

VIDYA BHAWAN BALIKA VIDYA PITH

शक्तिउत्थानआश्रमलखीसरायबिहार

Class :-12(Maths)

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1. Given that E and F are events such that $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$, find $P(E|F)$ and $P(F|E)$

Solution:

Given $P(E) = 0.6$, $P(F) = 0.3$ and $P(E \cap F) = 0.2$

We know that by the definition of conditional probability,

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

By substituting the values we get

$$\Rightarrow P(E|F) = \frac{P(E \cap F)}{P(F)} = \frac{0.2}{0.3} = \frac{2}{3}$$

$$\text{And } \Rightarrow P(F|E) = \frac{P(E \cap F)}{P(E)} = \frac{0.2}{0.6} = \frac{2}{6} = \frac{1}{3}$$

2. Compute $P(A|B)$, if $P(B) = 0.5$ and $P(A \cap B) = 0.32$

Solution:

Given: $P(B) = 0.5$ and $P(A \cap B) = 0.32$

We know that by definition of conditional probability,

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

Now by substituting the values we get

$$\Rightarrow P(A|B) = \frac{0.32}{0.5} = \frac{32}{50} = \frac{16}{25}$$

3. If $P(A) = 0.8$, $P(B) = 0.5$ and $P(B|A) = 0.4$, find

(i) $P(A \cap B)$

(ii) $P(A|B)$

(iii) $P(A \cup B)$

Solution:

Given $P(A) = 0.8$, $P(B) = 0.5$ and $P(B|A) = 0.4$

(i) We know that by definition of conditional probability,

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

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

$$\Rightarrow P(A \cap B) = 0.4 \times 0.8$$

$$\Rightarrow P(A \cap B) = 0.32$$

(ii) We know that by definition of conditional probability,

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

Now substituting the values we get

$$\Rightarrow P(A|B) = \frac{0.32}{0.5} = 0.64$$

$$\Rightarrow P(A|B) = 0.64$$

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

Substituting the values we get

$$\Rightarrow P(A \cup B) = 0.8 + 0.5 - 0.32 = 1.3 - 0.32$$

$$\Rightarrow P(A \cup B) = 0.98$$

4. Evaluate $P(A \cup B)$, if $2P(A) = P(B) = 5/13$ and $P(A|B) = 2/5$.

Solution:

$$\text{Given } 2P(A) = P(B) = \frac{5}{13} \text{ and } P(A|B) = \frac{2}{5}$$

$$\Rightarrow P(B) = \frac{5}{13}, P(A) = \frac{5}{13 \times 2} = \frac{5}{26}, P(A|B) = \frac{2}{5} \dots\dots\dots (i)$$

We know that by definition of conditional probability,

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

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

$$\Rightarrow P(A \cap B) = \frac{2}{5} \times \frac{5}{13} = \frac{2}{13} \dots\dots\dots (ii)$$

$$\text{Now, } \because P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$\Rightarrow P(A \cup B) = \frac{5}{26} + \frac{5}{13} - \frac{2}{13} = \frac{5 + 10 - 4}{26} = \frac{15 - 4}{26}$$

$$\Rightarrow P(A \cup B) = \frac{11}{26}$$

5. If $P(A) = 6/11$, $P(B) = 5/11$ and $P(A \cup B) = 7/11$, find

(i) $P(A \cap B)$

(ii) $P(A|B)$

(iii) $P(B|A)$