Assignment 1

AI1110: Probability and Random Variables
Indian Institute of Techonology Hyderabad

Arsh Srivastava
AI22BTECH11003

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) $P(A \mid B) = \frac{P(B)}{P(A)}$

2) $P(A \mid B) < P(A)$

3) $P(A \mid B) \geq P(A)$

4) None of these

Answer: (3)
Solution:

As given in the question,

$$A \subset B \implies AB = A \tag{1}$$

$$\therefore P(A \mid B) = \frac{P(AB)}{P(B)} \tag{2}$$

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

$$P(B) \neq 0 \tag{4}$$

Equation (4) is given in the question

$$\implies 0 < P(B) \leq 1 \tag{5}$$

$$\implies \frac{1}{P(B)} \geq 1 \tag{6}$$

$\therefore$ Using equation (1) ,

$$P(A|B) = P(A) \times \frac{1}{P(B)} \geq P(A) \tag{7}$$

$$\therefore P(A \mid B) \geq P(A) \tag{8}$$

Hence, the correct option is (3).