Probability and Applied Statistics Formula Sheet

Chapter 2:

Mean:

Standard Deviation:

Variance:

Gaussian Distribution:

* : 68% of measurements
* : 95% of measurements
* : 99.7% of measurements

Definition 2.6

* **Axiom 1**:
* **Axiom 2**:
* **Axiom 3**: “If form a sequence of pairwise mutually exclusive events in note that if must be true: “\*

**Corollaries of the Axioms**

Theorem 2.1: **MN-Rule**

**Combination**:

**Permutation**:

**Multinomial Coefficients:**

**Conditional Probability**:

* Also,
* In general:

**Independence vs Dependence**

* **Independent** if:
* Otherwise, **dependent**

**Multiplicative Law of Probability**

* If both A and B are independent, then:

**General Additive Rule** (for arbitrary A and B)

* If both A and B are mutually exclusive, then: and
* Also,
  + If and are mutually exclusive:
  + If and are mutually exclusive:
  + By Axiom 3: and
    - So,

Theorem 2.7: **Complement Rule**

**Law of Total Probability**:

**Bayes’ Theorem**

* For events A and B in a sample space S, where and :
* If , then :

**Probability Distribution**:

* Definition 2.12: “A ***random variable*** is a real-valued function for which the domain is a sample space”
* Definition 3.1: “A random variable Y is said to be ***discrete*** if it can assume only a finite or countably infinite1 number of distinct values”
* Theorem 3.1: “For any discrete probability distribution, the following must be true:”
  + for all y
  + , where the summation is over all values of y with nonzero probability

**Expected Function**:

**Variance Function:**

**Standard Deviation Function**:

**Binomial Distribution:** where and

* Also,
* The probability of success is denoted by:
* The probability of failure is denoted by:
* **Expected:**
* **Variance:**

**Geometric Distribution:** , where and

* Also,
* The probability of success is denoted by:
* The probability of failure is denoted by:
* **Expected:**
* **Variance:**
* **Extra Formulas:**
  + A success occurs on or before the trial:
  + A success occurs before the trial:
  + A success occurs on or after the trial:
  + A success occurs after the trial:

**Negative Binomial Distribution:** , where and

* Also,
* The probability of success is denoted by:
* The probability of failure is denoted by:
* **Expected:**
* **Variance:**

**Hypergeometric Probability Distribution:** , where and and

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

**Poisson Probability Distribution:** , where and

* **Expected And Variance:**

**Tchebysheff’s Theorem:**  or

The mu and sigma are either given or obtained from other distributions, which we must figure out