

Section 6.1 Notes
Random Variables and Expected Value

A _____ is a variable (typically represented by x) that has a single numerical value, determined by chance, for each outcome of a procedure.

- A _____ random variable has either a finite number of values or a countable number of values where "countable" refers to the fact that there might be infinitely many values, but they can be associated with a countable process.
- A _____ random variable has infinitely many values, and those values can be associated with measurements on a continuous scale without gaps or interruptions.

A _____ is a description that gives the probability for each value of the random variable. It is often expressed in the format of a graph, table, or formula.

Requirements:

- _____ where x assumes all possible values (That is, the sum of all probabilities must be 1).
- _____ for every individual value of x . (That is, each probability value must be between 0 and 1 inclusively).

PROBABILITY DISTRIBUTION FORMULAS:

Mean: _____ Variance #1: _____

Variance #2: _____ Standard Deviation: _____

The _____ of a discrete random variable is denoted by E , and it represents the average value of the outcomes.

Formula: _____

Example:

The random variable x is a count of the number of girls that occur when two babies are born.

1. Construct a table representing the probability distribution.

2. Find the mean.

3. Find the standard deviation.

The Effect of Linear Transformation of X on μ_x and σ_x

Mean: _____ Standard Deviation: _____

Addition and Subtraction Rules for Random Variables

Given X and Y are random variables.

Mean: $\mu_{X+Y} =$ _____
 $\mu_{X-Y} =$ _____

Variance $\sigma_{X+Y}^2 =$ _____
 $\sigma_{X-Y}^2 =$ _____

Example: A regular die is rolled, then a tetrahedral die is rolled. The difference is calculated.

1. Construct a probability distribution table of the difference of the number on the regular die and the number on the tetrahedral die.

2. Show that the mean and standard deviation is equivalent to the difference rules.

Section 6.2 Notes
The Binomial Distribution

A **binomial probability distribution** results from a procedure that meets all the following requirements:

- B** Each trial must have all outcomes classified into _____ (commonly referred to as success and failure).

- I** The trial must be _____. (The outcome of any individual trial doesn't affect the probabilities in the other trials.)

- N** The procedure has a _____

- S** The probability of a success _____ in all trials.

BINOMIAL PROBABILITY FORMULA

$$P(X = k) = \binom{n}{k} p^k (1 - p)^{n-k}$$

Where n = _____
k = _____
p = _____

$$\binom{n}{k} =$$

Example:

1. Find the probability of getting exactly 3 girls when 5 babies are born. Is this event unusual? Why or why not?

Formulas (ONLY can be used when it is a binomial distribution)

Mean: _____

Variance: _____

Standard Deviation: _____

Example: In a test of a gender-selection technique, 150 couples each have one baby, and the result consists of 100 girls and 50 boys.

1. Find the mean and standard deviation for the number of girls that would occur in groups of 150 births.

2. Is the result of 100 girls unusual? Why or why not?

