

AI1103: Assignment 2

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Download all latex codes from

<https://github.com/Geetha495/Assignment2/blob/main/Assignment2.tex>

Thus option 4 is true.

Hence, FALSE statement is option 3.

1 PROBLEM

Suppose A and B are two independent events with probabilities $\Pr(A) \neq 0$ and $\Pr(B) \neq 0$. Let A' and B' be their complements. Which one of the following statements is FALSE?

- 1) $\Pr(A \cap B) = \Pr(A) \Pr(B)$
- 2) $\Pr(A|B) = \Pr(A)$
- 3) $\Pr(A \cup B) = \Pr(A) + \Pr(B)$
- 4) $\Pr(A' \cap B') = \Pr(A') \Pr(B')$

2 SOLUTION

- 1) As A, B are independent events, By definition,

$$\Pr(A \cap B) = \Pr(A) \Pr(B)$$

Thus option 1 is true.

- 2)

$$\begin{aligned} \Pr(A|B) &= \frac{\Pr(A \cap B)}{\Pr(B)} \\ &= \frac{\Pr(A) \Pr(B)}{\Pr(B)} \\ &= \Pr(A) \end{aligned}$$

Thus option 2 is true.

- 3)

$$\begin{aligned} \Pr(A \cup B) &= \Pr(A) + \Pr(B) - \Pr(A \cap B) \\ &= \Pr(A) + \Pr(B) - \Pr(A) \Pr(B) \end{aligned}$$

Thus option 3 is false.

- 4)

$$\begin{aligned} \Pr(A' \cap B') &= \Pr((A \cup B)') \\ &= 1 - \Pr(A \cup B) \\ &= 1 - \Pr(A) - \Pr(B) + \Pr(A \cap B) \\ &= (1 - \Pr(A))(1 - \Pr(B)) \\ &= \Pr(A') \Pr(B') \end{aligned}$$