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

$$Pr(B|A) = 1. \tag{2.0.1}$$

By definition,

$$Pr(B|A) = \frac{Pr(AB)}{Pr(A)} \tag{2.0.2}$$

$$\implies \frac{Pr(AB)}{Pr(A)} = 1 \tag{2.0.3}$$

$$\implies Pr(AB) = Pr(A) \tag{2.0.4}$$

$$\implies AB = A \tag{2.0.5}$$

A) Take any

$$X \in A \tag{2.0.6}$$

. From (2.0.5), we get

$$X \in AB \tag{2.0.7}$$

is also true.
Therefore, for any

$$X \in A \tag{2.0.8}$$

$$\implies X \in B \tag{2.0.9}$$

$$A \subseteq B \tag{2.0.10}$$

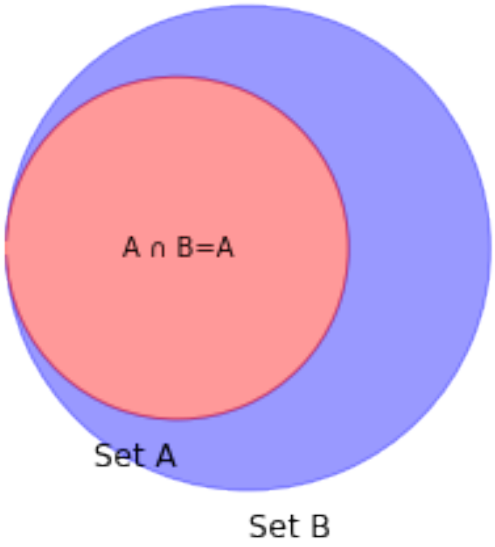
is also true.
But, since A and B are two events,

$$A \neq B \tag{2.0.11}$$

. Hence,

$$A \subset B \tag{2.0.12}$$

Therefore, option (A) is correct.



Venn diagram

B) If

$$B \subset A \tag{2.0.13}$$

Then,

$$AB = B. \tag{2.0.14}$$

$$\implies Pr(AB) = Pr(B) \tag{2.0.15}$$

But, from (2.0.4), we have,

$$Pr(AB) = Pr(A) \tag{2.0.16}$$

$$\implies Pr(AB) = Pr(A) = Pr(B) \tag{2.0.17}$$

But,since A and B are two events,

$$A \neq B \tag{2.0.18}$$

. Hence, option (B) is incorrect.

C) If

$$B = \phi \tag{2.0.19}$$

$$\implies Pr(AB) = 0 \tag{2.0.20}$$

From (2.0.4), we know that,

$$Pr(AB) = Pr(A) \tag{2.0.21}$$

$$\implies Pr(AB) = Pr(A) = 0 \tag{2.0.22}$$

But,from the given data, we know that

$$Pr(A) \neq 0 \tag{2.0.23}$$

Therefore,option C is incorrect.

D) If

$$A = \phi \tag{2.0.24}$$

$$\implies Pr(A) = 0 \tag{2.0.25}$$

But,from the given data, we know that

$$Pr(A) \neq 0 \tag{2.0.26}$$

Therefore,option D is incorrect.