

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 $\Pr(B) \neq 0$, then which of the following is correct?

Options:

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

Answer: (3)

Solution:

As given in the question,

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

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

$$\implies \Pr(A|B) = \frac{\Pr(A)}{\Pr(B)} \quad (3)$$

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

Equation (4) is given in the question

$$\implies 0 < \Pr(B) \leq 1 \quad (5)$$

$$\implies \frac{1}{\Pr(B)} \geq 1 \quad (6)$$

\therefore Using (1) ,

$$\Pr(A|B) = \Pr(A) \times \frac{1}{\Pr(B)} \geq \Pr(A) \quad (7)$$

$$\therefore \Pr(A | B) \geq \Pr(A) \quad (8)$$

Hence, the correct option is (3).