

# Assignment 1

Amulya Tallamraju - AI20BTECH11003

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,

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

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

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

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

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

$$\Rightarrow X \in AB \quad (2.0.4)$$

is also true.

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

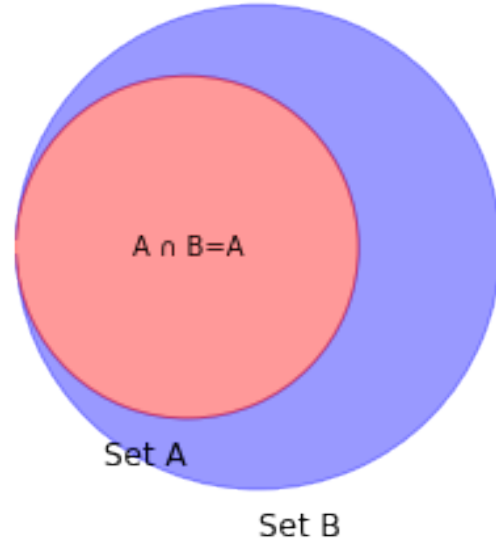
$$\Rightarrow A \subseteq B \quad (2.0.5)$$

is also true.

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

Hence,

$$A \subset B \quad (2.0.6)$$



Venn diagram

Therefore, option (A) is correct.

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

$$AB = B. \quad (2.0.7)$$

$$\Rightarrow Pr(AB) = Pr(B) \quad (2.0.8)$$

But, from (2.0.2), we have,

$$Pr(AB) = Pr(A) \quad (2.0.9)$$

$$\Rightarrow Pr(AB) = Pr(A) = Pr(B) \quad (2.0.10)$$

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

Hence, option (B) is incorrect.

C) If  $B = \phi$

$$\Rightarrow Pr(AB) = 0 \quad (2.0.11)$$

From (2.0.2), we know that,

$$Pr(AB) = Pr(A) \quad (2.0.12)$$

$$\Rightarrow Pr(AB) = Pr(A) = 0 \quad (2.0.13)$$

But, from the given data, we know that  $Pr(A) \neq 0$ .

Therefore, option C is incorrect.

D) If  $A = \phi$ ,

$$\implies Pr(A) = 0 \quad (2.0.14)$$

But, from the given data, we know that  $Pr(A) \neq 0$ .

Therefore, option D is incorrect.