Project 1 Formula Sheet

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# Definition 1.1: Mean (page 9)

The mean of a sample of measured responses is given by:

The corresponding population mean is denoted .

# Definition 1.2: Variance (page 10)

The *variance* of a sample of measurements 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 .

# Definition 1.3: Standard Deviation (page 10)

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

# Definition 2.7 and Theorem 2.2: Permutation (page 43)

An ordered arrangement of distinct objects is called a *permutation*. The number of ways of ordering distinct objects taken at at a time will be designated by .

# Theorem 2.3: Number of Subsets of Various Sizes That Can Be Formed (page 44)

The number of ways of partitioning distinct objects into distinct group containing objects, respectively, where each object appears in exactly one group and , is:

# Definition 2.8 and Theorem 2.4: Combination (page 46)

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

# Definition 2.9: Conditional Probability (page 52)

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

provided . [The symbol is read “probability of given .”]

# Definition 2.10: Independent Events (page 53)

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

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

# Theorem 2.5: The Multiplicative Law of Probability (page 57)

The probability of the intersection of two events and is:

If and are independent, then:

# Theorem 2.6: The Additive Law of Probability (page 58)

The probability of the union of two events and is:

If and are mutually exclusive events, and

# Theorem 2.7: Probability of an Event and its Complement (page 59)

If is an event, then:

# Definition 2.11: Partition (page 70)

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

1. , for .

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

# Theorem 2.8: Decomposition (page 70)

Assume that is a partition of S (see Definition 2.11) such that , for . Then for any event :

# Theorem 2.9: Bayes’ Rule (page 71)

Assume that is a partition of S (see Definition 2.11) such that , for . Then:

# Definition 3.4: Expected Value (page 91)

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

# Theorem 3.2: Expected Value of (page 93)

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

# Definition 3.5: Variance of a Random Variable (page 93)

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: Mean or Expected Value of a Nonrandom Quantity is Equal to (page 95)

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

# Theorem 3.4: Mean or Expected Value of the Product of a Constant Times a Function of a Random Variable is Equal to the Constant Times the Expected Value of the Function of the Variable (page 95)

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

# Theorem 3.5: Mean or Expected Value of a Sum of Functions of a Random Variable is Equal to the Sum of Their Respective Expected Values (page 95)

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

# Theorem 3.6: Variance of a Discrete Random Variable

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

# Definition 3.7: Binomial Distribution (page 103)

A random variable is said to have a *binomial distribution* based on trials with success probability if and only if:

, and

# Theorem 3.7: Mean and Variance Associated with a Binomial Random Variable (page 107)

Let be a binomial random variable based on trials and success probability . Then:

and

# Definition 3.8: Geometric Probability Distribution (page 115)

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

,

# Theorem 3.8: The Mean of a Random Variable with a Geometric Distribution is Equal to (page 116)

If is a random variable with a geometric distribution:

and