PROBABILITY

EXERCISE - 01 CHECK YOUR GRASP

1. Let the roots of the quadratic equation be α, β

After squaring α^2, β^2

$\alpha\beta = (\alpha\beta)^2 \Rightarrow \alpha\beta(\alpha\beta - 1) = 0$

$\Rightarrow \alpha\beta = 0$ ... (1)

$\Rightarrow \alpha\beta = 1$ ... (2)

Now $\alpha^2 + \beta^2 = \alpha + \beta$

$(\alpha + \beta)^2 - 2\alpha\beta = (\alpha + \beta)$

$\Rightarrow (\alpha + \beta)^2 - (\alpha + \beta) - 2\alpha\beta = 0$

$(\alpha + \beta)\{(\alpha + \beta) - 1\} = 0$ $(\because \alpha\beta = 0)$

$\alpha + \beta = 0$ ... (3)

$\alpha + \beta = 1$ ... (4)

Solving (1) & (3)

$\alpha = 0, \beta = 0$

solving (1) & (4)

$\alpha(1 - \alpha) = 0 \Rightarrow \alpha = 0, 1$

$\Rightarrow \beta = 1, 0$

solving (2) & (4)

$$\alpha + \frac{1}{\alpha} = 1$$

$\alpha^2 - \alpha + 1 = 0$

$(\alpha, \beta) \in (\omega, \omega^2)$

Hence sample space $\rightarrow$ (0, 0) (1, 1) (0, 1) (ω, ω^2)

$$\therefore \quad P(A) = \frac{2}{4} = \frac{1}{2}$$

6. $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc < 0$

P(E) $\rightarrow$ when determinant value is negative

a	d	b	c
0	0	1	1
0	1	1	1
1	0	1	1

$\therefore$ Probability will be $\rightarrow 1 - \dfrac{3}{16} = \dfrac{13}{16}$

7. Event (A) $\rightarrow$ Plate has letter is palindrome

Event (B) $\rightarrow$ Plate has digit is palindrome

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{(26)^2 \times (10)^3}{(26 \times 10)^3} + \frac{(26)^3 \times (10)^2}{(26 \times 10)^3} - \frac{(26)^2 \times (10)^2}{(26 \times 10)^3}$$

9. When B rides A probability of winining of

$$A = \frac{2}{3} \times \frac{1}{6}$$

When C rides A probability of winining of

$$A = \frac{1}{3} \times \frac{1}{6} \times 3$$

$$\therefore \quad P(A) = \frac{2}{18} + \frac{1}{6} = \frac{5}{18}$$

Now odds against his winning $= \dfrac{18 - 5}{5} = \dfrac{13}{5}$.

15. Selection of 3 no. having 3 as minimum is ${}^6C_2$

selection of 3 no. having 7 as maximum is ${}^7C_2$.

selection of 3 no. having 3 as minimum & 7 as maximum is ${}^3C_1$.

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= {}^6C_2 + {}^7C_2 - {}^3C_1$

sample space $= {}^{10}C_3$

$$P(A) = \frac{{}^7C_2 + {}^6C_2 - {}^3C_1}{{}^{10}C_3}$$

17. Probability that 3 people out of 7 born on Wednesday $= \dfrac{{}^7C_3}{7^3}$

Probability that 2 people out of remaining 4, born on Thursday is $\dfrac{{}^4C_2}{7^2}$

Probability of remaining 2 born on Sunday is $\dfrac{{}^2C_2}{7^2}$

$\therefore$ required probability $= \dfrac{{}^7C_3}{7^3} \times \dfrac{{}^4C_2}{7^2} \times \dfrac{{}^2C_2}{7^2} = \dfrac{K}{7^6}$

$\Rightarrow \quad K = 30$

18. Events are defined as

E_1 = A rigged die is chosen

E_2 = A fair die is chosen

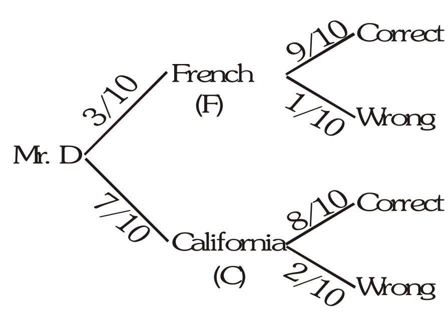
A = die shows 5 in all the three times

using Baye's Theorem :

$$P(E_1/A) = \frac{P(E_1)\,P(A/E_1)}{P(E_1)\,P(A/E_1) + P(E_2)\,P(A/E_2)}$$

$$= \frac{\frac{1}{4} \times (1)^3}{\frac{1}{4} \times (1)^3 + \frac{3}{4} \times \left(\frac{1}{6}\right)^3} = \frac{216}{219}$$

20.



$$P\left(\frac{C}{F}\right) = \frac{\frac{7}{10} \times \frac{2}{10}}{\frac{7}{10} \times \frac{2}{10} \times \frac{3}{10} \times \frac{9}{10}} = \frac{14}{41}$$

21. After removing face cards & tens remaning cards $= 52 - 16 = 36$

$P(A) = \frac{4}{36}$, $P(H) = \frac{9}{36}$, $P(S) = \frac{9}{36}$

$$P(A \cap S) = \frac{1}{36}$$

$$P(A \cap H) = \frac{1}{36}$$

$$P(A \cup S) = \frac{12}{36}$$

22. Ratio of their probabilities are 5 : 3 : 2

$\Rightarrow \quad 5x + 3x + 2x = 1 \quad \Rightarrow \quad x = \frac{1}{10}$

their respective probabilities of A, B & C will be

$= \frac{1}{2}, \frac{3}{10}, \frac{1}{5}$

Now After A's accident

$\frac{1}{2} - t = \frac{1}{3}$

$\Rightarrow \quad t = \frac{1}{6}$ probability get reduced

which will be shared between B & C

$\Rightarrow \quad 3y + 2y = \frac{1}{6} \quad \Rightarrow \quad y = \frac{1}{30}$

$\Rightarrow \quad$ Probability of C $= \frac{1}{5} + 2 \times \frac{1}{30} = \frac{4}{15}$

Probability of B $= \frac{3}{10} + 3 \times \frac{1}{30} = \frac{2}{5}$

EXERCISE - 02 BRAIN TEASERS

1. Total cases of selecting two squares out of 64 $= {}^{64}C_2$

Favourable cases = 8.7 + 7.8

Probability $= \frac{8.7 + 7.8}{{}^{64}C_2} = \frac{1}{18}$

3. Total cases $= 15^7$

7 coupons are selected such that largest number on a selected coupon is 9. Fav. cases $= 9^7 - 8^7$

so required probability $= \frac{9^7 - 8^7}{15^7}$

4. When dice are thrown

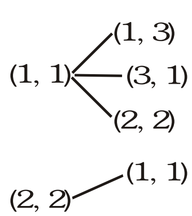
equal no. = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}

Unequal no. whose sum is six =

{(1, 5), (5, 1), (4, 2), (2, 4)}

Probability of getting six with unequal no. $= \frac{4}{36}$

When numbers are equal then getting sum six in four dice is



so probability of getting six =

$\frac{4}{36} + \frac{1}{6} \times \frac{3}{36} + \frac{1}{6} \times \frac{1}{36} = \frac{148}{1296}$

7. a, b & c are three numbers

set (1, 2, 3, 4, 5)

sample space $= 5^3$

ab + c = even

a	b	c	
odd	odd	odd	$= 3^3$
even	odd	even	= 2 3 2
odd	even	even	= 2 3 2
even	even	even	= 2 2 2

favourable case = 27 + 12 + 12 +8 = 59

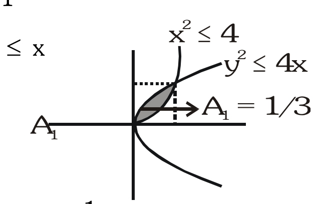
Probability to getting even no. $= \frac{59}{125}$

11. $0 \le x \le 1, \quad 0 \le y \le 1$

Let A be the event $y^2 \le x$

B the event $x^2 \le y$

total area = 1



$P(A \cap B) = \frac{\text{Shaded area}}{\text{Total area}} = \frac{1}{3}$

13. P(A) ; denote the probability that bus A will be late.

P(B) ; denote the probability that bus B will be late.

$P(A) = \frac{1}{5}$, $P(B) = \frac{7}{25}$

$P\left(\frac{B}{A}\right) = \frac{9}{10} \Rightarrow P(A \cap B) = \frac{9}{50}$

(i) $\quad P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B)$

$= 1 - \left(\frac{1}{5} + \frac{7}{25} - \frac{9}{50}\right) = \frac{35}{50} = \frac{7}{10}$

(ii) $P\left(\frac{A}{B}\right) = \frac{P(A).P\left(\frac{B}{A}\right)}{P(B)} = \frac{\frac{1}{5}\times\frac{9}{10}}{\frac{7}{25}} = \frac{18}{28}$

14. $P(B) \neq 1$

(A) $P\left(\frac{A}{B^C}\right) = \frac{P(AB^C)}{P(B^C)} = \frac{P(A)-P(A\cap B)}{1-P(B)}$

(B) $1 \geq P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cap B) \geq P(A) + P(B) - 1$

(D) $P\left(\frac{A}{B^C}\right) + \frac{P(A^C)}{P(B^C)}$

$= \frac{P(A)-P(A\cap B)}{1-P(B)} + \frac{P(A^C)-P(A^C\cap B)}{1-P(B)}$

$= \frac{P(A)-P(A\cap B)+1-P(A)-P(B)+P(A\cap B)}{1-P(B)} = 1$

15. The probability of event

$A \cap B$, A, B & $A \cup B$ are A.P.

$P(B) - P(A) = P(A) - P(A \cap B) = P(A)$ (Given)

$P(B) = 2P(A)$; $P(A \cap B) = 0$

19. P(A) : denotes passing in A

P(B) : denotes passing in B

P(C) : denotes passing in C

$P(A) = p$, $P(B) = q$, $P(C) = \frac{1}{2}$

probability that student is successful $= \frac{1}{2}$

$= p.\frac{q}{2} + p.\frac{1}{2}.\frac{1}{2} = \frac{1}{2}$

$2pq + p = 2$

Now check options

20. Total number of ways of selecting winners $= {}^{16}C_8$

favourable ways $= {}^2C_1.{}^{14}C_7$ (out of s_1 & s_2 & rest)

so probability $= \frac{{}^2C_1.{}^{14}C_7}{{}^{16}C_8} = \frac{8}{15}$

EXERCISE - 03 MISCELLANEOUS TYPE QUESTIONS

Fill in the blanks :

4. $0 \leq \frac{1+3p}{3} \leq 1$

$0 \leq \frac{1-p}{4} \leq 1$

$0 \leq \frac{1-2p}{2} \leq 1$

$0 \leq \left(\frac{1+3p}{2}\right) + \left(\frac{1-p}{4}\right) + \left(\frac{1-2p}{2}\right) \leq 1$

Match the column :

1. (B) Selecting two box out of 5 which remain empty $= {}^5C_2$

Favourable ways $= {}^5C_2\ (3^5 - 3(2^5 - 2) - 3)$

Total ways $= 5^5$

probability $= \frac{{}^5C_2(3^5-3(2^5-2)-3)}{5^5} = \frac{12}{25}$

(C) Let P(A) be the probability that the selected letters came from London

P(B) be the probability that the selected letters came from clifton

P(E) denotes the probability that ON is legible

$P(A) = \frac{2}{5}$, $P(B) = \frac{1}{6}$

$P\left(\frac{A}{E}\right) = \frac{P(A).P\left(\frac{E}{A}\right)}{P(E)} = \frac{\frac{1}{2}.\frac{2}{5}}{\frac{1}{2}\left(\frac{2}{5}+\frac{1}{6}\right)} = \frac{12}{17}$

Assertion & reason :

1. Statement-I :

$P\left(\frac{A\cap\bar{B}}{C}\right) = \frac{P((A\cap\bar{B})\cap C)}{P(C)}$

$= \frac{P(A\cap C)-P((A\cap B)\cap C)}{P(C)}$

Statement-II :

$P(A\cap\bar{B}) = P(A) - P(A\cap B)$

$\{\because A\cap\bar{B} = A-(A\cap B)\}$

Compression # 2

Let $P(T_i)$ denotes probability of success if she studies is i hours.

P(S) : Probability of success

$P(T_{10}) = 0.8$, $P(T_7) = 0.6$, $P(T_4) = 0.4$

1. P(S) = 0.8 0.1 +0.2 0.6 + 0.7 0.4

= 0.48

2. $P\left(\frac{T_4}{S}\right) = \frac{P(T_4).P\left(\frac{S}{T_4}\right)}{P(S)} = \frac{0.4\times 0.7}{0.48} = \frac{7}{12}$

3. $P\left(\frac{T_4}{\bar{S}}\right) = \frac{P(T_4).P\left(\frac{\bar{S}}{T_4}\right)}{P(\bar{S})} = \frac{0.7\times(1-0.4)}{0.52} = \frac{21}{26}$

2. Total cases = 6 6 = 36

favourable cases = Ist die IInd die

5	1, 2, 3, 4, 5
6	1, 2, 3, 4, 5, 6

favourable cases = $^2C_1(6 + 5) - 2 = 22 - 2 = 20$

so probability = $\frac{20}{36} = \frac{5}{9}$

5. Let three independent critics A, B & C

Odd in favour for A is $\frac{5}{2}$ hence P(A) = $\frac{5}{7}$

Odd in favour for B is $\frac{4}{3}$ hence P(B) = $\frac{4}{7}$

Odd in favour for C is $\frac{3}{4}$ hence P(C) = $\frac{3}{7}$

Probability that majorty will be

favourable = $P(A)P(B)\,P(\bar{C}) + P(B).P(C).P(\bar{A}) +$

$P(C).P(A).P(\bar{B})$ + $P(A).P(B).P(C)$

= $\frac{5}{7}\times\frac{4}{7}\times\frac{4}{7}+\frac{4}{7}\times\frac{3}{7}\times\frac{3}{7}+\frac{3}{7}\times\frac{5}{7}\times\frac{3}{7}+\frac{5}{7}\times\frac{4}{7}\times\frac{3}{7}$

= $\frac{209}{343}$

7. Two groups

Ist Group 5 Science & 3 Engg.

IInd Group 3 Science & 5 Engg.

When a die is tossed

P(A) : probability that 3 or 5

P(A) = $\frac{2}{6}$, $P(\bar{A}) = \frac{4}{6}$

Probability that an engg. subject selected when die is tossed = $\frac{2}{6}\times\frac{3}{8}+\frac{4}{6}\times\frac{5}{8}=\frac{26}{48}=\frac{13}{24}$

13. Let the first event A_1

Let the second event A_2

Let $P(A_1) = \frac{p^2}{q^2}$

$P(A_2) = \frac{p}{q}$

odds against seconds = $\frac{q-p}{p}$

odds against first = $\frac{q^2-p^2}{p^2}$

$\Rightarrow \left(\frac{q-p}{p}\right)^3 = \frac{q^2-p^2}{p^2}$

$\Rightarrow (q - p)^2 = (q + p)\,p$

$\Rightarrow q^2 = 3pq \Rightarrow \frac{p}{q} = \frac{1}{3}$

$P(A_1) = \frac{1}{9}$; $P(A_2) = \frac{1}{3}$

16. Let the probability hitting the enemy plane in I, II, III & IV shots are denoted by $P(G_1)$, $P(G_2)$, $P(G_3)$ & $P(G_4)$

$P(G_1) = \frac{4}{10}$, $P(G_2) = \frac{3}{10}$, $P(G_3) = \frac{2}{10}$, $P(G_4) = \frac{1}{10}$

P(All four shots do not hit the plane)

= $P(\bar{G}_1).P(\bar{G}_2).P(\bar{G}_3).P(\bar{G}_4)$

= $\frac{6}{10}\times\frac{7}{10}\times\frac{8}{10}\times\frac{9}{10}=\frac{189}{625}$

so probability of hitting the plane

= $1-\frac{189}{625}=\frac{436}{625}$

17. Let P(I), P(W) & P(T) denote the probability of student reads Business India, Business world & Business today

$P(I) = \frac{80}{100}$, $P(W) = \frac{50}{100}$, $P(T) = \frac{30}{100}$

Probability that student reads exactly two

$P(I \cap W) + P(I \cap T) + P(W \cap T) - 3P(I \cap W \cap T)$

$= P(I)+P(W)+P(T)+ P(I \cap W \cap T) -1 -3P(I \cap W \cap T)$

= $\frac{80}{100}+\frac{50}{100}+\frac{30}{100}-1-\frac{10}{100}=\frac{50}{100}=\frac{1}{2}$

19. (A) : puzzle solved by A

(B) : puzzle solved by B

(D) : puzzle solved by D

(C) : support either A or B

(A) = p, P(B) = p, P(D) = p

If C supports A $P(C) = \frac{1}{2}$

$P(\bar{C}) = \frac{1}{2}$

for team {A, B, C} = $P(A)\frac{1}{2} + P(B)\frac{1}{2}$

$= \frac{p}{2} + \frac{p}{2} = p$

which is equal to P(D)

$\Rightarrow$ both are equally likely.

25. Let q = 1 – p = probability of getting the tail. We have α = probability of A getting the head on tossing firstly

$= P(H_1 \text{ or } T_1T_2T_3H_4 \text{ or } T_1T_2T_3T_4T_5T_6H_7 \text{ or } \ldots)$

$= P(H) + P(H)\,P(T)^3 + P(H)P(T)^6 + \ldots$

$= \frac{P(H)}{1-P(T)^3} = \frac{p}{1-q^3}$

Also,

β = probability of B getting the head on tossing secondly

$=P(T_1H_2 \text{ or } T_1T_2T_3T_4H_5 \text{ or } T_1T_2T_3T_4T_5T_6T_7H_8 \text{ or } \dots)$

$= P(H)P(T) + P(H)\,P(T)^4 + P(H)P(T)^7 + \dots$

$= P(T)\,[P(H) + P(H)\,P(T)^3 + P(H)P(T)^6 + \dots]$

$= q\,\alpha = (1-p)\,\alpha = \dfrac{p(1-p)}{1-q^3}$

Again we have $\alpha + \beta + \gamma = 1$

$\Rightarrow \quad \gamma = 1 - (\alpha+\beta) = 1 - \dfrac{p+p(1-p)}{1-q^3}$

$= 1 - \dfrac{p+p(1-p)}{1-(1-p)^3} = \dfrac{1-(1-p)^3 - p - p(1-p)}{1-(1-p)^3}$

$= \dfrac{1-(1-p)^3 - 2p + p^2}{1-(1-p)^3} = \dfrac{p-2p^2+p^3}{1-(1-p)^3}$

Also, $\alpha = \dfrac{p}{1-(1-p)^3}, \beta = \dfrac{p(1-p)}{1-(1-p)^3}$

EXERCISE - 04[B] BRAIN STORMING SUBJECTIVE EXERCISE

1. Let $a = 2^x$ & $b = 2^y \Rightarrow \log_a b = \dfrac{y}{x}$ so $\dfrac{y}{x}$ must be integer. We know $x, y \in \{1, 2, \dots, 25\}$

as $y = nx$ so y is multiple of x

If x	1	2	3	4	5	6	7	8	9	10 to 12	13 to 25
No. of possible values of y	24	11	7	5	4	3	2	2	1	1 each	no number

required probability $= \dfrac{62}{25.24} = \dfrac{31}{300}$

2. $P(6) = P(24 \cup 42 \cup 33)$

$= \dfrac{1}{2}.\dfrac{1}{4} + \dfrac{1}{4}.\dfrac{1}{2} + \dfrac{1}{4}.\dfrac{1}{4} = \dfrac{2}{8} + \dfrac{1}{16} = \dfrac{5}{16}$

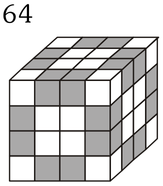
$P(666) = \left(\dfrac{5}{16}\right)^3$

A : getting 4 = {2, 2} $\Rightarrow P(A) = \dfrac{1}{2}.\dfrac{1}{2} = \dfrac{1}{4}$

P(at least one 4) $= 1 - P(\bar{A}\bar{A}\bar{A})$

$= 1 - \left(\dfrac{1}{4}\right)^3 = \dfrac{63}{64}$

3. $\dfrac{^{24}C_2}{^{64}C_2}$



4. E_r = Scored exactly r points

$P(E_n) = P(E_{n-2}H \cup E_{n-1}T)$

$= P(E_{n-2})\,P(H) + P(E_{n-1})\,P(T)$

$P_n = P_{n-2}\,\dfrac{1}{2} + \dfrac{1}{2}P_{n-1}$

$P_n - P_{n-1} = \dfrac{1}{2}(P_{n-2} - P_{n-1})$

5. A : 1st man hit the target

B : 2nd man hit the target

C : 3rd man hit the target

(a) (i) $P(A \cap B \cap C) = (0.3)\,(0.5)\,(0.4) = 0.6$

(ii) $P(\bar{A} \cap \bar{B} \cap \bar{C}) = (0.7)\,(0.5)\,(0.6) = 0.21$

(b) (i) $1 - P(\bar{A} \cap \bar{B} \cap \bar{C}) = 0.79$

(ii) $P(A \cap \bar{B} \cap \bar{C}) + P(\bar{A} \cap B \cap \bar{C}) + P(\bar{A} \cap \bar{B} \cap C)$

$= (0.3)\,(0.5)\,(0.6) + (0.7)\,(0.5)\,(0.6)$

$+ (0.7)\,(0.5)\,(0.4)$

$= 0.09 + 0.21 + 0.14 = .44$

(c) E : only one hits the target

$= A\bar{B}\bar{C} \cup \bar{A}B\bar{C} \cup \bar{A}\bar{B}C$

$P(A\bar{B}\bar{C}/E) = \dfrac{(0.3)(0.5)(0.6)}{0.44} = \dfrac{0.09}{0.44}$

6. $P(\bar{A} \cup B) = P(\bar{A}) + P(B) - P(\bar{A} \cap B)$ ... (1)

also $\dfrac{P(\bar{A} \cap \bar{B})}{P(\bar{B})} = 0.1 \Rightarrow P(\overline{A \cup B}) = 0.02$

$P(A \cup B) = 0.98$

$P(A \cap B) = 0.4 + 0.8 - 0.98$

$= 0.22$ ... (2)

Put (2) in (1)

$P(\bar{A} \cup B) = 0.6 + 0.8 - [P(B) - P(A \cap B)]$

$= 0.6 + 0.8 - (0.8 - 0.22) = 0.82$

(ii) $P(\bar{A} \cup B) + P(A \cap \bar{B})$

$= P(A) + P(B) - 2P(A \cap B)$

$= 0.4 + 0.8 - 2(0.22) = 0.76$

7. A : Target hit in 1st shot

B : Target hit in 2nd shot

C : Target hit in 3rd shot

E_1 : destroyed in exactly one shot

E_2 : destroyed in exactly two shot

E_3 : destroyed in exactly three shot

$P(E_1) = P(E_1A\bar{B}\bar{C} \cup E_1\bar{A}B\bar{C} \cup E_1\bar{A}\bar{B}C)$

$= \dfrac{1}{3}\left[\dfrac{1}{2}.\dfrac{1}{3}.\dfrac{1}{4} + \dfrac{1}{2}.\dfrac{1}{3}.\dfrac{3}{4} + \dfrac{1}{2}.\dfrac{2}{3}.\dfrac{1}{4}\right] = \dfrac{1+3+2}{3.24} = \dfrac{1}{12}$

$P(E_2) = P(E_2\bar{A}BC \cup E_2AB\bar{C} \cup E_3A\bar{B}C)$

$= \dfrac{7}{11}\left[\dfrac{1}{2}.\dfrac{2}{3}.\dfrac{3}{4} + \dfrac{1}{2}.\dfrac{2}{3}.\dfrac{1}{4} + \dfrac{1}{2}.\dfrac{1}{3}.\dfrac{3}{4}\right] = \dfrac{7.\ 11}{11.24} = \dfrac{7}{24}$

$P(E_3) = P(E_3ABC) = 1.\frac{1}{2}.\frac{2}{3}.\frac{3}{4} = \frac{1}{4}$

$P(E_1 \cup E_2 \cup E_3) = P(E_1) + P(E_2) + P(E_3)$

$= \frac{1}{12} + \frac{7}{24} + \frac{1}{4} = \frac{2+7+6}{24} = \frac{15}{24} = \frac{5}{8}$

8. $P(\bar{H}/S) = \frac{P(\bar{H}S)}{P(S)}$ ... (1)

also $\frac{P(HS)}{P(H)} = 1 - a \Rightarrow P(HS) = a(1-a)$ ...(2)

also $\frac{P(\bar{S}\bar{H})}{P(\bar{H})} = 1 - a \Rightarrow P(\bar{S}\bar{H}) = (1-a)^2$

$P(\bar{S} \cap \bar{H}) = P(\overline{S \cup H}) = (1-a)^2$

$\Rightarrow$ $1 - [P(S) + P(H) - P(SH)] = (1-a)^2$

$\Rightarrow$ $[P(S) + a - a + a^2] = 2a - a^2$

$P(S) = 2a(1-a)$ ... (3)

also $P(\bar{H}S) = P(S) - P(SH)$

$= 2a(1-a) - a(1-a) = a(1-a)$ ... (4)

from (3) & (4) $P(\bar{H}/S) = \frac{1}{2}$

9. A : Weather is favourable

$\bar{A}$: Weather not good or low cloud

B : Reliability (instrument functions probability)

C : Safe landing

$P(C/A) = p_1$. $P(B) = P$. $P(C/B) = p_1$

$P(C/\bar{B}) = p_2$. $P(\bar{A}) = \frac{K}{100}$

$P(C) = P(A\,C \cup \bar{A}\,B\,C \cup \bar{A}\bar{B}C)$

$= \left(1 - \frac{K}{100}\right) p_1 + \frac{K}{100}\,[P\,p_1 + (1-P)p_2]$

$P((\bar{A}BC \cup \bar{A}\bar{B}C)/C)$

$$= \frac{\frac{K}{100}[Pp_1 + (1-P)p_2]}{\left(1 - \frac{K}{100}\right)p_1 + \frac{K}{100}(Pp_1 + (1-P)p_2)}$$

10. $\frac{{}^nC_1\,(2^{n-1} - 1) + {}^nC_2\,(2^{n-2} - 1) + \ldots + {}^nC_{n-1}\,(2-1)}{(2^n - 1)^2}$

$= \frac{{}^nC_1\,2^{n-1} + {}^nC_2\,2^{n-2} + \ldots + 2\,{}^nC_{n-1} - (2^n - 2)}{(2^n - 1)^2}$

$= \frac{(1+2)^n - 2^n - 1 - 2^n + 2}{(2^n - 1)^2} = \frac{3^n - 2^{n+1} + 1}{(2^n - 1)^2}$

11. Total ways to ans. are ${}^5C_1 + {}^5C_2 + \ldots + {}^5C_5 = 31$

If n chances are given then probability of success is $P(C_1 \cup C_2 \cup \ldots\ldots C_n) = \frac{1}{31} + \frac{1}{31} + \ldots + \frac{1}{31}$

$= \frac{n}{31} \geq \frac{1}{3} \Rightarrow n \geq 10\frac{1}{3}$

$\Rightarrow n = 11$

12. C : Vehicle is Car $P(\bar{C}) = 2/5$

$\bar{C}$: Vehicle is Truck $P(C) = 3/5$

E : Vehicle stops for fuel $P(E/C) = 2/50$

$P(\bar{E}/\bar{C}) = 1/30$

$P(E) = P(CE \cup \bar{C}E)$

$= P(CE) + P(\bar{C}E)$

$= \frac{2}{5}\left(\frac{2}{50}\right) + \frac{3}{5}.\frac{1}{30} = \frac{1}{10}\left[\frac{4}{25} + \frac{1}{5}\right] = \frac{9}{250}$

$P(C/E) = \frac{P(CE)}{P(E)} = \frac{4/250}{9/250} = \frac{4}{9}$

13.

Red Box		Green Box		
Red	Green	Green	Red	
5	0	8	1	→ Non-prime
4	1	7	2	
3	2	6	3	
2	3	5	4	
1	4	4	5	→ Non-prime
0	5	3	6	

Required probability $= \frac{{}^6C_5\,.{}^8C_0 + {}^6C_1\,.{}^8C_4}{{}^{14}C_5} = \frac{213}{1001}$

14.

$y^2 \backslash x^2$	0	1	4	5	6	9
0	✓					
1						✓
4					✓	
5				✓		
6			✓			
9		✓				

$P(0) = \frac{1}{10} = P(5)$

$P(1) = P(4) = P(6)$

$= P(9) = \frac{2}{10}$

$P(00 + 19 + 91 + 55 + 64 + 46)$

$= \frac{1}{100} + \left(\frac{4}{100}\right)4 + \frac{1}{100} = \frac{18}{100}$

(b) $x^2 - y^2 = (x-y)(x+y)$

1	4	7	......	3n – 2
2	5	8	......	3n – 1
3	6	9	......	3n

Required probability $= \frac{{}^nC_2 + {}^nC_1\,{}^nC_1 + {}^nC_2 + {}^nC_2}{{}^{3n}C_2}$

$= \frac{3n(n-1) + 2n^2}{3n(3n-1)} = \frac{5n-3}{9n-3}$

15. E_r : hunters shoots the animal at r distance

P(E) = P(escapes) = $1 - P(\bar{E}_{2a}\bar{E}_{3a}.....\bar{E}_{na})$

$$= 1 - \left(1 - \frac{a^2}{4a^2}\right)\left(1 - \frac{a^2}{9a^2}\right)....\left(1 - \frac{a^2}{n^2a^2}\right)$$

$$= 1 - \left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right)....\left(1 - \frac{1}{n^2}\right)$$

$$= 1 - \left(\frac{1.3}{2.2}\right)\left(\frac{2}{3}.\frac{4}{3}\right)\left(\frac{3}{4}.\frac{5}{4}\right)....\left(\frac{n-1}{n}\frac{n+1}{n}\right)$$

$$= 1 - \frac{n+1}{2n} = \frac{n-1}{2n}$$

odds against the hunter $= \dfrac{P(\bar{E})}{P(E)} = \dfrac{n+1}{n-1}$

16.

Defective	Not Defective	Defective	Not Defective
n	N − n	m	M − m

$P(E_1)$: The selected article is from I[st] lot . $= \dfrac{K}{K+L}$

$P(E_2)$: The selected article is from II[nd] lot.$= \dfrac{L}{K+L}$

Required probability $= \dfrac{K}{K+L}.\dfrac{n}{N} + \dfrac{L}{K+L}.\dfrac{m}{M} =$

$$\frac{KMn + LmN}{NM(K+L)}$$

17. A : A solves correctly B : B solves correctly
E : Commit same mistake
F : same result

$$P(AB/F) = \frac{P(AB)}{P(AB) + P(\bar{A}\bar{B}E)} = \frac{\frac{1}{8}.\frac{1}{12}}{\frac{1}{8}.\frac{1}{12} + \frac{7}{8}.\frac{11}{12}.\frac{1}{1001}}$$

$$= \frac{1001}{1078} = \frac{13}{14}$$

EXERCISE - 05 [A] JEE-[MAIN] : PREVIOUS YEAR QUESTIONS

1. Probability problem is not solved by A = $1 - \dfrac{1}{2} = \dfrac{1}{2}$

Probability problem is not solved by B = $1 - \dfrac{1}{3} = \dfrac{2}{3}$

Probability problem is not solved by C = $1 - \dfrac{1}{4} = \dfrac{3}{4}$

Probability of solving the problem = 1 – P (not solved by any body)

$\therefore$ P = $1 - \dfrac{1}{2}.\dfrac{2}{3}.\dfrac{3}{4} = 1 - \dfrac{1}{4} = \dfrac{3}{4}$

2. $P(A \cup B) = \dfrac{3}{4}$, $P(A \cap B) = \dfrac{1}{4}$

$P(\bar{A}) = \dfrac{2}{3} \Rightarrow P(A) = \dfrac{1}{3}$

$\therefore$ $P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$\dfrac{1}{4} = \dfrac{1}{3} + P(B) - \dfrac{3}{4} \Rightarrow P(B) = \dfrac{2}{3}$

$P(\bar{A} \cap B) = P(B) - P(A \cap B)$

$= \dfrac{2}{3} - \dfrac{1}{4} = \dfrac{8-3}{12} = \dfrac{5}{12}$.

3. Probability of getting odd p = $\dfrac{3}{6} = \dfrac{1}{2}$

Probability of getting others q = $\dfrac{3}{6} = \dfrac{1}{2}$

Variance = npq = $5.\dfrac{1}{2}.\dfrac{1}{2} = \dfrac{5}{4}$

4. Out of 5 horses only one is the winning horse. The probability that Mr. A selected the losing horse $= \dfrac{4}{5} \times \dfrac{3}{4}$

$\therefore$ The probability that Mr. A selected the winning horse = $1 - \dfrac{4}{5} \times \dfrac{3}{4} = \dfrac{2}{5}$

7. E = {x is a prime number}

P(E) = P(2) + P(3) + P(5) + P(7) = 0.62

F = (x < 4), P(F) = P(1) + P(2) + P(3) = 0.50

$\therefore$ $P(E \cup F) = P(E) + P(F) - P(E \cap F)$

= 0.62 + 0.50 – 0.35 = 0.77

8. $\left.\begin{array}{l} np = 4 \\ npq = 2 \end{array}\right\} \Rightarrow q = \dfrac{1}{2}, \; p = \dfrac{1}{2}, \; n = 8$

$$P(X = 2) = {}^8C_2\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^6 = 28.\frac{1}{2^8} = \frac{28}{256}$$

10. For a particular house being selected,

Probability = $\frac{1}{3}$

Probability (all the persons apply for the same house) = $\left(\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}\right)3$ = $\frac{1}{9}$.

14. Let A be the event that sum of digits is 8

exhaustive cases $\to$ $^{50}C_1$

favourable cases $\to$ 08, 17, 26, 35, 44 = $^5C_1$

$$P(A) = \frac{^5C_1}{^{50}C_1}$$

Let B be the event that product of digits is zero

favourable cases $\to$

$\{00, 01, ---, 09, 10, 20, 30, 40\}$ = $^{14}C_1$

$$\therefore\ P(B) = \frac{^{14}C_1}{^{50}C_1}$$

$$\therefore\ P(A/B) = \frac{P(A\cap B)}{P(B)} = \frac{1/^{50}C_1}{^{14}C_1/^{50}C_1} = \frac{1}{14}$$

15. The probability of at least one success

$$1-\left(\frac{3}{4}\right)^n \ge \frac{9}{10}$$

$$\left(\frac{3}{4}\right)^n \le \frac{1}{10}$$

$$n \ge \log_{3/4}\left(\frac{1}{10}\right)$$

$$n \ge \frac{-\log 10}{\log_{10}3-\log_{10}4}$$

$$n \ge \frac{1}{\log_{10}4-\log_{10}3}$$

16. Required probability $= \frac{^3C_1}{^9C_1}\ \frac{^4C_1}{^8C_1}\ \frac{^2C_1}{^7C_1}\ 3! = \frac{2}{7}$

17. Let terms of an AP

a, a + d, a + 2d, a + 3d

$\because$ a $\ge$ 1, a + 3d $\le$ 20

3d $\le$ 19 $\Rightarrow d \le \frac{19}{3}$

so d = ±1, ±2, ±3, ±4, ±5 and ±6

statement 2 is wrong

if d = 1

then a + 3d ≤ 20

a ≤ 17

so 17 cases will be there

similarly d = –1

so in this case also 17 cases will be there

Total case for d = ±1 is 34

18. $P\left(\frac{C}{D}\right) = \frac{P(C\cap D)}{P(D)} = \frac{P(C)}{P(D)}$

$$P(D) = \frac{P(C)}{P\left(\frac{C}{D}\right)} \le 1$$

$$P(C) \le P\left(\frac{C}{D}\right)$$

$$P\left(\frac{C}{D}\right) \ge P(C)$$

19. at least one failure = 1 – all sucess

$$1 \ge 1 - p^5 \ge \frac{31}{32}$$

$$0 \le p^5 \le \frac{1}{32}$$

$$0 \le p \le \frac{1}{2}$$

$$p \in \left[0, \frac{1}{2}\right]$$

20. $P(A \cap B \cap C) = 0$

$$P\left(\frac{\bar{A}\cap\bar{B}}{C}\right) = \frac{P\{(\bar{A}\cap\bar{B})\cap C\}}{P(C)} = \frac{P(\bar{A}\cap\bar{B})P(C)}{P(C)}$$

$$= \frac{[1-P(A)-P(B)+P(A)P(B)]P(C)}{P(C)}$$

$(\because P(A \cap B \cap C) = 0)$

$$= \frac{P(C)-P(A)P(C)-P(B)P(C)}{P(C)}$$

$= 1 - P(A) - P(B) = P(A^C) - P(B)$

21. Let Events A denotes the getting min No. is 3 & B denotes the max. no. is 6

$$P\left(\frac{A}{B}\right) = \frac{P(A\cap B)}{P(B)} = \frac{^2C_1}{^5C_2} = \frac{2}{10} = \frac{1}{5}$$

Aliter :

$$P\left(\frac{A}{B}\right) = \frac{P(A\cap B)}{P(B)} = \frac{\frac{^4C_3-(2)}{^8C_3}}{\frac{^6C_3-{}^5C_3}{^8C_3}} = \frac{2}{10} = \frac{1}{5}$$

22. P(4correct) + P(5 correct)

$$= {}^5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)+\left(\frac{1}{3}\right)^5 = \frac{11}{3^5}$$

1. p_n denotes the probability that no two (or more) consecutive heads occur

$\Rightarrow p_n$ denotes the probability that 1 or no head occur. For n = 1, $p_1 = 1$ because in both cases we get less than two heads (H, T)

For n = 2

$p_2 = 1 - p$(two head simultaneously occur)

$= 1 - p(HH) = 1 - pp = 1 - p^2$

(probability of head is given as p not 1/2)

For $n \geq 3$, $p_n = p_{n-1}(1 - p) + p_{n-2}(1 - p)p$

$= (1 - p)p_{n-1} + p(1 - p)p_{n-2}$ Hence proved.

2. **(a)** Let $w_1 \rightarrow$ ball drawn in the first draw is white.

$b_1 \rightarrow$ ball drawn in the first draw is black.

$w_2 \rightarrow$ ball drawn in the second draw is white.

Then

$P(w_2) = P(w_1).P(w_2/w_1) + P(b_1)\ P(w_2 / b_1)$

$$= \left(\frac{m}{m+n}\right)\left(\frac{m+k}{m+n+k}\right)+\left(\frac{n}{m+n}\right)\left(\frac{m}{m+n+k}\right)$$

$$= \frac{m(m+k)+mn}{(m+n)(m+n+k)}$$

$$= \frac{m(m+n+k)}{(m+n)(m+n+k)} = \frac{m}{m+n}$$

2. **(b)** Total number of favourable cases

$= (3^n - 3.2^n + 3).\ {}^6C_3$

$\Rightarrow$ required probability

$$= \frac{(3^n - 3.2^n + 3) \times {}^6C_3}{6^n}$$

5. **(a)** Here, $P(A \cup B).P(A' \cap B')$

$\Rightarrow \{P(A) + P(B) - P(A \cap B)\}\ \{P(A').P(B')\}$

{Since A, B are independent $\Rightarrow$ A', B' are independent}

$\therefore P(A \cup B).P(A' \cap B')$

$\leq \{P(A) + P(B)\}.\{P(A').P(B')\}$

$= P(A).P(A').P(B') + P(B).P(A').P(B')$ ... (1)

$\leq P(A).P(B') + P(B).P(A')$

{Since in (1), $P(A') \leq 1$ and $P(B') \leq 1$}

$\Rightarrow P(A \cup B).P(A' \cap B') \leq P(A).P(B') + P(B).P(A')$

$\Rightarrow P(A \cup B).P(A' \cap B') \leq P(C)$

{as $P(C) = P(A).P(B') + P(B).P(A')$}

5. **(b)** Using Baye's theorem;P(B/A)

$$= \frac{\sum_{i=1}^{3} P(A_i).P(B/A_i)}{\sum_{i=1}^{3} P(A_i)}$$

where A be the event at least 4 white balls have been drawn.

A_i be the event exactly 4 white balls have been drawn. A_2 be the event exactly 5 whitle balls have been drawn.

A_3 be the event exactly 6 white balls have been drawn B be the event exactly 1 white ball is drawn from two draws.

$\therefore$ P(B/A)

$$= \frac{\frac{{}^{12}C_2.{}^6C_4}{{}^{18}C_6}.\frac{{}^{10}C_1.{}^2C_1}{{}^{12}C_2} + \frac{{}^{12}C_1.{}^6C_5}{{}^{18}C_6}.\frac{{}^{11}C_1.{}^1C_1}{{}^{12}C_2}}{\frac{{}^{12}C_2.{}^6C_4}{{}^{18}C_6} + \frac{{}^{12}C_1.{}^6C_5}{{}^{18}C_6} + \frac{{}^{12}C_0.{}^6C_6}{{}^{18}C_6}}$$

$$= \frac{({}^{12}C_2.{}^6C_4.{}^{10}C_1.{}^2C_1) + ({}^{12}C_1.{}^6C_5.{}^{11}C_1.{}^1C_1)}{{}^{12}C_2({}^{12}C_2.{}^6C_4 + {}^{12}C_1.{}^6C_5 + {}^{12}C_0.{}^6C_6)}$$

5. **(c)** As three distinct numbers are to be selected from first 100 natural numbers

$\Rightarrow$ $n(S) = {}^{100}C_3$

$E_{(favourable\ events)}$ = All three of them are divisible by both 2 and 3.

$\Rightarrow$ divisible by 6 i.e., {6, 12, 18, ..., 96}

$n(E) = {}^{16}C_3$

$$P(E) = \frac{16 \times 15 \times 14}{100 \times 99 \times 98} = \frac{4}{1155}$$

10. Statement I : If $P(H_i \cap E) = 0$ for some i, then

$$P\left(\frac{H_i}{E}\right) = P\left(\frac{E}{H_i}\right) = 0$$

If $P(H_i \cap E) \neq 0$ for $\forall$ i = 1, 2, ..., n, then

$$P\left(\frac{H_i}{E}\right) = \frac{P(H_i \cap E)}{P(H_i)} \times \frac{P(H_i)}{P(E)}$$

$$= \frac{P\left(\frac{E}{H_i}\right) \times P(H_i)}{P(E)} > P\left(\frac{E}{H_i}\right)P(H_i)$$

[as $0 < P(E) < 1$]

Hence statement I may not always be true.

Statement II : Clearly, $H_1 \cup H_2 \cup \ldots \cup H_n = S$ (sample space)

$\Rightarrow \quad P(H_1) + P(H_2) + \ldots + P(H_n) = 1$

12. Let B have n number of outcomes.

so $\quad P(B) = \dfrac{n}{10}, \quad P(A) = \dfrac{4}{10}$

$P(A \cap B) = \dfrac{4}{10} \quad \dfrac{n}{10} = \dfrac{2n/5}{10}$

$\Rightarrow \quad \dfrac{2n}{5}$ is an integer

$\Rightarrow \quad n = 5$ or 10

17. C : Correct signal is transmitted

$\bar{C}$: false signal is transmitted

G : Original signal is green

R : Original signal is red

K : Signal received at station B is green.

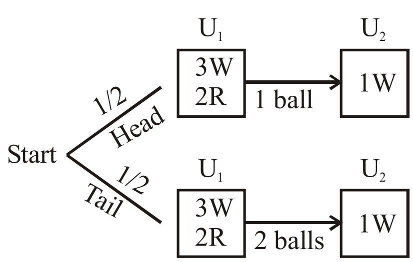
$$P(G/K) = \frac{P(G).P(K/G)}{P(K)}$$

$$= \frac{P(GCC) + P(G\bar{C}\bar{C})}{P(GCC) + P(G\bar{C}\bar{C}) + P(RC\bar{C}) + P(R\bar{C}C)}$$

$$= \frac{\frac{4}{5}\times\frac{3}{4}\times\frac{3}{4}+\frac{4}{5}\times\frac{1}{4}\times\frac{1}{4}}{\frac{4}{5}\times\frac{3}{4}\times\frac{3}{4}+\frac{4}{5}\times\frac{1}{4}\times\frac{1}{4}+\frac{1}{5}\times\frac{3}{4}\times\frac{1}{4}+\frac{1}{5}+\frac{1}{4}\times\frac{3}{4}}$$

$$= \frac{40}{46} = \frac{20}{23}$$

Paragraph for Question 18 and 19



18. **Ans. (B)**

Required probability

$$= \frac{1}{2}\left(\frac{3}{5}.1 + \frac{2}{5}.\frac{1}{2}\right) + \frac{1}{2}\left(\frac{^3C_2}{^5C_2}.1 + \frac{^2C_2}{^5C_2}.\frac{1}{3} + \frac{^3C_1\,^2C_1}{^5C_2}.\frac{2}{3}\right)$$

$$= \frac{1}{2}\left(\frac{4}{5}\right) + \frac{1}{2}\left(\frac{3}{10} + \frac{1}{30} + \frac{2}{5}\right) = \frac{2}{5} + \frac{11}{30} = \frac{23}{30}$$

19. **Ans. (D)**

Required probability

$$= \frac{2/5}{2/5 + 11/30} \quad \text{(using Baye's theorem)}$$

$$= \frac{12}{23}$$

21. $P(X) = E_1E_2E_3 + E_1E_2\bar{E}_3 + E_1\bar{E}_2E_3 + \bar{E}_1E_2E_3$

$$= \frac{1}{2}\times\frac{1}{4}\times\frac{1}{4} + \frac{1}{2}\times\frac{1}{4}\times\frac{3}{4} + \frac{1}{2}\times\frac{3}{4}\times\frac{1}{4} + \frac{1}{2}\times\frac{1}{4}\times\frac{1}{4}$$

$\Rightarrow P(X) = \dfrac{1}{4}$

$$P\left(\frac{X_1^c}{X}\right) = \frac{P\left(X_1^C \cap X\right)}{P(X)} = \frac{1/32}{1/4} = \frac{1}{8}$$

P(Exactly two engines are functioning |x)

$$= \frac{7/32}{1/4} = \frac{7}{8}$$

$$P\left(\frac{X}{X_2}\right) = \frac{P(X \cap X_2)}{P(X_2)} = \frac{5/32}{1/4} = \frac{5}{8}$$

$$P\left(\frac{X}{X_1}\right) = \frac{P(X \cap X_1)}{P(X_1)} = \frac{7/32}{1/2} = \frac{7}{16}$$

22. $1 - \dfrac{^6C_1.5^3}{6^4} = \dfrac{91}{216}$

23. $P(X \cap Y) = P(X), P(Y/X)$

$\Rightarrow \quad P(X) = \dfrac{1}{2}$

Also $P(X \cap Y) = P(Y).P(X/Y)$

$\Rightarrow \quad P(Y) = \dfrac{1}{3}$

$\Rightarrow \quad P(X \cap Y) = P(X).P(Y)$

$\Rightarrow \quad$ X,Y are independent

$P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$

$$= \frac{1}{3} + \frac{1}{2} - \frac{1}{6} = \frac{2}{3}$$

$P(X^C \cap Y) = P(Y) - P(X \cap Y) = \dfrac{1}{3} - \dfrac{1}{6} = \dfrac{1}{6}$

$\Rightarrow \quad$ (A, B) are correct

24. P(Problem is solved by at least one of them)

= 1 – P(solved by none)

$$= 1 - \left(\frac{1}{2}\times\frac{1}{4}\times\frac{3}{4}\times\frac{7}{8}\right)$$

$$= 1 - \frac{21}{256} = \frac{235}{256}$$

25. Let $P(E_1) = p_1$, $P(E_2) = p_2$, $P(E_3) = p_3$

given that $p_1(1 - p_2)(1 - p_3) = \alpha$ ......(i)

$p_2(1 - p_1)(1 - p_3) = \beta$ .....(ii)

$p_3(1 - p_1)(1 - p_2) = \gamma$ .....(iii)

and $(1 - p_1)(1 - p_2)(1 - p_3) = p$ ......(iv)

$$\Rightarrow \quad \frac{p_1}{1-p_1}=\frac{\alpha}{p}, \frac{p_2}{1-p_2}=\frac{\beta}{p} \quad \& \quad \frac{p_3}{1-p_3}=\frac{\gamma}{p}$$

Also $\beta=\frac{\alpha p}{\alpha+2p}=\frac{3\gamma p}{p-2\gamma}$

$\Rightarrow \quad \alpha p - 2\alpha\gamma = 3\alpha\gamma + 6p\gamma$

$\Rightarrow \quad \alpha p - 6p\gamma = 5\alpha\gamma$

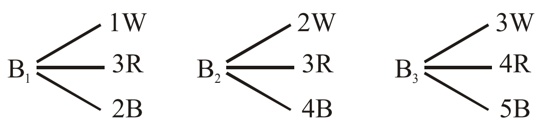
$$\Rightarrow \quad \frac{p_1}{1-p_1}-\frac{6p_3}{1-p_3}=\frac{5p_1p_3}{(1-p_1)(1-p_3)}$$

$\Rightarrow \quad p_1 - 6p_3 = 0$

$$\Rightarrow \quad \frac{p_1}{p_3}=6$$

Paragraph for Question 26 to 27

26. Ans. (D)



A = Total drawn balls are drawn & one is white, another is Red

$P(B_2|A)$ is to be determined

$P(B_2|A)$

$$=\frac{P(A|B_2)P(B_2)}{P(A|B_1)P(B_1)+P(A|B_2)P(B_2)+P(A|B_3)P(B_3)}$$

$P(B_1) = P(B_2) = P(B_3) = \frac{1}{3}$

$$P\left(\frac{A}{B_1}\right)=\frac{{}^1C_1\times{}^3C_1}{{}^6C_2}$$

$$P(A|B_2)=\frac{{}^2C_1\times{}^3C_1}{{}^9C_2}$$

$$P(A|B_3)=\frac{{}^3C_1\times{}^4C_1}{{}^9C_2}$$

By putting the values

$$P(B_2|A)=\frac{55}{181}$$

27. Ans. (A)

$$B_1\begin{cases}1W\\3R\\2B\end{cases} \qquad B_2\begin{cases}2W\\3R\\4B\end{cases} \qquad B_3\begin{cases}3W\\4R\\5B\end{cases}$$

Probability of 3 drawn balls of same colour

$$=\frac{1}{6}\times\frac{2}{9}\times\frac{3}{12}+\frac{3}{6}\times\frac{3}{9}\times\frac{4}{12}+\frac{2}{6}\times\frac{4}{9}\times\frac{5}{12}=\frac{82}{648}$$