**STATISTICS ASSIGNMENT\_4**

**1.Is it possible that an event is independent of itself? If so, when?**

In probability and statistics, independence between two events refers to the absence of a relationship between the occurrence of the two events. This means that the occurrence of one event does not affect the probability of the other event happening.

For an event to be independent of itself, it means that the occurrence of the event would affect its own probability of happening. This is a logical contradiction and cannot occur. The probability of an event is fixed and determined by the underlying distribution, and the occurrence of the event does not change this probability.

Therefore, it is not possible for an event to be independent of itself, as independence is a property that applies to pairs of events, not to individual events.

**2. Is it always true that if A and B are independent events, then Ac and Bc are independent events? Show that it is, or give a counterexample.**

Yes, it is always true that if A and B are independent events, then their complements Ac and Bc are also independent events.

The complement of an event A is the event that consists of all outcomes that are not in event A. If A and B are independent events, then the probability of both events happening is the product of their individual probabilities: P(A and B) = P(A) \* P(B).

Since the complement of an event is the event of all remaining outcomes after the event occurs, the probability of the complement of an event happening is equal to 1 minus the probability of the event happening: P(Ac) = 1 - P(A).

Using this relationship, we can show that Ac and Bc are independent events by calculating the joint probability of both complements:

P(Ac and Bc) = P(Ac) \* P(Bc) = (1 - P(A)) \* (1 - P(B)) = 1 - P(A) - P(B) + P(A and B) = 1 - P(A) - P(B) + P(A) \* P(B) = 1 - P(A) - P(B) + 0 = 1 - P(A) - P(B)

Since the joint probability of Ac and Bc is equal to 1 minus the sum of their individual probabilities, they are independent events. This holds true for all pairs of independent events A and B.