Engineering Mathematics

Q.1 If P and Q are two random events, then which of the following is true?

(A) Independence of P and Q implies that Probability $(P \cap Q) = 0$

(B) Probability $(P \cap Q) \geq$ Probability (P) + Probability (Q)

(C) If P and Q are mutually exclusive then they must be independent

(D) Probability $(P \cap Q) \leq$ Probability (P)

Q.2 A box contains 4 white balls and 3 red balls. In succession, two balls are randomly selected and removed from the box. Given that the first removed ball is white, the probability that the second removed ball is red is

(A) $\frac{1}{3}$ (B) $\frac{3}{7}$ (C) $\frac{1}{2}$ (D) $\frac{4}{7}$

Q.3 Consider a company that assembles computers. The probability of a faulty assembly of any computer is p. The company therefore subjects each computer to a testing process. This testing process gives the correct result for any computer with a probability of q. What is the probability of a computer being declared faulty?

(A) $pq + (1-p)(1-q)$ (B) $(1-q)p$ (C) $(1-p)q$ (D) pq

Q.4 A determinant is selected from the set of all determinants of order 2 with elements 0 and (or) 1. Find the probability that the selected determinant is non zero :

(A) $\frac{13}{16}$ (B) $\frac{10}{16}$ (C) $\frac{6}{16}$ (D) 0

Q.5 An examination consists of two papers, paper 1 and paper 2. The probability of failing in paper 1 is 0.3 and that in paper 2 is 0.2. Given that a student has failed in paper 2, the probability of failing in paper 1 is 0.6. The probability of a student failing in both papers is

(A) 0.5 (B) 0.18 (C) 0.12 (D) 0.06

Q.6 Dialing a phone number, A man forgot the last two digits and remembering only that they are different dialed them at random the probability the number being dialled correctly.

(A) $\frac{1}{2}$ (B) $\frac{1}{45}$ (C) $\frac{1}{72}$ (D) $\frac{1}{90}$

Q.7 There are ten coins, of these nine are unbiased and one is a biased coin with two heads. A coin is drawn at random and tossed two times, it appears head on both the times. Then the probability that the head is happened in biased coin is

(A) $\frac{13}{40}$ (B) $\frac{4}{13}$ (C) $\frac{9}{13}$ (D) $\frac{5}{13}$

Q.8 The probability that a student knows the correct answer to a multiple choice question is 2/3. If the student does not know the answer, then the student guesses the answer. The probability of the guessed answer being correct is 1/4. Given that the student has answered the question correctly, the conditional probability that the student knows the correct answer is

(A) $\frac{2}{3}$ (B) $\frac{3}{4}$ (C) $\frac{5}{6}$ (D) $\frac{8}{9}$

Q.9 In binomial distribution $B\left(n, p=\frac{1}{4}\right)$ if the probability of atleast 1success is greater than equal to $\frac{9}{10}$. Then n is approximately equal _____.

Q.10 Consider a random variable to which a Poisson distribution is best fitted. It happens that $P_{(X=1)}=\frac{2}{3}P_{(X=2)}$ on this distribution plot. The variance of this distribution will be

(A) 3 (B) 2 (C) 1 (D) $\frac{2}{3}$

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1⇒ (1)

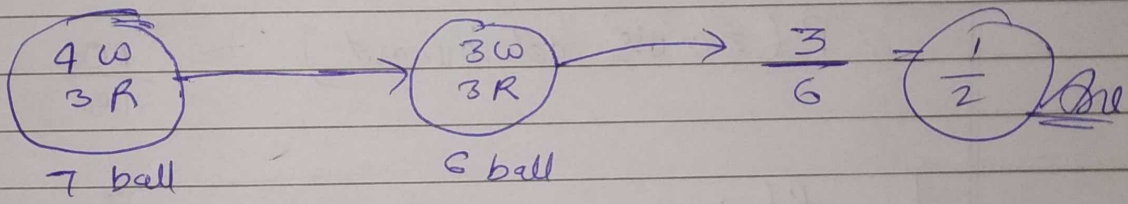
P & Q are two random events,

True - ?

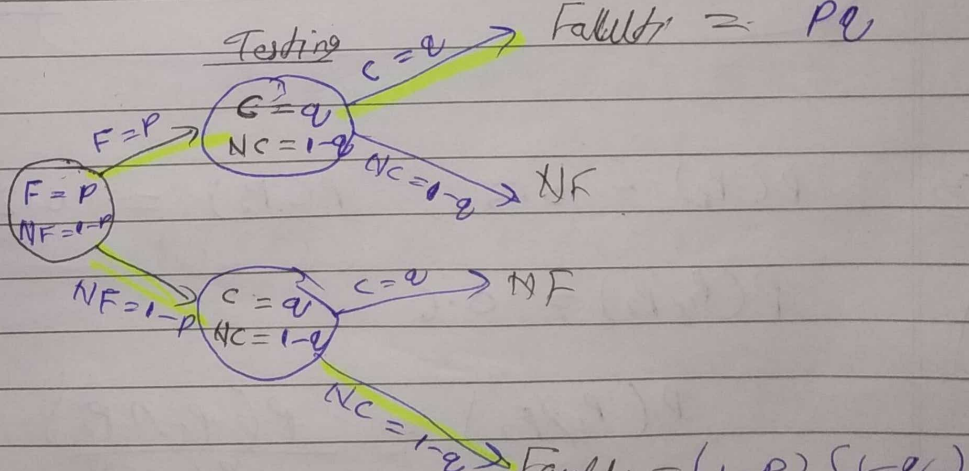
→ $P(P \cap Q) \leq P(P)$

2⇒ (C)

Box contains → 4 ω & 3 R



3⇒ (A)



$$\text{Faulty} = PQ + (1-P)(1-Q)$$

4⇒ determinant order 2 → $|det| = 0$

(c)

$$\begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix}, \begin{vmatrix} 1 & 0 \\ 0 & 0 \end{vmatrix} \begin{vmatrix} 0 & 1 \\ 0 & 0 \end{vmatrix} \begin{vmatrix} 0 & 0 \\ 1 & 0 \end{vmatrix} \begin{vmatrix} 0 & 0 \\ 0 & 1 \end{vmatrix}$$

$$\begin{vmatrix} 1 & 1 \\ 0 & 0 \end{vmatrix} \begin{vmatrix} 1 & 0 \\ 1 & 0 \end{vmatrix} \begin{vmatrix} 0 & 0 \\ 1 & 1 \end{vmatrix} \begin{vmatrix} 0 & 1 \\ 0 & 1 \end{vmatrix} \begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix}$$

$$P(\text{zero's determinant}) = \frac{10}{16}$$

$$P(\text{non-zero's}) = \frac{6}{10}$$ Ans

5⇒ $P(P_1) = 0.3$, $P(P_2) = 0.2$

(c)

$P(P_1/P_2) = 0.6$

$$P(P_1/P_2) = \frac{P(P_1 \wedge P_2)}{P(P_2)}$$

$$P(P_1 \wedge P_2) = 0.6 \times 0.2$$

$$0.12$$ Ans

6⇒ (P)

1st no. — (1-9) not 0 → 1/9

2nd no — (0-9) → 1/10

contact no. = $\frac{1}{9} \times \frac{1}{10}$

$= \frac{1}{90}$ Ans

7⇒ (B)

10 coins → 9 UB = {H, T}

→ 1 B = {H, H}

$P(B/2H) = \frac{P(B \cap 2H)}{P(2H)}$

$P(2H) = P(UB \cap 2H) + P(B \cap 2H)$

$= \frac{9}{10} \times \left(\frac{1}{2} \times \frac{1}{2}\right) + \frac{1}{10} \times 1$

$= \frac{13}{40}$

$P\left(\frac{B}{2H}\right) = \frac{1/10}{13/40} = \frac{4}{13}$ Ans

8 ⇒ $P(K \cap C) = 2/3$

D $P(\not{D}K) = 1 - 2/3 = 1/3$

$P(DK \cap GC) = 1/3 \times 1/4$

$= \frac{1}{12}$

$P\left(\frac{K \cap C}{C}\right) = \frac{2/3}{P(K \cap C) + P(\not{D}K \cap GC)}$

$= \frac{2/3}{2/3 + 1/12}$

$= \frac{2/3}{\frac{8+1}{12}}$

$= \frac{8}{9}$ Ans

9 ⇒

$P = 1/4 \;, \; q = 1 - 1/4 = 3/4$

8 $P(n \geq 1) = 1 - P(n \geq 0) \;\; 2/9/10$

$P(n=0) = 1/10$

${}^nC_0 \left(\frac{1}{4}\right)^0 \left(\frac{3}{4}\right)^n = \frac{1}{10}$

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

$n = \frac{\log(1/10)}{\log(3/4)} = 8$ Ans

Teacher's Signature .....

Ans

A

$$P(r) = \frac{e^{-m} m^r}{r!}$$

$$\frac{e^{-m} m^4}{4!} = \frac{2}{3} \times \frac{e^{-m} m^2}{2!}$$

$$m = 3$$ Ans