Solution to 11.16.3.24

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Question: If $\Pr(A+B) = \Pr(AB)$ for any two events A and B , then

A) $\Pr(A)$=$\Pr(B)$
B) $\Pr(A) > \Pr(B)$
C) $\Pr(A) < \Pr(B)$
D) none of these

Solution:

$$\Pr(A) + \Pr(B) - \Pr(AB) = \Pr(A+B) \tag{1}$$

$$\Pr(A) + \Pr(B) - \Pr(AB) = \Pr(AB) \tag{2}$$

$$[\Pr(A) - \Pr(AB)] + [\Pr(B) - \Pr(AB)] = 0 \tag{3}$$

But

$$\Pr(A) - \Pr(AB) \geq 0 \tag{4}$$

$$\Pr(A) - \Pr(AB) \geq 0 \tag{5}$$

$$\implies \Pr(A) - \Pr(AB) = 0 \tag{6}$$

$$\Pr(A) - \Pr(AB) = 0 \tag{7}$$

$$\implies \Pr(A) = \Pr(AB) \tag{8}$$

$$\Pr(B) = \Pr(AB) \tag{9}$$

From equations (8) and (9), it can be said that

$$\Pr(A) = \Pr(B) \tag{10}$$