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) ≠ 0 and $P(B|A) = 1$, then

A) A ⊂ B
B) B ⊂ A
C) B = ϕ
D) A = ϕ

2 Solution

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

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

$$\implies \frac{Pr(AB)}{Pr(A)} = 1 \tag{2.0.1}$$

$$\implies Pr(AB) = Pr(A) \tag{2.0.2}$$

$$\implies AB = A \tag{2.0.3}$$

Take any X ∈ A. From (2.0.3), since $A \cap B = A$

$$\implies X \in AB \tag{2.0.4}$$

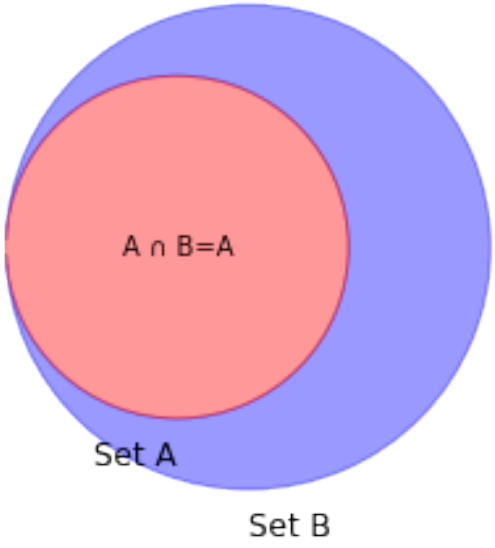
is also true.
Therefore, for any X ∈ A , X ∈ B

$$\implies A \subseteq B \tag{2.0.5}$$

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

$$A \subset B \tag{2.0.6}$$

Therefore, option (A) is correct.



Venn diagram

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

$$AB = B. \tag{2.0.7}$$

$$\implies Pr(AB) = Pr(B) \tag{2.0.8}$$

But, from (2.0.2), we have,

$$Pr(AB) = Pr(A) \tag{2.0.9}$$

$$\implies Pr(AB) = Pr(A) = Pr(B) \tag{2.0.10}$$

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

Option C) If $B = \phi$

$$\implies Pr(AB) = 0 \tag{2.0.11}$$

From (2.0.2), we know that,

$$Pr(AB) = Pr(A) \tag{2.0.12}$$

$$\implies Pr(AB) = Pr(A) = 0 \tag{2.0.13}$$

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

Option D) If $A = \phi$,

$$\implies Pr(A) = 0 \tag{2.0.14}$$

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