9/10/23

1.3.6 PYQs:-

GATE-2017:- P and Q are considering to apply for job. The probability that P applies for job is 1/4. The probability that Q applies for job given that P applies for job is 1/3. The probability that P does not apply for job given Q does not apply for job.

(A.) 4/5 (B.) 5/6 (C.) 7/8 (D.) 11/12

$\Rightarrow P(P) = 1/4$

$P(Q|P) = 1/3$

To find $P(\bar{P}|\bar{Q})$?

$$P(\bar{P}|\bar{Q}) = \frac{P(\bar{P} \cap \bar{Q})}{P(\bar{Q})}$$

$$P(Q|P) = \frac{P(Q \cap P)}{P(P)}$$

$$\therefore P(Q \cap P) = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$$

$$P(P|Q) = \frac{P(P \cap Q)}{P(Q)}$$

$$\therefore P(Q) = \frac{P(P \cap Q)}{P(P|Q)}$$

$$\therefore P(Q) = \frac{1/12}{1/2} = \frac{1}{6}$$

$P(\overline{P \cup Q}) = P(\overline{P} \cap \overline{Q})$

$P(P \cup Q) = P(P) + P(Q) - P(P \cap Q)$

$= 1/4 + 1/6 - 1/12$

$= 1/4 + 1/12$

$= 4/12 = 1/3$

$P(\overline{P \cup Q}) = 1 - 1/3 = 2/3$

$P(\overline{Q}) = 1 - P(Q) = 1 - 1/6 = 5/6$

$P(\overline{P} | \overline{Q}) = \frac{P(\overline{P} \cap \overline{Q})}{P(\overline{Q})}$

$= \frac{2/3}{5/6} = 4/5$

GATE-1999 :- Consider two events E1 and E2 such that Probability of E1, $P[E1] = 1/2$, probability of E2, $P[E2] = 1/3$, and probability of E1 and E2, $P[E1 \cap E2] = 1/5$. Which of the following statements are True or false? or

(A.) $P[E1 \text{ and } E2]$ is 2/3

(B.) Events E1 and E2 are independent

(C.) Events E1 and E2 are not independent

(D.) $P[E1 | E2] = 1/5$.

$\Rightarrow P(E1 \cup E2) = P(E1) + P(E2) - P(E1 \cap E2)$

$= 1/2 + 1/3 - 1/5$

$= 5/6 - 1/5 = 25 - 6/30$

$= 19/30$

$P(E_1 \cap E_2) \neq P(E_1) \cdot P(E_2)$

$1/5 \neq (1/2)(1/3)$

$1/5 \neq 1/6$

$P(E_1|E_2) = \frac{P(E_1 \cap E_2)}{P(E_2)}$

$= \frac{1/5}{1/2} = \frac{2}{5}$

GATE-2021 :- A box contains 25 blue balls and 45 black balls. If 2 balls are selected randomly, without replacement, the probability of an outcome in which the first selected is blue ball and the second selected is a black ball is

(A.) 3/16 (B.) 45/236 (C.) 1/4

(D.) 3/4

⇒ Total balls = 60

$\rightarrow P(B) \cdot P(\text{Blacks}) = \frac{25}{60} \times \frac{45}{59} = \frac{45}{236}$