K19FG-15-JAN

Friday, January 15, 2021
12:53 PM

Ex 3.35 An MBA applies for a job in two firm X and Y. The prob. of his being selected in X firm is 0.7 and being rejected in Y is 0.5. The prob. of atleast one to be rejected is that 0.6. Find the prob that he will be selected in one of the firm.

Soln:- Let A = Selected in X firm

B = Selected in Y firm

$P(A) = 0.7$, $P(\bar{B}) = 0.5$, $P(\bar{A} \cup \bar{B}) = 0.6$

$P(B) = 1 - P(\bar{B}) = 1 - 0.5 = 0.5$

$P(A \cup B) = ?$

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

$= 0.7 + 0.5 - \underline{P(A \cap B)}$

$\because P(\bar{A} \cup \bar{B}) = 0.6$

$P(\overline{A \cap B}) = 0.6$

$1 - P(A \cap B) = 0.6 \Rightarrow P(A \cap B) = 1 - 0.6 = \underline{\underline{0.4}}$

$\Rightarrow P(A \cup B) = 0.7 + 0.5 - 0.4 = \underline{\underline{0.8}}$ Ans

Conditional Probability:- Let A and B are two events then if the Prob. of first one is affected by second event then A is called conditional event under B and such conditional events are denoted by $\underline{\underline{A|B}}$.

A|B event is that event in which sample space is B and favourable space is $A \cap B$.

No. of $(A \cap B)$ $\Rightarrow P(A|B) = \boxed{P(A \cap B)}$

B and favourable space is A∩B.

$$P(A|B) = \frac{\text{No. of } (A \cap B)}{\text{No. of } (B)} \Rightarrow P(A|B) = \frac{\boxed{P(A \cap B)}}{\boxed{P(B)}}$$

$$P(A|B) = \frac{\text{No. of } (A \cap B) / \text{No. of sample space } S}{\text{No. of } B \,/\, \text{No. of sample space } S}$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow \boxed{P(A|B) = \frac{P(A \cap B)}{P(B)}}$$

$$\Rightarrow \boxed{P(A \cap B) = P(B) \cdot P(A|B)}$$ # Multiplication Thm

$$\boxed{P(A \cap B) = P(A) \cdot P(B|A)}$$

Independent events :- Let A and B are two events then A and B are called independent to each other if $\boxed{P(A|B) = P(A)}$ or $P(B|A) = P(B)$

$$\Rightarrow P(A \cap B) = P(A) \cdot P(B|A) = P(A) \cdot P(B)$$

$$\boxed{P(A \cap B) = P(A) \cdot P(B)}$$ # Multiplication Th for independent events.

Note :- Conditional Prob is always less than actual event. ~~that~~

i) $P(A|B) > P(A)$

event ~~that~~

$$\boxed{P(A|B) \leq P(A)}$$

i) $P(A|B) > P(A)$

(ii) $P(A|B) \geq P(A)$

(iii) $P(A|B) \leq P(A)$ ✓

(iv) None of the above

Note :- A and B are two events then if $A \cap B = \phi$

$\Rightarrow$ if A and B are disjoint events then they are dependent events

or if $A \cap B \neq \phi \Leftrightarrow$ A and B are independent events

$A \cap B = \phi \Leftrightarrow$ A and B are dependent events

it is noted that A and B are possible events

i.e $P(A) > 0$, $P(B) > 0$

Note :- $\boxed{P(\phi|B) = 0} = \frac{P(\phi \cap B)}{P(B)} = \frac{P(\phi)}{P(B)} = \frac{0}{P(B)} = 0$

Theorem :- Let A, B and C are three events then

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

~~$P(A \cup B | C)$~~

$$\boxed{P(A \cup B|C) = P(A|C) + P(B|C) - P(A \cap B|C)}$$

Proof :- $P(A \cup B|C) = \frac{P((A \cup B) \cap C)}{P(C)} = \frac{P((A \cap C) \cup (B \cap C))}{P(C)}$

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

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

$$= P(A|C) + P(B|C) - P(A\cap B|C) \quad \text{Ans}$$

Que: If A and B are two independent events then

(i) A and $\bar{B}$ (ii) B and $\bar{A}$ (iii) $\bar{A}$ and $\bar{B}$

are also independent

Soln:- $\because$ A and B are independent then we get

$$\boxed{P(A\cap B) = P(A)\cdot P(B)} \quad \text{—— (1)}$$

(i) $P(A\cap\bar{B}) = P(A)\cdot P(\bar{B})$ we have to prove.

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

$$= P(A)\left[1 - P(B)\right]$$

$$= P(A)\cdot P(\bar{B}) \quad \text{Ans}$$

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

$$\boxed{P(\bar{A}\cap\bar{B}) = P(\bar{A})\cdot P(\bar{B})}$$ Prove your self.