

5. a. Define the following:

i. Sample Space

A sample space is a space containing all possible events in a trial. You can think of it as the collection of all possible outcomes in a trial.

ii. Disjoint Events

Disjoint events are events that have no outcomes in common. These are events that cannot occur at the same time and that cannot occur together. For example, heading East and heading West are considered disjoint events because you cannot walk both East and West at the same time.

iii. Independent Events

Independent events are events whose outcomes cannot affect one another. We say that two events are independent if the outcome of one event does not influence the probability of another event. For example, if you flip a quarter and get heads on the first flip, and then decide to flip another coin, the first flip will tell you nothing about what you will get on the second flip because the two coins do not influence each other. This is an example of independent events.

iv. Exhaustive Events

Exhaustive events are a set of events that when combined would form an entire sample space. They are such that one of them must necessarily occur when an experiment is conducted.

v. Partition of a Sample Space

A partition of a sample space is a set that is said to partition a sample space with other sets if these sets are mutually disjoint and have as their union the entire sample space. You can think of a partition of a sample space as being like a subset of a sample space or a piece of a sample space

b. State De-Morgan's Law

De-Morgan's law basically states that the complement of the union of two sets is equal to the intersection of their separate complements. It also states that the complement of the intersection of two sets is the union of their complements. You can see the examples below:

$$(A \cup B)' = A' \cap B' \text{ and } (A \cap B)' = A' \cup B'$$