

Assignment 1

AI1110: Probability and Random Variables
Indian Institute of Technology Hyderabad

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Question 12.13.3.14 :

If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

Options:

- 1) $P(A | B) = \frac{P(B)}{P(A)}$
- 2) $P(A | B) < P(A)$
- 3) $P(A | B) \geq P(A)$
- 4) None of these

Answer: (3)

Solution:

As given in the question,

$$A \subset B \Rightarrow AB = A \quad (1)$$

$$\therefore P(A | B) = \frac{P(AB)}{P(B)} \quad (2)$$

$$\Rightarrow P(A|B) = \frac{P(A)}{P(B)} \quad (3)$$

$$P(B) \neq 0 \quad (4)$$

$$\Rightarrow 0 < P(B) \leq 1 \Rightarrow \frac{1}{P(B)} \geq 1 \quad (5)$$

\therefore Using equation (1) ,

$$P(A|B) = P(A) \times \frac{1}{P(B)} \geq P(A) \quad (6)$$

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

Hence, the correct option is (3).