Definition 1.1

The **mean** of a sample of n measured responses $y_1 y_2 \ldots y_n$ is given by

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n}(y_1)$$

The corresponding population mean is denoted μ.

Definition 1.2

The **variance** of a sample of measurements $y_1 y_2 \ldots y_n$ is the sum of the square of the differences between the measurements and their mean, divided by n − 1. . Symbolically, the sample variance is

$$\mathrm{s}^2 = \frac{1}{n-1}\sum_{i=1}^{n}(y_{1-}\bar{y})^2$$

The corresponding population variance is denoted by the symbol σ^2.

Definition 1.3

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

$$s = \sqrt{(s)^2}$$

The corresponding population standard deviation is denoted by $\sigma = \sqrt{(\sigma\,)^2}$

Definition 2.7

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 P_n^r

P_n^r = n (n – 1) (n − 2) ··· (n − r + 1) = $\frac{n!}{(n-r)}$

Definition 2.8

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 C_r^n or $\binom{r}{n}$.

P_n^r = n (n – 1) 0(n − 2) ··· (n − r + 1) = $\frac{n!}{(n-r)}$

Definition 2.9

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

$P(A|B) = \frac{P(A \cap B)}{P(B)}$, provided P(B) > 0. [The symbol P(A|B) is read "probability of A given B."]

Definition 3.7

A random variable Y is said to have a **binomial distribution** based on n trials with success probability p if and only if $P(y) = \binom{n}{y} P^y\, Q^{n-y},\ y = 0, 1, 2, \ldots, n$ and $0 \le p \le 1$.

Definition 3.8

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

$P(y) = Q^{y-1},\ y = 0, 1, 2, \ldots,\ 0 \le p \le 1.$

Definition 3.10

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

$$P(y) = \frac{\binom{r}{y}\binom{N-r}{n-y}}{\binom{N}{n}}$$

where y is an integer 0, 1, 2, ... n, subject to the restrictions $y \le r$ and $n - y \le N - r$.

Definition 3.11

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

$P(y) = \frac{\lambda^y}{y!} e^{-\lambda}$, y = 0, 1, 2, ..., $\lambda > 0$.