**Definition 1.1**

This finds the mean of a sample:

Corresponding population mean is denoted by *µ.*

**Definition 1.2**

This finds the variance:

Corresponding population variance is denoted by the symbol

**Definition 1.3**

This finds standard deviation from variance:

Corresponding population standard deviation is denoted by σ =

**Definition 2.1**

An *experiment* is the process by which an observation is made**.**

**Definition 2.2**

A simple event is denoted by

**Definition 2.3**

A sample space will be denoted by

**Definition 2.4**

A discrete sample space is on that contains a finite number of sample points.

**Definition 2.5**

An event in a discrete sample space is a collection sample point.

**Definition 2.6**

Suppose is a subset of we then assign a number, , called the probability of so that axioms hold:

Axiom 1:

Axiom 2:

Axiom 3: If ... form a sequence of pairwise mutually exclusive

In (that is, if ) then,

**Theorem 2.1**

With elements and elements , it is possible to form containing one element from each group.

**Definition 2.7**

An ordered arrangement of distinct objects is called a permutation. Finds the number of ways of ordering objects taken in groups at a time. Can be show with

**Theorem 2.2**

Permutations – objects taken at a time

**Theorem 2.3**

Finds the number of ways can go into distinct groups. Where each object appears exactly one group

**Definition 2.8**

The number of combinations of objects taken at a time is the number of subsets, each of size , that can be formed from the objects. This number will be denoted by

**Theorem 2.4**

The number of unordered subsets of size chosen (without replacement) from available objects is

**Definition 2.9**

The conditional probability of an event , given that an event has occurred, is equal to

Provided . [Symbol is read “the probability of given .”

**Definition 2.10**

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

Otherwise, the events are said to dependent

**Theorem 2.5**

The Multiplicative Law of Probability The probability of the intersection of two events and is

If and are independent, then.

**Theorem 2.6**

The Additive Law of Probability The probability of the union of two events and is

If and are mutually exclusive events, and

**Theorem 2.7**

If is an event, then.

**Definition 2.11**

For some positive integer , let the sets be such that.

Then the collection of sets is said to be a partition of

**Theorem 2.8**

Assume that is a partition of . such that Then for any event

**Theorem 2.9**

Bayes’ Rule Assume that is a partition of such that . Then

**Definition 2.12**

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

**Definition 2.13**

Let and represent the numbers of elements in the population and sample, respectively. If the sampling is conducted in such a way that each of the 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

**Definition 3.1**

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

**Definition 3.2**

The probability that takes on the value , is defined as the sum of the probabilities of all sample points in that are assigned the value y. We will sometimes denote.

**Definition 3.3**

The probability distribution for a discrete variable can be represented by a formula, a table, or a graph that provides for all

**Theorem 3.1**

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

1. for all
2. **,** wherethe summation is over all values of with nonzero probability.

**Definition 3.4**

Let be a discrete random variable with the probability function . Then the expected value of is defined to

**Theorem 3.2**

Let be a discrete random variable with probability function be a real-valued function of . Then the expected value of is given by

**Definition 3.5**

If is a random variable with mean , the variance of a random variable is defined to be the expected value of . That is,

The standard deviation of is the positive square root of .

**Theorem 3.3**

Let be a discrete random variable with probability function and be a constant. Then .

**Theorem 3.4**

Let be a discrete random variable with probability function be a function of , and be a constant. Then

**Theorem 3.5**

Let be a discrete random variable with probability function and be functions of . Then

**Theorem 3.6**

Let be a discrete random variable with probability function and mean ; then

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 .
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* said to have a binomial distribution based on n trials with success probability *p* if and only if

**Theorem 3.7**

Let *Y* be a binomial random variable based on n trials and success and probability *p. then*