WEEK 13 (2^{ND} LEC)
lecture 24

Rule of combination

The classical or A Priori definition of probability

The relative frequency or a Posteriori definition of probability

RULE OF COMBINATION

A combination is any subset of r objects, selected without regard to their order, from a set of n distinct objects.

The total number of such combinations is denoted by the symbol nCr, is given by .

The number of combinations of *n* objects taken *r* at a time is

$${}_nC_r = n(n - 1)(n - 2) \dots (n - r + 1)/r! = n! / r!(n - r)!$$

where r ≤ n. It should be noted that

Combinations and permutations are related according to the following formulas:

$${}_nP_r = {}_nC_r * r! \quad \text{and} \quad {}_nC_r = {}_nP_r / r!$$

EXAMPLE

Suppose we have a group of three persons, A, B, & C.

If we wish to select a group of two persons out of these three, the three possible groups are {A, B}, {A, C} and {B, C}.

In other words, the total number of combinations of size two out of this set of size three is 3.

Now, suppose that our interest lies in forming a committee of two persons, one of whom is to be the president and the other the secretary of a club.

The six possible committees are:

(A, B) , (B, A), (A, C) , (C, A), (B, C) & (C, B).

In other words, the total number of permutations of two persons out of three is 6.

EXAMPLE

In how many ways can three student-council members be elected from five candidates?

$$_5C_3 = \frac{5x4x3}{3!} = \frac{60}{6} = 10 \text{ ways}$$

A DJ will play three CD choices from the 5 requests.

The classical or A Priori definition of probability

There is an experiment with n mutually exclusive, equally likely, and exhaustive elementary events. m of the elementary events are favorable to the occurrence of an event. Then the probability of occurrence of the event (represented by P(Event)) is given by the ratio of the Number of favorable choices for the event to the Total number of possible choices in the experiment.

Probability of Occurrence of an Event

$$= \frac{\text{Number of Favorable Choices for the Event}}{\text{Total Number of Possible Choices for the Experiment}}$$

$$\Rightarrow P(E) = \frac{m_E}{n}$$

E represents the event.

The relative frequency or a Posteriori definition of probability

If a random experiment is repeated a large number of times, say n times, under identical. conditions and if an event A is observed to occur m times, then the **probability** of the event A is defined as the LIMIT of the relative frequency m/n as n tends to infinitely. Symbolically, we write

$$P(A) = \lim_{n \to \infty} \frac{m}{n}$$

As its name suggests, the relative frequency definition relates to the relative frequency with which are event occurs in the *long run*. In situations where we can say that an experiment has been repeated a very large number of times, the *relative frequency definition* can be applied.