

Assignment 1

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Download all python codes from

<https://github.com/AmulyaTallamraju/Assignment-1/blob/main/Assignment1/codes/Assignment-1.py>

and latex-tikz codes from

<https://github.com/AmulyaTallamraju/Assignment-1/blob/main/Assignment1/Assignment-1.tex>

1 PROBLEM

If A and B are two events such that $P(A) \neq 0$ and $P(B|A) = 1$, then

- A) $A \subset B$
- B) $B \subset A$
- C) $B = \phi$
- D) $A = \phi$

2 SOLUTION

Given $Pr(B/A) = 1$. By definition,

$$Pr(B/A) = \frac{Pr(AB)}{Pr(A)}$$

$$\Rightarrow \frac{Pr(AB)}{Pr(A)} = 1 \quad (2.0.1)$$

$$\Rightarrow Pr(AB) = Pr(A) \quad (2.0.2)$$

$$\Rightarrow AB = A \quad (2.0.3)$$

Take any $X \in A$. From 2.0.3, since $A \cap B = A$

$$\Rightarrow X \in AB$$

is also true.

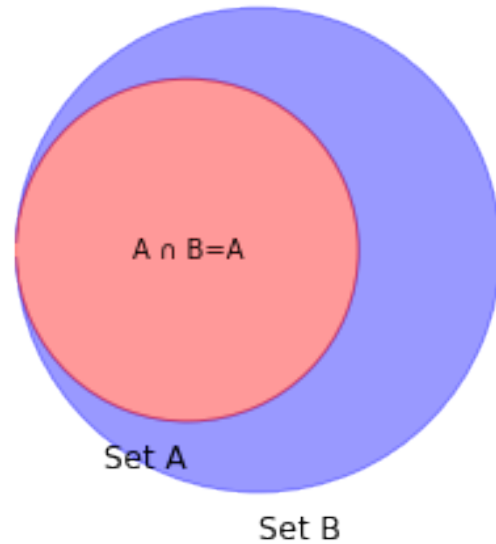
Therefore, for any $X \in A$, $X \in B$

$$\Rightarrow A \subseteq B$$

But, since A and B are two events, $A \neq B$. Hence,

$$A \subset B$$

Therefore, option (A) is correct.



Venn diagram

Option B) If $B \subset A$, Then,

$$AB = B.$$

$$\Rightarrow Pr(AB) = Pr(B)$$

But, from 2.0.2, we have,

$$Pr(AB) = Pr(A) \Rightarrow Pr(AB) = Pr(A) = Pr(B)$$

But, since A and B are two events, $A \neq B$. Hence, option (B) is incorrect.

Option C) If $B = \phi$

$$\Rightarrow Pr(AB) = 0$$

From 2.0.2, we know that,

$$Pr(AB) = Pr(A)$$

$$\Rightarrow Pr(AB) = Pr(A) = 0$$

But, from the given data, we know that $Pr(A) \neq 0$.
Therefore, option C is incorrect.

Option D) If $A = \phi$,

$$\implies Pr(A) = 0$$

But, from the given data, we know that $Pr(A) \neq 0$.
Therefore, option D is incorrect.