1.1 The *mean* of a sample of n measured responses

1.2 The *variance* of a sample of n measured responses

1.3 The *standard deviation* of a sample of n measured responses is the positive square root of the variance

The corresponding *population* standard deviation is denoted by

2.6 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 *A*1, *A*2, *A*3, … form a sequence of pairwise mutually exclusive events in *S* (that is, *Ai* ∩ *Aj* = ∅ if *i* ≠ *j*), then

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

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

2.9 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.”]

2.10 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), P(A∩B) = P(A)P(B). Otherwise, the events are said to be dependent.

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

3.5 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 (*Y* - *µ*)2. That is,

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

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

3.9 A random variable *Y* is said to have a *negative binomial probability distribution* if and only if

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

Where *y* is an integer 0, 1, 2, …, *n*, subject to the restrictions *y* ≤ *r* and *n* – *y* ≤ *N* – *r*

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

3.15 Let *Y* be an integer-valued random variable for which *P(Y=i)=pi*, where *i =* 0, 1, 2, …. The *probability-generating function P(t)* for *Y* is defined to be

For all values of *t* such that *P(t)* is finite

3.16 The *k*th *factorial moment* for a random variable *Y* is defined to be

Where *k* is a positive integer

4.1 Let Y denote any random variable. The *distribution function* of *Y*, denoted by *F*(y), is such that F(y)= P(Y ≤ y) for -∞ < y < ∞.

4.2 A random variable Y with distribution function F(y) is said to be *continuous* if F(y) is continuous, for -∞ < y < ∞.

4.3 Let F(y) be the distribution function for a continuous random variable Y. Then f(y), given by

Wherever the derivative exists, is called the *probability density function* for the random variable Y.

4.4 Let Y denote any random variable. If 0 < p < 1, the pth quantile of Y, denoted by φp, is the smallest value such that P(Y ≤ φq ) = F(φp) ≥ p. If Y is continuous, φp is the smallest value such that F(φp) = P(Y ≤ φp) = p. Some prefer to call φp the 100pth percentile of Y

4.5 The expected value of a continuous random variable Y is

Provided that the integral exists

4.6 If θ1 < θ2, a random variable Y is said to have a continuous *uniform probability distribution* on the interval (θ1, θ2) if and only if the density function of Y is

4.8 A random variable Y is said to have a *normal probability distribution* if and only if, for ơ > 0 and -∞ < µ < ∞, the density function of Y is

4.9 A random variable Y is said to have a *gamma distribution with parameters* α > 0 and β > 0 if and only if the density function of Y is

where

4.11 A random variable Y is said to have an *exponential distribution with parameter* β > 0 if and only if the density function of Y is

4.12 A random variable Y is said to have a *beta probability distribution with parameters* α > 0 *and* β > 0 if and only if the density function of Y is

where

4.13 If Y is a continuous random variable, then the *k*th *moment about the origin is* given by

The *k*th *moment about the mean*, or the *k*th *central moment*, is given by

4.14 If Y is a continuous random variable, then the *moment-generating function of* Y is given by

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The moment-generating function is said to exits if there exists a constant *b* > 0 such that *m*(t) is finite for |t| ≤ *b*.

4.15 Let Y have the mixed distribution function

and supposed that X1 is a discrete random variable with distribution function F1(y) and that X2 is a continuous random variable with distribution function F2(y). Let g(Y) denote a function of Y. Then

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