PROBABILITY AND RANDOM VARIABLES (AI1103)

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Assignment 1

Question

Assigned Problem 6.9
If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

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

Solution

We know that A is the subset of B.
$\Rightarrow$ Every element of A is an element of B.

$$\therefore A \cap B = A \tag{1}$$

We know that

$$\begin{aligned} P(\frac{A}{B}) &= \frac{P(A \cap B)}{P(B)} \\ &= \frac{P(A)}{P(B)} \end{aligned} \tag{2}$$

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

By multiplying with P(A) on both sides of the inequality, we get

$\frac{P(A)}{P(B)} \geq$ P(A)

Using 2, we have

$$P\left(\frac{A}{B}\right) \geq P(A)$$

Therefore, option 3 is correct.