PROBABILITY

UDAY KUMAR - FWC22086

13.4.14 [1]If A and B are two events such that A $\subset$ B and $\Pr(B) \neq 0$,then which of the following is correct ?

(a) $\Pr(A \mid B) = \frac{\Pr(B)}{\Pr(A)}$

(b) $\Pr(A \mid B) < \Pr(A)$

(c) $\Pr(A \mid B) \geq \Pr(A)$

(d) None of these

Solution:
if A $\subset$ B and P(B)$\neq$ 0 then

$$AB = A \tag{13.4.4.1}$$
$$\implies \Pr(A) < \Pr(B) \tag{13.4.4.2}$$
$$\implies P(A|B) = \frac{\Pr(AB)}{\Pr(B)} = \frac{\Pr(A)}{\Pr(B)} \tag{13.4.4.3}$$

we know that

$$\Pr(B) \leq 1 \tag{13.4.4.4}$$
$$\implies 1 \leq \frac{1}{\Pr(B)} \tag{13.4.4.5}$$

multiply both sides with P(A),we get

$$\Pr(A) \leq \frac{\Pr(A)}{\Pr(B)} \tag{13.4.4.6}$$

from (13.4.4.3)

$$\Pr(A) \leq \Pr(A \mid B)) \tag{13.4.4.7}$$
$$\implies \Pr(A \mid B)) \geq \Pr(A) \tag{13.4.4.8}$$

[1]Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)