

# 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:**

$$\Pr(A) + \Pr(B) - \Pr(AB) = \Pr(A + B) \quad (1)$$

$$\Pr(A) + \Pr(B) - \Pr(AB) = \Pr(AB) \quad (2)$$

$$[\Pr(A) - \Pr(AB)] + [\Pr(B) - \Pr(AB)] = 0 \quad (3)$$

But,

$$\Pr(A) - \Pr(AB) \geq 0 \quad (4)$$

$$\Pr(B) - \Pr(AB) \geq 0 \quad (5)$$

$$\implies \Pr(A) - \Pr(AB) = 0 \quad (6)$$

$$\implies \Pr(A) = \Pr(AB) \quad (7)$$

Also,

$$\Pr(B) - \Pr(AB) = 0 \quad (8)$$

$$\implies \Pr(B) = \Pr(AB) \quad (9)$$

From equations (7) and (9), it can be said that

$$\Pr(A) = \Pr(B) \quad (10)$$