**Probability Distributions**

A probability distributiondescribes the likelihood of a sample space as a function of its events.

**Preliminaries**

1.

A function *maps e*veryto exactly one

2.

A function is *monotonic* if it is always increasing *or* non-decreasing.

**Definitions**

1.

Random Variable:

i. A *random variable* is a quantity whose value is uncertain.

ii. A *random variable* is a function of the events in the sample space.

*Symbolically:*

iii. A *random variable* assigns a number to every event in the sample space.

2.

Distribution Function:

Fundamental Principles of Counting

1. Counting Principle.

Let E and F be any sets with the respective cardinalities of n and m. Let G be the set of sequences such that the first term of the sequence is drawn from E and the second term of the sequence is drawn from F. Then the cardinality of G is

Symbolically:

i.

ii.

iii.

=>

2. Generalized Counting Principle

Let E1, E2, … , Ek be sets with cardinalities n1, n2, … , nk respectively. Let G be the set of sequences such that the first term of the sequence is drawn from E1, the second term is drawn from E2, … and the kth term is drawn from Ek. Then the cardinality of G is

Symbolically:

i.

ii.

iii.

=>

Immediate Consequences

1. Power Set Theorem