Question 11.16.3.35

The probability of an occurrence of event A is .7 and that of the occurrence of event B is .3 and the probability of occurrence of both is .4.Is this statement true or false?

Solution:

Given,

$$\Pr(A) = 0.7 \tag{1}$$

$$\Pr(B) = 0.3 \tag{2}$$

$$\Pr(A.B) = 0.4 \tag{3}$$

According to standard probability rules, the probability of the intersection of two events cannot be greater than or equal to the probability of either of the individual events.

In other words,

$$\Pr(A.B) \leq \Pr(A) \text{ and } \Pr(A.B) \leq \Pr(B) \tag{4}$$

$$\therefore \Pr(A.B) \leq \Pr(A) \times \Pr(B) \tag{5}$$

$$\implies \Pr(A.B) \leq 0.7 \times 0.3 \tag{6}$$

$$\implies \Pr(A.B) \leq 0.21 \tag{7}$$

But given that $\Pr(A.B) = 0.4 > 0.21$

$\therefore$ The given statement is false.