Definition 1.1:

Definition 1.3: (The standard deviation of a sample of measurements is the positive square root of the variance)

Theorem 2.1: With m elements a1, a2, …, am and n elements b1, b2,.., bn, it is possible to form mn = m x n pairs containing one element from each group.

Theorem 2.2:

Theorem 2.3: The number of ways of partitioning n distinct objects into k distinct groups containing n1, n2,…, nk objects, respectively, where each object appears in exactly one group and , is

Theorem 2.4: The number of unordered subsets of size r chosen (without replacement) from n available objects is

(n r) =

Theorem 2.5: The Multiplicative Law of Probability The probability of the intersection of two events A and B is

If A and B are independent, then

Theorem 2.6: The Additive Law of Probability The probability of the union of two events A and B is

If A and B are mutually exclusive events, and

Theorem 2.7: If A is an event, then

Theorem 2.8: Assume that {B1, B2, … , Bk} is a partition of S such that P(Bi) > 0, for I = 1,2,…,k. Then for any event A

Theorem 2.9: Bayes’ Rule Assume that {B1,B2,…,Bk} is a partition of S such that P(Bi) > 0, for I = 1,2,…,k. Then

Definition 2.1: An experiment is the process by which an observation is made.

Definition 2.2: A simple event is an event that cannot be decomposed. Each simple event corresponds to one and only one sample point. The letter E with a subscript will be used to denote a simple event or the corresponding sample point.

Definition 2.3: The sample space associated with an experiment is the set consisting of all possible sample points. A sample space will be denoted by S.

Definition 2.4: A discrete sample space is the one that contains either a finite or a countable number of distinct sample points.

Definition 2.5: An event in a discrete sample space S is a collection of sample points—that is, any subset of S.

Definition 2.6: Suppose S is a sample space associated with an experiment. To every event A in S (A is a subset of S), we assign a number, P(A), called the probability of A, so that the following axioms hold:

Axiom 1: P(A) 0.

Axiom 2: P(S) = 1.

Axiom 3: If A1, A2, A3,…. Form a sequence of pairwise mutually exclusive events in S (that is, Ai Aj if I j), then

Definition 2.7: An ordered arrangement of r distinct objects is called a permutation. The number of ways of ordering n distinct objects taken r at a time will be designated by the symbol .

Definition 2.8: The number of combinations of n objects taken r at a time is the number of subsets, each of size r, that can be formed from the n objects. This number will be denoted by or (n r). PS I physically cannot for the life of me figure out how to put it properly for that (n r) notation.

Definition 2.9: The conditional probability of an event A, given that an event B has occurred is equal to

,

Provided P(B) > 0. [The symbol P(A|B) is read “probability of A given B.”]

Definition 2.10: Two events A and B are said to be independent if any one of the following holds:

P(A|B) = P(A),

P(B|A) = P(B),

P(A B) = P(A) \* P(B).

Otherwise, the events are said to be dependent.

Definition 2.11: For some positive integer k, let the sets B1, B2,….,Bk be such that

1. for i j

Then the collection of sets {B1, B2, … , Bk} is said to be a partition of S.

Definition 2.12: A random variable is a real-valued function for which the domain is a sample space.

Definition 2.13: Let N and n represent the numbers of elements in the population and sample, respectively. If the sampling is conducted in such a way that each of the (N n) samples has an equal probability of being selected, the sampling is said to be random, and the result is said to be a random sample.

Theorem 3.1: For any discrete probability distribution, the following must be true:

1. for all y.
2. , where the summation is over all values of y with nonzero possibility.

Theorem 3.2: Let Y be a discrete random variable with probability function p(y) and g(Y) be a real-valued function of Y. Then the expected value of g(Y) is given by

Theorem 3.3: Let Y be a discrete random variable with probability function p(y), g(Y) be a function of Y, and c be a constant. Then

Theorem 3.4: Let Y be a discrete random variable with probability function p(y), g(Y) be a function of Y, and c be a constant. Then E[cg(Y)] = cE[g(Y)].

Theorem 3.5: Let Y be a discrete random variable with probablity function p(y) and g1(Y), g2(Y), … , gk(Y) be k functions of Y. Then

Theorem 3.6: Let Y be a discrete random variable with probability function p(y) and mean E(Y) = Mu; then

Theorem 3.7: Let Y be a binomial random variable based on n trials and success probability p. Then

and

Theorem 3.8: If Y is a random variable with a geometric distribution,

and

Definition 3.1: A random variable Y is said to be discrete if it can assume only a finite or countably infinite number of distinct values.

Definition 3.2: The probability that Y takes on the value y, P(Y = y), is defined as the sum of the probabilities of all sample points in S that are assigned the value y. We will sometimes denote P(Y=y) by p(y).

Definition 3.3: The probability distribution for a discrete variable Y can be represented by a formula, a table, or a graph that provides p(y) = P(Y = y) for all y.

Definition 3.4: Let Y be a discrete random variable with the probability function p(y). Then the expected value of Y, E(Y), is defined to be

Definition 3.5: If Y is a random variable with mean E(Y) = , the variance of a random variable Y is defined to be the expected value of (Y - )^2. That is,

The standard deviation of Y is the positive square root of V(Y).

Definition 3.6: A binomial experiment possesses the following properties:

1. The experiment consists of a fixed number, n, of identical trials.
2. Each trial results in one of two outcomes: success, S, or failure, F.
3. The probability of success on a single trial is equal to some value p and remains the same from trial to trial. The probability of a failure is equal to q = (1-p).
4. The trials are independent.
5. The random variable of interest is Y, the number of successes observed during the n trials.

Definition 3.7: A random variable Y is said to have a binomial distribution based on n trials with success probability p if and only if

Definition 3.8: A random variable Y is said to have a geometric probabiltiy distribution if and only if