Question: state True or False for the given statement: Two independent events are always mutually exclusive.

Solution:

Two events A and B are said to be independent if the occurrence of one does not affect the probability of the probability of the occurrence of the other. for these events to be independent

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

$$0 = \Pr(A) \times \Pr(B) \tag{2}$$

Example: There are two Events A and B for a pack of cards.
Event A: Drawing a red card (hearts or diamonds).
Event B: Drawing a face card (jack, queen, or king).
Now,

$$\Pr(AB) = 0 \tag{3}$$

$$\Pr(A) = \frac{26}{52} \tag{4}$$

$$\Pr(B) = \frac{12}{52} \tag{5}$$

$$\Pr(A) \times \Pr(B) = \frac{3}{26} \neq \Pr(AB) \tag{6}$$

$P(AB) > 0$, this demonstrates that Events A and B are not mutually exclusive.