**Kaden Fuller-Aujla**

**Table Of Contents**

[Definition - Mean](#_Definition_1.1_-)……...……………………......………………………….……………………..……………………2

[Definition - Variance](#_Definition_1.2_-)…………………….………....……………………..……………………....…………………...2

[Definition - Standard Deviation](#_Definition_1.3_–)…….………....……………………..…………………………....…………………...2

[Definition - Experiment](#_Definition_2.1_-)…….………....……………………..……………………....………………………………...2

[Definition - Simple event](#_Definition_2.2_-)…….………....……………………..……………………....………………………..……...2

[Definition - Sample Space](#_Definition_2.3_-)…….………....……………………..……………………....……………………………...2

[Definition - Discrete Sample Space](#_Definition_2.4_-)…….………....……………………..……………………....………………..…...3

[Definition - Event](#_Definition_2.5_-)…….………....……………………..……………………....……………………………………….3

[Definition - Axioms that form definition of Probability](#_Definition_2.6_-)…….………....………………………....…………………....3

[Definition - Permutation](#_Definition_2.7_-)…….………....……………………..……………………....………………………...……...3

[Definition - Combination](#_Definition_2.8_-)…….………....……………………..……………………....…………………..…………...3

[Definition - Conditional Probability](#_Definition_2.9_-)…….………....……………………..……………………....…………….……...3

[Definition - Independence](#_Definition_2.10_-)…….………....……………………..……………………....………………….…………...4

[Theorem - The Multiplicative Law of Probability](#_Theorem_2.5_-)…….………....……………………………....………………….....4

[Theorem - The Additive Law of Probability](#_Theorem_2.6_-)…….………....……………………..……………....…………………...4

[Theorem - Relationship between](#_Theorem_2.7_-)  …….………....……………………..…………………………......4

[Definition - Partition](#_Definition_2.11_-)…….………....……………………..……………………....………………………….………...4

[Theorem - Bayes’ Rule](#_Theorem_2.9_-)…….………....……………………..……………………....……………………….………...5

[Definition - Random Variable](#_Definition_2.12_-)…….………....……………………..……………………....……………………...…...5

[Definition - Random Sample](#_Definition_2.13_-)…….………....……………………..……………………....…………………………...5

[Definition - Discrete](#_Definition_3.1_-)…….………....……………………..……………………....………………………..…………...5

[Definition - Sum of all probabilities of all sample points in S](#_Definition_3.2_-)…….………....………………....………………...…...5

[Definition - Probability Distribution](#_Definition_3.3_-)…….………....……………………..……………………....……………….…...5

[Definition - Expected Value](#_Definition_3.4_-)…….………....……………………..……………………....……………….…………...5

[Definition - Standard Deviation of distribution given by p(y)](#_Definition_3.5_-) …….………....……………………..………………....5

[Definition - Binomial Experiment](#_Definition_3.6_-)…….………....……………………..……………………....……………………...6

[Definition - Binomial Distribution](#_Definition_3.7_-)…….………....……………………..……………………....……………………...6

[Definition - Geometric Probability Distribution](#_Definition_3.8_-)…….………....…………………….…………....…………………...6

[Theorem - Geometric Distribution](#_Theorem_3.8_-)…….………....……………………..……………………....……………………...6

Chapter 1:

# **Definition 1.1 - Mean**

The *mean* of a sample of n measured responses … is given by

The corresponding population mean is denoted mu

# **Definition 1.2 - Variance**

The *variance* of a sample of measurements y1, y2,..., yn is the sum of the square of the differences between the measurements and their mean, divided by n − 1. Symbolically, the sample variance is

The corresponding population variance is denoted by the symbol σ2.

# **Definition 1.3 – Standard Deviation**

The standard deviation of a sample of measurements is the positive square root of the variance; that is,

The corresponding population standard deviation is denoted by

**Chapter 2:**

# **Definition 2.1 - Experiment**

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

# **Definition 2.2 - Simple Event**

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 - Sample Space**

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 - Discrete Sample Space**

A *discrete sample* space is one that contains either a finite or a countable number of distinct sample points.

# **Definition 2.5 - Event**

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

# **Definition 2.6 - Axioms that form definition of Probability**

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 … form a sequence of pairwise mutually exclusive events in

*S* (that is, then

# **Definition 2.7 - Permutation**

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 - Combination**

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 .

# **Definition 2.9 - Conditional Probability**

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 - Independence**

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),*

Otherwise, the events are said to be *dependent.*

# **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

The multiplicative law follows directly from Definition 2.9, the definition of conditional probability.

# **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 - Relationship between**

If A is an event, then

# **Definition 2.11 - Partition**

For some positive integer *k,* let the sets be such that

Then the collection of sets is said to be a *partition* of S.

# **Theorem 2.9 - Bayes’ Rule**

Assume that {} is a partition of S (see definition 2.11) such that

Then

# **Definition 2.12 - Random Variable**

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

# **Definition 2.13 - Random Sample**

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 ) 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.*

Chapter 3:

# **Definition 3.1 - Discrete**

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

# **Definition 3.2 - Sum of all probabilities of all sample points in S**

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 - Probability Distribution**

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 - Expected Value**

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

# **Definition 3.5 - Standard Deviation of distribution given by p(y)**

If Y is a random variable with mean E(Y ) = *µ,* the variance of a random variable *Y* is defined to be the expected value of *.* That is,

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

# **Definition 3.6 - Binomial Experiment**

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 - Binomial Distribution**

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 - Geometric Probability Distribution**

A random variable Y is said to have a *geometric probability distribution* if and only if

# **Theorem 3.8 - Geometric Distribution**

If *Y* is a random variable with a geometric distribution,