**Nick Domenico**

**Probability and Applied Statistics Formula Sheet**

**Mean (Def 1.1):**

**Variance (Def 1.2):**

**Standard Deviation (Def 1.3):**

**Empirical Rule:**

contains approximately 68% of the measurements

contains approximately 95% of the measurements

contains almost all of the measurements

**Probability Axioms (Def 2.6):**

Axiom 1:

Axiom 2:

Axiom 3: If ,, , … form a sequence of pairwise mutually exclusive events in (that is, if ), then

**Permutations (Def 2.7 and Theorem 2.2):**

**Multinomial Coefficients (Theorem 2.3):**

**Combinations (Def 2.8 and Theorem 2.4):**

**Conditional Probability (Def 2.9):**

**Determine Independence (Def 2.10):**

**Multiplicative Law of Probability (Theorem 2.5):**

If A and B are independent:

**Additive Law of Probability (Theorem 2.6):**

If A and B are mutually exclusive:

**Complement Rule (Theorem 2.7):**

**Theorem of Total Probability (Theorem 2.8):**

\*How the book writes it:

**Bayes Theorem (Theorem 2.9):**

By theorem of total probability:

**Probability Mass Function (Def 3.2):**

**Probability Distribution (Def 3.3):**

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

**Discrete Probability Distribution Axioms (Theorem 3.1):**

1. for all

2. , where the summation is over all the values of with nonzero probability

**Expected Value (Discrete Random Variables) (Def 3.4):**

**Variance (Discrete Random Variables) (Def 3.5):**

**Standard Deviation (Discrete Random Variables):**

**Binomial Distribution (Def 3.7):**

and

* p = probability of success
* q = probability of failure
* n = # of trials
* y = # of successes

**Geometric Distribution (Def 3.8):**

* **Expected (Theorem 3.8):**
* **Variance (Theorem 3.8):**
* **Standard Deviation:**

**Geometric Distribution Extra Formulas:**

* **A success occurs on or before the nth trial:**
* **A success occurs before the nth trial:**
* **A success occurs on or after the nth trial:**
* **A success occurs after the nth trial:**

**Hypergeometric Distribution:**

where is an integer subject to the restrictions

and

* N = total number in set
* n = total number selected
* r = total number in subset
* y = number in subset we want
* **Expected (Theorem 3.10):**
* **Variance (Theorem 3.10):**
* **Standard Deviation:**

**Negative Binomial Distribution (Def 3.9):**

* **Expected (Theorem 3.9):**
* **Variance (Theorem 3.9):**

**Poisson Distribution (Def 3.11):**

* **Expected (Theorem 3.11):**
* **Variance (Theorem 3.11):**

**Tchebysheff’s Theorem (Theorem 3.14):**

or

**Formulas for Project 2**

**Probability Distribution Function (Def 4.1):**

for

**Properties of Distribution Functions (Theorem 4.1):**

1. is a nondecreasing function of y. [If and are *any* values such that , then ]

**Probability Density Function (Def 4.3):**

and it follows that

**Properties of Density Functions (Theorem 4.2):**

1. for all y,

**Probability Between Intervals (Theorem 4.3):**

**Expected (Continuous Random Variables) (Def 4.5):**

provided the that the integral exists

**Expected of a Function (Theorem 4.4):**

**Expected of Function Rules (Theorem 4.5):**

**Variance (Continuous Random Variables) (Example 4.6):**

**Uniform Distribution (Def 4.6):**

* **Expected:**
* **Variance:**

**Bivariate (Joint) Distributions (Def 5.1):**

or

**Joint Mass Function Properties (Theorem 5.1):**

1. for all
2. where the sum is over all values that are assigned nonzero probabilities

**Bivariate Distribution Function (Def 5.2):**

**Marginal Probability Functions (Def 5.4):**

and

**Marginal Density Functions (Def 5.4):**

and

**Conditional Discrete Probability (Def 5.5):**

**Conditional Distribution Function (Def 5.6):**

**Conditional Density Function (Def 5.7):**

or