MATHEMATICS ANSWERS .

Q1

A box X contains 2 white and 3 black balls and another bag Y contains 4 white and 2 black balls. One bag is selected at random and a ball is drawn from it. Then the probability for the ball chosen be white is

1) $\frac{2}{15}$ 2) $\frac{7}{15}$ 3) $\frac{8}{15}$ 4) $\frac{14}{15}$

ANSWER

$$R.P = \frac{1}{2}\left[\frac{2}{5} + \frac{4}{6}\right]$$

Q2

A bag contains 5 red and 3 blue balls. If 3 balls are drawn at random without replacement the probability of getting exactly one red ball is

1) $\frac{45}{196}$ 2) $\frac{135}{392}$ 3) $\frac{15}{56}$ 4) $\frac{15}{29}$

ANSWER

$$n(S) = {}^8c_3 = \frac{8\times7\times6}{3\times2\times1} = 56$$

$$n(E) = {}^5c_1 \times {}^3c_2 = 15$$

$$P(E) = \frac{15}{56}$$

Q3

Six unbiased coins are tossed, the probability of obtaining atleast two heads is

1) $\frac{50}{64}$ 2) $\frac{55}{64}$ 3) $\frac{57}{64}$ 4) $\frac{60}{64}$

ANSWER

$$n = 6, P(X \geqslant 2)$$

Q4

A die is rolled. If X denotes the number of positive divisors of the outcome then the range of the random variable X is

1) $\{1, 2, 3\}$ 2) $\{1, 2, 3, 4\}$ 3) $\{1, 2, 3, 4, 5, 6\}$ 4) $\{1, 3, 5\}$

ANSWER

$$S = \{1, 2, 3, 4, 5, 6\}$$

The positive divisors of 1 =1

The positive divisors of 2 =1,2

The positive divisors of 3 =1,3

The positive divisors of 4 =1,2,4

The positive divisors of 5 =1,5

The positive divisors of 6=1,2,3,6

$\therefore$ the range x={1, 2, 3, 4, 5, 6}

Q5

Two symmetrical dice are rolled. The probability that sum of the points on them is divisible by 5 is

1) $\frac{2}{9}$ 2) $\frac{4}{9}$ 3) $\frac{7}{36}$ 4) $\frac{5}{9}$

ANSWER

P(x=5)+P(X=10)
= 4+3/36
= 7/36

Q6

A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice the variance of the random variable X defined on number of tails is

1) $\frac{1}{8}$ 2) $\frac{7}{8}$ 3) $\frac{5}{8}$ 4) $\frac{3}{8}$

ANSWER

$$n = 2, p = \frac{1}{4}, q = \frac{3}{4}$$

$$\text{Therefore variance} = \text{npq} = 2 \times \frac{1}{4} \times \frac{3}{4} = \frac{3}{8}$$

Q7

A box contains 100 bulbs, out of which 10 are defective. A sample of 5 bulbs is drawn. The probability that none is defective is

1) $\frac{9}{10}$ 2) $\left(\frac{1}{10}\right)^5$ 3) $\left(\frac{9}{10}\right)^5$ 4) $\left(\frac{1}{2}\right)^5$

ANSWER

$$\text{P} = \text{Probability of getting good}$$

$$= \frac{90}{100} = \frac{9}{10}$$

$$q = 1 - P = \frac{1}{10}$$

$$n = 5$$

$$P(x = 5) = {}^5C_5\, p^5\, q^0 = \left(\frac{9}{10}\right)^5$$

Q8

In the first box there are tickets marked with numbers 1,2,3,4. In the second box there are tickets marked with numbers 2,4,6,7,8,9. If a box is chosen and a ticket is drawn from it at random, the probability for the number of the ticket to be 2 or 4 is

1) 9/12 2) 5/12 3) 5/6 4) 1/6

ANSWER

$$B_1 \rightarrow 1, 2, 3, 4$$

$$B_2 \rightarrow 2, 4, 6, 7, 8, 9$$

$$P(B_1) = \frac{1}{2}, P(B_2) = \frac{1}{2}$$

E be the event getting 2 or 4

$$P(E) = P(B_1) . P(E/B_1) + P(B_2) . P(E/B_2)$$

$$= \frac{1}{2} \times \frac{2}{4} + \frac{1}{2} \times \frac{2}{6}$$

$$= \frac{1}{4} + \frac{1}{6} = \frac{3+2}{12} = \frac{5}{12}$$

Q9

If X be binomial variation with $E(X) = 5$ and $E(X^2) - \{E(X)\}^2 = 4$, then the parameters of distribution are

1) $\frac{1}{4}, 20$ 2) $\frac{1}{5}, 20$ 3) $\frac{1}{5}, 25$ 4) $\frac{4}{5}, 25$

ANSWER

$$E(x) = np = 5, E(x^2) - [E(x)]^2 = npq = 4$$

Q10

India plays two matches each with West Indies and Australia. In any match, the probabilities. India getting points 0,1 and 2 are 0.45, 0.05, 0.50 respectively. Assuming that the out are independent, the probability of India getting at least 7 points is

1) 0.8750 2) 0.0875 3) 0.0625 4) 0.0

ANSWER

$$P(X \geqslant 7) = P(X = 7) + P(X = 8)$$

$$= 4 \times (0.50)^3 (0.05) + (0.50)^4$$

Q11

In a room, there are 6 couples. Out of them if 4 are selected at random, the probability that they may be couples is

1) $\frac{4}{33}$ 2) $\frac{2}{33}$ 3) $\frac{1}{33}$ 4) $\frac{3}{33}$

ANSWER

The probability that a candidate secures a seat in eng. through JEE is $\frac{1}{10}$. 7 candidates are selected at random from a centre. The probability that exactly two will get seats is

1) $15 \cdot (1)^2 \cdot (.9)^5$ 2) $20 \cdot (1)^2 \cdot (.9)^5$ 3) $21 \cdot (0.1)^2 \cdot (0.9)^5$ 4) $23 \cdot (1)^2 \cdot (.9)^5$

Q12

The probability that a candidate secures a seat in eng. through JEE is $\frac{1}{10}$. 7 candidates are selected at random from a centre. The probability that exactly two will get seats is

1) $15 \cdot (1)^2 \cdot (.9)^5$ 2) $20 \cdot (1)^2 \cdot (.9)^5$ 3) $21 \cdot (0.1)^2 \cdot (0.9)^5$ 4) $23 \cdot (1)^2 \cdot (.9)^5$

ANSWER

$$P(E) =^7 c_2 \times \left(\frac{1}{10}\right)^2 \left(\frac{9}{10}\right)^5 = 21(0.1)^2 (0.9)^5$$

Q13

The sum of two natural numbers is 20. Find the chance that their product less than 50 is

1) $\frac{4}{19}$ 2) $\frac{3}{19}$ 3) $\frac{2}{19}$ 4) $\frac{1}{19}$

ANSWER

$$n(E) = 4, n(S) = 19$$

Q14

A die is thrown 31 times. The probability of getting 2,4 or 5 atmost 15 times is

1) $\frac{1}{3}$ 2) $\frac{1}{4}$ 3) $\frac{1}{5}$ 4) $\frac{1}{2}$

ANSWER

$$The\text{ probability of getting 2 or 4 or 5 in single trial is p} = \frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\frac{1}{2}$$

$$\therefore q=\frac{1}{2}$$

The probability of getting 2 or 4 or 5 atmost 15 times while throwing a die times

$$={}^{31}Cq^{31}+{}^{31}C_1.\,pq^{30}+{}^{31}C_2.\,p^2q^{29}+\ldots\ldots{}^{31}C_{15}.\,p^{15}q^{16}$$

$$=\left({}^{31}C_0+{}^{31}C_1+\ldots\ldots+{}^{31}C_{15}\right)\frac{1}{2^{31}}\left(\therefore p=q=\frac{1}{2}\right)$$

$$=\frac{1}{2}\left({}^{31}C_0+{}^{31}C_1+\ldots\ldots{}^{31}C_{31}\right)\frac{1}{21^{31}}\left(\therefore{}^{31}C_{16}={}^{31}C_{15},etc\right)$$

$$\frac{1}{2}.2^{31}.\frac{1}{2^{31}}=\frac{1}{2}$$

Q15

If P(A/B) > P(A), then which of the following is correct?

1) P(B/A) < P(B) 2) $P(A\cap B)<P(A).P(B)$ 3) P(B/A) > P(B) 4) P(B/A) = P(B)

ANSWER

$$\frac{P(A\cap B)}{P(B)}>P(A)$$

$$P(A\cap B)>P(A).P(B)$$

$$P\left(\frac{B}{A}\right).P(A)>P(A).P(B)$$

$$P\left(\frac{B}{A}\right)>P(B)$$

Q16

In a binomial distribution $B\left(n, p=\frac{1}{4}\right)$, if the probability of at least one success is greater than or equal to $\frac{9}{10}$, then n is greater than

1) $\frac{1}{\log_{10}4-\log_{10}3}$ 2) $\frac{1}{\log_{10}4+\log_{10}3}$ 3) $\frac{9}{\log_{10}4-\log_{10}3}$ 4) $\frac{4}{\log_{10}4-\log_{10}3}$

ANSWER

$$\textit{According}\text{ to the condition } 1-\left(\frac{3}{4}\right)^n \geqslant \frac{9}{10}$$

$$\Rightarrow \left(\frac{3}{4}\right)^n \leqslant 1-\frac{9}{10}=\frac{1}{10} \Rightarrow \left(\frac{4}{3}\right)^n \geqslant 10$$

$$\Rightarrow n\left[\log_{10}4-\log_{10}3\right] \geqslant \log_{10}10=1$$

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

Q17

The face cards are removed from a well shuffled pack of 52 cards. Out of the remaining cards 4 are drawn at random. The probability that they belong to different suits is

1) $\frac{13^4}{^{52}C_4}$ 2) $\frac{^{13}C_4}{^{40}C_4}$ 3) $\frac{10^4}{^{40}C_4}$ 4) $\frac{13^4}{^{40}C_4}$

ANSWER

$$P.E=\frac{10^4}{^{40}C_4}$$

Q18

If the events A and B are mutually exclusive events such that $P(A) = \frac{3x+1}{3}$ and $P(B) = \frac{1-x}{4}$, then the set of possible values of x lies in the interval:

1) $[0, 1]$ 2) $\left[\frac{1}{3}, \frac{2}{3}\right]$ 3) $\left[-\frac{1}{3}, \frac{5}{9}\right]$ 4) $\left[-\frac{7}{9}, \frac{4}{9}\right]$

ANSWER

$$\textit{Since}\ \text{A and B are mutually exclusive}$$

$$\therefore \mathrm{P}(A \cap B) = 0$$

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

$$P(S) = P(A) + P(B)\ [\because s = A \cup B]$$

$$1 = \frac{3x+1}{3} + \frac{1-x}{4}$$

$$1 = \frac{12x + 4 + 3 - 3x}{12}$$

$$12 = 9x + 7$$

$$9x = 5$$

$$x = \frac{5}{9}$$

$$\therefore x \in \left[-\frac{1}{3}, \frac{5}{9}\right]$$

Q19

On the average if it rains on 5 days in every 30 days, the probability that there will be rain on exactly three days of a given week is

1) ${}^7C_3\left(\frac{1}{6}\right)^3$ 2) ${}^7C_3\left(\frac{5}{6}\right)^6$ 3) ${}^7C_3\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^4$ 4) ${}^7C_3\left(\frac{1}{6}\right)^4$

ANSWER

$$P(X=3), n=7, p=\frac{5}{30}$$

Q20

A box A contains 1 red and 2 white balls and another box B contains 3 red and 2 white balls. One ball is drawn at random from one of the boxes and it was found to be white. The probability that it was drawn from box B is

1) $\frac{2}{8}$ 2) $\frac{5}{8}$ 3) $\frac{7}{8}$ 4) $\frac{3}{8}$

ANSWER

$$\frac{A}{1R\ 2W} \quad \frac{B}{3R\ 2\mathrm{W}}$$

$$P\left(A\right)=\frac{1}{2}, P\left(B\right)=\frac{1}{2}$$

$$E=\text{ event getting white}$$

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

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

$$=\frac{1}{3}+\frac{1}{5}=\frac{8}{15}$$

$$P\left(\frac{B}{E}\right)=\frac{P\left(B\right).P\left(\frac{E}{B}\right)}{P\left(E\right)}=\frac{\frac{1}{2}\times\frac{2}{5}}{\frac{8}{15}}=\frac{3}{8}$$

Q21

A and B alternately cut a each from a pack of cards with replacement and pack is shuffled after each cut. If A starts the game and the game is continued till one cuts a spade, the respective probabilities of A and B cutting a spade are

1) $\frac{1}{3}, \frac{2}{3}$ 2) $\frac{3}{4}, \frac{1}{4}$ 3) $\frac{4}{7}, \frac{3}{7}$ 4) $\frac{3}{7}, \frac{4}{7}$

ANSWER

$$p = \frac{1}{4}, q = \frac{3}{4}, P(A) = \frac{p}{1 - q^2} = \frac{4}{7}, P(B) = 1 - \frac{4}{7} = \frac{3}{7}$$

Q22

α is a solution of the equation $z^n = (z+1)^n$ where $n \geqslant 2, n \in N$. Then the probability that α lies on the real axis is

1) $\frac{1}{n}$ 2) $\frac{2}{n}$ 3) $\frac{1}{n-1}$ 4) $\frac{2}{n-1}$

ANSWER

$$RP = \frac{1}{n-1}$$

Q23

A man is known to speak the truth 2 out of 3 times. He throws a die and reports that it is 'Five'. The probability that it is actually not a 'Five' is

1) $\frac{1}{2}$ 2) $\frac{2}{7}$ 3) $\frac{1}{7}$ 4) $\frac{5}{7}$

ANSWER

$$\text{Required Probability} = \frac{\frac{1}{3}\left(\frac{5}{6}\right)}{\frac{2}{8}\left(\frac{1}{6}\right) + \frac{1}{3}\left(\frac{5}{6}\right)}$$

Q24

Corner points of the feasible region for an LPP are (0,2), (3,0), (6,0), (6,8) and (0,5).

Let $F = 4x + 6y$ be the objective function. Then maximum of F−minimum of F =

1) 60 2) 48 3)42 4) 18

ANSWER

Ans: (1)

Max-Min=72-12=60

Q25

A tosses 2 coines while B tosses 3. The probability that B obtains more number of heads is

1) $\frac{1}{4}$ 2) $\frac{1}{3}$ 3) $\frac{1}{2}$ 4) $\frac{3}{4}$

ANSWER

$$\mathrm{P(E)} = \frac{1}{2}$$

Q26

Box A contains 3 red and 2 black balls. Box B contains 2 red and 3 black balls. One ball is drawn at random from box A and placed in box B. Then one ball is drawn at random from the box B and placed in A. The probability that the composition of balls in the two boxes remains unaltered is

1) $\frac{9}{30}$ 2) $\frac{4}{15}$ 3) $\frac{17}{30}$ 4) $\frac{16}{30}$

ANSWER

$$\text{Required Probability} = \frac{3}{5} \times \frac{3}{6} + \frac{2}{5} \times \frac{4}{6} = \frac{17}{30}$$

Q27

If A and B are two independent events such that $P(A) = \frac{1}{3}$ and $P(B) = \frac{3}{4}$, then $P\left\{\frac{B}{(A \cup B)}\right\} =$

1) $\frac{7}{10}$ 2) $\frac{8}{10}$ 3) $\frac{9}{10}$ 4) $\frac{6}{10}$

ANSWER

$$P\left(\frac{B}{A\cup B}\right)=\frac{P(B)}{P(A\cup B)}=\frac{9}{10}$$

Q28

A box 'A' contains 2 white, 3 red and 2 black balls. Another box 'B' contains 4 white, 2 red and 3 black balls. If two balls are drawn at random, without replacement, from a randomly selected box and one ball turns out to be white while the other ball turns out to be red, then the probability that both balls are drawn from box 'B' is

1) $\frac{9}{16}$ 2) $\frac{7}{16}$ 3) $\frac{9}{32}$ 4) $\frac{7}{8}$

ANSWER

$$\Pr obability \text{ that box A is selected } \mathrm{P}\ (A) = \frac{1}{2}$$

$$\Pr obability \text{ that box B is selected } \mathrm{P}\ (B) = \frac{1}{2}$$

E be event that one ball is white while the other is red

$$\mathrm{P}\ (E) = P\ (A)\ .\ P\ (E/A) + P\ (B)\ P\ (E/B)$$

$$= \frac{1}{2}\left[\frac{2.3}{{}^{7}C_{2}} + \frac{4.2}{{}^{9}C_{2}}\right] = \frac{1}{2}\left[\frac{6}{21} + \frac{8}{36}\right] = \frac{1}{2}\left[\frac{2}{7} + \frac{2}{9}\right] = \frac{16}{63}$$

$$P\ (B/E) = \frac{P\ (B)\ P\ (E/B)}{P\ (E)} = \frac{1/9}{16/63} = \frac{7}{16}$$

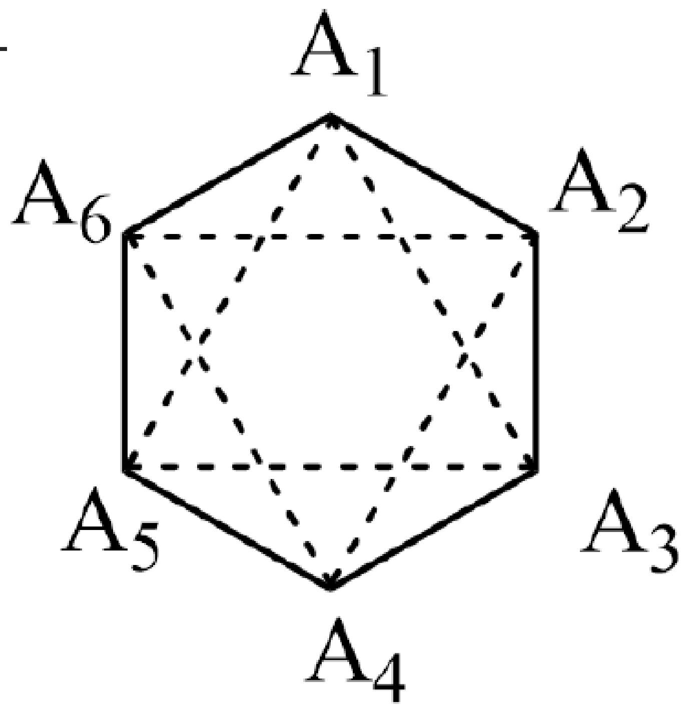
Q29

Three of the six vertices of a regular hexagon are chosen at random. The probability that the triangle with three vertices is equilateral is

1) $\frac{1}{2}$ 2) $\frac{1}{5}$ 3) $\frac{1}{10}$ 4) $\frac{1}{20}$

ANSWER

$$P = \frac{2}{20} = \frac{1}{10}$$



Q30

) If A and B are two mutually Exclusive events in a sample spaces S such that P(B) = 2 P(A) and $A \cup B = S$ then P(A) =

1) $\frac{1}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{4}$ 4) $\frac{1}{5}$

ANSWER

$$P(A) + P(B) = 1; P(A) = \frac{1}{3}$$

Q31

) A sample of 2 items is selected at random from a bag containing 5 items of which 2 are defective. Then mean of number of defective items is

1) $\frac{4}{5}$ 2) $\frac{1}{5}$ 3) $\frac{2}{5}$ 4) $\frac{3}{5}$

ANSWER

$$n = 2$$

$$\text{P} = \text{probability of selecting 1 item which is defect}$$
$$= \frac{2}{5}$$

$$\text{mean} = np = 2 \times \frac{2}{5} = \frac{4}{5}$$

Q32

) In a market region half of the households is known to use a particular brand of soap. In a household survey, a sample of 10 households are alloted to each investigator and 2048 investigators are appointed for the survey. The number of investigators likely to report that there are alteast 4 users is

1) 240 2) 352 3) 1696 4) 120

ANSWER

$$2048 - 352 = 1696$$

Q33

Corner points of the feasible region determined by the system of linear constraints are (0,3), (1,1) and (3,0). Let $z = px + qy$, where $p, q > 0$. Condition on p and q so that the minimum of z occur at (3,0) and (1,1) is

1)$p = 2q$ 2)$p = 3q$ 3)$p = \frac{q}{2}$ 4)$p = q$

ANSWER

Ans : (3)

3p=p+q

Q34

The sum and product of mean and variance of a binomial distribution are 24 and 128 respectively. The binomial distribution is

1) $\left(\frac{1}{2}+\frac{1}{2}\right)^{32}$ 2) $\left(\frac{3}{10}+\frac{7}{10}\right)^{32}$ 3) $\left(\frac{1}{50}+\frac{49}{50}\right)^{32}$ 4) $\left(\frac{1}{3}+\frac{2}{3}\right)^{32}$

ANSWER

$$\bar{x}+\sigma^2=24;\bar{x}.\sigma^2=128,x^2-\sigma^2=8$$

Q35

The odds that book be reviewed favourably by three independent critics are 5 to 2, 4to 3 and 3 to 4 respectively. The probability that of the three reviews a majority will be favourable is

1) $\frac{209}{343}$ 2) $\frac{135}{343}$ 3) $\frac{6}{343}$ 4) $\frac{120}{343}$

ANSWER

$$P_1=\frac{5}{7},P_2=\frac{4}{7},P_3=\frac{3}{7}$$

$$P(E)=P_1P_2\overline{P_3}+P_1\overline{P_2}P_3+\overline{P_1}P_2P_3+P_1P_2P_3$$

$$=\frac{5.4.4+5.3.3+2.4.3+5.4.3}{7.7.7}$$

$$=\frac{80+45+24+60}{343}=\frac{209}{343}$$

Q36

A bag contains (2n+1) coins. It is known that n of these coins have a head on both sides, whereas the remaining n+1 coins are fair. A coin is picked up at random from the bag and tossed. If the probability that the toss results in a head is 31/42, then n is equal to

1) 10.0 2) 11.0 3) 12.0 4) 13.0

ANSWER

A_1= Event that a coin having head on both sides is choosen

A_2=event that a fair coin is choosen.

E= Event that head occures

$$P(A_1) = \frac{n}{2n+1}.\ P(A_2) = \frac{n+1}{2n+1}$$

$$P(\frac{E}{A_1}) = 1 \quad P(\frac{E}{A_1}) = \frac{1}{2}$$

$$P(E) = P(A_1 \cap E) + P(A_2 \cap E)$$

$$\frac{31}{42} = \frac{n}{2n+1}.1 + \frac{n+1}{2n+1}.\ \frac{1}{2}$$

$$\Rightarrow n = 10$$

Q37

The chance that a person with two dice, the faces of each being numbered 1 to 6, will throw aces exactly 4 times in 6 trails is

1) $\left(\frac{1}{36}\right)^4$ 2) $\left(\frac{35}{36}\right)^4$ 3) ${}^6C_4\left(\frac{1}{36}\right)^4\left(\frac{35}{36}\right)^2$ 4) ${}^6C_4\left(\frac{35}{36}\right)^4\left(\frac{1}{36}\right)^2$

ANSWER

$$n = 6, p\left(x = 4\right), p = \frac{1}{36}$$

Q38

If $P\left(A \ \cap \ B\right) \ = \ \frac{7}{10}$ and $P\left(B\right) \ = \ \frac{17}{20}$, where P stands for probability then P(A/B) is equal to

1) $\frac{14}{17}$ 2) $\frac{7}{8}$ 3) $\frac{1}{8}$ 4) $\frac{17}{20}$

ANSWER

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

$$= \frac{7/10}{17/20} = \frac{14}{17}$$

Q39

A bag contains 4 red and 6 black balls. A ball is drawn at random from the bag, its colour is observed and this ball along with two additional balls of the same colour are returned to the bag. If now a ball is drawn at random from the bag, then the probability that this drawn ball is red, is

1) $\frac{2}{5}$ 2) $\frac{1}{5}$ 3) $\frac{3}{4}$ 4) $\frac{3}{10}$

ANSWER

Required probability

$$\frac{4}{10} \times \frac{6}{12} + \frac{6}{10} \times \frac{4}{12}$$

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

R	B
4	6

Q40

A player tosses two coins. He wins Rs.1 if one head appears, Rs.2 if two heads appear. But he loses Rs.5 if no head appear, the mean of the prize money is

1) $\frac{1}{2}$ 2) $\frac{1}{4}$ 3) $\frac{-1}{4}$ 4) $\frac{1}{5}$

ANSWER

$$\mu = \sum x_i p(X = x_i)$$

Q41

If the range of a random variable X is $\{0, 1, 2, 3, ...\}$ with $P(X = k)\ \frac{(k+1)a}{3^k}$ for $k \geqslant 0$, then $a =$

1) $\frac{2}{3}$ 2) $\frac{4}{9}$ 3) $\frac{8}{27}$ 4) $\frac{16}{81}$

ANSWER

$$\sum P(Xi) = 1$$

$$\Rightarrow \sum_{K=0}^{\infty} \frac{(K+1)a}{3^K} = 1$$

$$\Rightarrow a\left[1 + \frac{1}{3} + \frac{3}{3^2} + \frac{4}{3^3} + \ldots\ldots.\right] = 1$$

$$\text{Put } \frac{1}{3} = x$$

$$\Rightarrow a\left[1 + 2x + 3x^2 + 4x^3 + \ldots\ldots.\right] = 1$$

$$\Rightarrow a[1-x]^{-2} = 1$$

$$\Rightarrow a = \frac{4}{9}$$

Q42

If the mean and variance of a binomial variable X are 2 and 1 respectively, then $P(X \geqslant 1) =$

1) $\frac{2}{3}$ 2) $\frac{15}{16}$ 3) $\frac{7}{8}$ 4) $\frac{4}{5}$

ANSWER

$$p = q = \frac{1}{2}, n = 4$$

Q43

An urn contains 6 white and 4 black balls. A fair die whose faces are numbered from 1 to 6 is rolled and number of balls equal to that of the number appearing on the die is drawn from the urn at random. The probability that all those are white is

1) $\frac{1}{5}$ 2) $\frac{2}{5}$ 3) $\frac{3}{5}$ 4) $\frac{4}{5}$

ANSWER

$$\text{Required Probability} =$$

$$\frac{1}{6}\left[\frac{{}^{6}c_1}{{}^{10}c_1} + \frac{{}^{6}c_2}{{}^{10}c_2} + \ldots\ldots + \frac{{}^{6}c_6}{{}^{10}c_6}\right]$$

Q44

A man is known to speak the truth 3 out 4 times. He throws a die and reports that it is a six. The probability that it is actually a six is

1) $\frac{3}{8}$ 2) $\frac{3}{4}$ 3) $\frac{1}{5}$ 4) $\frac{2}{5}$

ANSWER

$$P\left(\frac{A}{E}\right)=\frac{P(A)\,P\left(\frac{E}{A}\right)}{P(A)\,P\left(\frac{E}{A}\right)+P(\bar{A})\,P\left(\frac{E}{\bar{A}}\right)}$$

$$=\frac{\frac{3}{4}\cdot\frac{1}{6}}{\frac{3}{4}\cdot\frac{1}{6}+\frac{1}{4}\cdot\frac{5}{6}}$$

$$=\frac{3}{8}$$

Q45

In constructing problem on vectors, the three components of a vector are randomly chosen from the digit 0 to 5 with replacement. The probability that the magnitude of the vector is 5 is

1) $\frac{1}{24}$ 2) $\frac{1}{12}$ 3) $\frac{1}{6}$ 4) $\frac{1}{30}$

ANSWER

$$n(S)=6^3=216;\,n(E)=\angle 3+\frac{\angle 3}{\angle 2}=9$$

Q46

Out of ten coins, one of the coin is known to have heads on both sides. He takes out one coin at random and tosses it 5 times. If it always falls with head upwards , the probability that it is double-heads coin is

1) $\frac{32}{51}$ 2) $\frac{32}{41}$ 3) $\frac{32}{61}$ 4) $\frac{12}{41}$

ANSWER

A $\rightarrow$ all 5 times head(special or ordinary coin)

B $\rightarrow$ double -headed coin

$$P\left(\frac{B}{A}\right)=\frac{P(A\cap B)}{P(A)}=\frac{\frac{1}{10}}{\frac{1}{10}.1+\frac{9}{10}\left(\frac{1}{2}\right)^{5}}=\frac{1}{1+\frac{9}{32}}=\frac{32}{41}$$

Q47

If A and B are two events such that $P(A)=\frac{3}{8}, P(B)=\frac{5}{8}$ and $P(A\cup B)=\frac{3}{4}$, then $P\left(\frac{B}{\bar{A}}\right)=$

1) $\frac{2}{5}$ 2) $\frac{3}{5}$ 3) $\frac{4}{5}$ 4) $\frac{1}{5}$

ANSWER

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

$$\frac{3}{4}=\frac{3}{8}+\frac{5}{8}-P(A\cap B)\,;\,P(A\cap B)=\frac{1}{4}$$

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

$$=1-\frac{\frac{1}{4}}{\frac{5}{8}}=\frac{3}{5}$$

Q48

) Of the bolts produced by a factory 2% are defective. In a shipment of 3600 bolts from the factory, the expected number of defective bolts is

1) 144 2) 72 3) 36 4) 18

ANSWER

$$p = \frac{2}{100}, n = 3600, \mu = np$$

Q49

) There are three events A,B and C one of which and only one can happen. The odds are 7 to 3 against A and 6 to 4 against B. The odds against C are

1) 3 to 4 2) 4 to 3 3) 7 to 3 4) 3 to 7

ANSWER

$$P(A) = \frac{3}{10}, P(B) = \frac{4}{10}$$

$$P(A) + P(B) + P(C) = 1$$

$$P(C) = \frac{3}{10}$$

$$P\left(\overline{C}\right) : P(C) = 7 : 3$$

Q50

A vertex of a feasible region by the linear constraints $3x+4y \leq 18$, $2x+3y \geq 3$ and x, y ≥ 0, is

1) (0, 2) 2) (4.8, 0) 3) (0, 3) 4) none of these

ANSWER

Ans : (4)

Q51

Which of the following is false?

1)Maximum value of the objective function $z = ax + by$ in a LPP always occurs at only one corner point of the feasible region.

2)In a LPP, the maximum value of the objective function $z = ax + by$ is always finite.

3)A feasible region of a system of linear inequalities is said to be bounded if it can be enclosed within a circle.

4) Objective function of LPP is a function to be optimized.

ANSWER

Ans: (1)

Q52

Which of the following set is convex?

1)$\{(x, y): x^2 + y^2 \geq 1\}$

2)$\{(x, y): 2x^2 + 5y^2 \leq 3\}$

3) $\{(x, y): 4 \leq x^2 + y^2 \leq 7\}$

4) $\{(x, y): 5 \leq 2x^2 + 5y^2 \leq 3\}$

ANSWER

Ans: (2)

Q53

The feasible region of an LPP is always

1)a close set 2)an unbounded set 3)a bounded set 4)a convex set

ANSWER

Ans: (4)

Q54

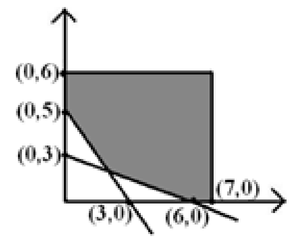
The shaded region in the following figure, is the solution set of the inequations

1)$x + 2y \leq 6, 5x + 3y \geq 15, x \leq 7, y \leq 6, x, y \geq 0$

2)$x + 2y \leq 6, 5x + 3y \leq 15, x \leq 7, y \leq 6, x, y \geq 0$

3)$x + 2y \geq 6, 5x + 3y \geq 15, x \leq 7, y \leq 6, x, y \geq 0$

4)$x + 2y \geq 6, 5x + 3y \leq 15, x \leq 7, y \leq 6, x, y \geq 0$



ANSWER

Ans: (3)

Q55

The corner points of an LPP are (0,0), (8,0), (5,6) and (0,3). Then the area of the feasible region (in sq.units) is

1)31.5 2)33.5 3)16.5 4) 17.5

ANSWER

Ans: (1)

Area of a quadrilateral$=\frac{1}{2}\begin{vmatrix} 0-5 & 8-0 \\ 0-6 & 0-3 \end{vmatrix}=31.5$

Q56

The solution set of the constraints $x + 2y \geq 11, 3x + 4y \geq 30, 2x + 5y \geq 30,$ $x \geq 0, y \geq 0$ does not include the point

1)(5,10) 2)(5,5) 3)(6,4) 4)(4,2)

ANSWER

Ans: (4)

Q57

. Maximize $z = 50x + 15y$ subject to $5x + y \leq 100, x + y \leq 60,\ x, y \geq 0$. The optimal solution of the LPP is

1) 1250 2)1350 3) 1450 4)1550

ANSWER

Ans: (4)

Maximum at the point (10, 50) is 1250

Q58

. The number of solutions of the system of inequalities $x + 2y \leq 3, 3x + 4y \geq 12,$ $x \geq 0, y \geq 0$ is

1)0 2) 2 3)finite 4) infinite

ANSWER

Ans: (1)

Q59

. Objective function of an LPP is

1)a constant 2) a function to be optimized

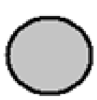
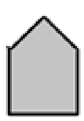
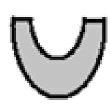
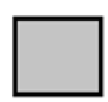
3)an inequality 4) a quadratic expression

ANSWER

Ans: (2)

Q60

. Which of the following shaded region is not a convex set?

1)  2)  3)  4) 

ANSWER

Ans: (3)