \dfrac{4}{15} - \dfrac{2}{15} = \dfrac{1}{3} + \dfrac{2}{15} = \dfrac{7}{15}$

$p(\bar{x} | y) = \dfrac{p(\bar{x} \cap y)}{p(y)} = \dfrac{p(y) - p(x \cap y)}{p(y)} = 1 - \dfrac{p(x \cap y)}{p(y)} = 1 - \dfrac{2/15}{4/15} = \dfrac{1}{2}$